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THE NEW COLUMBIA ENCYCLOPEDIA



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THE COLUMBIA ENCYCLOPEDIA

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MANUFACTURED IN THE UNITED STATES OF AMERICA

PREFACE

The New Columbia Encyclopedia is the fourth edition of *The Columbia Encyclopedia*. Compact and ready for instant reference, the encyclopedia offers authentic and accurate information in condensed form. Cross-references enable the reader to locate an article quickly, and bibliographies at the end of many articles provide guides to additional reading matter. Since the development of specialization, no encyclopedia can succeed in presenting the sum of human knowledge. Nevertheless, the editors of *The New Columbia Encyclopedia* have provided the reader with a wide-ranging variety of subjects that fall within the province of a general reference work. There are articles on the arts and literature, geography, the life and physical sciences, and the social sciences.

The tradition of this encyclopedia can be traced back to the year 1935 and the late Clarke Fisher Ansley, the editor of the first edition. In the Preface to that edition, Dr. Ansley wrote:

One who makes good use of the art of reading needs to have three reference works at hand: a dictionary, an atlas, and an encyclopedia. The dictionary and the atlas for workaday purposes are each in one volume. On the Continent of Europe one-volume encyclopedias have long been in general use. *The Columbia Encyclopedia* has been compiled to serve readers of English in a like way, as the companion of the dictionary and the atlas.

Although the first edition was indeed comprehensive, it did not attempt to provide information for scholars in their own fields. According to Dr. Ansley: "The most that others may have in a specialist's field is first aid, and in the specialties of others, the specialist's need is not less than that of other men."

With these principles in mind, the editors reviewed authoritative sources and summarized generally accepted judgments, not individual interpretations. Insofar as possible, the first edition was a survey of prevailing views, written in language that was clear and intelligible to the general reader.

A second (1950) and a third (1963) edition of *The Columbia Encyclopedia* followed the first, adhering to Dr. Ansley's principle, while at the same time expanding it to meet the needs of contemporary readers. The fourth edition follows the tradition of the first three, of which there are more than 900,000 copies in print, applying it to the world of the 1970s. Between the first and second editions World War II effected enormous sociological and political changes. Between the second and third editions the space age came upon us, school curricula were revised in keeping with the importance of scientific discoveries, and the computer began to reshape our lives. In the years between the third and fourth editions more startling changes occurred. Men traveled more than 200,000 miles from earth and set foot on the moon, study increased in land use, conservation, and environmentalism, and in 1974 for the first time in history a President of the United States resigned from office. *The New Columbia Encyclopedia*, which covers these events, is as up to date as humanly possible as of January, 1975.

The fourth edition in many ways is really new. Although the encyclopedia is still intended primarily for English-speaking readers, its articles cover a wider variety of people, countries, and cultures than ever before. For example, coverage of Africa, Asia, and South America has been greatly expanded. In keeping with the increased knowledge and sophistication of readers, the science entries in this edition include more advanced and detailed

technical information than those in previous editions. *The New Columbia Encyclopedia* was set by computer, an innovation that enabled us to include more information on a page than in previous editions. The type of this edition is also easier to read.

For the convenience of the reader, the fourth edition contains certain other improvements. Drawings and maps are now found within or near the articles they illustrate. More information has been organized into charts for easy reference; for example, there are tables listing Shakespeare's plays, constellations, popes, U.S. Presidents and Supreme Court justices, British and Canadian prime ministers, and French, Spanish, and Russian rulers. Also, metric equivalents are given for most measurements in English standard units.

In the preparation of the fourth edition, every article from the third edition was reviewed. Some were revised or replaced, others were found to be more than adequate and remain as they were in the third edition. Also, we retained a special feature of all previous editions. There is an entry for every proper name in the Authorized Version (King James Version) of the Bible, with alternate names and spellings from the revised versions of the Bible whenever possible. As in former editions, because several people were involved in the production of an article, all entries are unsigned.

This encyclopedia is neither an official nor an unofficial publication of Columbia University, but without Columbia University this book would not have been possible. On the following pages is a list of academic consultants, many from the University, who gave unstintingly of their time and knowledge in helping us prepare the article lists, and in some instances the articles themselves, in their fields of specialty.

The population figures are from the most recent sources available at the time the articles were written. For the figures of the People's Republic of China, we are indebted to Kingsley Davis, Ford Professor of Sociology and Comparative Studies and Director of International Population and Urban Research, University of California, Berkeley. We are especially grateful to Hammond Inc. and to Ashley Talbot, Executive Editor, for his generous cooperation in making many of Hammond's vast files of population statistics available to us.

The editors of *The New Columbia Encyclopedia* wish to express our gratitude to Charles G. Proffitt, former President and Director of Columbia University Press, who from the very beginning of the encyclopedia through the third edition and the inception of the fourth edition has been its mentor and guide. Thanks are due to Robert G. Barnes, the present President and Director of the Press, who saw *The New Columbia Encyclopedia* through to its final stages. We wish also to thank Henry H. Wiggins, Assistant Director of the Press, for his dedication to the encyclopedia, a staff editor on the first two editions and consultant on the third, he contributed both experience and scholarship to the fourth edition. In addition, we are grateful to Gerard S. Mayers, who supervised the production of *The New Columbia Encyclopedia*, and to Marshall Lee, who was our consultant on typography and design and was responsible for setting the style of the maps and other illustrations. Finally, we wish to thank Rocappi, the computerized composition division of the Lehigh Press, Inc., who with patience and skill prepared our manuscript for computer typesetting.

HOW TO USE THE NEW COLUMBIA ENCYCLOPEDIA

The New Columbia Encyclopedia is easy to use. All articles are arranged alphabetically, with each article heading in **boldface type**. The headings of biographical articles are inverted and alphabetized by the subject's surname, with the exception of articles on some historical figures. Thus, William Faulkner appears as **Faulkner, William**, but Stephen Bathory and Joan of Arc are listed as **Stephen Bathory** and **Joan of Arc**.

The problem of alphabetizing names that include de, van, von, and the like has been resolved by employing as the heading the most commonly used form of the name. Accordingly, the German statesman Otto von Bismarck is entered as **Bismarck, Otto von**, while the painter Vincent van Gogh is under **Van Gogh, Vincent**, with a cross-reference from **Gogh, Vincent van**.

M', Mc, and Mac are listed as if they were spelled Mac. Thus the political scientist **McBain, Howard Lee** precedes the Scottish king **Macbeth**, who precedes the American author and public official **McCarthy, Charles**. In each instance it is the letter or letters after the Mc or Mac that determine the alphabetical order. Exceptions to this rule are African names beginning with M', they are listed in strict alphabetical order: M'Ba, Mbandaka, M'Bour, Mdina, etc.

Abbreviations are alphabetized as though they were spelled out (e.g., St is alphabetized as Saint). Therefore, the heading **St. Clair, Arthur** is listed before **Saint Clair, Lake**, which precedes **St. Denis, Ruth** and the Dutch island **Saint Eustatius**. Again, in each case the first letter of the word after Saint determines the alphabetical order.

When two or more articles have the same heading, entries are alphabetized by category: persons, places, and things. Thus, if one were to look for an article heading with the name Washington, **Washington, George** (person) would precede **Washington**, state (place), and that would precede **Washington, Treaty of** (thing). The order of entry for persons of the same name is determined by rank: saints, popes, emperors, kings, followed by titled nobility, such as crown prince, duke or count, baron, baronet, and so forth. Monarchs of the same name are listed numerically and alphabetically by country: **Charles X**, king of France, appears before **Charles III**, king of Naples, who in turn precedes **Charles III**, king of Spain.

Within some articles in *The New Columbia Encyclopedia*, related material is introduced by subheadings in smaller **boldface type**. For example, in the biographical article **Mond, Ludwig** there is a description of the **Mond process**. The main heading **naval conferences** contains five boldface subheadings: **London Naval Conference** (1908-9), **Washington Conference** (1921-22), **Geneva Conference** (1927), **London Conference** (1930), and **London Conference** (1935). If a reader wishes to have information on any one of these subheadings, he can find it directly without reading the entire article.

This method is also used for family articles. The **Bach** family article contains subheadings for seven members, three of these are cross-references to separate articles on **Johann Sebastian Bach**, **Carl Philipp Emanuel Bach**, and **Johann Christian Bach**.

Boldface numbers are also used in some multiple entries. For example, when several U.S. cities have the same name, they are

listed alphabetically by state in a single article.

Jacksonville. 1 City (1970 pop. 19,832), Pulaski co., central Ark. **2** City (1970 pop. 528,865), coextensive (since 1968) with Duval co., NE Fla. **3** City (1970 pop. 20,553), seat of Morgan co., W central Ill. **4** City (1970 pop. 16,289), seat of Onslow co., E N.C.

Because space is limited in a single-volume encyclopedia, information provided in one article is generally not repeated in another. Instead, cross-references are used extensively in the text to guide the reader to various articles containing related material. References to those headings are printed in SMALL CAPITALS. An example of this system may be found in the article **environmentalism**, which has the following definition: "movement to protect the quality and continuity of life through CONSERVATION OF NATURAL RESOURCES, prevention of POLLUTION, and control of LAND USE." All the articles mentioned in SMALL CAPITALS are in the encyclopedia and provide additional information; when read together, they will give the reader a basic understanding of this particular subject. There are many names mentioned in articles that are not indicated as cross-references. However, this does not necessarily mean that there are no separate articles on these persons in the encyclopedia. Cross-references are used only as a means of suggesting that there is further information about the subject matter.

Cross-referencing makes an index in *The New Columbia Encyclopedia* unnecessary. Some boldface entries are cross-references directing the reader to appropriate headings (**mind reading**: see PARAPSYCHOLOGY, TELEPATHY). Others catalog references pertaining to a particular subject; for example, **music** provides some 70 cross-references while instructing the reader how to locate specific information.

music. For information on types of music, see such articles as ABSOLUTE MUSIC, ALEATORY MUSIC, CHAMBER MUSIC, JAZZ. In addition, see entries on the music of various nations and peoples, including AMERICAN NEGRO SPIRITUALS, ARABIAN MUSIC, BALINESE MUSIC, and JEWISH LITURGICAL MUSIC, etc.

An additional aid to the reader is the bibliography that appears at the end of many articles. These books have been selected to enable the reader to expand his knowledge on a subject that cannot be treated at great length in a short-entry encyclopedia and, indeed, cannot be treated comprehensively in any encyclopedia. In order to save space not all books have been identified by title. Instead, the kind of work and the author are given. For example, at the end of the article on the French painter **Eugène Delacroix** there are bibliographic references to his journal, selected letters edited by J. Stewart, and studies by L. F. Johnson and G. P. Mras. Although no specific titles are given, such works may be found without difficulty by consulting the card catalog of a library.

Pronunciations have been provided for headings consisting of unfamiliar names or scientific terms; for many foreign names both native and anglicized pronunciation is shown. The key to pronunciation appears on page xi.

In order to conserve space, many abbreviations are used in the text. A list of terms abbreviated in *The New Columbia Encyclopedia* and other common abbreviations begins on page xii.

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KEY TO PRONUNCIATION

ə	sofa (sō'fə), item (ī'təm), easily (ē'zəlē), cannon (kān'an), circus (sūr'kəs)	ng	singing (sīng'ing), finger (fīng'gər), sang (sāng), sank (sāngk)
ă	act (ăkt), bat (băt)	ō	hot (hōt), body (bōd'e)
ā	ape (āp), fail (fāl), day (dā)	ō	over (ō'vər), hope (hōp), grow (grō)
â	air (âr), care (kâr)	ô	orbit (ôr'bit), fall (fôl), saw (sô)
a	art (art), father (fa'thər)	ōō	foot (fōōt), wolf (wōōlf), put (pōōt), pure (pyōōr)
b	back (băk), labor (lā'bər), cab (kāb)	ou	boot (bōōt), lose (lōōz), drew (drōō), true (trōō)
ch	chin (chīn), hatchet (hăch'ət), rich (rīch)	oi	oil (oil), royal (roi'əl), boy (boi)
d	dock (dōk), lady (lā'dē), sad (sād)	ou	out (out), crowd (kroud), how (hou)
ě	end (ěnd), steady (stěd'ě), met (mět)	p	pipe (pīp), happy (hăp'ē)
ē	eve (ēv), clear (klēr), see (sē)	r	road (rōd), appeared (əpērd'), carpenter (kar'pəntər)
f	fat (fât), phase (fāz), cough (kôf)	s	so (sō), cite (sīt), baste (bāst)
g	get (gēt), bigger (bīg'ər), tag (tāg)	sh	shall (shāl), sure (shōōr), nation (nā'shən)
h	hand (hănd), ahead (əhēd')	t	tight (tīt), better (bět'ər), talked (tōkt)
hw	wheel (hwēl), which (hwīch)	th	thin (thīn), bath (băth)
ī	it (īt), pill (pīl), mirror (mīr'ər)	th	then (thēn), father (fa'thər), bathe (băth)
ī	iron (ī'ərən), eye (ī), buyer (bī'ər)	ū	but (būt), flood (flūd), some (sūm)
j	jam (jām), ginger (jīn'jər), edge (ěj)	û	curl (kûrl), girl (gûrl), fern (fûrn), worm (wûrm)
k	kit (kīt), tackle (tak'əl), cook (kōōk)	v	vest (vēst), trivial (trīv'ēəl), eve (ēv)
l	little (līt'əl), holly (hōl'ē), pull (pōōl)	w	wax (wăks), twins (twīnz), coward (kou'ərd)
m	man (măn), hammer (hăm'ər), climb (klīm)	y	you (yōō), onion (ūn'yən)
n	new (nōō), known (nōn), winner (wīn'ər)	z	zipper (zīp'ər), ease (ēz), treads (trēdz)
		zh	pleasure (plēzh'ər), rouge (rōōzh)

Foreign Sounds

o	as in French <i>peu</i> (po), German <i>Goethe</i> (go'tə)
u	as in French <i>Cluny</i> (klunē')
kh	as in German <i>ach</i> (akh), <i>ich</i> (īkh), Scottish <i>loch</i> (lōkh)
N	this symbol indicates that the preceding vowel is nasal as in French <i>cinq</i> (sāNk), <i>un</i> (oN), <i>sans</i> (saN), <i>tombe</i> (tōNb), <i>en</i> (āN)

Accents and Hyphens

- ' primary accent, written after accented vowel or syllable *Nebraska* (nəbrās'kə), *James Buchanan* (byōōkā'nən)
- '' secondary accent *Mississippi* (mīs''əs-sīp'ē)
- dash, replacing obvious portion of pronunciation *hegemony* (hījēm'anē, hē-, hēj'əmō'nē, hēj'ə-)
- hyphen, to prevent ambiguity in syllabification *Erlanger* (ūr'lāng-ər), *dishearten* (dīs-har'tən)

ABBREVIATIONS

The following abbreviations are used in the text of *The New Columbia Encyclopedia*

<p>Å = angstrom AA = Alcoholics Anonymous AAA = Agricultural Adjustment Agency, American Automobile Association AB = <i>Artium Baccalaureus</i> [Bachelor of Arts] ABA = American Bar Association abbr = abbreviation(s), abbreviated abr = abridged AC = alternating current Acad = Academy ACLU = American Civil Liberties Union AD = <i>anno Domini</i> [in the year of the Lord] AEC = Atomic Energy Commission AFL = American Federation of Labor AFTRA = American Federation of Television and Radio Artists Afrik = Afrikaans AIA = American Institute of Architects AKC = American Kennel Club ALA = American Library Association Ala = Alabama alt = altitude Alta = Alberta AM = <i>ante meridiem</i> [before noon], <i>Artium Magister</i> [Master of Arts] AM = amplitude modulation AMA = American Medical Association amp = ampere(s) amp-hr = ampere-hour(s) amu = atomic mass unit(s) antilog = antilogarithm AP = Associated Press Arab = Arabic Ariz = Arizona Ark = Arkansas AS = Anglo-Saxon ASCAP = American Society of Composers, Authors, and Publishers Assn = Association ASSR = Autonomous Soviet Socialist Republic at no = atomic number at % = atomic percent at wt = atomic weight AU = atomic unit(s) Aug = August AV = Authorized Version AVC = American Veterans Committee avdp = avoidupois Ave = Avenue AWOL = absent without leave b = born, born in BA = Bachelor of Arts B Arch = Bachelor of Architecture BBC = British Broadcasting Corporation BC = before Christ BD = Bachelor of Divinity BEV = billion electron volts BLit = Bachelor of Literature B Mus = Bachelor of Music bp = boiling point BPOE = Benevolent Protective Order of Elks Brig Gen = Brigadier General BS = Bachelor of Science Btu = British thermal unit(s) Bul = Bulletin Bulg = Bulgarian C = Celsius (centigrade) c = circa [about]</p>	<p>CAA = Civil Aeronautics Administration cal = calorie(s) Calif = California Cant = Canticles (Song of Solomon) Capt = Captain CARE = Cooperative for American Remittances to Everywhere cc = cubic centimeter(s) cd = candela(s) cent = century, centuries CENTO = Central Treaty Organization cgs = centimeter-gram-second Chin = Chinese Chem E = Chemical Engineer Chron = Chronicles CIA = Central Intelligence Agency CID = Criminal Investigation Department CIO = Congress of Industrial Organizations cm = centimeter(s) cm/sec² = centimeter(s) per second per second co = county Col = Colonel, Colossians Coll = Collection Colo = Colorado Comdr = Commander COMECON = Council for Mutual Economic Assistance comp = compiled, compiler com pop = commune population Conn = Connecticut Cor = Corinthians CORE = Congress of Racial Equality Corp = Corporation cos = cosine cot = cotangent coul = coulomb(s) CPA = Certified Public Accountant Cpl = Corporal CPO = Chief Petty Officer CSC = Civil Service Commission csc = cosecant cu = cubic CVA = Columbia Valley Authority CWA = Civil Works Administration d = died, died in Dan = Daniel, Danish DAR = Daughters of the American Revolution dB = decibel(s) DC = direct current DC = District of Columbia DCL = Doctor of Civil Law DD = Doctor of Divinity DDS = Doctor of Dental Surgery DDT = Dichloro-diphenyl-trichloroethane Dec = December, declination Del = Delaware dept = department Deut = Deuteronomy dist = district div = division Dr = doctor dr = dram(s) D Sc = Doctor of Science Du = Dutch E = east ECA = Economic Cooperation Administration Eccles = Ecclesiastes Ecclus = Ecclesiasticus</p>	<p>ECSC = European Coal and Steel Community ed = edited, edition, editor(s) EDC = European Defense Community EE = Electrical Engineer EEC = European Economic Community EFTA = European Free Trade Association eg = <i>exempli gratia</i> [for example] emf = electromotive force emu = electromagnetic unit(s) Eng = English enl = enlarged Eph = Ephesians ERA = Emergency Relief Administration ERP = European Recovery Program ESC = Economic and Social Council (UN) ESP = extrasensory perception et al = <i>et alii</i> [and others] EV = electron volts Ex = Exodus Ezek = Ezekiel F = Fahrenheit, farad F = formal FAA = Federal Aviation Administration fac = facsimile FAO = Food and Agriculture Organization of the United Nations FBI = Federal Bureau of Investigation FCC = Federal Communications Commission Feb = February FDA = Food and Drug Administration FEPC = Fair Employment Practices Committee Finn = Finnish fl = <i>floruit</i> [flourished] Fla = Florida fl oz = fluid ounce(s) FM = frequency modulation FPO = Fleet Post Office Fr = French ft = foot, feet ft-lb = foot-pound(s) FTC = Federal Trade Commission G = gauss Ga = Georgia Gal = Galatians gal = gallon(s) Gall = Gallery Gen = General, Genesis Ger = German GEV = billion electron volts GHz = gigahertz GMT = Greenwich mean time GNP = gross national product GOP = Grand Old Party (Republican party) Gov = Governor Gr = Greek grad = graduated, graduated at h = hour H = henry Hab = Habakkuk Hag = Haggai Heb = Hebrew, Hebrews (NT) HMS = His (Her) Majesty's Ship, His (Her) Majesty's Service Hon = the Honorable hp = horsepower hr = hour(s)</p>	<p>Hung = Hungarian Hz = hertz or cycle(s) per second IADB = Inter-American Defense Board IAU = International Astronomical Union ICAO = International Civil Aviation Organization ICBM = intercontinental ballistic missile ICC = Interstate Commerce Commission Icel = Icelandic ie = <i>id est</i> [that is] IGY = International Geophysical Year ILA = International Longshoremen's Association ILGWU = International Ladies Garment Workers Union Ill = Illinois ILO = International Labor Organization in = inch(es) inc = incorporated Ind = Indiana Inst = Institute, Institution introd = introduction IQ = intelligence quotient IRA = Irish Republican Army IRBM = intermediate-range ballistic missile Isa = Isaiah Ital = Italian ITO = International Trade Organization ITU = International Telecommunications Union IUPAC = International Union of Pure and Applied Chemistry IWW = Industrial Workers of the World J = joule(s) Jan = January Jap = Japanese JD = <i>Juris Doctor</i> [Doctor of Laws] Jer = Jeremiah Jg = junior grade Jr = junior K = Kelvin kc = kilocycle(s) kg = kilogram(s) kg m = kilogram meter(s) KKK = Ku Klux Klan kl = kiloliter(s) km = kilometer(s) kw = kilowatt(s) kwh = kilowatt hour(s) Ky = Kentucky £ = <i>libra</i> [pound], <i>librae</i> [pounds] La = Louisiana Lam = Lamentations Lat = Latin lat = latitude lb = <i>libra</i> [pound], <i>librae</i> [pounds] Lev = Leviticus LHD = <i>Litterarum Humaniorum Doctor</i> [Doctor of Humane Letters] Lib = Library lim = limit Lith = Lithuanian Litt B = <i>Litterarum Baccalaureus</i> [Bachelor of Literature] Litt D = <i>Litterarum Doctor</i> [Doctor of Literature]</p>
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LL B = *Legum Baccalaureus* [Bachelor of Laws]
 LL D = *Legum Doctor* [Doctor of Laws]
 ln = logarithm, natural
 log = logarithm
 long = longitude
 LSD = lysergic acid diethylamide
 Lt = Lieutenant
 Lt Col = Lieutenant Colonel
 Ltd = Limited
 Lt Gen = Lieutenant General
 m = meter(s)
 M = molar
 m = molal
 m = minute(s)
 m/sec² = meters per second per second
 M A = Master of Arts
 Mac = Maccabees
 Maj Gen = Major General
 Mal = Malachi
 Man = Manitoba
 Mass = Massachusetts
 mass no = mass number
 Mat = Matthew
 M D = *Medicinae Doctor* [Doctor of Medicine]
 Md = Maryland
 M E = Mechanical Engineer, Middle English
 MEV = million electron volts
 Mex = Mexican
 mg = milligram(s)
 M H G = Middle High German
 mi = mile(s)
 Mich = Michigan
 min = minute(s)
 Minn = Minnesota
 Miss = Mississippi
 mks = meter-kilogram-second
 ml = milliliter(s)
 Mlle = Mademoiselle [Miss]
 mm = millimeter(s)
 Mme = Madame [Mrs]
 Mo = Missouri
 Mont = Montana
 m p = melting point
 mph = miles per hour
 Mr = Mister (always abbreviated)
 Mrs = Mistress (always abbreviated)
 MS, MSS = manuscript(s)
 M S = Master of Science
 Msgr = Monsignor
 Mt = Mount, Mountain
 mts = mountains
 Mus = Museum
 Mus B = *Musicae Baccalaureus* [Bachelor of Music]
 Mus D = *Musicae Doctor* [Doctor of Music]
 MVA = Missouri Valley Authority
 N = north, Newton(s)
 N = normal (unit of measure)
 NAACP = National Association for the Advancement of Colored People
 NAM = National Association of Manufacturers
 NASA = National Aeronautics and Space Administration
 NATO = North Atlantic Treaty Organization
 N B = New Brunswick
 N C = North Carolina

NCO = Noncommissioned Officer
 N Dak = North Dakota
 NE = northeast
 NEA = National Education Association
 Nebr = Nebraska
 Neh = Nehemiah
 Nev = Nevada
 New Lat = New Latin
 N F = Newfoundland
 N H = New Hampshire
 N J = New Jersey
 NLRB = National Labor Relations Board
 N Mex = New Mexico
 no = *numero* [number]
 Nor = Norwegian
 Nov = November
 NRA = National Recovery Administration
 NROTC = Naval Reserve Officers' Training Corps
 N S = New Style, Nova Scotia
 Num = Numbers
 NW = northwest
 N Y = New York
 NYA = National Youth Administration
 OAS = Organization of American States
 Obad = Obadiah
 Oct = October
 O E = Old English
 OECD = Organization for Economic Cooperation and Development
 OEO = Office of Economic Opportunity
 OES = Office of Economic Stabilization
 O Fr = Old French
 O H G = Old High German
 Okla = Oklahoma
 O N = Old Norse
 Ont = Ontario
 Op = *Opus* [work]
 OPA = Office of Price Administration
 O S = Old Style
 OSS = Office of Strategic Services
 oz = ounce(s)
 Pa = Pennsylvania
 PAU = Pan American Union
 Pd D = *Pedagogiae Doctor* [Doctor of Pedagogy]
 P E I = Prince Edward Island
 Pers = Persian
 PFC = Private First Class
 Ph B = *Philosophiae Baccalaureus* [Bachelor of Philosophy]
 Ph D = *Philosophiae Doctor* [Doctor of Philosophy]
 Philip = Philipians
 pl = plural
 P M = *post meridiem* [afternoon]
 PO = Petty Officer
 Pol = Polish
 pop = population
 Port = Portuguese
 Pr of Manas = Prayer of Manasses
 Prov = Proverbs
 prov(s) = province(s)
 Ps = Psalm
 pseud = pseudonym
 Pss = Psalms
 pt = pint(s)
 pt = part(s)
 pub = published, publisher

Pvt = Private
 PWA = Public Works Administration
 qt = quart(s)
 Que = Quebec
 R = Roentgen
 R A = right ascension
 RAF = Royal Air Force
 repr = reprinted
 Rev = Revelation, the Reverend
 rev = revised
 R I = Rhode Island
 R N = registered nurse
 RNA = ribonucleic acid
 Rom = Romans
 ROTC = Reserve Officers Training Corps
 rpm = revolution(s) per minute
 RR = railroad
 RSFSR = Russian Soviet Federated Socialist Republic
 RSV = Revised Standard Version
 Rt Rev = the Right Reverend
 Rum = Rumanian
 Rus = Russian
 RV = Revised Version
 S = south
 s = second(s)
 Sam = Samuel
 Sask = Saskatchewan
 S C = South Carolina
 Sc D = *Scientiae Doctor* [Doctor of Science]
 S Dak = South Dakota
 SE = southeast
 SEATO = Southeast Asia Treaty Organization
 SEC = Securities and Exchange Commission
 sec = second(s), secant
 Sept = September
 Ser = Series
 Sgt = Sergeant
 sin = sine
 S J = *Socretas Jesu* [Society of Jesus]
 Skt = Sanskrit
 Song = Song of Solomon
 SOS = distress signal (not a true abbreviation)
 Span = Spanish
 SPCA = Society for the Prevention of Cruelty to Animals
 SPCC = Society for the Prevention of Cruelty to Children
 sp gr = specific gravity
 sq = square
 Sr = Senior
 S S = Steamship
 SSR = Soviet Socialist Republic
 St = Saint, Street
 S T D = *Sacrae Theologiae Doctor* [Doctor of Sacred Theology]
 Ste = *Sainte* [Saint, feminine]
 STP = standard temperature and pressure
 SW = southwest
 Swed = Swedish
 tan = tangent
 TASS = Telegraphnoye Agentstvo Sovyetskovo Soyuzu (Soviet News Agency)
 Tenn = Tennessee
 Thess = Thessalonians
 Tim = Timothy
 TNT = trinitrotoluene, trinitrotoluol

tr = translated, translation, translator(s)
 Turk = Turkish
 TVA = Tennessee Valley Authority
 UAW = United Automobile Workers
 UCV = United Confederate Veterans
 UDC = United Daughters of the Confederacy
 UHF = ultrahigh frequency
 Ukr = Ukrainian
 UMW = United Mine Workers
 UN = United Nations
 UNESCO = United Nations Educational, Scientific, and Cultural Organization
 UNICEF = United Nations Children's Fund
 uninc = unincorporated
 Univ = University
 UNRRA = United Nations Relief and Rehabilitation Administration
 UPI = United Press International
 U S = United States
 USA = United States Army
 USAF = United States Air Force
 USBGN = United States Board on Geographic Names
 USCG = United States Coast Guard
 USMC = United States Marine Corps
 USN = United States Navy
 USO = United Service Organizations
 U S S = United States Ship
 USSR = Union of Soviet Socialist Republics
 V = volt(s)
 VA = Veterans Administration
 Va = Virginia
 var = variety (in botany)
 Ved = Vedic
 VFW = Veterans of Foreign Wars
 VHF = very high frequency
 VISTA = Volunteers in Service to America
 vol = volume(s)
 vs = versus
 Vt = Vermont
 W = west, watt(s)
 WAC = Women's Army Corps
 Wash = Washington
 WAVES = Women Accepted for Voluntary Emergency Service (United States Women's Naval Reserve)
 WCTU = Woman's Christian Temperance Union
 WFU = World Federation of Trade Unions
 WHO = World Health Organization
 Wis = Wisconsin
 WMO = World Meteorological Organization (UN)
 WPA = Work Projects Administration
 wt = weight
 W Va = West Virginia
 Wyo = Wyoming
 yd = yard(s)
 YMCA = Young Men's Christian Association
 YMHA = Young Men's Hebrew Association
 YWCA = Young Women's Christian Association
 YWHA = Young Women's Hebrew Association
 Zech = Zechanah
 Zeph = Zephaniah

THE NEW COLUMBIA ENCYCLOPEDIA



A, first letter of the ALPHABET Its Greek correspondent is named alpha, symbolizing God It is a usual symbol for a low central vowel as in *father*, English *ā* is pronounced as a diphthong of *ē* and *y* In MUSICAL NOTATION it is the symbol of a note in the scale

Aa (a) [from a word for "water" of the same Indo-European root as Lat *aqua*], name of many small streams of N Europe and Switzerland **Aa**, or a derivative of it, is a component part of hundreds of European place names

aa (ā'a) see LAVA

Aabenraa: see ÅBENRÅ, Denmark

Aachen (ä'khan), **Aix-la-Chapelle** (äks-lä-shapël'), or **Bad Aachen** (bät ä'khan), city (1970 pop 173,473), North Rhine-Westphalia, W West Germany, near the Belgian and Dutch borders One of the great historic cities of Europe, it is now chiefly important as an industrial center and rail and road junction Its manufactures include textiles, machinery, rubber goods, metal products, and furniture Hard coal is mined in the region The city's hot mineral baths, frequented by the Romans in the 1st cent AD, are still used to treat gout, rheumatism, and skin diseases Charlemagne, who was probably born in Aachen in 742, made the city his northern capital and the leading center of Carolingian civilization He built a splendid palace and founded the great cathedral, which reputedly contained his tomb The cathedral, which has an octagonal nucleus modeled on the Church of San Vitale in Ravenna, Italy, received extensive Gothic additions in the 14th-15th cent From 936 to 1531, German kings were usually crowned at Aachen Although it later declined in importance, Aachen remained a free imperial city until it was occupied (1794) by French troops and later annexed (1801) by France It passed to Prussia in 1815 From 1918 to 1930 the city was occupied by the Allies as a result of Germany's defeat in World War I During World War II approximately two thirds of Aachen was destroyed by aerial bombardment, and the city was the first major German city to fall (Oct, 1944) to the Allies Treaties ending the War of Devolution (1668) and the War of the Austrian Succession (1748) were signed at Aachen (see AIX-LA-CHAPELLE, TREATY OF) At the Congress of Aix-la-Chapelle (1818) Czar Alexander I of Russia unsuccessfully proposed that the Holy Alliance be tightened Aachen is the site of a technical university

Aakjaer, Jeppe (jēp'ä ök'yär), 1866-1930, Danish poet and novelist He wrote mostly of his native Jutland, and his concern for the poor is reflected in such novels as *The Peasant's Son* (1899) and *Children of Wrath* (1904) Aakjaer's finest work is his poetry, *Songs of the Rye* (1906) and *Heimdal's Wanderings* (1924) Recall his lyric gift

Aalborg: see ÅLBORG, Denmark

Aalesund see ÅLESUND, Norway

Aalsmeer (äls'mär), town (1970 pop 18,666), North Holland prov, W central Netherlands, on Westeinder Plassen lake, near Amsterdam It has one of the largest flower nurseries in Europe

Aalst (älst), Fr *Alost*, city (1970 pop 46,659), East Flanders prov, W central Belgium It is a commercial and industrial center, manufactures include textiles, clothing, and footwear Known since the 9th cent, Aalst was held by France from 1667 to 1706 and was the capital of Austrian Flanders in the 18th cent Of note are the city hall (13th cent) and the Church of St Martin (15th cent), which contains a painting by Rubens

Aalto, Alvar (öl'vär äl'tö), 1898-, Finnish architect and furniture designer Aalto is considered one of the foremost architects of the 20th cent Most of his designs were made in collaboration with his wife, Aino Marsio, the celebrated furniture designer, until her death in 1949 Aalto's work adapts Finnish building traditions to modern European techniques and to the specific function of the structure in boldly expressive style His designs for the municipal library at Viipuri (1927-35, destroyed when it was made part of Russian territory in 1940) and the tuberculosis sanitarium at Paimio (1929-33) are out-

standing functionalist works He gained international fame by his remarkable designs for laminated-wood furniture and by his plans for the Finnish pavilions at the expositions in Paris (1937) and New York (1939) Appointed professor at the Massachusetts Institute of Technology in 1940, he designed there the serpentine Baker House (1947-48) After World War II he was active in reconstruction in Finland His major postwar works include a number of striking civic buildings in Helsinki, the Maison Carre in Paris (designed in collaboration with Elissa Makkinkheim, his second wife), and the Wolfsburg cultural center in Germany See his complete works, ed by Karl Fleig (tr of 3d ed, 2 vol, 1970-71), studies by F A Gutheim (1960) and George Baird, ed (1971)

Aar, river see AARE

Aarau (ä'rou), town (1970 pop 16,881), capital of Aargau canton, N Switzerland, at the foot of the Jura mts and on the Aare River A noted shoe-manufacturing center, it also has factories producing bells, mathematical instruments, electrical and optical goods, and other products Aarau was founded c 1250, it was the temporary capital (1798) of the HELVETIC REPUBLIC

aardvark (ärd'vark) [Du, =ground pig], nocturnal mammal of the genus *Orycteropus*, sole representative of the order Tubulidentata There are two species, one in central Africa and the other in S Africa The aardvark, about 6 ft (180 cm) long, has a long snout, large erect ears, an almost naked or sparsely haired body, and a long tail Its forefeet are adapted for making burrows in the ground and for clawing open the nests of ants and termites in order to capture the insects with its long sticky tongue Its cylindrical teeth are without enamel and roots The aardvark resembles the New World ANTEATERS but is not closely related to them It is also called ant bear and earth pig Aardvarks are classified in the phylum CHORDATA, subphylum Vertebrata, class Mammalia, order Tubulidentata, family Orycteropodidae

aardwolf (ärd'wölf), carnivore of the HYENA family The aardwolf, *Proteles cristatus*, resembles the true hyena but is smaller and more delicate It has less powerful teeth and jaws and five instead of four toes on its forepaws The coat of the aardwolf is yellow-gray with dark stripes, a ridge of hair extends down its sloping back It is a nocturnal, burrowing animal, inhabiting sandy plain and scrub from South Africa to Angola and Somaliland A timid beast, it feeds on small animals and insects, especially termites, and defends itself by emitting a foul-smelling fluid from anal scent glands A litter may include as many as six cubs, but two to four is typical, gestation lasts three months Aardwolves are solitary, but several females with cubs may share a burrow In captivity they have been known to live as long as 13 years Aardwolves are classified in the phylum CHORDATA, subphylum Vertebrata, class Mammalia, order Carnivora, family Hyenidae

Aare (är'ä) or **Aar** (är), longest river entirely in Switzerland, 183 mi (295 km) long, rising in the Bernese Alps and fed by several glaciers The upper Aare emerges from dam-impounded Grimsel Lake and flows generally W through Lake Brienz, past Interlaken (where it is canalized), and through Lake Thun, the head of navigation The Aare continues northwest, flowing through Bern before turning and flowing generally northeast, past Solothurn and Aarau, to join the Rhine River opposite Waldshut, West Germany With its chief tributaries, the Reuss and Limmat rivers, the Aare drains most of Switzerland The Aare is connected with Lake Biel by two canals Near Meiringen, the Aare flows through a scenic gorge There are more than 40 hydroelectric power plants on the river

Aargau (är'gou), Fr *Argovie*, canton (1970 pop 433,284), 542 sq mi (1,404 sq km), N Switzerland AARGAU is the capital It is traversed by the Aare and Reuss rivers, and there are wooded hills and fertile valleys Cereals and fruit are raised, and cattle grazing is important Textiles, electrical goods, paper, cement, and metal products are the principal manu-

factures BADEN and RHEINFELDEN are noted health resorts Originally a Celtic settlement, the area was later occupied by the Romans and fell to the Franks in the 6th cent The territory was taken (1415) by BERN from the house of Hapsburg and was governed by the Swiss cantons until 1798 In 1803, Aargau was admitted as a canton to the Swiss Confederation Its population is mainly German-speaking and Protestant

Aarhus: see ÅRHUS, Denmark

Aaron (är'an), in the Bible, first high priest of the Hebrews, the brother of Moses and his spokesman in Egypt He was the instrument of Jehovah in miracles, as in turning his rod into a serpent and in causing the rod to bud, blossom, and bear almonds He made the golden calf and took part in the worship of it Ex 4 14-16, 6 20, 7 1-12, 28-32, Num 12, 17, 18, 20, 33 38, 39, Deut 10 6 His descendants were high priests and priests The prestige of descent from him was emphasized especially after the Exile

Aaron, Hank, 1934-, U S baseball player, b Mobile, Ala His real name is Louis Henry Aaron A right-handed batter with remarkable bat control, he played most of his major league career with the Braves, first in Milwaukee (1954-65) and then in Atlanta (1966-74) At the end of the 1974 season he was traded to the Milwaukee Brewers In 1974, Aaron broke Babe Ruth's monumental lifetime record of 714 home runs, closing the season with 733 Also a fine outfielder with an excellent arm, he was the major league lifetime leader in extra-base hits and total bases

Aaron's-beard, name sometimes applied to several plants usually characterized by some beardlike aspect, as the 5t John's-wort because of its many stamens and the Kenilworth ivy because of its thread-like runners Aaron's-beard cactus is *Opuntia leucotricha*, a true cactus

Aaron's-rod, popular name for several tall-flowering, infrequently branching plants, such as golden-rod and mullein The name is an allusion to the rod that Aaron placed before the ark and that miraculously blossomed and bore almonds (Num 17 8)

Aba (ä'bä), city (1969 est pop 152,000), SE Nigeria It is an important regional market, a road and rail hub, and a manufacturing center for textiles, pharmaceuticals, processed palm oil, shoes, plastics, soap, and beer Originally a small 180 village, Aba was developed by the British as an administrative center in the early 20th cent In 1929, women in Aba rioted against Britain's arbitrary use of indigenous persons as rulers and against direct taxation

abacá see MANILA HEMP

Abaco and Cays (äb'äkö, kēz, káz), island group, c 780 sq mi (2,020 sq km), most northerly of the Bahamas Islands It includes Great Abaco (the largest), Little Abaco, and the surrounding islets The low islands, composed mainly of coral limestone, have native pine forests Fish and sponges are taken from surrounding waters Great Abaco was settled by Loyalists from New York City in 1783

abacus (äb'akəs), in architecture, flat slab forming the top member of a capital In classical orders it varies from a square form having unmolded sides in the Greek Doric, to thinner proportions and ovolo molding in the Greek Ionic, and to sides incurving and corners cut in Roman Ionic and Corinthian examples In Romanesque work the abacus is heavier in proportion, projects less, and is generally molded and decorated In Gothic work the form varies, appearing in square, circular, and octagonal forms with molded members

abacus (äb'äkas, äbäk'-), in mathematics, simple device for performing arithmetic calculations The type of abacus now best known is represented by a frame with sliding counters An elementary abacus might have ten parallel wires strung between two boards on a frame, with nine beads on each wire Each bead on a given wire has the same value either ten or some multiple or submultiple of ten For example, all of the beads on a particular wire may have a value of 1, making this the units wire, or 10,

making this wire the tens wire. Numbers are represented and added together on the abacus by grouping beads together. To represent 155, five beads on the units wire are separated from the others on that wire, five beads on the tens wire, and one bead on the hundreds wire. To add 243 to 155, three more beads on the units wire are slid over to join the group of five, four more beads on the tens wire join the five there, and two more beads on the hundreds wire join the one there. The number 398 is now represented on the abacus. Subtraction can be performed by separating groups of beads. More elaborate processes are used to perform multiplication and division. The abacus is used for calculating in the Middle East, the Orient, and Russia and for teaching children the elements of arithmetic in many countries. An apparatus of pebbles or other movable counters was known in antiquity to the Egyptians, Greeks, Romans, and Chinese. A special merit of the abacus was that it simplified the addition and subtraction of numbers written in Roman numerals. Another type of abacus includes a board covered with sand or wax to facilitate making and erasing marks. See J. M. Pullan, *The History of the Abacus* (1968), P. H. Moon, *The Abacus* (1971).

Abadan (ābādān', ābadan'), city (1971 est. pop. 281,000), Khuzestan prov., SW Iran, on Abadan Island, in the delta of the Shatt al Arab, at the head of the Persian Gulf. It is the terminus of major oil pipelines and is an important oil refining and shipping center. There is a large petrochemical complex that produces plastics, detergents, and caustic soda. Abadan is the point of origin of a natural gas pipeline to the USSR. Abadan Island was ceded to Iran by Turkey in 1847. Abadan city was an unimportant village until the discovery (1908) of nearby oilfields. Its oil refinery (commissioned 1913) was the largest in the world until 1951, when it was temporarily closed as a result of the nationalization of the Anglo-Iranian Oil Company. The city is the site of an institute of technology (1938).

Abaddon (ābādān'), Hebrew name of APOLLYON. Rev. 9:11. In ancient Jewish tradition it was used for part of Sheol.

Abadeh (ābādā'), town (1966 pop. 16,000), Fars prov., S central Iran. It is the trade center for a grain and fruit-growing region. Sesame oil, castor oil, and opium are also produced there. Woodcarving is a local craft.

Abagtha (ābāg'thā), one of Ahasuerus' seven chamberlains. Esther 1:10.

Abakan (ābakan'), city (1970 pop. 90,000), capital of the Khakass Autonomous Oblast, in S central Siberian USSR, on the Yenisei River. A commercial center on the South Siberian RR, it produces textiles, furniture, foodstuffs, and metal products. Founded (1707) as a fortress, Abakan was known as Ust-Abakanskoye until 1931. Bronze Age tumuli and Turkic inscriptions have been found in the city.

abalone (ābālō'nē), popular name in the United States for a univalve GASTROPOD mollusk of the genus *Haliotis*, members of which are also called ear shells, or sea ears, as their shape resembles the human ear. The shell provides a rooflike covering for the abalone and is perforated by a row of holes on one side through which the animal respire. The iridescent mother-of-pearl shell lining is used to make buttons and other articles. The large, muscular foot is edible, and the animal is taken in large numbers off the coast of California for food. Holding tenaciously to a rock with its foot, the abalone feeds by scraping the substratum with its rasping tongue, or radula. Before protective legislation was enacted, much of the dried flesh and some shells were exported to the Orient. Abalone are classified in the phylum MOLLUSCA, class Gastropoda, order Archaeogastropoda, family Haliotidae.

Abana (ābā'nā), river of Damascus. 2 Kings 5:12. It is probably the Barada, flowing near Damascus. See also PHARPAR.

abandonment, in law, voluntary, intentional, and absolute relinquishment of rights or property without conveying them to any other person. Abandonment also means willfully leaving one's spouse or children, intending not to return (see DESERTION). In many states the abandonment of a child is a criminal offense.

Abano, Pietro d' (pyā'trō dā'banō), 1250?-1316?, Italian physician and philosopher, a professor of medicine in Padua. His famous work *Conciliator differentiarum* was an attempt to reconcile Arabian medicine and Greek speculative natural philosophy and was considered authoritative as late as the 16th cent. His efforts marked the rise of the Paduan school as a center for medical study. He was tried

twice by the Inquisition on charges of heresy and practicing magic. Acquitted at the first trial, he was found guilty at the second, after his death.

Abarbanel, Isaac: see ABRAVANEL, ISAAC.

Abarim (āb'arīm), general term for the country E of the Jordan Num. 27:12, 33:47, Deut. 32:49. The same original term is translated "the passages" in Jer. 22:20.

Abascal, José Fernando de (hōsā' fērnān'dō dā abaskāl'), 1743-1827, Spanish viceroy of Peru (1806-16). During the South American revolt against the colonial rule of Spain, he skillfully reconciled the Spanish officials and the creole colonials of Peru. He promoted educational reforms, abolished the Inquisition, reorganized the army, stamped out local rebellions, and opposed the revolutionists of Buenos Aires and Chile.

Abashiri (a'bā'shīrē), city (1970 pop. 43,904), Hokkaido prefecture, E Hokkaido, Japan, on the Sea of Okhotsk and the Abashiri River, lying on the Abashiri plain. It is a fishing center and port.

Abati, Niccolò dell': see ABBATE, NICCOLÒ DELL'.

abattoir (āb'atwār') [Fr.], building for butchering. The abattoir houses facilities to slaughter animals, dress, cut and inspect meats, and refrigerate, cure, and manufacture by-products. The largest abattoirs are those of the MEAT-PACKING industry. Plant construction, drainage, water supply, disposal of refuse, and all operations are under government regulation. Abattoirs are also called slaughterhouses.

Abbadids (ā'bādīdīz), Arab dynasty in Spain that ruled SEVILLE from 1023 to 1091. Taking advantage of the disintegration of the caliphate of CORDOBA, the cadī [governor] of Seville seized power and became (1023) king of the newly founded state as Abbad I. His son, who succeeded him in 1042 as Abbad II, made Seville the most powerful kingdom in S Spain. He was noted for his cruelty. He was succeeded in 1069 by his son, Abbad III (Abbad al-Mutamid), a poet and a great patron of the arts, but an inept ruler. Seeking military support against ALFONSO VI of Leon and Castile, Abbad called in the ALMORAVIDS from Morocco. They defeated Alfonso in 1086 but deposed (1091) Abbad, who died in exile.

Abbagmano, Nicolai (nēkō'lī ab-bagmā'nō), 1901-, Italian philosopher, Ph.D. Univ. of Naples. He taught at the Univ. of Turin from 1936 and became the leading Italian existentialist, criticizing French and German existentialism. He set out his philosophy in *La struttura dell'esistenza* (1939) and called for a change in philosophy's outlook in his 3-volume *Storia della filosofia* (2d ed. 1963). Some of his writings were translated into English in *Critical Existentialism* (ed. by Nino Langiulli, 1969). See Gari Lesnoff-Caravaglia, *Education as Existential Possibility* (1972).

Abbas (āb'ās, āb'ās, abas'), d. 653, uncle of Muhammad the Prophet and of Ali the caliph. A wealthy merchant of Mecca, he was at first opposed to the religious movement initiated by his nephew Muhammad. In 629 he became a convert, however, and from then on he was a companion of Muhammad and the chief financial support of Islam. His descendants founded the Abbasid dynasty. The son of Abbas, Ibn Abbas (Abd Allah), was a celebrated authority on Islamic traditions and law.

Abbas I (Abbas the Great), 1557-1629, shah of Persia (1587-1628), of the Safavid dynasty. In 1597 he ended the raids of the Uzbeks, and subsequently (1603-23) he conquered extensive territories from the Turks. He maintained diplomatic contacts with Europe, and with English aid he took (1622) Hormuz from the Portuguese and founded what is now the port of BANDAR ABBAS. He broke the power of the tribal chiefs and established a new tribe, the Shahsavan [friends of the shah]. At his capital at Esfahan, he erected many palaces, mosques, and gardens and did much to improve public works in Persia.

Abbas II (Abbas Hilmi), 1874-1944, last khedive of Egypt (1892-1914), son and successor of TEWFIK PASHA. Nominally he ruled in subordination to the Ottoman Empire, but in fact Egypt was controlled by the British resident—at first Lord CROMER, and later Kitchener. Although he resisted complete British rule, Abbas met with little success, in 1899 he was forced to admit the British claim to rule jointly with Egypt over the Sudan. When Turkey joined the Central Powers in World War I, Britain declared Egypt a British protectorate and deposed Abbas. He lived thereafter in Switzerland, where he died. He wrote *The Anglo-Egyptian Settlement* (1930).

Abbasid (ābās'īd, ābāsīd) or **Abbaside** (-sīd, -sīd), Arabic family descended from ABBAS, the uncle of Muhammad. The Abbasids held the caliphate from 749 to 1258, but they were recognized neither in

Spain nor (after 787) W of Egypt. Under the Umayyad caliphs the Abbasids lived quietly until they became involved in numerous disputes, beginning early in the 8th cent. The family then joined with the Shiite faction in opposing the Umayyads, and in 747 the gifted ABU MUSLIM united most of the empire in revolt against the Umayyads. The head of the Abbasid family became caliph as ABU AL-ABBAS AS-SAFFAH late in 749. The last Umayyad caliph, Marwan II, was defeated and killed and the Umayyad family nearly exterminated, one surviving member fled to Spain, where the Umayyads came to rule. Under the second Abbasid caliph, called al-Mansur (see MANSUR, AL-, d. 775), the capital was moved from Damascus to Baghdad, and Persian influence grew strong in the empire. The early years of Abbasid rule were brilliant, rising to true splendor under HARUN AR-RASHID, the fifth caliph, and to intellectual brilliance under his son al-Mamun (see MAMUN, AL-), the seventh caliph. After less than a hundred years of rule, however, the slow decline of the Abbasids began. Long periods of disorder were marked by assassinations, depositions, control by Turkish soldiers, and other disturbances, and from the beginning of their reign there were rival caliphs (see CALIPHATE). In 836 the capital was transferred to Samarra, remaining there until 892. Under the later Abbasids, the power of the caliphate became chiefly spiritual. Many independent kingdoms sprang up, and the empire split into autonomous units. The Seljuk Turks came to hold the real power at Baghdad. The conquests of Jenghiz Khan further lowered the prestige of the Abbasids, and in 1258 his grandson Hulagu Khan sacked Baghdad and overthrew the Abbasid caliphate. The 37th caliph died in the disaster, but a member of the family escaped to Cairo, where he was recognized as caliph (see MAMELUKES). The Cairo line of the Abbasid caliphate, completely subordinated to the Mamelukes, survived until after the Ottoman conquest (1517) of Egypt. See Sir William Muir, *The Caliphate* (1898, repr. 1964), Guy Le Strange, *Baghdad during the Abbasid Caliphate* (1925), P. K. Hitti, *History of the Arabs* (10th ed. 1970), M. A. Shaban, *The Abbasid Revolution* (1970).

Abbate or Abati, Niccolò dell' (nēk-kōlō' dēl-labba'tā, -bā'tē), 1512?-1571, Italian mannerist painter. From c. 1552 he assisted Primaticcio in the decorations at Fontainebleau. He was one of the first in France to paint landscapes. Among them is the *Landscape with Orpheus and Eurydice* in the National Gallery, London.

Abbe, Cleveland (āb'ē), 1838-1916, American meteorologist, b. New York City, brother of Robert Abbe. He was the first official daily weather forecaster in the United States. Abbe studied astronomy at the Univ. of Michigan, under B. A. Gould at Cambridge, Mass., and in Pulkovo, Russia. As director of the Cincinnati Observatory, he inaugurated daily weather predictions based on telegraphic reports. This work prompted the establishment of the national weather service, under the Signal Corps (1870), which Abbe joined in 1871, from 1891 to 1916 he served in the U.S. Weather Bureau.

Abbe, Ernst (ērnst ā'bā), 1840-1905, German physicist. He was appointed professor at the Univ. of Jena in 1870 and director of its astronomical and meteorological observatories in 1878. From 1866 he was associated with the Carl-Zeiss optical works at Jena, of which he became sole owner in 1888. He subsequently reorganized the firm on a cooperative basis. He made his plant a laboratory for the development of model working conditions, created a noncontributory pension fund and a discharge compensation fund, and introduced other advanced ideas that have been influential in shaping thought on the conditions of labor. He invented the Abbe refractometer for determining the refractive index of substances and improved photographic and microscopic lenses.

Abbe, Robert (āb'ē), 1851-1928, American surgeon, b. New York City, M.D. Columbia, 1874, brother of Cleveland Abbe. He was noted for his skill and resource, especially in plastic surgery, and was a pioneer in the use of catgut sutures. A friend of the Curies, Abbe was also one of the first in the United States to use radium in treating cancer.

Abbeville (ābvē'l'), town (1968 pop. 25,072), Somme dept., N France, in PICARDY, on the Somme River. Sugar refining, brewing, and the manufacture of jute and hemp are the chief industries. Abbeville received its commercial charter in 1184 and enjoyed prosperity until the revocation of the Edict of NANTES (1685) caused the Protestants, who constituted the skilled labor, to flee. The closing of the Somme River port because of sedimentation also affected prosperity. Although heavily damaged in World War II,

the town retains the late Gothic Church of St Wolfram, with its 13th-century belfry

Abbeville (ā'bēvīl), city (1970 pop 10,996), seat of Vermilion parish, S La., on the Vermilion River, with access to the Intracoastal Waterway, inc 1850 It is a trade and processing center for a region of dairies and rice and sugarcane fields In the colorful Teche Cajun country, Abbeville was settled (1843) by descendants of Acadians from Nova Scotia and was laid out like a French town It grew around the Roman Catholic chapel built in 1845 and preserves much of the early atmosphere in its old buildings

Abbevillian: see PALEOLITHIC PERIOD

Abbey, Edwin Austin, 1852-1911, American illustrator and painter, b Philadelphia, studied at the Pennsylvania Academy of the Fine Arts Employed by Harper & Brothers, he was sent to England, where he gathered materials for his illustration of Herrick's poems and other works His illustration of Shakespeare is usually considered his best work *The Quest of the Holy Grail* (a series of wall panels in the Boston Public Library) is perhaps his most famous painting He was official painter of the coronation of Edward VII See biography by E V Lucas (1921), catalog by Yale University Art Gallery (1974)

abbey, monastic house, especially among Benedictines and Cistercians, consisting of not less than 12 monks or nuns ruled by an abbot or abbess Many abbeys were originally self-supporting In the Benedictine expansion after the 8th cent, abbeys were often important centers of learning and peaceful arts, and, like FULDA, were sometimes the nuclei of future towns The buildings surround a church and include a dormitory, refectory, and guest house, all surrounded by a wall The courtyard, derived from the Roman ATRIUM, was a usual feature, as was the CLOISTER or arcade surrounding the court Cluniac abbeys were always ornate, Cistercian ones notably bare The design of the abbey has been radically altered in the modern Benedictine abbey built by Le Corbusier at La Tourette, France The CARthusians with their special polity developed an altogether different structure called the charterhouse

Abbey Theatre, Irish theatrical company devoted primarily to indigenous drama W B Yeats was a leader in founding (1902) the Irish National Theatre Society with Lady Gregory, J M Synge, and A E (George Russell) contributing their talents as directors and dramatists In 1904, Annie E F Horniman gave them a subsidy and the free use of the Abbey Theatre in Dublin The theater was bought for them by public subscription in 1910 Among dramatists whose works the Abbey Theatre first presented are Padraic Colum, Lennox Robinson, Sean O'Casey, and Paul Vincent Carroll The acting company, which included such notable performers as William Fay and Frank Fay, Dudley Digges, Barry Fitzgerald, and Sara Allgood, toured the United States several times See Lady Gregory, *Our Irish Theatre* (1913), and her journals (ed by Lennox Robinson, 1946), Robert Hogan and M J O'Neill, ed, *Joseph Holloway's Abbey Theatre* (1967), studies by Peter Kavanaugh (1950) and Lennox Robinson (1951, repr 1973)

Abbo of Fleury (abō', florē'), Fr *Abbon de Fleury*, 945?-1004, French monk at the abbey of Fleury (at present-day Saint-Benoît-sur-Loire, France) Head of the monastery school, he later taught at the abbey in Ramsey, England, and in 988 became abbot at Fleury He defended his monastery against domination by the high clergy and also served as a diplomat for King Robert II of France Abbo wrote on grammar, astronomy, mathematics, and philosophy

Abbot, Charles Greeley, 1872-1973, American astrophysicist, b Wilton, N H He was acting director in 1896 and director in 1907 of the astrophysical observatory of the Smithsonian Institution, he was secretary of the institution from 1928 to 1944, when he became a research associate Many of his research studies were initiated by S P Langley, his predecessor He completed the mapping of the infrared solar spectrum and carried out systematic studies of variation in solar radiation, its relation to the sunspot cycle, and its effect on weather variation He also studied intensively the nature of atmospheric transmission and absorption Abbot perfected various standardized instruments now widely used for measuring the sun's heat, and he invented devices utilizing solar energy He was the oldest person ever to receive a U S patent when his last was issued to him at the age of 99

Abbot, George, 1562-1633, archbishop of Canterbury He was one of the collaborators (from Oxford Univ) on the Authorized Version of the Bible and was an authority on geography He became archbishop in 1611 His firm Puritan views and antipathy

toward the growing High Church party made him unpopular His accidental killing of a gamekeeper while hunting (1621) was used against him His steady opposition to William Laud, together with his refusal (1627) to countenance the elevation of the king's prerogative over law and Parliament, led Charles I to force him from active control over church affairs See biography by P A Welsby (1962), bibliography by R A Christophers (1966)

Abbott, Berenice, 1898-, American photographer, b Springfield, Ohio Abbott turned from sculpture to photography in 1923 She was assistant to Man Ray in Paris (1923-25), where she made an extraordinary series of portraits of the artistic and literary celebrities of the 1920s She began her great documentation of New York City in 1929 Abbott produced a vast series of photographs of physical phenomena (begun 1958) She discovered the work of Eugène ATGET in 1925 and labored successfully to secure him international recognition See her *Photographs* (1970)

Abbott, Edith: see ABBOTT, GRACE

Abbott, Edwin Abbott, 1838-1926, English clergyman and author, b London He wrote several theological works and a biography (1885) of Francis Bacon, but he is best known for his standard *Shakespearean Grammar* (1870), see bibliography by R A Christophers (1966)

Abbott, George, 1889-, American theatrical producer, director, and playwright, b Forestville, N Y Abbott became celebrated as co-author and director of many hit plays, including *The Fall Guy* (1925) and *Coquette With Three Men on a Horse* (1935) he was acclaimed as a master of farce His later successes include *On Your Toes*, *The Boys from Syracuse* (1938), *The Pajama Game* (1954, film 1957), and *Damn Yankees* (1955, film 1958) In 1960 he won a Pulitzer Prize for the musical *Fiorello!* (with Jerome Weidman) See his autobiography (1963)

Abbott, Grace, 1878-1939, American social worker, b Grand Island, Nebr She did notable work as director (1921-34) of the Child Labor Division of the U S Children's Bureau *The Child and the State* (2 vol, 1938) is her most important publication Her sister, Edith Abbott, 1876-1957, became dean of the School of Social Service Administration, Univ of Chicago, in 1924 Her publications include *Women in Industry* (1910) and *The Tenements of Chicago* (1936)

Abbott, Lyman, 1835-1922, American clergyman and editor, b Roxbury, Mass, son of Jacob Abbott He was ordained a minister in 1860 and was pastor in several churches before succeeding Henry Ward Beecher at the Plymouth Congregational Church, Brooklyn, in 1888 With Beecher he had begun in 1876 to edit the *Christian Union*, the name of which he changed in 1893 to the *Outlook* He championed a modern rational outlook in American Christianity His works include *The Theology of an Evolutionist* (1897), *Henry Ward Beecher* (1903), and *Reminiscences* (rev ed 1923) See biography by I V Brown (1953, repr 1970)

Abbottabad (āb'atābad), town (1961 pop 31,036), NE Pakistan It is a popular health resort c 4,000 ft (1,220 m) above sea level in the Himalaya region It is also an administrative center and a market town for an agricultural and timber area Founded by Sir James Abbott, a deputy commissioner of British India, it was an important British military post Nearby are rock inscriptions of Indian emperor Asoka (3d cent B C)

abbreviation, in writing, arbitrary shortening of a word, usually by cutting off letters from the end, as in U S and Gen (General) Contraction serves the same purpose but is understood strictly to be the shortening of a word by cutting out letters in the middle, the omission sometimes being indicated by an apostrophe, as in the word *don't* Most abbreviations are followed by a period Usage, however, differs widely, and recently omission of periods has become common, as in NATO and UN A period is never used when apostrophes appear A list of abbreviations used in this encyclopedia may be found in the prefatory matter

Abda (āb'dā) 1 Father of Solomon's officer Adoniram 1 Kings 4:6 2 Levite Neh 11:17 Obadiah 1 Chron 9:16

Abd al-Aziz (āb'dal-azēz', Turk *abdul'azēz'*), 1830-76, Ottoman sultan (1861-76), brother and successor of Abd al-Majid The reforms enacted under his rule could not outpace the decline of the Ottoman Empire (Turkey) In 1875 his bankrupt government repudiated the interest on the huge loans raised in Western Europe, this act led to foreign control over part of the Ottoman revenues RUMANIA, SERBIA and

EGYPT gained virtual independence, and revolts broke out in Bosnia and Herzegovina and Bulgaria Political decay was paralleled, however, by cultural rebirth Many important schools were founded, and newspapers helped to educate the Turks politically In 1876, MIDHAT PASHA, foremost among the liberals (known as the Young Turks), overthrew Abd al-Aziz, who died a few days later, probably by suicide He was succeeded by his nephew, Murad V

Abd al-Aziz IV, 1880-1943, sultan of Morocco (1894-1908), son of Hassan His weak control was evident after the death (c 1900) of the regent 8a Ahmed His submissiveness to foreign influence, his indulgence in European luxuries (which Muslims considered unbefitting his position as religious leader), and his reorganization of the tax system led to widespread unrest The Franco-British agreement of 1904 furnished a pretext for French demands that led in 1906 to the Algeiras Conference (see MOROCCO) Moroccan disapproval of the settlement led to revolt, Abd al-Aziz was deposed (1908) by his brother Abd al-Hafiz

Abd al-Aziz ibn Saud see IBN SAUD

Abd al-Hafid (ab'dal-hāfēd'), 1875?-1937, sultan of Morocco (1908-12) Placed on the throne by the revolution that deposed his brother Abd al-Aziz IV, he was soon confronted with uprisings and the demands of European creditors Besieged (1911) at Fez by rebels, he was relieved by a French army On March 30, 1912, he accepted a French protectorate, and on Aug 12 he abdicated

Abd al-Hamid I (ab'dal-hamēd', Turk *abdul'hamēd'*), 1725-89, Ottoman sultan (1774-89), brother and successor of Mustafa III His reign, one of decline for the Ottoman Empire (Turkey), saw the end of the war of 1768-74 and the beginning of the war of 1787-91 with Catherine II of Russia (see RUSSO-TURKISH WARS) The peace terms in 1774 (see KUCHUK KAINARJI, TREATY OF) established Russia as the foremost power in the Middle East and had incalculable effects In 1775, Austria, jealous of Russian expansion, forced the Turks to cede Bukovina Abd al-Hamid was succeeded by his nephew, Selim III

Abd al-Hamid II, 1842-1918, Ottoman sultan (1876-1909) His uncle, Abd al-Aziz, was deposed from the throne of the Ottoman Empire (Turkey) in 1876 by the Young Turks, a liberal reformist group Abd al-Hamid's brother, Murad V, succeeded as sultan, but was shortly declared insane, and Abd al-Hamid ascended the throne He at first accepted (1876) the constitution promulgated by MIDHAT PASHA but soon suspended it, dismissed Midhat, and eventually had him strangled The war with Russia (see RUSSO-TURKISH WARS) led to the Treaty of SAN STEFANO, subsequently modified by the Congress of Berlin (see BERLIN, CONGRESS OF) To save what remained of his empire, the sultan then pursued a policy of friendship with Germany German officers reorganized the Turkish army, and German business interests obtained concessions, most notably for the construction of the BAGHDAD RAILWAY For his part in the Armenian massacres of 1894-96, he was called the Great Assassin and the Red Sultan Ruling as absolute monarch, Abd al-Hamid lived in virtual seclusion In 1908 the Young Turks, who had penetrated the armed services, revolted and forced the sultan to adhere to the constitution of 1876 He was deposed (1909) when he tried to plot a counterrevolution and was succeeded by his brother, Muhammad V See study by Joan Haslip (new ed 1973)

Abd al-Kadir (ab'dal-kadēr'), c 1807-1883, Algerian leader claiming descent from Muhammad Although born to an anti-Turkish family, he was chosen emir of Mascara to fight the French invaders who had just defeated the Turks From 1832 to 1839, by alternately fighting and coming to terms with the French, he extended his power over much of N Algeria, subduing hostile tribes and organizing the hinterland A learned Muslim, he reformed his army along Western lines and finally proclaimed (1839) a holy war In four years of fighting, General Bugeaud drove Abd al-Kadir into Morocco, where he gained the sultan's support The Moroccan defeat at Isly (1844) soon forced the sultan to repudiate his ally Abd al-Kadir surrendered in 1847 and was imprisoned in France until 1852 See Wilfred Blunt, *Desert Hawk* (1947), 5 A Salik, *The Saint of Ilan* (1961)

Abd Allah ibn Yasin. see ALMORAVIDS

Abd al-Majid (ab'dāl-majēd', Turk *abdul' majēd'*), 1823-61, Ottoman sultan (1839-61), son and successor of Mahmud II to the throne of the Ottoman Empire (Turkey) The rebellion of MUHAMMAD ALI was checked by the intervention (1840-41) of England, Russia, and Austria Abd al-Majid was influenced by the British ambassador, Viscount STRATFORD DE RED

CLIFFE, who helped persuade the sultan to introduce Western reforms. Two decrees (1839, 1856) led to many changes but did not have permanent effect. Confident in British and French support, Abd al-Majid resisted (1853) the Russian claim to act as protector of the Orthodox Christians in the Ottoman Empire. This was a primary cause of the CRIMEAN WAR. Turkey received no concrete gains at the Congress of Paris (1856, see PARIS, CONGRESS OF). The sultan was succeeded by his brother, Abd al-Aziz.

Abd al-Malik (ab'dōl-malik'), c 646-705, 5th Umayyad caliph (685-705), son of Marwan I. At his accession, Islam was torn by dissension and threatened by the Byzantine Empire. With the help of his able general al-Hajjaj, Abd al-Malik overthrew the rival caliphs and united Islam. His battles with Byzantine forces were without final result. An able administrator, he reorganized the government and introduced Arabic coins, improved postal facilities, and made Arabic the official language.

Abd al-Mumin (ab'dal-mōmīn), d 1163, founder of the empire of the ALMOHADS. He was the favorite of the Almohad religious reformer Ibn Tumart and became (1130) his successor. Even before his rise to leadership, he had attacked the ALMORAVIDS. After long campaigns in Morocco and NW Algeria, he was able to destroy (1147) the Almoravid empire. In 1158 he invaded the Muslim states of Tunisia and NE Algeria, which had been weakened by attacks by Arab nomads and Sicilian Normans. By 1160 his rule reached from the Atlantic to Tripoli. The last years of his life were spent fighting the Christians of Spain.

Abd al-Rahman. For Muslim rulers thus named, see ABD AR-RAHMAN.

Abd ar-Rahman (ab'dar-raman'), d 732, Muslim governor of Spain (721-32). Invading Aquitaine in 732, he won a victory over the Franks at Toulouse but was defeated in the battle of Tours by CHARLES MARTEL.

Abd ar-Rahman, 1778-1859, sultan of Morocco (1822-59). He sought, unsuccessfully, to take advantage of the overthrow of Turkish rule in Algeria in order to extend his territory. Later he allied himself with the emir, ABD AL-KADIR, but after their defeat at Isly (1844), he made peace with France and refused the emir further asylum in Morocco. Abd ar-Rahman was at various times involved in difficulties with Austria, Spain, and Great Britain.

Abd ar-Rahman I, d 788, first Umayyad emir of Cordoba (756-88). The only survivor of the Abbasid massacre (750) of his family in Damascus, he fled from Syria and eventually went to Spain. There he defeated (756) the emir of Cordoba at Alameda and seized power. Despite the jealousy of the Arab aristocracy and the turbulence of the Berbers, he reorganized and consolidated the state and tried to unite the various Muslim races. In 778, CHARLEMAGNE invaded N Spain but was turned back at Saragossa and then defeated at Roncesvalles. The great mosque at Cordoba, which Abd ar-Rahman started, was continued by his son and successor, Hisham I.

Abd ar-Rahman III, 891-961, Umayyad emir (912-29) and first caliph (929-61) of Cordoba. When he succeeded to the throne, the Spanish emirate was reduced to Córdoba and its environs and beset with tribal warfare. Abd ar-Rahman recovered the lost provinces, consolidated the central government, and created internal peace and prosperity. He built up a strong army and navy and waged war successfully against the Fatimids in N Africa and the Christian kings of León. He made Cordoba one of the greatest cities in the West.

Abd ar-Rahman Khan (kan, khan), 1844?-1901, emir of Afghanistan (1880-1901), grandson of Dost Muhammad. He opposed his uncle, SHERE ALI, and was forced into exile in 1869. He was, however, recognized by the British as emir in 1880, and he supported British interests as, for example, against Russia.

Abdeel (āb'dēēl), father of the Shelemiah sent to arrest Baruch and Jeremiah. Jer 36:26.

Abd el-Krim (ab'dēl-krim'), 1882?-1963, leader of the Rif tribes of Morocco, called in full Muhammad ben Abd el-Krim. He was an important figure in the administration of the Spanish Zone until 1920, when he took up arms against Spanish rule. In 1921 his small force defeated a disorganized and ill-equipped Spanish army. In the next three years he strengthened his position and in 1924 drove the Spanish back to Tetuán. After capturing his only rival, PAISULT, he advanced into the French Zone in 1925. Defeated by combined Franco-Spanish forces, he surrendered in 1926 and was deported to Reunion. He escaped (1947) to Egypt, was awarded

(1958) the title national hero by King Muhammad V of Morocco, and in 1962 announced that he would return to Morocco, but he died before he could carry out his wish. See study by D. S. Woolman (1968).

Abdera (ābdē'ra) or **Avdīra** (avdē'ra), town, NE Greece, in Thrace, near the mouth of the Mesta River. It is a small agricultural settlement. Founded (c 650 B.C.) by colonists from Clazomenae, it was destroyed by the Thracians (c 550 B.C.) and rebuilt (c 500 B.C.) by refugees from Teos. The town passed to Macedon in 352 B.C. and in 198 B.C. became a free city under Roman rule. The Abderites were considered stupid by the ancient Greeks, and *Abderite* was a term of reproach. However, the philosophers Protagoras, Leucippus, and Democritus lived there.

Abdera, Spain. see ADRA.

Abdi (āb'dī) 1, 2 Merarite Levites. 1 Chron 6:44, 2 Chron 29:12. 3 Israelite married to a foreign wife. Ezra 10:26.

Abdias (ābdī'ās), Vulgate form of OBADIAH.

abdication, in a political sense, renunciation of high public office, usually by a monarch. Some abdications have been purely voluntary and resulted in no loss of prestige. For instance, Holy Roman Emperor CHARLES V, who abdicated for religious motives, remained influential until his death, and PHILIP V of Spain actually resumed the throne after abdicating. In Japan it has not been uncommon for the ruler to retire voluntarily to a life of religious contemplation, assured of a special title and many honors. However, most abdications have amounted to a confession of a failure in policy and are only the final and formal renunciation of an authority that events have already taken away. In the Chinese Empire forced abdications were frequent; the empire itself ending with the abdication of the boy ruler Hsuan T'ung in 1912 (see PU YI, HENRY). Since 1688, when the English Parliament declared James II to have abdicated by reason of flight and subversion of the constitution, abdication by a British ruler without parliamentary consent has been forbidden. When EDWARD VIII of England abdicated in 1936 in order to marry an American divorcee (his ministers having refused to approve the marriage), the abdication was given legal effect by an act of Parliament. Though several written constitutions contain provisions for abdication, there are few uniformly accepted rules for dealing with it. Defeat and political chaos following World Wars I and II forced the abdication of many rulers, most notably Emperor William II of Germany, Farouk of Egypt, and Leopold III of Belgium.

Abdiel (āb'dīāl), in the Bible, a Gadite. 1 Chron 5:15.

abdomen, in man and other vertebrates, portion of the trunk between the diaphragm and lower pelvis. In man the wall of the abdomen is a muscular structure covered by fascia, fat, and skin. The abdominal cavity is lined with a thin membrane, the peritoneum, which encloses the stomach, intestines, liver, and gall bladder, the pancreas, kidneys, and urinary bladder are located behind the peritoneum. The abdomen of the female also contains the ovaries, fallopian tubes, and uterus. The navel, or umbilicus, an exterior scar on the front of the abdomen, marks the point of attachment of the fetus to the maternal organism before birth. In insects, crustacea, and some other arthropods, the term *abdomen* refers to the entire rear portion of the body.

Abdon (āb'dōn) 1 Judge of Israel. Judges 12:13-15. 2 Officer under Josiah. 2 Chron 34:20. Achbor. 2 Kings 22:12, Jer 26:22, 36:12. 3, 4 Benjamites. 1 Chron 8:23,30, 9:36. 5 Unidentified boundary town, NW Palestine. Joshua 21:30, 1 Chron 6:74. Hebron KJV and Ebron RSV. Joshua 19:28.

Abdubakar Tafawa Balewa, Alhaji Sir. see BALEWA, ALHAJI SIR ABUBAKAR TAFAWA.

Abdul Aziz. For Ottoman sultans thus named, see ABD AL AZIZ.

Abdul Hamid. For Ottoman sultans thus named, see ABD AL HAMID.

Abdullah (Abdullah ibn Husayn) (abdōl'la ī'bān hōōsīn', -sān'), 1882-1951, king of Jordan (1946-51), b Mecca, son of HUSAYN IBN ALI. During World War I, Abdullah led Arab revolts against Turkish rule and had British support. After the war he unsuccessfully fought against IBN SAUD for the control of the Hejaz. In 1921, Great Britain created Abdullah emir of Trans-Jordan. In World War II, Abdullah strongly opposed the Axis. Following the partition of Palestine (May, 1948) he led the troops of his British-trained force, the Arab Legion, against Israel. He annexed the portions of Palestine not assigned to Israel. His foreign policy was directed toward creation of an Arab federation, preferably under the rule of a

member of his family. He was assassinated in Jerusalem in 1951. See his *Memoirs* (1951).

Abdullah, Sheikh Muhammad (shākh mōōham'-mad abdōl-la'), 1905-, nationalist leader in Kashmir, known as the Lion of Kashmir. He became active in political reform while a student at Lahore Univ. and was frequently imprisoned from 1931 for urging self-rule for Kashmir, a region now in India but also claimed by Pakistan. He cooperated with Mohandas Gandhi and Jawaharlal Nehru in the movement for India's independence and then became prime minister of Jammu and Kashmir when independence was achieved in 1947. After denouncing (1953) India's treatment of Kashmir, he was removed as prime minister and generally kept in preventive detention by the Indian government, although he was allowed to play a more active role in the early 1970s.

Abdul Mecid. For Ottoman sultans thus named, see ABD AL-MAJID.

Abdul Rahman, Tunku. see RAHMAN, TUNKU ABDUL.

Abdul Razak: see RAZAK, ABDUL.

à Becket, Thomas: see THOMAS À BECKET, SAINT.

Abed-nego (abēd'nēgō), one of the THREE HOLY CHILDREN cast into the fiery furnace.

Abel, son of Adam and Eve, a shepherd, killed by his older brother, Cain. Gen 4:1-8. Mentioned as the first martyr. Mat 23:35.

Abel, Sir Frederick Augustus, 1826-1902, English chemist, an authority on explosives. He was professor of chemistry at the Royal Military Academy (1851-55) and chemist to the War Dept. and government referee (1854-88). Among his achievements are improvements in the manufacture of gun cotton, the invention, with Sir James Dewar, of cordite, a study, in collaboration with Sir Andrew Noble, Scottish physicist, of the behavior of black powder when fired, and the invention of an instrument used in the Abel test, named for him, to determine the flash point of petroleum. He wrote widely on explosives.

Abel, Iorwith Wilbur, 1908-, American labor leader, b Magnolia, Ohio. In 1925 he went to work in a rolling mill in Canton, Ohio. He soon emerged as a leader of union organization in the steel industry. In 1937 he was appointed staff representative of the Steel Workers Organizing Committee, the progenitor of the United Steelworkers of America. From 1942 to 1952 he was the union's district director for the Canton area. In 1953 he became secretary-treasurer of the union, and in 1965 he succeeded David J. McDonald as third president. In the same year he was also elected a vice president of the AFL-CIO.

Abel, John Jacob, 1857-1938, American pharmacologist, b Cleveland, grad Univ of Michigan, 1883, M.D. Univ of Strasbourg, 1888. Professor of pharmacology (1893-1932) and director of the laboratory for endocrine research (from 1932) at Johns Hopkins, he is known for the isolation of epinephrine (adrenaline) in 1898 and later of insulin in crystalline form. Other contributions include the isolation of amino acids from the blood. He was a founder and editor (1909-32) of the *Journal of Pharmacology and Experimental Therapeutics*.

Abel, Niels Henrik (nēls hēn'rik ā'bəl), 1802-1829, Norwegian mathematician. While a student at the University of Christiania (Oslo) he did fundamental work on the integration of functional expressions and proved the impossibility of representing a solution of a general equation of fifth degree or higher by a radical expression. He investigated generalizations of the binomial theorem, pioneered in the general theory of elliptic functions, and showed that elliptic functions are a generalization of trigonometric functions. Commutative groups are also called Abelian groups in his honor. He died of tuberculosis at the age of 26, leaving contributions that rank him as one of the greatest mathematicians of the 19th cent. See Oystein Ore, *Niels Henrik Abel Mathematician Extraordinary* (1957, repr 1973).

Abel, Thomas. see ABELL THOMAS.

Abel 1. Ostensibly a place name. 1 Sam 6:18. The RSV text does not give the name. 2. See ABEL BETH MAACHAH.

Abelard, Peter (āb'elārd), Fr. *Pierre Abelard* (pyēr ābālār'), 1079-1142, French philosopher and teacher, b Le Pallet, near Nantes. He went (c 1100) to Paris to study under WILLIAM OF CHAMPEAUX at the school of Notre Dame and soon attacked the ultrarealist position of his master with such success that William was forced to modify his teaching. Abelard became master at Notre Dame but, when deprived of his place, set himself up (1112) at a school on Mont-Saint-Geneviève, just outside the city walls. Abelard's

fame as a dialectician attracted great numbers of students to Paris, because of this fact Abelard is usually regarded as the founder of the Univ of Paris. This part of his career was cut short by his romance with Heloise (d c 1164), the learned and beautiful niece of Fulbert, canon of Notre Dame, who had hired Abelard as her tutor. After Heloise gave birth to a son, a secret marriage was held to appease her uncle. Fulbert's ill-treatment of Heloise led Abelard to remove her secretly to the convent at Argenteuil. Fulbert, who thought that Abelard planned to abandon her, had ruffians attack and emasculate him. Abelard sought refuge at Saint-Denis, where he became a monk. In 1120 he left Saint-Denis to teach. At the instigation of his rivals, the Council of Soissons had his first theological work burnt as heretical (1121). After a short imprisonment, he returned to Saint-Denis but fell out with the monks and built a hermitage near Troyes. Students sought him out, and to house them he built a monastery, the Paraclete. When he became abbot at Saint-Gildas-en-Rhuys, Brittany, he gave the Paraclete to Heloise, who became an abbess of a sisterhood there. St BERNARD OF CLAIRVAUX thought Abelard's influence dangerous and secured his condemnation by the Council of Sens (1140). Abelard appealed to the pope, who upheld the council. Abelard submitted and retired to Cluny. He was buried at the Paraclete, as was Heloise; their bodies were later moved to Pere-Lachaise in Paris. A Platonist in theology, Abelard emphasized the method of Aristotle's dialectic. His belief that the methods of logic could be applied to the truths of faith was in opposition to the mysticism of St Bernard. He also opposed the extreme views of William of Champeaux and ROSCELIN on the problems of universals. His own solution, in which universals are considered as entities existent only in thought but with a basis in particulars, is called moderate realism and to some extent anticipates the conceptualism of St Thomas Aquinas. His most influential work, the *Sic et non*, a collection of contradictory writings of the Fathers of the Church, formed the basis for the widely read *Sentences* of PETER LOMBARD, who may have been Abelard's pupil. Abelard was perhaps most important as a teacher, among his pupils were some of the celebrated men of the 12th cent, including John of Salisbury and Arnold of Brescia. Of Abelard's poetry only Latin hymns survive. He is chiefly remembered for the events of his life as chronicled in his autobiographical *Historia calamitatum* (tr by J T Muckle, 1954, repr 1964) and revealed in the poignant letters of Heloise and Abelard (tr by C K Scott Moncrieff, 1926). See Joseph McCabe, *Life of Peter Abelard* (1901, repr 1973), J G Sikes, *Peter Abailard* (1932, repr 1965), E H Gibson, *Heloise and Abelard* (tr 1951, repr 1960), D W Robertson, Jr, *Abelard and Heloise* (1972), Regine Pernoud, *Heloise and Abelard* (tr 1973).

Abel-beth-maachah (ā'bal-bēth-mā'ākā), town, Palestine, the modern Tel Abil (Israel), S of Migdalla. It was attacked by Ben-hadad and taken by Tiglath-pileser 1 Kings 15 20, 2 Kings 15 29. Abel and Beth-maachah 2 Sam 20 14. Abel of Beth-maachah 2 Sam 20 15. Abel-maim 2 Chron 16 4.

Abell, Kjeld (kyēl a'bēl), 1901-61, Danish playwright. Abell's *Melody That Got Lost* (1935, tr 1939) was an early success. Trained as a stage designer, he was an innovator in stage technique. He later turned to ethical and social drama, *Anna Sophie Hedvig* (1939, tr 1944), *The Queen Walks Again* (1943), *Silkeborg* (1946), and *Skriget* (1961) are arresting and powerful problem plays concerned with justice and social protest.

Abell or Abel, Thomas (both ā'bəl), d 1540, English priest, chaplain to KATHARINE OF ARAGON. In 1528 he served as Katharine's secret envoy to her nephew, Holy Roman Emperor Charles V, in connection with Henry VIII's proposed divorce. Abell vigorously opposed the divorce both in his sermons and in a book, *Invicta veritas* [truth unconquered] (1532). He was imprisoned for six years in the Tower of London and was finally executed for upholding the validity of Henry's first marriage. See J E Paul, *Katherine of Aragon and Her Friends* (1966).

Abel-maim (ā'bal-mā'im), town, Palestine, the same as ABEL-BETH MAACHAH.

Abel-meholah (ā'bal-mēhō'la), name of towns or districts mentioned in the Bible, probably not all different. 1 Near the Jordan, limit of the Midianites' flight Judges 7 22. 2 In N central Palestine 1 Kings 4 12. 3 Home of Adriel 1 Sam 18 19. 4 Elisha's home 1 Kings 19 16. See MEHOLATHITE.

Abel-mizraim (ā'bal-mīzrā'im), place "beyond Jordan" where Jacob was mourned Gen 50 11.

Abel-shittim: see SHITTIM.

Abenaki Indians: see ABNAKI INDIANS.

Aben Ezra, Abraham ben Meir: see IBN EZRA.

Abengourou (abēng-gōō'rōō), town (1964 est pop 18,000), E Ivory Coast. It is the commercial center for a region producing cacao, coffee, kola nuts, plantains, yams, manioc, and timber. The French established an administrative post in Abengourou in 1896.

Åbenrå (ō'bānrō'), city (1970 com pop 20,484), capital of Sønderjylland co, S Denmark, at the head of the Åbenrå Fjord. It is a port and the commercial center for a rich agricultural region. The city was chartered in 1335. It was held by Prussia from 1864 to 1920 and was then known as Apenrade. The name was spelled Aabenraa until 1948.

Abeokuta (a'bēōkōō'tā, āb'—), city (1969 est pop 217,000), SW Nigeria. It is the trade center for an agricultural region producing cacao, kola nuts, and palm products. Manufactures of the city include beer, cement, dyed textiles, and canned foods. Abeokuta was founded in the 1830s by Egba refugees from the YORUBA civil wars. The city repelled attacks by raiders from Dahomey in 1851 and 1864. It came under British protection in 1893.

Aberavon, Wales: see PORT TALBOT.

Aberbrothock: see ARBROATH, Scotland.

Abercrombie, Lascelles (lās'əlz), 1881-1938, English poet and critic. Complex and cerebral in style, his poetry often expresses his distaste for 20th-century industrialism. His volumes of poetry include *Interludes and Poems* (1908), *Emblems of Love* (1912), and *Collected Poems* (1930). He also wrote influential critical works, notably *Thomas Hardy* (1912) and *The Theory of Poetry* (1924).

Abercrombie, Sir Patrick, 1879-1957, British architect and town planner. Professor of civil design at the Univ of Liverpool from 1915 to 1935 and of town planning at the Univ of London after 1935, he acted as consultant in the rebuilding and planning of London, Edinburgh, Bath, and other British cities. He was knighted in 1945. His voluminous writing has been of considerable influence in the field of city and regional planning. His books include *The Preservation of Rural England* (1926) and *Town and Country Planning* (1933).

Abercrombie, Fort: see FORT ABERCROMBIE.

Abercromby, James, 1706-81, British general in the French and Indian Wars, b Scotland. He arrived in America in 1756 and in 1758 replaced the earl of Loudoun as supreme British commander. After failing to take Ticonderoga from General Montcalm, Abercromby was replaced (1758) by Jeffrey AMHERST.

Abercromby, Sir Ralph, 1734-1801, British general. He served in the Seven Years War but later retired from active service because he sympathized with the American colonists. Returning in 1793 for service against France, he won a major military reputation by his command of a brilliant retreat in Flanders in the winter of 1794-95. He was (1795-97) commander in chief in the West Indies, where he captured Grenada, St Lucia, St Vincent, and Trinidad. In 1800, Abercromby was sent to expel the French from Egypt. He landed at Aboukir in March, 1801, but was mortally wounded in the first engagement (which was successful). He is noted for having renewed the discipline and reputation of the army.

Aberdare (ābārdār'), urban district (1971 pop 37,760), Glamorganshire, S Wales. It is in an anthracite and iron-ore region. Cables are made. In 1974, Aberdare became part of the new nonmetropolitan county of Mid Glamorgan.

Aberdeen, George Hamilton-Gordon, 4th earl of, 1784-1860, British statesman. He served (1813) as ambassador extraordinary at Vienna and helped arrange (1814) the peace terms at Paris after Napoleon I's initial defeat. He was foreign secretary (1828-30) in the duke of Wellington's cabinet and secretary for war and the colonies (1834-35) under Sir Robert PEEL. As foreign secretary (1841-46) in Peel's second government, he settled two boundary disputes with the United States, the Northeast Boundary Dispute by the Webster-Ashburton Treaty (1842) and the Oregon controversy by the treaty of 1846. He also improved relations with France. He supported Peel in repealing the corn laws (1846) and resigned with him. As prime minister (1852-55), Aberdeen headed a brilliant coalition ministry and was quite successful in home affairs. He was, however, unable to prevent Viscount PALMERSTON and others in his cabinet from involving England on the side of the Ottoman Empire (Turkey) in the Crimean War. Bad management of the campaigns and unpopularity of the war forced his resignation in 1855. See biography by

Lady Frances Balfour (1922), study by W D Jones (1958).

Aberdeen, city (1971 pop 182,006), county town of Aberdeenshire, NE Scotland, on the North Sea at the mouth of the Dee River. Part of the city lies in Kincardineshire. It is Scotland's third largest city and the only industrial center outside the midland belt. Famous as a herring and whitefish port, it is also known for its granite quarries. Other manufactures are paper, textiles, linen, and wool. There are shipyards, engineering and chemical works, and facilities for agricultural research. Aberdeen became a royal burgh in 1176 and was a leading port for trade with England and the Low Countries as early as the 14th cent. The town was burned by the English in 1336. It was a stronghold of royalist and episcopal sentiment in the religious wars of the 17th cent. Aberdeen is noted for its granite Cathedral of St Machar. The Univ of Aberdeen includes King's College (founded 1493) and Marischal College (founded 1593). Under the Local Government Act of 1973, Aberdeen became (1975) part of the Grampian region.

Aberdeen. 1 Town (1970 pop 12,375), Harford co, NE Md, in a farm region, inc 1892. Just south, on Chesapeake Bay, is the U S army's huge Aberdeen Proving Ground, a major research, development, and testing installation and site of the army ordnance center and school. To the northeast, on the Susquehanna River, is a large hydroelectric plant 2 City (1970 pop 26,476), seat of Brown co, NE S Dak, inc 1882. The trade and distributing center for a wheat and livestock region, it has flour mills, dairy-processing plants, and a bottling house. Manufactures include fertilizers and feeds, gear boxes, computers, and tools. Northern State College and a junior college are in the city. 3 City (1970 pop 18,489), Grays Harbor co, W Wash, a port of entry on Grays Harbor, at the confluence of the Chehalis and the Wishkah rivers, inc 1890. With its adjacent twin city, Hoquiam, it has lumbering, wood-product, fishing, canning, and shipping industries. The two communities, which have grown together and are for all practical purposes one city, are in a region containing some of the world's densest stands of cedar, hemlock, and Douglas fir. They are a gateway to Olympic National Park. A junior college is in Aberdeen, and nearby are many tree farms and two state parks.

Aberdeen Angus cattle: see ANGUS CATTLE.

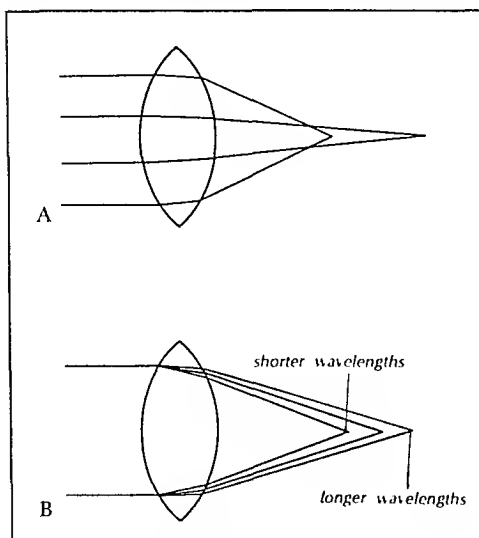
Aberdeenshire (ābārdēn'shīr), county (1971 pop 319,887), 1,971 sq mi (5,105 sq km), NE Scotland. ABERDEEN is the county town. The terrain varies from the Grampian Mts in the southwest to the rolling farmlands of the Don valley and the treeless lowlands of Buchan. Oats, barley, turnips, and potatoes are grown. Sheep and the famous Aberdeen Angus cattle are raised. Fishing is carried on from the North Sea ports of Aberdeen, FRASERBURGH, and PETERHEAD. The county played a large role in the Scottish wars of independence (13th cent) and was a royalist stronghold during the ENGLISH CIVIL WAR. It was the headquarters of the JACOBITE uprising of 1715. BALMORAL CASTLE is the Scottish residence of the British kings and queens. Under the Local Government Act of 1973, Aberdeenshire became (1975) part of the Grampian region.

Aberdeen University, at Aberdeen, Scotland, founded by the bishop of Aberdeen under the authority of a papal bull obtained 1494-95. It has faculties of arts, science, divinity, law, and medicine. Robert Gordon's Institute of Technology and the North of Scotland College of Agriculture are affiliated with the university.

Aberhart, William (ā'bārhart), 1878-1943, premier of Alberta, Canada, b Ontario. He was a school-teacher and a founder and dean of the Calgary Prophetic Bible Institute (opened 1927). About 1932 he became interested in SOCIAL CREDIT, which advocated direct money payments to all citizens. He was an organizer of the Social Credit party of Alberta and was elected (1935) to the provincial legislature with enough supporters to control it. Thus Aberhart became premier (1935-43) of the first Social Credit government in the world. However, many of the legislative attempts to enact his principles were declared invalid by the courts.

aberration, in optics, condition that causes a blurring and loss of clearness in the images produced by lenses or mirrors. Spherical aberration is caused by the failure of a LENS or MIRROR of spherical section to bring parallel rays of light to a single focus. The effect results from the operation of the laws of optics, not from defects in construction. Spherical aberration can be prevented by using a parabolic rather than a spherical section, but this involves much

greater complexity and expense in lens or mirror construction. Chromatic aberration results in the blurred coloring of the edge of an image when



A Spherical aberration. Light rays near the edge of the lens are bent more and brought to focus nearer to the lens.

B Chromatic aberration. Shorter wavelengths (higher frequencies) are bent more and focused nearer to the lens.

white light is sent through a lens. This is caused by the fact that some colors of light are bent, or refracted, more than others after passing through a lens. For example, violet light is bent more than red and thus is brought to a focus nearer the lens than red. No single lens can ever be free of chromatic aberration, but by combining lenses of different types, the effects of the component lenses can be made to cancel one another. Such an arrangement is called an achromatic lens. See REFLECTION, REFRACTION.

aberration of starlight, angular displacement of the apparent path of light from a star, resulting in a displacement of the apparent position of the star from its true position, discovered by the English astronomer James Bradley and explained by him in 1729. The phenomenon is caused by the orbital motion of the earth, in the same way, vertically falling raindrops appear to fall diagonally when viewed from a moving vehicle. The true path of light from a star to an observer is along the straight line from the star to the observer, but, because of the component of the observer's velocity in a direction perpendicular to the direction to the star, the light appears to be traveling along a path at an angle to the true direction to the star. Thus, in order to observe a star the central axis of a telescope must be tilted as much as 20.5 (seconds of arc) from the true direction to the star, the exact amount of the angle depending on the direction to the star relative to the direction of the earth's motion in its orbit. Because of the earth's orbital motion, the stars appear to move in elliptical paths on the celestial sphere. All these ellipses have the same semimajor axis, 20.5 of arc, a value known as the constant of aberration. The tangent of the constant of aberration is equal to the ratio of the earth's orbital speed to the speed of light.

Abersychan, Wales. See PONTYPOOL.

Abertawe, England. See SWANSEA.

Abertillery (äb'ärtilär'ë), urban district (1971 pop. 21,140), Monmouthshire, SE Wales. It is located in an area of coal and iron mines and produces tin plate. In 1974, Abertillery became part of the new nonmetropolitan county of Gwent.

Aberystwyth (äb'ärüst'with), municipal borough (1971 pop. 12,672), Cardiganshire, W Wales, on Cardigan Bay. It is a summer resort and a cultural center. Before the construction of railroads, Aberystwyth was a coastal trade center. It is the seat of a constituent college of the Univ. of Wales and of the National Library of Wales, which has an outstanding collection of Welsh manuscripts. In 1974, it became part of the new nonmetropolitan county of Dyfed.

Abiez (ä'baz), city of Issachar. Joshua 19:20.

Abgar, Epistles of: see PSEUDEPIGRAPHIA.

Abhidharma (üb'idür'mä) [Skt., = further dharma, or doctrine], schools of Buddhist philosophy. Early BUDDHISM classified experience into 5 skandhas or

aggregates, and alternatively into 18 dhatus or elements. Later, different schools developed the process of analysis and listing that was called *Abhidharma*, their treatises were collected in the *Abhidharmapitaka*, one of the three main divisions of the Buddhist canon of scriptures (see BUDDHIST LITERATURE). The categories of analysis were dharmas, or natures, ultimate factors or principles that arise and pass away in irreducible moments of time. Orthodox lists of dharmas varied from 75 to 157, with different classifications of the dharmas into groups. The exact definition of a dharma became the subject of much controversy. The greatest systematizer of Abhidharma thought was Vasubandhu (5th cent. A.D.) who wrote the encyclopedic *Abhidharmakosa* or *Treasury of Abhidharma*. See Herbert Guenther, *Philosophy and Psychology in the Abhidharma* (1957), F. I. Shcherbatskoi, *The Central Conception of Buddhism* (4th ed. 1970).

Abi (ä'bī) [short for ABIJAH], King Hezekiah's mother. 2 Kings 18:2. Abijah. 2 Chron. 29:1.

Abia (äbī'ä) see ABIJAH 2 and ABIJAH 6.

Abiah (äbī'ä), variant of ABIJAH. 1 Wife of Hezion. 1 Chron. 2:24. 2 Benjamite. 1 Chron. 7:8. 3 Second son of Samuel. 1 Sam. 8:2.

Abi-albon (ä'bī-äl'bön) see ABIEL 2.

Abiasaph (äbī'äsäf), Levitical family. Ex. 6:24. Ebiaph. 1 Chron. 6:23, 9:19. Asaph. 1 Chron. 26:1.

Abiathar (äbī'äthar), priest, son of Ahimelech, the only one of his family who escaped massacre by Doeg. He fled to David, to whom he remained loyal. Later he sided with Adonijah against Solomon, who took away his priesthood. 1 Sam. 22:9-23, 2 Sam. 15:29, 1 Kings 1:7, 2:27, Mark 2:26. Name exchanged with his father's. 2 Sam. 8:17, 1 Chron. 18:16, 24:6.

Abida or **Abidah** (both äbī'dä), son of Midian. Gen. 25:4, 1 Chron. 1:33.

Abidan (äbī'dän, äbī'-), Benjamite chief. Num. 1:11, 2:22, 7:60, 65, 10:24.

Abidjan (äbī'jän), city (1973 est. pop. 408,000), capital of Ivory Coast, a port on the Ebrie Lagoon (an arm of the Gulf of Guinea). Abidjan is Ivory Coast's administrative center and largest city. Its modern port is centered on Little Bassam Island, which is linked with the rest of the city by two bridges, a canal through the lagoon bar provides access to the Atlantic Ocean. Coffee, cacao, timber, pineapples, and plantains are the chief items shipped from the port. Abidjan's major industries are food processing, sawmilling, and the manufacture of textiles, chemicals, beverages, and soap. A communications and transportation hub, the city is connected by road or rail with neighboring countries. An international airport is nearby. Abidjan was a small village until the French began to enlarge it in the 1920s. In 1934 it became the capital of France's Ivory Coast colony. Today it is one of Africa's most modern cities. The Univ. of Abidjan, several technical colleges, and the Museum of the Ivory Coast are in Abidjan, which is also a popular tourist spot.

Abiel (ä'bēēl, äbī'äl, äb'ēēl) 1 Grandfather of King Saul. 1 Sam. 9:1, 14:51. 2 One of David's valiant men. 1 Chron. 11:32. Probably erroneously Abi-albon. 2 Sam. 23:31.

Abiezzer (ä'bīē'zar) 1 Manasseite. 1 Chron. 7:18. Jeezer. Num. 26:30. 2 One of David's captains. 2 Sam. 23:27, 1 Chron. 27:12.

Abigail (äb'ägäl) 1 The wife of Nabal. She persuaded David not to take vengeance on her husband. When Nabal died, she married David. 1 Sam. 25:2, 5 Sam. 3:3, 1 Chron. 3:1. 2 David's stepsister, mother of Amasa. 2 Sam. 17:25, 1 Chron. 2:16, 17.

Abihail (äbahä'al) 1 Father of Queen Esther. Esther 2:15, 9:29. 2 Gadite. 1 Chron. 5:14. 3 Merarite woman. Num. 3:35. 4 Wife of Abishur. 1 Chron. 2:29. 5 Mother-in-law of Rehoboam. 2 Chron. 11:18.

Abihu (äbī'hyō), son of Aaron, destroyed with his brother, Nadab, for offering "strange" fire. Ex. 6:23, 24:1, 9, 28:1, Lev. 10:1, Num. 3:2, 26:60, 61, 1 Chron. 6:3, 24:1.

Abihud (äbī'häd), grandson of Benjamin. 1 Chron. 8:3.

Abijah (äbī'jä) 1 See ABI. 2 Died c. 911 B.C., king (c. 914-c. 911 B.C.) of Judah, the southern kingdom. He succeeded his father, Rehoboam, and King Jeroboam continued warfare against him. 2 Chron. 13. Abijam. 1 Kings 15:1-8. Abia. 1 Chron. 3:10, Mat. 17:3. Son of Jeroboam, whose death was used by a prophet to foreshadow the death of Jeroboam. 1 Kings 14:4, 5. See ABIAH 2, 3. 6 Priestly family. 1 Chron. 24:10. Abia. Luke 1:5. 7, 8 Priests in the return to Jerusalem. Neh. 10:7, 12:4, 17.

Abijam (äbī'jam) see ABIAH 2.

Abiko (ä'bē'kō), city (1970 pop. 49,240), Chiba prefecture, central Honshu, Japan. It is an important railway junction, a resort town, and a residential suburb NE of Tokyo.

Abildgaard, Nikolaj Abraham (nikölī' ä'bēlgōro), 1743-1809, Danish painter of the neoclassical school. He was a student of Eckersberg. Among his own pupils was Thorvaldsen, whom he greatly influenced. Abildgaard's work may be seen in the House of Representatives in Copenhagen.

Abilene (äb'ilēn) 1 City (1970 pop. 6,661), seat of Dickinson co., central Kansas, on the Smoky Hill River, inc. 1869. It was (1867-71) a railroad for a large cattle-raising region extending SW into Texas. Under the promotion of J. G. McCoy, millions of head of cattle followed the Chisholm Trail into Abilene's stockyards prior to shipment. One of the wildest and toughest cowtowns of the Old West, Abilene once had Wild Bill Hickok as its marshal. The city, now a shipping point for a wheat and farm region, has feed and flour mills. Greyhound racing dogs are bred in Abilene, which is the headquarters of the National Greyhound Association. Former President Dwight D. Eisenhower lived in Abilene in his youth, the Eisenhower Center (completed 1961) includes his old family homestead, a museum, the Eisenhower Library, and his grave. 2 City (1970 pop. 89,653), seat of Taylor co., W central Texas, inc. 1882. Buffalo hunters first settled there, the town, which was founded in 1881 with the coming of the railroad, was named after Abilene, Kansas. Abilene grew as a shipping point for cattle ranches and is now the financial, commercial, and educational center of a large part of W Texas. The city's diversified manufactures include electronic, aircraft, and missile components, oil-field equipment, food and dairy products, cottonseed oil, agricultural equipment, clothing, metals, and musical instruments. Agriculture (cattle, sheep, poultry, cotton, and grain sorghums) and minerals (oil, natural gas, stone, sand and gravel, and clays) are important in the economy of the surrounding area, the headquarters of regional petroleum interests are in Abilene. Hardin-Simmons Univ., Abilene Christian College, and McMurry College are also in the city. Dyess Air Force Base and a Nike missile installation are nearby, as are the ruins of Fort Phantom Hill, an early army post and stagecoach stop. Other points of interest include the ruins of the old frontier town of Buffalo Gap, and Lake Abilene, the city's reservoir, located in a state park.

Abimael (äbīm'äēl), descendant of Shem. Gen. 10:28, 1 Chron. 1:22.

Abimelech (äbīm'alēk) 1 Name or title of a king of Gerar who had various dealings with Abraham and Isaac. Gen. 20:2, 21, 26. 2 See AHIMELECH 1. 3 Son of Gideon. He murdered his 70 brothers, except Jotham, and became "king." Judges 9:1-57, 2 Sam. 11:21. 4 See ACHISH 1.

Abinadab (äbīn'ädäb) 1 Second son of Jesse. 1 Sam. 16:8, 17:13, 1 Chron. 2:13. 2 Son of King Saul, killed at the battle of Mt. Gilboa. 1 Sam. 31:2, 1 Chron. 10:2. 3 Man in whose house the ark remained for 20 years. 1 Sam. 7:1, 2 Sam. 6:3, 4, 1 Chron. 13:7. 4 Father of one of Solomon's chief officers. 1 Kings 4:11. The officer is called Ben-abinadab in RSV.

Abington 1 Town (1970 pop. 12,334), Plymouth co., E Mass., settled 1668, inc. 1713. Chiefly residential, it has some light industry. 2 Township (1970 pop. 62,899), Montgomery co., SE Pa., a residential suburb of Philadelphia, settled 1696, inc. 1906. A junior college campus of Pennsylvania State Univ. is there.

Abinoam (äbīn'ōām), father of Barak. Judges 4:6, 12, 5:12.

Abiram (äbī'rām) 1 Levite who died with his brother DATHAN. 2 Son of a rebuilder of Jericho, associated obscurely with its foundations. 1 Kings 16:34.

Abishag (äb'äshäg), Shunammite woman, David's attendant in his old age and the indirect cause of Adonijah's murder. 1 Kings 1:2.

Abishai (äbīsh'äi, äb'īshī), nephew of David. 2 Sam. 2:18-24, 10:14, 23:18, 1 Sam. 26:6-9.

Abishalom (äbīsh'alōm, äbī'shā-) see ABSALOM.

Abishua (äbīsh'yōōa) 1 Priest. 1 Chron. 6:4, 5, 50, Ezra 7:5. 2 Benjamite. 1 Chron. 8:4.

Abishur (äb'īshär, äbī'-), grandson of Jerahmeel. 1 Chron. 2:28.

Abital (äb'itäl), mother of David's son Shephatiah. 2 Sam. 3:4, 1 Chron. 3:3.

Abitibi Lake (äbātībī'ë), irregularly shaped lake, c. 60 mi (100 km) long, SW Que. and E Ont., Canada. It is a popular tourist area and the site of the Abitibi

Game Reserve. The Abitibi River drains the lake and flows W and N to the Moose River

Abitub (ăb'itab), Benjamite 1 Chron 8:11

Abiud (ăb'iud) [Gr for ABIUD], son of Zerubbabel in Matthew's genealogy Mat 1:13

Abkhaz Autonomous Soviet Socialist Republic (ăbkăz', Rus abkhaz'), autonomous region (1970 pop 487,000, 3,300 sq mi (8,547 sq km), SE European USSR, in Georgia, between the Black Sea and the Greater Caucasus SUKHUMI (the capital) and GAGRA are the chief cities. Despite some perpetually snowcapped peaks, the region is mainly one of subtropical agriculture. Tobacco is the leading crop, there are also tea and citrus plantations, vineyards, and fruit orchards. Industries include sawmilling, canning, metalworking, and the manufacture of leather goods. Coal is the region's chief mineral. The population is made up of Abkhazians (an Orthodox Christian and Muslim people of the North Caucasian linguistic family), Georgians, Russians, and Armenians. Originally colonized in the 6th cent. B.C. by the Greeks, the region later came under Roman and Byzantine rule. In the 8th cent. a leader of the Abkhaz tribe formed an independent kingdom that became part of Georgia in the 10th cent. In 1578 the Turks conquered the area and gradually converted it to Islam. By a treaty with the Abkhazian dukes, Russia acquired Sukhumi in 1810 and declared a protectorate over all Abkhazia, which was formally annexed in 1864. Abkhazia became an autonomous republic in 1921 and was made part of Georgia in 1930. The region is famous for its health resorts.

ablative (ăb'lătiv') [Lat, =carrying off], in Latin grammar, the CASE used in a number of circumstances, particularly with certain prepositions and in locating place or time. The term is also used in the grammar of some languages (e.g., Sanskrit, Finnish) for a case of separation, e.g., "from the house."

ablaut (ap'lout) [Ger, =off-sound], in INFLECTION, vowel variation (as in English sing, sang, sung, song) caused by former differences in syllabic accent. In a prehistoric period the corresponding forms of the language (known through scientific reconstruction) had differences in accent, not differences in vowel. See UMLAUT.

ABM see GUIDED MISSILE

Abnaki Indians or **Abenaki Indians** (both ăbna'-kē), North American Indians of the Algonquian branch of the Algonquian-Wakashan linguistic stock (see AMERICAN INDIAN LANGUAGES). The name *Abnaki* was given to them by the French, but properly it should be *Wabanaki*, a word that refers to morning and the east and may be interpreted as those "living at the sunrise." The Abnaki lived mostly in what is now Maine, New Hampshire, and Vermont. Abnaki legend has it that they came from the Southwest, but the exact time is unsure, although archaeological sites do show that they were in the Northeast several thousand years before the beginning of the Christian era. After a series of bloody conflicts with British colonists, the Abnaki and related tribes (the Malecite, the Passamaquoddy, the Pennacook, the Penobscot, and others) withdrew into Canada, where they received protection from the French. The Abnaki were in settled villages, often surrounded by palisades, and lived by growing corn, fishing, and hunting. Their own name for their conical huts covered with bark or mats, *WIGWAM*, came to be generally used in English.

Abner, relative of Saul and commander in chief of his army. Jealousy and revenge probably caused his death at Joab's hands 1 Sam 14:50, 51, 17:55, 2 Sam 2:8.

Äbo, Finland see TURKU

abolitionists, in U.S. history, particularly in the three decades before the Civil War, members of the movement that agitated for the compulsory emancipation of Negro slaves. Abolitionists are to be distinguished from free-soilers, who opposed the further extension of slavery, but the groups came to act together politically and otherwise in the antislavery cause. Although antislavery sentiment had existed during the American Revolution, and abolitionist Benjamin LUNDY began his work early in the 19th cent., the abolition movement did not reach crusading proportions until the 1830s. One of its main-springs was the growing influence of evangelical religion, with its religious fervor, its moral urgency to end sinful practices, and its vision of human perfection. The preaching of Lyman Beecher and Nathaniel Taylor in New England and the religious revivals that began in W. New York state in 1824 under Charles G. FINNEY and swept much of the North, created a powerful impulse toward social reform—emancipation of the slaves as well as temperance, foreign missions, and women's rights. Outstanding

among Finney's converts were Theodore D. Weld and the brothers Arthur and Lewis TAPPAN. The Tappans and William Lloyd GARRISON, who began publishing an abolitionist journal, *The Liberator*, in 1831, were the principal organizers in Dec., 1833, at Philadelphia, of the American Anti-Slavery Society. The primary concern of the society was the denunciation of slavery as a moral evil, its members called for immediate action to free the slaves. In 1835 the society launched a massive propaganda campaign. It flooded the slave states with abolitionist literature, sent agents throughout the North to organize state and local antislavery societies, and poured petitions into Congress demanding the abolition of slavery in the District of Columbia. The abolitionists were at first widely denounced and abused. Mobs attacked them in the North, Southerners burned antislavery pamphlets and in some areas excluded them from the mails, and Congress imposed the GAG RULE to avoid considering their petitions. These actions, and the murder of abolitionist editor Elijah P. Lovejoy in 1837, led many to fear for their constitutional rights. Abolitionists shrewdly exploited these fears and antislavery sentiment spread rapidly in the North. By 1838, more than 1,350 antislavery societies existed with almost 250,000 members, including many women. Although abolitionists united in denouncing the African venture of the AMERICAN COLONIZATION SOCIETY, they disagreed among themselves as to how their goal might be best reached. Garrison believed in moral suasion as the only weapon, he and his followers also argued that women be allowed to participate fully in antislavery societies, thus disturbing the less radical element. When the Garrisonians passed such a resolution at the 1840 convention, a large group led by the Tappan brothers withdrew and formed the American and Foreign Anti-Slavery Society. The abolitionists were never again united as a single movement. Advocates of direct political action founded (1840) the Liberty party, James G. BIRNEY was its presidential candidate in 1840 and 1844. Writers such as John Greenleaf WHITTIER and orators such as Wendell PHILLIPS gave their services to the cause, while Frederick DOUGLASS and other freed or escaped slaves also took to the lecture platform. An antislavery lobby was organized in 1842, and its influence grew under Weld's able direction. Abolitionists hoped to convert the South through the churches, until the withdrawal of Southern Methodists (1844) and Baptists (1845) from association with their Northern brethren. After the demise of the Liberty party, the political abolitionists supported the FREE-SOIL PARTY in 1848 and 1852, and in 1856 they voted with the Republican party. The passage of more stringent fugitive slave laws in 1850 increased abolitionist activity on the UNDERGROUND RAILROAD. *Uncle Tom's Cabin*, by Harriet Beecher STOWE, became an effective piece of abolitionist propaganda, and the KANSAS question further aroused both North and South. The culminating act of extreme abolitionism occurred in the raid of John BROWN on Harpers Ferry. After the opening of the Civil War, insistent abolitionist demands for immediate freeing of the slaves, supported by radical Republicans in Congress, pushed President Lincoln in his decision to issue the EMANCIPATION PROCLAMATION. The abolitionist movement was one of high moral purpose and courage, its uncompromising temper made the slavery question the prime concern of national politics and hastened the demise of slavery in the United States. See SLAVERY. See G. H. Barnes, *The Antislavery Impulse, 1830-1844* (1933, rev. ed. 1957, repr. 1964), D. L. Dumond, *Antislavery the Crusade for Freedom in America* (1961, repr. 1964), Louis Filler, *The Crusade against Slavery, 1830-1860* (1960), Lawrence Lader, *The Bold Brahmins: New England's War against Slavery* (1961), Martin Duberman, ed., *The Antislavery Vanguard* (1965), Alma Lutz, *Crusade for Freedom: Women in the Antislavery Movement* (1968), Benjamin Quarles, *Black Abolitionists* (1969), A. S. Kraditor, *Means and Ends in American Abolitionism* (1969), Hugh Hawkins, ed., *The Abolitionists* (2d ed. 1972), Lewis Perry, *Radical Abolitionism* (1973).

Abomey (ăbōmă', ăbō'mē), town (1970 est. pop. 42,000), S Dahomey. It is the trade center for an agricultural region where grain and palm products are processed. The town is linked by railroad with COTONOU. Abomey was the capital of the kingdom of DAHOMEY, which was founded in the early 17th cent. and conquered by the French between 1892 and 1894. Ruins of the palaces of former Dahomey kings remain, and there is a museum. The city has a fruit research institute.

abominable snowman or **yeti**, manlike creature so named because it is associated with the perpetual

snow region of the Himalayas. A figure unknown except through tracks ascribed to it and through alleged encounters, it is described as 6 or 7 ft (18 or 21 m) tall and covered with long, dark hair. Attempts after the 1950s to verify these tracks (notably by Sir Edmund HILLARY in 1960) have had no results. While many scholars dismiss the existence of the snowman as a myth, others claim that it may be a form of hitherto unclassified ape.

abortion, expulsion of the product of conception before the embryo or fetus is viable. Any interruption of human pregnancy prior to the 28th week is known as abortion. Some authorities restrict the use of this term to the first 12 weeks and refer to the premature termination of pregnancy after the placenta is formed as a miscarriage. Popularly, miscarriage is used to signify accidental premature birth at any period, as opposed to purposely induced abortion. Spontaneous abortion may occur after the death of the fetus and hemorrhage in the uterus. Spontaneous expulsion during the last two thirds of pregnancy may be due to many causes, among them infectious disease (e.g., syphilis and toxemia), endocrine dysfunction (as in hypothyroidism and diabetes), and trauma. Abortion has long been practiced and was used as a form of birth control in ancient Greece and Rome. In the Middle Ages in Western Europe it was generally accepted in the early months of pregnancy. However, in the 19th cent. opinion about abortion changed. In 1869 the Catholic Church prohibited abortion under any circumstances. In England and in the United States in the 19th cent. stringent antiabortion laws were passed. The 20th cent. has generally seen a liberalization of attitudes toward abortion. In the United States on Jan. 22, 1973, the Supreme Court ruled that a state may not prevent a woman from having an abortion during the first six months of pregnancy, thus invalidating abortion laws in some states and overturning restrictive abortion laws in many other states. Abortion was legalized in England in 1967 and is also authorized in the Soviet Union, Japan, various of the Eastern European countries, and Scandinavia. Nevertheless, different groups, because of religious or other convictions, have continued to protest abortions and in the United States have organized, pressing to prohibit them by constitutional amendment. Abortion procedures include vacuum suction, and dilation and curettage—both methods are used in the early stages of pregnancy—as well as saline injection and hysterotomy.

abracadabra (ăb'rakădăb'ră), magical formula used by the Gnostics (see Gnosticism) of the 2d cent. to invoke the aid of benevolent spirits to ward off disease and affliction. It is supposed to be derived from, or similar in origin to, the abraxas, a word highly significant of the Supreme Power, which was engraved on gems and amulets or was variously worn as a protective charm. Handed down through the Middle Ages, the abracadabra gradually lost its occult significance, and its meaning was extended to cover any hocus-pocus.

Abraham [according to Gen. 17:5 = father of many] or **Abram** [Heb., = the father is high], progenitor of the Hebrews. He is the example of a man devoted to God, as in his journey to Canaan from Haran, his treatment of Lot, or his willingness to sacrifice his son. He is principally important as the founder of Judaism, the religion of a covenant. In this function he instituted circumcision and received the promise of Canaan for his people, who are descended from Isaac, the son of his old age. Gen. 11-25. Because of this dual role as founder of a race and its religion, the expression "Abraham's bosom," meaning the bliss awaiting his children, was current among later Jews and has become, for Christians, a synonym for heaven. Luke 16:22-31. His titles, Father of the Faithful and Friend of God (2 Chron. 20:7, Rom. 4:11), are used by Muslims who deem him ancestor, through Ishmael, of the Arabs. The frequent use of his name among Christians and the numerous paintings depicting the story of the sacrifice of Isaac (e.g., by Andrea del Sarto) testify to the universal reverence in which worshippers of God have held this founder of their faith. Modern biblical research tends to accept his historicity. See Sir C. L. Woolley, *Abraham: Recent Discoveries and Hebrew Origins* (1936), A. Gonzalez, *Abraham, Father of Believers* (tr. 1967), H. Gaubert, *Abraham, Loved by God* (tr. 1968).

Abraham, Plains of, fairly level field adjoining the upper part of the city of Quebec, Canada. There, in 1759, the English under Gen. James Wolfe defeated the French under Gen. Louis Montcalm. The battle decided the last of the FRENCH AND INDIAN WARS and led to British supremacy in Canada. Part of the battle

site is now built over, but a part is preserved as a national park. See C. P. Stacey, *Quebec, 1759: The Siege and the Battle* (1959).

Abraham ben Meir ibn Ezra· see IBN EZRA

Abraham Lincoln Birthplace National Historic Site, 117 acres (47 hectares), central Ky., near Hodgenville, est. 1916. Abraham Lincoln was born in a log cabin in this area on Feb. 12, 1809. The exact location of the original cabin has not been conclusively established, but evidence seems to indicate that it was situated on top of the knoll where the memorial building now stands. Inside of the building is the log cabin traditionally accepted as Lincoln's birthplace.

Abram· see ABRAHAM

Abramovich, Sholem (or **Solomon**) **Yakob**· see MENDELE MOCHER SFORIM

Abramovitz, Max· see HARRISON WALLACE KIRKMAN

Abrams, Creighton Williams, 1914–74, U.S. military officer, b. Springfield, Mass. After graduating (1936) from West Point, he served with distinction during World War II, most notably as commander of the 37th Tank Battalion, which relieved Allied forces trapped at Bastogne during the Battle of the Bulge. After service in Korea (1953–54) and in West Germany (1960–62) during the Berlin crisis, he became (1964) vice chief of staff of the U.S. army and was promoted (1964) to the rank of general. Abrams was appointed (1967) deputy commander of U.S. forces in Vietnam under Gen. William Westmoreland and later served (1968–72) as commanding general. From 1972 until his death he was U.S. army chief of staff.

Abrantes (ābrān'tīsh), town (1970 municipal pop. 48,161), Santarém dist., W central Portugal, in Ribatejo, on the Tagus River. It is the commercial center of a fruit growing region. Historically, Abrantes was a strategic point on the road to Lisbon. Alfonso I took it from the Moors in 1148. John I gathered his army there before the battle of Aljubarrota (1385). In the Napoleonic Wars, the French under Junot won the battle of Abrantes in 1807, but in 1810 they were unable to take the town by siege.

abrasive, material used for grinding, smoothing, cutting, or polishing another substance. Among the important natural abrasives are DIAMOND (in the form of dust and small inferior stones), CORUNDUM, emery, SAND, ground QUARTZ, PUMICE, KIESELGUHR, CHALK, and TRIPOLI. Important artificial abrasives are alundum (see ALUMINA), carborundum (see SILICON CARBIDE), boron carbide, and tungsten carbide, all of which are very hard. Since it was first produced in 1955, synthetic diamond has also become an important abrasive. Tripoli, chalk, and aluminum hydroxide, suspended in water, are efficient polishing agents. Silicon carbide, emery, and corundum are frequently mixed with cement and molded into wheels, blocks, and sticks. The finer powders are dusted on glue paper to produce emery paper, glass paper, and sandpaper. Pumice, finely powdered, is used in some toothpastes. Sand is used to great advantage in sand-blast machines. Automobile cylinders and valves are ground with emery or carborundum powder, mixed with oil, and tools are sharpened on emery wheels. Diamonds are cut by a thin revolving disk of phosphor bronze that has been impregnated with diamond dust. Materials with abrasive qualities can do much damage to machinery, especially to bearings and sliding parts.

Abra-vanel (ābra'vānēl) or **Abarbanel**, **Isaac** (–bārbā–), 1437–1508, Jewish theologian, biblical commentator, and financier, b. Lisbon. He served as treasurer to Alfonso V of Portugal but fled that country when he was implicated (1483) in a plot. He was then employed by Ferdinand and Isabella of Spain, until they expelled the Jews from their kingdom. He was later employed by the governments of Naples and Venice. His biblical commentaries are notable for their interpretation of the books of the Bible in terms of their various historical and social backgrounds and for their liberal quotations from Christian commentaries. Abra-vanel attacked the use (by Maimonides) of philosophical allegory, which he believed weakened the faith of many and thus tended to undermine the Jewish community in a precarious time. In his analyses of the Messianic prophecies he specifically denied Christian claims of Jesus as the Messiah (a dangerous position to take at that time), and looked to an impending Messianic age in which the Dispersion would end with Israel's return to the Holy Land and the reign of Messianic rule for all humanity. See study by Ben-Zion Netanyahu (2d ed. 1968).

Abra-vanel or **Abarbanel**, **Judah**, c.1460–c.1523, Jewish philosopher, physician, and poet, son of Isaac Abra-vanel, b. Lisbon, he is also known as

Leone Ebreo. He fled (1483) from Portugal to Spain with his father and, after the expulsion (1492) of the Jews from Spain, went to Naples, where he became (1505) physician to the viceroy. Philosophically, Abra-vanel was influenced by the scholars of the Platonic Academy of Florence, most notably Marsilio Ficino and Giovanni Pico della Mirandola, in addition, there are clear indications of philosophical influence from Maimonides and Ibn Gabirol. In his most celebrated work, the *Dialoghi di Amore* (published posthumously, 1535, tr. *The Philosophy of Love*, with introduction by Cecil Roth, 1937), Abra-vanel gave a classic exposition of platonic love. Holding love to be the dominating and motivating force within the universe, and seeing as its end a union of the lover with the idea of the beautiful and the good as embodied in the beloved, he posited as the ultimate goal of all creation a union with the sublime goodness and intellect that are contained within God. A "circle of love" is thus formed between the universe and its creator in which all things find sustenance and fulfillment. The work had a profound effect upon philosophers into the 17th cent., most notably upon Giordano Bruno and Baruch Spinoza.

Abruzzi, Luigi Amedeo, duca degli (lūwē'jē amādē'ō dōō'ka dā'lyē abroōt'sē), 1873–1933, Italian explorer and mountain climber, cousin of Victor Emmanuel III. He led (1897) the first ascent of Mt. St. Elias in Alaska. His polar expedition (1899–1900) reached a point farther north than Nansen's record. He explored (1906) the Ruwenzori range in Africa and unsuccessfully attempted (1909) to reach the peak of Mt. GODWIN AUSTIN, the southeast ridge of the peak is named in his honor. After 1919 he explored and tried to establish colonies in East Africa. A naval officer, he served in the Italo-Turkish War and World War I. Records of his polar exploration and his Asiatic mountain climbing have been translated.

Abruzzi (abroōt'sē), region (1971 pop. 1,163,334), 4,167 sq mi (10,793 sq km), central Italy, bordering on the Adriatic Sea in the east. L'AQUILA is the capital of the region, which is divided into Chieti, L'Aquila, Pescara, and Teramo provs. (named for their capitals). Abruzzi is mostly mountainous and is crossed by three ranges of the Apennines, which reach their highest point (9,560 ft/2,914 m) there in the Gran Sasso d'Italia group. There is a narrow coastal strip along the Adriatic. The chief rivers are the Pescara, the Sangro, and the Tronto. A generally poor region, Abruzzi has mostly small-scale agriculture and limited, but growing, industry. The main crops are grapes, olives, sugar beets, and tobacco; pigs and sheep are raised. The chief manufactures are processed food, textiles, clothing, and plastics. Tourism is important. Abruzzi was conquered by the Romans in the 4th cent. B.C. Later, it was part of the Lombard duchy of Spoleto (6th–11th cent. A.D.), the Norman kingdom of Sicily (12th–13th cent.), and the kingdom of Naples (13th–19th cent.). From 1948 to 1965 it was included in the region of Abruzzi e Molise. There are universities at Chieti and L'Aquila.

Absalom (āb'sālōm), son of David. He murdered his brother Amnon for the rape of their sister Tamar and fled. After a time he returned, but no sooner was he reconciled with his father than he stirred up a rebellion ultimately resulting in his death. 2 Sam. 3:3, 13–39, 2 Chron. 11:20, 21. The form Abishalom is used in Kings 15:2, 10.

Absalon (ap'salōn) or **Axel** (ak'sæl), c.1128–1201, Danish churchman, archbishop of Lund (1178–1201). He had great influence on political affairs under Waldemar I and Canute VI, warred against the pagan Wends, and in 1184 won a naval victory over Bogislav, duke of Pomerania. He attempted monastic reforms, introduced canon law into Denmark, and was patron of Svend Aagesen and Saxo Grammaticus. In 1167, Absalon was in charge of fortifying Copenhagen.

Absaroka Indians· see CROW INDIANS

abscess, accumulation of pus in the tissues as a result of INFECTION. Abscesses are characterized by inflammation and swelling, often painful. They occur in the skin, at the root of a tooth, in the middle ear, on the eyelid (see STY), in the mammary glands, in the recto-anal area, and elsewhere in the body. In tuberculosis, abscesses (tubercles) may develop in lung tissue, in the lymph nodes, and in bone. A sinus abscess may result in a FISTULA, and abscess of the appendix in appendicitis. Unless an abscess discharges spontaneously, surgical incision and drainage is required. Many cases respond to treatment with antibiotics. See BOIL, CARBUNCLE.

abscissa· see CARTESIAN COORDINATES

absentee ownership, system under which a person (or a corporation) controls and derives income from land in a region where he does not reside. Abuses existed in absenteeism in pre-Revolutionary France, in 19th-century Ireland, in E and SE Europe before World War I, and in some oil-producing nations of the Middle East as late as the second half of the 20th cent. Revolution and reform have abolished or greatly reduced the amount of absentee control throughout the world. In the United States the term has been applied to the concentration of economic power through various corporate devices. Chain stores and branch banking are sometimes classified as types of absentee ownership.

absinthe (äb'sīnth), an emerald-green, toxic LIQUEUR distilled from wormwood and other aromatics, including angelica root, sweet-flag root, star anise, and dittany, which have been macerated and steeped in alcohol. It was invented by a Dr. Ordinaire, a Frenchman who lived in Switzerland. Genuine absinthe is 70% to 80% alcohol. Because of the harmful effect it has on the nerves, it has been banned in most western countries—Switzerland (1908), the United States (1912), France (1915), an exception is Spain, where absinthe may be legally consumed.

absolute, in philosophy, term used to identify reality, the opposite of *relative*. The term has acquired numerous widely variant connotations in different philosophical systems. It means unlimited, unconditioned, or free of any relation, perfect, complete, or total, permanent, inherent, or ultimate, independent, or valid without reference to a perceiving subject. In logic, absolute means certain or indubitable as opposed to probable or hypothetical. As a substantive, the absolute is the ultimate basis of reality, the principle underlying the universe. Theologically, it is synonymous with, or characteristic of, God. Philosophically, it may be considered as the unknowable, the thing-in-itself, as that ultimate non-relative that is the basis of all relation, as the ultimate, all-comprehensive principle in which all differences and distinctions are merged. The concept of the absolute was present in Greek philosophy. In modern times, both realists and idealists have used the term, but it is, perhaps, most intimately connected with the idealism of G. W. HEGEL.

absolute differential calculus· see TENSOR

absolute magnitude· see MAGNITUDE

absolute monarchy· see MONARCHY

absolute music, term used for music dependent on its structure alone for comprehension. It is the antithesis of PROGRAM MUSIC. It is not associated with extramusical ideas or with a pictorial or narrative scheme of emotions, nor does it attempt to reproduce sounds in nature. Hence it is always instrumental, although not all instrumental music is absolute. The music of Bach is absolute music.

absolute pitch, the position of a tone in the musical scale determined according to its number of vibrations per second, irrespective of other tones. The term also denotes the capacity to identify any tone upon hearing it sounded alone or to sing any specified tone. Experiments have shown that this ability, a form of memory, can be acquired through practice, but in some individuals it appears to be inborn.

absolute temperature scale· see KELVIN TEMPERATURE SCALE, TEMPERATURE

absolute value, magnitude of a number or other mathematical expression disregarding its sign, thus, the absolute value is positive, whether the original expression is positive or negative. In symbols, if $|a|$ denotes the absolute value of a number a , then $|a| = a$ for $a \geq 0$ and $|a| = -a$ for $a < 0$. For example, $|7| = 7$ since $7 \geq 0$ and $|-7| = -(-7)$, or $|-7| = 7$, since $-7 < 0$.

absorption [Lat. = sucking from], taking of molecules of one substance directly into another substance. It is contrasted with ADSORPTION, in which the molecules adhere only to the surface of the second substance. Absorption may be either a physical or a chemical process, physical absorption involving such factors as solubility and vapor-pressure relationships and chemical absorption involving chemical reactions between the absorbed substance and the absorbing medium.

absorption spectrum· see SPECTRUM

abstinence· see FASTING, TEMPERANCE MOVEMENTS

abstract art· see ABSTRACT EXPRESSIONISM, MODERN ART

abstract expressionism, movement of abstract painting that emerged in New York City during the mid-1940s and attained singular prominence in American art in the following decade, also called

action painting and the New York school. It was the first important school in American painting to declare its independence from European styles and to influence the development of art abroad. Arshile Gorky first gave impetus to the movement. His paintings, derived at first from the art of Picasso, Miro, and surrealism, became more personally expressive. Jackson Pollock's turbulent yet elegant abstract paintings, which were created by spattering paint on huge canvases placed on the floor, brought abstract expressionism before a hostile public. Willem de Kooning's first one-man show in 1948 established him as a highly influential artist. His intensely complicated abstract paintings of the 1940s were followed by images of *Woman*, grotesque versions of buxom womanhood, which were virtually unparalleled in the sustained savagery of their execution. Other important artists were Hans Hofmann and Robert Motherwell. Painters such as Philip Guston and Franz Kline turned to the abstract late in the 1940s and soon developed strikingly original styles—the former, lyrical and evocative, the latter, forceful and boldly dramatic. Abstract expressionism presented a broad range of stylistic diversity within its largely, though not exclusively, nonrepresentational framework. For example, the expressive violence and activity in paintings by de Kooning or Pollock marked the opposite end of the pole from the simple, quiescent images of Mark Rothko. Basic to most abstract expressionist painting were the attention paid to surface qualities, i.e., qualities of brushstroke and texture, the use of huge canvases, the adoption of an approach to space in which all parts of the canvas played an equally vital role in the total work, the harnessing of accidents that occurred during the process of painting, and the glorification of the act of painting itself as a means of visual communication. The movement had an inestimable influence on the many varieties of work that followed it, especially in the way its proponents used color and materials. Its essential energy transmitted an enduring excitement to the American art scene. See articles on individuals (e.g., POLLOCK). See Michael Seuphor, *Abstract Painting: Fifty Years of Accomplishment from Kandinsky to the Present* (1962, repr. 1964); Irving Sandler, *The Triumph of American Painting: A History of Abstract Expressionism* (1970); Maurice Tuchman, ed., *The New York School: Abstract Expressionism in the 40s and 50s* (rev. ed. 1970).

abstract of title, in law, brief history of the title to a piece of land. An account is given of recorded documents, court proceedings, WILLS, MORTGAGES, taxes, previous sales, EASEMENTS, and all other factors that at any time affected the ownership or use of the land. The old rule in England required that an abstract of title should cover the 60 years before the proposed sale. In 1874 this was changed to 40 years. In some U.S. states the title is traced back to the original grant from the government, but in others it is traced only so far back as is necessary to show a present clear title.

Abu al-Abbas as-Saffah (a'boöl-abas' as-safa'), d. 754, 1st ABBASID caliph (749–54). Raised to the caliphate by the armed might of ABU MUSLIM, he took the reign name as-Saffah [shedder of blood]. Most of the Umayyad family was exterminated, and the reign was one of massacre and force. He was succeeded by his brother AL-MANSUR.

Abu al-Ala al-Ma'arri (ä'boö al-ala' al-ma-ar-ré'), 973–1057, Arabic freethinking poet. He was born and lived most of his life in Ma'arrah, S of Aleppo. He was blind from childhood. Brilliantly original, he became one of the literary reformers who discarded classicism for a modern intellectual urbanity. After 35 he lived a life of seclusion, and with his advocacy of an utterly ascetic purity, his poetry became more stereotyped. He believed in the ethical teachings of the monotheistic religions.

Abu al-Faraj. See BAR HEBRAEUS.

Abu al-Faraj Ali of Esfahan (a'boö al-faraj' alé', ésfahan'), 897–967, Arabic scholar. He is mainly known for his invaluable KITAB AL-AGHANI (book of songs), which provides detailed information about the culture and social life of medieval Islam.

Abu al-Fida (a'boöl-fé-da, -fidä'), 1273–1331, Arab historian, b. Damascus. He fought against the Christians in the last period of the Crusades and later became (1310) governor of Hama in Syria. He was a patron of learning and wrote a descriptive geography and a universal history, which is a superior source for Arabic history from the pre-Islamic period to 1329.

Abu Bakr (ä'boö bak'är), 573–634, 1st caliph, friend, father-in-law, and successor of Muhammad. He was

probably Muhammad's first convert outside the Prophet's family and certainly his most zealous believer. He alone accompanied Muhammad on the hegira. The marriage of Abu Bakr's daughter AISHA to Muhammad made the ties even stronger. On the Prophet's death in 632, UMAR secured Abu Bakr's election over the tribal chiefs and AU. The two years of his caliphate were critical for Islam. Though he was himself fervent rather than warlike, his party crushed opposition in Arabia and began the remarkable extension of Islam as a world religion. He was succeeded by Umar. See biography by A. Mohy-Nol-Din (1968); Asadul Qadri, *Interested Stories from the Life of Hazarat Abu Bakr Siddiq* (1970).

Abubus (abyö'bas), father of the Ptolemy who murdered Simon the Maccabee. 1 Mac. 16:11.

Abu Dhabi (a'boö tha'bē, za-, dā-), Arab. *Abu Zabi*, sheikhdom (1968 pop. 46,375), c. 26,000 sq mi (67,300 sq km), part of the federation of UNITED ARAB EMIRATES, E. Arabia, on the Persian Gulf. The sheikhdom is the largest in the federation, in it is located the town of Abu Dhabi, founded c. 1760, which is the temporary capital of the federation pending the construction of a new one on the border between Abu Dhabi and DUBAI. The sheikhdom became a British protectorate in 1892. The history of Abu Dhabi has been marked by violence within the ruling dynasty, few of the rulers died a natural death. Abu Dhabi frequently clashed with the neighboring sheikhdom of Sharjah. There was a long period of tranquility during the rule (1928–66) of Sheikh Shakhbut ibn Sultan, broken only by a war between Abu Dhabi and Dubai from 1945 to 1948. Oil was discovered in Abu Dhabi in the early 1960s. The oil revenues have been used for development and modernization. Abu Dhabi became part of the United Arab Emirates when it was formed in 1971.

Abu Hanifa (abö' hané'fa), 699–767, Muslim jurist. He founded the Hanafite system of Islamic jurisprudence, which gives the judge considerable discretion when the Koran and the Sunna (traditions) are inapplicable (see ISLAM).

Abukir: see ABU QIR, Egypt.

Abulcasis (a'boölka'sis) or **Abu Khasim** (a'boö ka'sim), Arabian physician, d. c. 1013, b. near Cordoba, Spain. His chief work, a detailed account of surgery and medicine, was for many years the leading surgical textbook. Known as the *Tasrif* [the collection], it consisted of three parts, dealing with cautery, with surgery, and with fractures and dislocations. It was translated many times into Latin and into other languages. His name also appears as Albucasis.

Abulfazl (ä'boölfa'zal, ä'boölüz'al), 1551–1602, minister of state and adviser to AKBAR, Mogul emperor of India. His *Book of Akbar*, in Persian, recounts the history of the reign, describing the political and religious organization of the empire. He was in part responsible for the development of Akbar's eclectic religion, Din-i-ilahi. Abulfazl was murdered at the instigation of Akbar's heir, the later emperor Jahangir.

Abu Muslim (ä'boö möös'lim), c. 728–755, Persian leader of the ABBASID revolution. By political and religious agitation he raised (747) the black banners of the Abbasids against the ruling Umayyad family. In 749 he established ABU AL-ABBAS AS-SAFFAH, the head of the Abbasid family, as caliph of Islam. Abu Muslim became governor of Khurasan, but the caliph Mansur feared his power and treacherously murdered him.

Abu Nuwas (a'boö nööwas'), d. c. 810, Arabic poet, b. Ahvaz, Persia. He spent most of his life in Baghdad. High in favor with the caliphs Harun ar-Rashid and Amin, he lived a courtier's life, his exquisite lyric poetry echoes the extravagance of this life.

Abu Qir or **Abukir** (both ä'boökär', äboökär'), village, N. Egypt, on a promontory in the Nile River delta. Admiral Horatio Nelson's victory over the French fleet off Abu Qir on Aug. 1, 1798 (sometimes called the battle of the Nile), restored British prestige in the Mediterranean region and, with the land victory (1801) led by Sir Ralph Abercromby, cut short the French venture in the Middle East begun by Napoleon I.

Abu Said ibn Abi al-Khair (a'boö sa'id 'ibän abé' äl-khär'), 967–1049, Persian poet, a Sufi and a dervish. He was the first to write rubaiyat (quatrains) in the Sufistic strain that Omar Khayyam made famous. **Abu-Simbel** (a'boö-sim'bäl) or **Ipsambul** (ip'sambööl'), village, S. Egypt, on the Nile River. Its two temples, hewn (c. 1250 B.C.) out of rock cliffs during the reign of Ramses II, were raised over 200 ft (61 m) to avoid the rising waters caused by the construction of the Aswan High Dam. UNESCO solicited funds from 52 nations for the salvage of the Nubian

archaeological treasure. The colossal statues of Ramses II and the temples were cut into 950 blocks, raised, and reassembled farther inland. The job was finished in 1966.

Abu Tammam Habib ibn Aus (tam-mam' habéb' 'ibän ous'), c. 805–c. 845, Arabic poet, compiler of the *HAMASA*. His poems of valor, often describing historical events, are important as source material.

abutilon (äbyööl'alön) see MALLOW.

Abydos (äb'ädäs), ancient city of Egypt, c. 50 mi (80 km) NW of Thebes. Associated in religion with Osiris, Abydos became the most venerated place in Egypt. It was the favorite burial place for the kings of the earliest dynasties, and later kings such as Seti I and Ramses II continued to build temples and sanctuaries there. Its remains date from the I to the XXVI dynasty (3100–500 B.C.). A famous list of kings, found on the wall of the temple built by Seti I, has been valuable in determining the order of succession among the Egyptian kings from Menes to Seti. **Abydos**, ancient town of Phrygia, Asia Minor, on the Asiatic side of the Hellespont opposite Sestos, in present-day Turkey. It was originally a Milesian colony. Near there Xerxes built his bridge of boats in 480 B.C., and in 411 the Athenian fleet defeated the Spartans. A free city until it was taken by Philip V of Macedon in 200 B.C., it became a major city of Antiochus III. It was the scene of the story of Hero and Leander.

abyssal plain: see OCEAN.

Abyssinia (äb'isín'ëya) see ETHIOPIA.

Abyssinian cat see CAT.

Abzine, mountains, Africa. See SAHARA.

Abzug, Bella Savitsky (sävit'ské äb'zöög'), 1920–, U.S. Congresswoman (1971–), b. New York City. Admitted to the bar in 1947, she handled many labor, civil rights, and civil liberties cases. Abzug helped found (1961) the Women's Strike for Peace to protest the testing of nuclear weapons and served (1961–70) as its legislative director. A founder (1968) of the reform-oriented New Democratic Coalition, she was elected to the U.S. House of Representatives (1970), where she quickly became a leader of the House antiwar movement. Abzug became known as a sharp critic of the House seniority system and a vigorous proponent of women's rights. See her *Bella! Ms. Abzug Goes to Washington*, ed. by Mel Ziegler (1972).

AC, chemical symbol of the element ACTINIUM.

AC: see ALTERNATING CURRENT.

acacia (äkä'shä), any plant of the large leguminous genus *Acacia*, often thorny shrubs and trees of the family Leguminosae (PULSE family). Chiefly of the tropics and subtropics, they are cultivated for decorative and economic purposes. Acacias are characteristic of savanna vegetation and are especially numerous in the South African bushveld. The foliage often appears feathery because of the many small leaflets, but in some species leaflike flattened stems contain chlorophyll and take the place of leaves. Various Old World species (especially *A. arabica* and *A. senegal*) yield gum arabic, other species, chiefly *A. catechu*, yield the dye CATECHU. Blackwood (*A. melanoxylon*) is valued in Australia for its hardwood timber. Other members of the genus are valuable for LAC, for perfume and essential oils, and for tannins, some are used as ornamentals. The Australian acacias are commonly called wattles—their pliable branches were woven into the structure of the early wattle houses and fences—and Wattle Day celebrates the national flower at blossoming time. Many wattles are cultivated elsewhere, particularly in California, as ornamentals for their characteristic spherical, dense flowers. The Central American bullhorn acacias (e.g., *A. sphaerocephala*) have large hollow thorns inhabited by ants that are said to feed upon a sweet secretion of the plant and in turn guard it against leaf-eating insects. The most common acacia indigenous to the United States is the cat's-claw (*A. greggii*) of the arid Southwest. The Biblical SHITTIM WOOD is thought to have come from an acacia. Various species of locust are sometimes called acacia, and acacias may be called mimosa, all are of the same family. *Acacia* is classified in the division MAGNOLIOPHYTA, class Magnoliopsida, order Rosales, family Leguminosae.

academic freedom, right of scholars to pursue research, to teach, and to publish without control or restraint from the institutions that employ them. It is a civil right that is enjoyed, at least in statute, by all citizens of democratic countries. In the case of scholars, whose occupation is directly involved with that right, the concept of academic freedom generally includes the property right of tenure of office.

(see **TENURE**, in education) Essential to the acceptance of the concept of academic freedom is the notion that truth is best discovered through the open investigation of all data. A less clearly developed corollary of academic freedom is the obligation of all those who enjoy it to pursue the line of open and thorough inquiry regardless of personal considerations. Historically, academic freedom developed during the Enlightenment. Early cultures, which viewed education as a system of absorbing a well-defined content of subject matter, offered little opportunity for speculation. The medieval universities also operated within a field of definite scope, primarily theological, and any teacher or scholar who extended his inquiry beyond the approved limits was subject to the charge of heresy. The scientific method of analyzing data and establishing hypotheses, a vital concomitant of academic freedom, was initiated during the Enlightenment, mainly by scholars outside university life such as Thomas Hobbes, John Locke, and Voltaire. It was in the Prussia of Frederick the Great that the new freedom first flourished within the university itself. In England, it was laymen like Jeremy Bentham, David Ricardo, Herbert Spencer, Charles Darwin, and Thomas Huxley who demonstrated the value of free investigation. Before the concept of academic freedom could gain general acceptance, however, it was necessary that education become secularized. It was not until 1828 that the first nonsectarian university was established in London. In the United States the early colleges were also religiously controlled, and there are still some denominational schools that define areas of inquiry. The AMERICAN ASSOCIATION OF UNIVERSITY PROFESSORS has been active in establishing standards of academic freedom and has investigated cases in which the right was alleged to have been jeopardized. See Richard Hofstadter and W. P. Metzger, *The Development of Academic Freedom in the US* (1955), R. M. MacIver, *Academic Freedom in Our Time* (1955, repr. 1967), Jack Nelson and Gene Roberts, Jr., *Censors and the Schools* (1963), Louis Joughin, *Academic Freedom and Tenure: A Handbook of the AAUP* (rev. ed. 1969), W. P. Metzger et al., *Dimensions of Academic Freedom* (1969), Sidney Hook, ed., *In Defense of Academic Freedom* (1971).

Académie française. see FRENCH ACADEMY

academies of art, official organizations of established artists. Lorenzo de' Medici's informal circle of great artists and thinkers was modeled on similar groups formed in classical Greece. The first official academy, the Accademia del Disegno, was founded in Florence by Vasari in 1561. Offshoots of this were the prototypes for the powerful Académie royale de peinture et de sculpture founded in 1648, the first of many French academies. The academies dictated elaborate conventions and aesthetic doctrines for the manufacture of works of art and the term "academic" came to imply derivative rather than creative work. The English Royal Academy, founded in 1768, now serves primarily as an art school and exhibition facility. The AMERICAN ACADEMY IN ROME is a school that embraces many fields including music and classical studies.

Academy, school founded by PLATO near Athens c. 387 B.C. It took its name from the garden (named for the hero Academus) in which it was located. Plato's followers met there for nine centuries until, along with other pagan schools, it was closed by Emperor Justinian in A.D. 529. The Academy has come to mean the entire school of Platonic philosophy, covering the period from Plato through Cicero. During this period Platonic philosophy was modified in various ways. These have been frequently divided into three phases: the Old Academy (until c. 250 B.C.) of Plato, SPEUSIPPUS, and XENOCRATES; the Middle Academy (until c. 150 B.C.) of ARCESILAUS and CARNEADES, who introduced and maintained skepticism as being more faithful to Plato and Socrates; and the New Academy (c. 110 B.C.) of Philo of Larissa, who, with subsequent leaders, returned to the dogmatism of the Old Academy.

Acadia (ākādēa), region and former French colony, E. Canada, centered on Nova Scotia but including also New Brunswick, Prince Edward Island, and the mainland coast from the Gulf of St. Lawrence S into Maine. The first and chief town, Port Royal (now ANNAPOLIS ROYAL, N.S.), was founded by the sieur de Monts in 1605 and was soon involved in the imperial struggle that was to end in America with the FRENCH AND INDIAN WARS. Destroyed by English colonists under Samuel ARGALL in 1613, the town was later rebuilt, and as British claims temporarily lapsed (see NOVA SCOTIA), the colony grew to be fairly prosperous with farmers on their dike-protected fields,

fishermen on the shore, and fur traders in the forests. Later, attacks on Port Royal were resumed, and its capture by the British in 1710 was confirmed as permanent in the Peace of Utrecht (1713). The British feared and distrusted their French-speaking, Roman Catholic neighbors, who were friendly with the Indians and, wishing only to remain neutral, refused to swear allegiance to Great Britain. In 1755 the British fell upon the peaceful Acadian farms and, seizing most of the Acadians, deported them to the more southerly British colonies, scattering them along the Atlantic coast from Maine to Georgia and sending some to the West Indies and Europe. The men were sent first, families were separated, farmhouses burned, and some lands abandoned to waste. A second expulsion took place in 1758. Later many exiles returned. Today in Canada, Acadian (French *Acadien*) means a French-speaking inhabitant of the Maritime Provinces. Many exiles who did not return found havens elsewhere, the most celebrated being the region around St. Martinville in S. Louisiana, where the Cajuns—as they are popularly called—still maintain a separate folk culture. The sufferings of the expulsion are pictured in Longfellow's *Evangeline*. See G. F. Clarke, *So Small a World: The Story of Acadia* (1958), J. B. Brebner, *New England's Outpost* (1927, repr. 1965), A. H. Clark, *Acadia: The Geography of Early Nova Scotia to 1760* (1968).

Acadia National Park, 41,642 acres (16,853 hectares), SE Maine, on the Atlantic coast, est. 1919. The park occupies a major portion of Mount Desert Island, Isle au Haut and several smaller islands, and the southern tip of Schoodic Peninsula. Almost completely surrounded by the sea, the park is characterized by a rugged, glacier-scoured interior with numerous valleys, lakes, and peaks, and a wave-eroded coastline. A great variety of land and sea life, both plant and animal, as well as several museums and nature centers are found in Acadia. During the 17th and early 18th cent. the region was part of France's New World territory of *La Cadie*.

Acadia University, at Wolfville, N.S., Canada, founded 1838, became Acadia University 1891. It has faculties of arts and science, engineering, home economics, music, theology, education, and business administration. Associated with the university is the Canada-Commonwealth Caribbean Centre.

Acajutla (akahōōt'la), town (1961 pop. 3,662), SW El Salvador, on the Pacific Ocean. It is a coffee and fishing port and a railroad terminus.

acanthus (ākān'thās), common name for a member of the Acanthaceae, a family of chiefly perennial herbs and shrubs, mostly native to the tropics. A few members of the family, many of which have decorative spiny leaves, are cultivated as ornamentals—especially the Mediterranean acanthus, or bear's-breech (genus *Acanthus*), whose ornate leaves were the source of a stylized motif used in Greek and Roman art (see CORINTHIAN ORDER). In Christian art the acanthus symbolizes heaven. Some species of the genus *Ruellia* are native to and cultivated as ornamentals in North America, chiefly in the South. *Acanthus* is classified in the division MAGNOLIOPHYTES, class Magnoliopsida, order Scrophulariaceae, family Acanthaceae.

Acapulco (ak'apōōl'kō), city (1970 pop. 234,866), Guerrero state, S. Mexico. A fashionable resort, it has lavish hotels and facilities for deep-sea fishing and skin diving. Its fine natural harbor, surrounded by cliffs and promontories, served as a base for Spaniards exploring the Pacific and later played a key role in trade with the Philippines. Today, however, the port is little used for commerce. Coconuts, beans, and bananas are grown in the area. Near the city, which was founded in 1550, are the archeological remains of the Ciudad Perdida [lost city], estimated to be 2,000 years old. Acapulco has suffered frequent earthquake and hurricane damage.

Acarnania (āk'arnā'nēa), region of ancient Greece, between the Achelous River and the Ionian Sea. The inhabitants maintained their isolation, contributing little to Greek civilization. The chief city was Stratos. The Acarnanians generally sided with Athens, and Athens helped Acarnania to uphold its independence against Corinth and Sparta in the 5th cent. B.C. Later (390–375 B.C.) Sparta controlled the region. The persistent struggle with the Aetolians cost Acarnania national existence for a time, but it was restored and the Acarnanians kept some autonomy under the Roman Empire until the Christian era. When the Byzantine Empire broke up (1204), Acarnania passed to Epirus and in 1480 to the Turks. In 1832 it became part of Greece.

Acarya· see BHASKARA

Acastus (ākās'tās), in Greek mythology, son of Pelias, cousin of Jason. He accompanied Jason on the Argonaut expedition, but when Jason and Medea murdered Pelias and usurped the throne of Iolcus, Acastus drove them away. Later, his wife fell in love with Peleus, the father of Achilles, who did not return her affection. Enraged, she falsely accused him of raping her. Acastus took revenge by leaving Peleus unprotected on Mt. Pelion. Rescued by the centaur Chiron, Peleus subsequently captured Iolcus and killed Acastus and his wife.

Accad· see AKKAD

Accademia della Crusca (ak-kadē'mēa dēl'la krōōs'ka) [Ital. = academy of the chaff], Italian literary society founded in Florence in 1582 to maintain the purity of the language. Leonardo Salviati, influenced by Pietro Bembo, and the poet Grazzini formed the society to unify literary Italian on the model of the vernacular of Tuscany. A comedy by Lorenzo de' Medici, *L'Aridosio*, was chosen as a standard, as were two plays by the artist and poet Michelangelo Buonarroti, first consul of the society. The major work of the society was the compilation of Grazzini's *Vocabolario*, a dictionary of "pure" words, first published in 1612. It has gone through many editions and remains one of the finest Italian dictionaries. The society succeeded in establishing literary purism in Italy for several centuries. Joined with two other academies, it is still in existence.

Acca Larentia (āk'a lārēn'shēa,-shə) or **Acca Larentina** (-tī'na), in Roman mythology, wife of the shepherd Faustulus and foster mother of Romulus and Remus. Her 12 sons founded the priesthood of the ARVAL BROTHERS. According to one legend she was a wealthy courtesan who left all her money to the people of Rome.

Accaron· see EKRON

Accault, Michel. see ACO MICHEL

acceleration, change in the VELOCITY of a body with respect to time. Since velocity is a VECTOR quantity, involving both magnitude and direction, acceleration is also a vector. In order to produce an acceleration, a FORCE must be applied to the body. The magnitude of the force *F* must be directly proportional to both the mass of the body *m* and the desired acceleration *a*, according to Newton's second law of motion, *F* = *ma*. The exact nature of the acceleration produced depends on the relative directions of the original velocity and the force. A force acting in the same direction as the velocity changes only the SPEED of the body. An appropriate force acting always at right angles to the velocity changes the direction of the velocity but not the speed. An example of such an accelerating force is the gravitational force exerted by a planet on a satellite moving in a circular orbit. A force may also act in the opposite direction from the original velocity. In this case the speed of the body is decreased. Such an acceleration is often referred to as a deceleration. The following formulas may be used to compute the acceleration *a* of a body from knowledge of the elapsed time *t*, the distance *s* through which the body moves in that time, the initial velocity *v_i*, and the final velocity *v_f*:

$$a = (v_f^2 - v_i^2) / 2s$$

$$a = 2(s - v_i t) / t^2$$

$$a = (v_f - v_i) / t$$

accelerator· see PARTICLE ACCELERATOR

accent, in speech, emphasis given a particular sound, called prosodic systems in linguistics. There are three basic accentual methods: stress, tone, and length. In English each word has at least one primary stressed syllable, as in *weath'er*, words of several syllables may also have secondary stress as in *el'e-va'tor*. In English, vowels in unaccented syllables are often pronounced as a regardless of the orthographic letter. Thus, the vowels of the second syllables in *cr'cus*, *na'tion*, *ther'mos*, *ea's'ly*, *saun'a*, and *so'r'rel* are all pronounced the same. Sentence stress, known as intonation or contour, includes three basic patterns: the statement, *It's a dog*, where the PITCH pattern is level-high-low, the yes/no question, *Is it a dog?* where the pattern is level-high pitch, and the command, *Catch him!* which begins high and ends low. Both word stress and sentence stress are obligatory in English. However, emphasis of certain words within a sentence is optional. Tonal languages, such as Chinese and Swedish, have a system of high low and/or rising falling tones. Duration or length of sounds (quantity) is used in some languages to create systematic differences. No language uses all three types of accentual systems. In writing, accent is also used to show syllable stress as in Spanish *María* (acute accent) and Italian *pieta* (grave accent). Such written symbols, misleadingly termed accents, are often used only to signal spe-

cific pronunciation rather than stress, as in French *éleve*. The word accent in English is also understood to mean the pronunciation and speech patterns that are typical of a speech community, as foreign accent, hillbilly accent, upper-class accent, it also denotes the particular manner of uttered expression that lends a special shade of meaning, as when one speaks in harsh or gentle accents. See also ABLAUT and PHONETICS

accessory, in criminal law, a person who, though not present at the commission of a crime, becomes a participant in the crime either before or after the fact of commission. An accessory before the fact is one whose counsel or instigation leads another to commit a crime. An accessory after the fact is one who, having knowledge that a crime has been committed, aids, or attempts to aid, the criminal to escape apprehension. In a MISDEMEANOR and in treason there is no distinction between principals and accessories. In some states the common law distinction between principal and accessory before the fact has been abolished, and the accessory before the fact is prosecuted as a principal. The penalties for being an accessory are usually much less severe than those meted out to the principal. Except where statutes provide differently, an accessory cannot be tried without his consent before the conviction of the principal, unless both are tried together. If an accessory is called as a witness, the court must decide if he is also an accomplice, because the testimony of an accomplice must be corroborated. An accomplice has been defined as any person who could be prosecuted for the crime of which the defendant is accused. This would include principals and accessories before the fact, depending on the jurisdiction and the facts of the case it might also include conspirators (see under CONSPIRACY) and accessories after the fact. See STOLEN GOODS

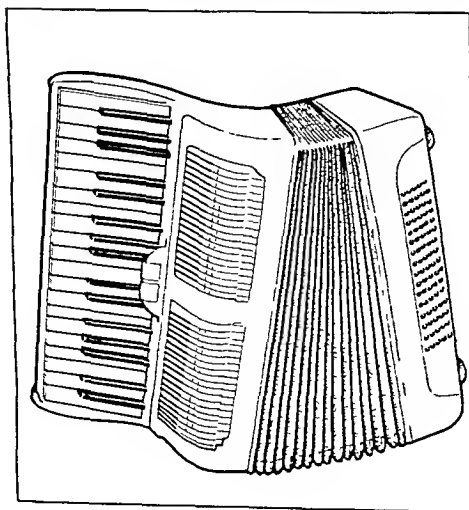
Accho (āk'ō), Old Testament variant of AKKO

accident, in law, an unusual or unexpected event producing physical injury or loss of property. The term includes events that happen without human agency (see ACT OF GOD) and those that are produced through human agency although without design. When not an act of God, an accident ordinarily involves NEGLIGENCE on the part of the perpetrator. Such terms as "mere accident" or "pure accident," however, connote absence of negligence. An inevitable accident is an act of God or an event produced through human agency that could not be foreseen or prevented. In EQUITY, relief may be given from the effects of an accident that benefits a party, thus, if by accident the boundaries of property are confused, the party injured may seek a judicial determination of the true boundaries. In INSURANCE and in WORKMEN'S COMPENSATION statutes, the term accident has specifically defined meanings.

Accolti, Benedetto (bānādēt'tō ak-kōl'tē), c 1415-1466?, Italian humanist and historian. From his history of the First Crusade, Tasso supposedly drew the idea for *Jerusalem Delivered*. His son **Bernardo Accolti**, 1465?-1535, was known in his day for extemporaneous poems. Another son, **Pietro Accolti**, 1455-1532, was a cardinal and drew up (1520) the papal bull against Martin Luther.

accomplice. see ACCESSORY

accordion, musical instrument consisting of a rectangular bellows expanded and contracted between the hands. Buttons or keys operated by the player



Accordion

The key to pronunciation appears on page xi

open valves, allowing air to enter or to escape. The air sets in motion free reeds, frequently made of metal. The length, density, shape, and elasticity of the reeds determine the pitch. The first accordions were made in 1822 by Friedrich Buschmann in Berlin. Bouton added a keyboard 30 years later in Paris, thus producing a piano accordion. The accordion is frequently used in folk music. See CONCERTINA

accounting, classification, analysis, and interpretation of the financial, or BOOKKEEPING, records of an enterprise. The professional who supplies such services is known as an accountant. The accountant evaluates records drawn up by the bookkeeper and shows the results of his investigation as losses and gains, leakages, economies, or changes in value, so as to reveal the progress or failures of the business and also its future limitations and possibilities. An accountant must also be able to draw up a set of financial records and prescribe the system of accounts that will most easily give the desired information; he must be capable of arriving at a comprehensive view of the economic and the legal aspects of a business, envisaging the effect of every sort of transaction on the profit and loss statement, and he must recognize and classify all other factors that enter into the determination of the true condition of the business, e.g., statistics or memoranda relating to production, and properties and financial records representing investment, expenditures, receipts, fiscal changes, and present standing. Cost accounting shows the actual cost in a certain period of each service rendered or of each article produced, by this system unprofitable ventures, services, departments, and methods may be discovered. Although there were stewards, auditors, and bookkeepers in ancient times, the professional accountant is a 19th-century development. Unlike his precursors, the modern accountant usually does not serve only one employer, instead he offers his services, for a fee, to various individuals and businesses. The profession was first recognized in Great Britain in 1854, when the Society of Accountants in Edinburgh was given a royal charter. Similar societies were later established in Glasgow, Aberdeen, and London. In the United States the first such professional society was the American Association of Public Accountants, chartered by the state of New York in 1887. All the states and also Puerto Rico and the District of Columbia now have laws under which the public accountant who complies with certain educational and experience requirements and passes the required examination may be granted the title Certified Public Accountant (CPA). The holders of such certificates have organized into societies in most of the states. The bodies representing the accounting profession in the United States are the American Institute of Accountants, which succeeded the American Association of Public Accountants in 1916, and the American Accounting Association, also organized in 1916. With the growth of corporate activity in the 20th cent., accounting has increased greatly in importance and has undergone many improvements in theory and techniques. The chief influences on modern accounting have been the increasingly complex income tax structure and the need to keep uniform accounts for possible governmental or public scrutiny. Much of contemporary accounting has taken on managerial functions and is no longer primarily concerned with ascertaining financial condition but rather with how a company can act on this information. AUDITING is an important branch of accounting. See N. A. H. Stacey, *English Accountancy, 1800-1954* (1954), Morton Backer, ed., *Modern Accounting Theory* (1966), Louis Goldberg and V. R. Hill, *The Elements of Accounting* (3d ed. 1966), James D. Edwards, *History of Public Accounting in the United States* (1960), A. J. Briloff, *Unaccountable Accounting* (1972).

Accra (āk'ra, āk'rā), city (1970 pop. 564,194), capital of Ghana, a port on the Gulf of Guinea. It is Ghana's largest city and its administrative, communications, and economic center. The chief manufactures are processed food, beverages, timber and plywood, textiles, clothing, chemicals, and printed materials. A transportation hub, Accra is linked by road and rail with KUMASI, in the interior, and with TEMA, a major seaport. Accra originally was the village-sized capital of a Ga kingdom. It developed into a sizable town around British and Dutch forts built in the 17th cent. In 1876, Accra replaced CAPE COAST as the capital of the British Gold Coast colony. After the completion (1923) of a railroad to the mining and agricultural hinterland, Accra rapidly became the economic center of Ghana. Riots in the city (1948), against high retail prices and European control, led to the rise of Kwame NKRUMAH as a popular leader

and marked an important early step in Ghana's road to independence (1957). Today Accra is a sprawling, modern city with wide avenues. It is the site of the national museum and Ghana's central library. Also of note is Christianborg Castle, built by the Danes in the 17th cent. On Accra's outskirts are Achimota School (1927), the country's leading secondary school, and, in Legon, the Univ. of Ghana (1948). The Defense Commission of the Organization of African Unity has its headquarters in Accra.

Accrington, municipal borough (1971 pop. 36,838), Lancashire, NW England. The principal industry is cotton weaving. Textile printing and dyeing and the manufacture of machinery and bricks are also important.

acculturation, the more or less continuous interaction between groups brought about by accommodation and resulting in the intermixture of shared, learned behavior patterns. It may result in almost complete absorption of the CULTURE of one of the groups or a relatively equal merging of traits and patterns from both cultures. Not infrequently, acculturative processes result in considerable social disturbance and individual psychological maladjustment. After World War II one of the most active areas in acculturation study was the one often termed "applied anthropology," in which attention was focused on practical programs aimed at desired changes in societies or subcultures dominated by others.

accusative (āk'yōō'zātīv') [Lat. =accusing], in Latin grammar, the CASE typically meaning that the noun refers to the entity directly affected by an action. The term is used for similar, but often not identical, features in the grammar of other languages. Thus in English *him*, usually called objective, is also called accusative.

Aceldama (asēl'damā) [according to Acts 1:18,19 = field of blood], potter's field bought with Judas' 30 pieces of silver, it is apparently the place where Judas died. The purchase of this field to bury strangers in is the origin of the term "potter's field" for the paupers' burying ground. Mat. 27:3-10, Acts 1:19,20.

acetaldehyde (ās'tīdāl'dēhīd) or **ethanal**, CH_3CHO , colorless liquid ALDEHYDE, sometimes simply called aldehyde. It melts at -123°C , boils at 20.8°C , and is soluble in water and ethanol. It is formed by the partial oxidation of ethanol, oxidation of acetaldehyde forms acetic acid. Acetaldehyde is made commercially by the addition of water to acetylene in the presence of sulfuric acid and mercuric sulfate. It is used as a reducing agent (e.g., for silvering mirrors), in the manufacture of synthetic resins and dyestuffs, and as a preservative. When treated with a small amount of sulfuric acid it forms paraldehyde, $(\text{CH}_3\text{CHO})_3$, a trimer, which is used as a hypnotic drug.

acetate, one of the most important forms of artificial cellulose-based fibers. The first patents for the production of fibers from cellulose acetate appeared at the beginning of the 20th cent. During World War I, production of acetylcellulose began on an industrial scale for military applications. Acetate fibers are basically delivered in the form of a continuous textile yarn. Their principal use is in the production of widely used consumer goods, such as men's shirts, women's blouses, underwear, ties, bathing suits, jersey jackets and sweaters, suit fabrics, coats, and sports clothing.

acetic acid (asē'tīk), $\text{CH}_3\text{CO}_2\text{H}$, colorless liquid that has a characteristic pungent odor, boils at 118°C , and is miscible with water in all proportions, it is a weak organic carboxylic acid (see CARBOXYL GROUP). Glacial acetic acid is concentrated, 99.5% pure acetic acid, it solidifies at about 17°C to a crystalline mass resembling ice. Acetic acid is the major acid in VINEGAR, as such, it is widely used as a food preservative and condiment. For industrial use concentrated acetic acid is prepared from acetylene by a reaction yielding ACETALDEHYDE, which is then oxidized to produce acetic acid. Acetic acid is also a product in the destructive distillation of wood. It reacts with other chemicals to form numerous compounds of commercial importance. These include cellulose acetate, used in making acetate rayon, nonflammable motion-picture film, lacquers, and plastics, various inorganic salts, e.g., lead, potassium, and copper acetates, and amyl, butyl, ethyl, methyl, and propyl acetates, which are used as solvents, chiefly in certain quick-drying lacquers and cements. Amyl acetate is sometimes called banana oil because it has a characteristic banana odor.

acetone (ās'tōn), **dimethyl ketone** (dīmēth'əl kē'tōn), or **2-propanone** (prō'pānōn), CH_3COCH_3 , colorless, flammable liquid. Acetone melts at

—94.8°C and boils at 56.2°C. It is the simplest aliphatic KETONE. Acetone is widely used in industry as a solvent for numerous organic substances and is a component of most paint and varnish removers. It is used in the manufacture of synthetic resins and fillers, smokeless powders (e.g., cordite), and numerous other organic compounds. Acetone is produced commercially chiefly by catalytic dehydrogenation of isopropanol.

acetylcholine (asēt'alkō'lēn), organic compound containing carbon, hydrogen, oxygen, and nitrogen. It is liberated at nerve cell endings, and there is strong evidence that it is the transmitter substance that conducts impulses from one cell to another in the ganglia of the autonomic nervous system, from nerve cells to smooth muscle, cardiac muscle, and exocrine glands, and from motor nerve cells to skeletal muscle. Its role in the conduction of nerve impulses elsewhere is still uncertain. The stimulation of skeletal muscle by acetylcholine is inhibited by curare. See NERVOUS SYSTEM.

acetylene (asēt'alēn') or **ethyne** (ēth'in), HC≡CH, a colorless gas. It melts at -80.8°C and boils at -84.0°C. Offensive odors often noted in commercial acetylene are due to impurities. Acetylene forms explosive mixtures with oxygen or air. It is soluble in acetone, ethanol, and water. When dissolved in acetone it is nonexplosive and so is stored dissolved in acetone under pressure in steel cylinders for commercial use. Since it is explosive in the liquid state, it is not generally stored in this form. Acetylene is usually prepared commercially by the reaction of calcium CARBIDE with water. It is used for cutting and welding metals (see OXYACETYLENE TORCH) and is sometimes used as an illuminant gas. When subjected to high temperatures, it undergoes polymerization, benzene may also be formed. It is used in the production of many organic compounds, e.g., neoprene rubber, plastics, and resins. Acetylene is the simplest ALKYNE.

acetylene series: see ALKYNE.

acetylsalicylic acid (asēt'alsāl'tsīl'ik), acetate ester of SALICYLIC ACID. See ASPIRIN.

Achaea (akē'ā), region of ancient Greece, in the northern part of the Peloponnesus on the Gulf of Corinth. It lay between Sicyon and Elis. There the Achaeans supposedly remained when driven from other parts of Greece by the Dorian invasion. The small Achaean cities eventually banded together in the First ACHAEAN LEAGUE. In the late 8th cent. B.C. the Achaeans colonized part of S. Italy but were at first of little significance in Greek politics. Later, however, the Second Achaean League became an important factor. After the downfall of the league, the name Achaea, or Achaia, was given to a Roman province in the Peloponnesus.

Achaean League (akē'ān), confederation of cities on the Gulf of Corinth. The First Achaean League, about which little is known, was formed presumably before the 5th cent. B.C. and lasted through the 4th cent. B.C. Its purpose was mutual protection against pirates. The Achaeans remained aloof from the wars in Greece until they joined the opposition to Philip II of Macedon in 338 B.C. The confederation was dissolved soon after. The Second Achaean League was founded in 280 B.C. Sicyon was freed from the rule of its tyrant in 251 B.C., and it soon joined the confederation under the leadership of ARATUS. Other cities outside Achaea were incorporated on terms of equality, and in 247 B.C. the Macedonians were driven from Corinth. There was some promise of liberating all Greece, but unfortunately the interference of CLEOMENES III of Sparta threatened the Achaean League, and in 227 B.C. he began a war. The Achaean League then requested (224 B.C.) Macedonian aid against Sparta and the Aetolian League. The result was the eclipse of the confederation until the wars between Macedon and Rome. In 198 B.C. the Achaeans went over to Rome and with Roman aid won practically the whole Peloponnesus, forcing Sparta and Messene to join. Later suspecting the Achaeans of again looking toward Macedon, the Romans deported (168 B.C.) many of them (including POLYBIUS) to Italy. Anti-Roman feeling grew, and in 146 B.C. the Achaeans waged a suicidal war. Rome easily triumphed at Corinth, dissolved the confederation, and ended Greek liberty. A smaller Achaean League was formed, but it was powerless.

Achaeans, people of ancient Greece, of unknown origin. In Homer, the Achaeans are specifically a Greek-speaking people of S. Thessaly. Historically, they seem to have appeared in the Peloponnesus during the 14th and 13th cent. B.C., and c.1250 B.C. they became the ruling class. There is no sharp line of separation between the earlier MYCENAEAN CIVIL-

IZATION and the Achaean, the cultures seem to have intermingled. The invasions of the DORIANS supposedly forced some of the Achaeans out to Asia Minor, others were concentrated in the region known in classical times as Achaea.

Achaemenids (āk'amēn'idz), dynasty of ancient Persia. They were descended presumably from one Achaemenes, a minor ruler in a mountainous district of SW Iran. His successors, when ELAM declined, spread their power westward. CYRUS THE GREAT established the Persian rule by his conquest of ASTYAGES of MEDIA. The Achaemenids (c.550-330 B.C.) were important for their development of government administration, the appearance of literature written in CUNEIFORM, and the spread of ZOROASTRIANISM, during this period there was also a great flourishing of PERSIAN ART AND ARCHITECTURE. The Achaemenid rulers after Cyrus were Cambyses, the impostor Smerdis, Darius I, Xerxes I, Artaxerxes I, Xerxes II, Sogdianus, Darius II, Artaxerxes II (opposed by Cyrus the Younger), Artaxerxes III, Arsēs, and Darius III. The dynasty ended when Darius III died in his flight from Alexander the Great.

Achaeus (akē'ās) see CREUSA 1.

Achaicus (ākā'ikas), a Christian. 1 Cor. 16:17, 18.

Achai of Shabcha see AHA OF SHABCHA.

Achan (ā'kān) or **Achar** (ā'kar), Judahite who kept some of the spoil from the city of Jericho. For this he was stoned. Joshua 7, 1 Chron. 27.

Achard, Franz Karl (frants karl akh'art), 1753-1821, German chemist. He made pioneer use of the discovery by his countryman Andreas Marggraf of sugar in beetroots. The government granted him an estate in Silesia where, in 1806, he succeeded in producing beet sugar. Among his other contributions is the discovery of a method for working platinum.

Achaz (ā'kāz), variant of AHAZ. Mat. 19.

Achbor (āk'bōr), same as ABDON 2.

Acheampong, Ignatius Kutu (kōō'tōō achā'ampōng), 1931-, government official in Ghana, b. Kumasi. He taught before joining (1959) the army, where he advanced to colonel. In 1972, following a bloodless army coup that overthrew Kofi Abrefa BUSIA, he became chairman of the ruling National Redemption Council.

Achelous: see AKHELOOS, river, Greece.

Achelous (āk'elō'ās), in Greek mythology, river god, son of Oceanus and Tethys. He possessed the power to appear as a bull, a serpent, or a bullheaded man. Hercules defeated him and broke off one of his horns, which, according to one legend, became the CORNUCOPIA. He is sometimes said to be the father of the Sirens.

achene, dry, simple, one-seeded fruit with the seed attached to the inner wall at only one point. Achenes are indehiscent, i.e., they do not split open at maturity. The so-called seed of a sunflower is an achene, the shell is the wall of the fruit, and the true seed lies within. A strawberry consists of many achenes embedded in a fleshy receptacle.

Achenwall, Gottfried (gōt'frēt akh'ənal), 1719-72, German statistician and political scientist. He used the term *Statistik* for the first time in his *Staatsverfassung der heutigen vornehmsten europäischen Reiche und Völker im Grundrisse* [the political constitution of the present principal European countries and peoples] (1749). By the term he meant a comprehensive description of the social, political, and economic features of a state.

Achernar (ā'karnar'), brightest star in the constellation ERIDANUS, Bayer designation α Eridani, 1970 position R.A. 1^h36^m, Dec. -57°23'. A bluish-white star with apparent MAGNITUDE 0.51, it is one of the 10 brightest stars in the entire sky. Its distance is about 120 light-years, and its luminosity about 600 times that of the sun. Achernar is of SPECTRAL CLASS B5 V. Its name is from the Arabic meaning "end of the river [Eridanus]."

Acheron (āk'ərōn) see HADES.

Acheson, Dean Gooderham (āch'tsən), 1893-1971, U.S. Secretary of State (1949-52), b. Middletown, Conn. He was (1919-21) private secretary to Louis D. Brandeis, became a successful lawyer, and served (1933) as Undersecretary of the Treasury until disagreement with President Franklin Delano Roosevelt's fiscal policy caused his resignation. Assistant Secretary of State (1941-45) and Undersecretary of State (1945-47), he was appointed (Jan. 1949) Secretary of State. Under his direction the policy of containment of Communist expansion through foreign economic and military aid was developed. He played an important role in establishing the NORTH ATLANTIC TREATY ORGANIZATION and the security pact

with Australia and New Zealand. His attempts to dissociate the United States from the Nationalist Chinese regime in Taiwan drew the relentless attack of many Congressmen of his own party, as well as Republicans. His support of U.S. military commitments to South Korea also aroused much criticism. Acheson's earlier friendly attitude toward Alger HISS became the basis for personal abuse and resulted in attacks on his handling of the loyalty and security policy of the Dept. of State. Returning to private practice in 1953, Acheson remained a spokesman for the Democratic party on foreign policy and exerted considerable influence on the Kennedy administration (1961-63). He wrote *A Democrat Looks at His Party* (1955), *A Citizen Looks at Congress* (1957), *Power and Diplomacy* (1958), *Fragments of My Fleece* (1971), and three autobiographical works, *Morning and Noon* (1965), *Present at the Creation* (1969), and *Grapes from Thorns* (1972). See studies by R. J. Stupak (1969) and Gaddis Smith (1972).

Acheulian (ashōō'lēan) see PALEOLITHIC PERIOD.

Achill (āk'il) [Irish, =eagle], island, 56 sq mi (145 sq km), Co. Mayo, W. Republic of Ireland, the largest island of Ireland. It is connected with the mainland by a bridge over Achill Sound. The rugged island is barren, and its inhabitants subsist with great difficulty by fishing and farming. Many of the small villages are resorts. Keel and Doogort are the chief towns. Achill is known for its magnificent cliff scenery. Slievemore, at the north end, rises to 2,204 ft (672 m).

Achilles (ak'il'ēz), in Greek mythology, foremost Greek hero of the Trojan War, son of Peleus and Thetis. He was a formidable warrior, possessing fierce and uncontrollable anger. Thetis, knowing that Achilles was fated to die at Troy, disguised him as a girl and hid him among the women at the court of King Lycomedes of Skyros. He was discovered there by Odysseus, who persuaded him to go to Troy. One of Lycomedes' daughters, Deidamia, bore Achilles a son, Neoptolemus. According to Homer, Achilles came to Troy leading the 50 ships of the Myrmidons. In the last year of the siege, when Agamemnon stole the captive princess Briseis from him, Achilles angrily withdrew and took his troops from the war. Later he allowed his intimate friend Patroclus to borrow his armor and lead the Myrmidons to aid the retreating Greeks. When Hector killed Patroclus, Achilles was filled with grief and rage and returned to the battle, routed the Trojans, and killed Hector, viciously dragging his body back to the Greek camp. Achilles died of a wound inflicted by Paris. According to one legend, Thetis attempted to make Achilles immortal by bathing him in the river Styx, but the heel by which she held him remained vulnerable, and Paris inflicted a fatal wound in that heel. Other legends state that Achilles was struck from behind and killed by Paris when he went to visit Priam's daughter Polyxena, with whom he had fallen in love. Achilles was the object of widespread hero worship.

Achilles' tendon (*tendo calcaneus*) (tēn'dō kāl'kā'nēās), sinew prominent at the back of the ankle, connecting the tendons of the calf muscles to the heelbone. When the musculature contracts, the pull on the Achilles' tendon elevates the heel in the springy motion essential to running and jumping. Since the effect is to lift the entire body weight against a severely adverse leverage ratio, the Achilles' tendon by necessity is the toughest and strongest of human tendons. The name derives from the mythical Greek hero Achilles, who was vulnerable only in the heel.

Achim (ā'kīm), name in the genealogy of Mat. 1:14.

Achish (āk'ish), king of Gath with whom David took refuge. 1 Sam. 27:2. Called Abimelech in the title of Ps. 34.

Achithophel (āk'it'əfēl), variant of AHITHOPHEL.

Achmet, For Ottoman sultans thus named, see AHMED.

Achor (ā'kōr), valley where Achan was stoned. Joshua 7:25, 26, 1 Chron. 27.

Achsa or **Achsa** (both āk'sā), Caleb's daughter, given as wife to Othniel. Judges 1:12-15, 1 Chron. 2:49.

Achshaph (āk'shāf), town of N. Palestine, taken by Joshua. Joshua 11:1, 2:20, 19:25.

Achzib (āk'zīb), 1 Seacoast Palestinian town, c.15 mi (24 km) S of Tyre. Joshua 19:29, Judges 1:31. 2 Unidentified city of Judah. Joshua 15:44, Micah 1:14. Ch�zib in Gen. 38:5 and Chozeba in 1 Chron. 4:22 may be the same.

acid anhydride (ānhī'drīd, -drəd), chemical compound that reacts with water to form an acid (see

ACIDS AND BASES) Anhydrides of inorganic acids are usually oxides of nonmetallic elements. Carbon dioxide, CO_2 , is the anhydride of carbonic acid, H_2CO_3 . Nitrogen pentoxide, N_2O_5 , is the anhydride of nitric acid, HNO_3 . Phosphorus pentoxide, P_2O_5 , is the anhydride of phosphoric acid, H_3PO_4 . Sulfur dioxide, SO_2 , is the anhydride of sulfurous acid, H_2SO_3 . Sulfur trioxide, SO_3 , is the anhydride of sulfuric acid, H_2SO_4 . Anhydrides of organic acids, like the acids themselves, contain the carbonyl group, >CO . Organic anhydrides include acetic anhydride or ethanoic anhydride, $(\text{CH}_3\text{C}=\text{O})_2\text{O}$, and benzoic anhydride, $(\text{C}_6\text{H}_5\text{C}=\text{O})_2\text{O}$.

acid-base indicators: see INDICATORS, ACID-BASE

acidophilus milk (äs'īdōfīl'ās) see FERMENTED MILK

acidosis and alkalosis (äs'īdō'sīs, āl'kālō'sīs), physiological conditions brought about by a disturbance in the balance of acids and bases, or alkalies, in the body. The acid-base balance is kept normal by three separate regulatory systems. First, a group of buffering compounds in the body fluids can react instantaneously to neutralize any excess acids or alkalies. Secondly, the respiratory system can restore balance in 1 to 3 min if the system is upset. Deep, rapid breathing excretes more carbon dioxide and consequently reduces the amount of carbonic acid in the tissues, thereby counteracting acidity; conversely, slow, shallow breathing increases the amount of carbonic acid in the tissues, counteracting alkalinity. The third mechanism, a function of the kidneys, is the most powerful of the regulatory systems; excess acid or alkali is excreted in the urine, but the process requires several hours to a day. Either acidosis or alkalosis follows the disruption of any of these mechanisms. Acidosis depresses the central nervous system, which, in extreme cases, leads to coma and death. It can result from a number of metabolic disturbances, e.g., diabetes, kidney failure, severe diarrhea, severe dehydration, excessive ingestion of acid salts, or liver disease. It is countered by the administration of alkali solutions and by treatment of the original cause of the imbalance. Respiratory acidosis occurs when severely diseased lungs retain too much carbon dioxide and take in too little oxygen; measures must be taken to reduce the carbon dioxide content of the blood and to increase oxygenation. Alkalosis causes overexcitation of the nervous system, which, in extreme cases, causes a state of muscular spasm called tetany. It is usually brought on by ingestion of alkalies in quantities greater than the kidneys can process, or by hyperventilation (rapid breathing) in hysterical or emotional states. Treatment of alkalosis must be addressed to restoring the normal acid-base balance and to removing the original cause of the disturbance.

acids and bases, two related classes of chemicals, the members of each class have a number of common properties when dissolved in a solvent, usually water. Acids in water solutions exhibit the following common properties: they taste sour, turn litmus paper red, and react with certain metals, such as zinc, to yield hydrogen gas. Bases in water solutions exhibit these common properties: they taste bitter, turn litmus paper blue, and feel slippery. When a water solution of acid is mixed with a water solution of base, a SALT and water are formed; this process, called NEUTRALIZATION, is complete only if the resulting solution has neither acidic nor basic properties. Acids and bases can be classified as organic or inorganic. Some of the more common organic acids are CITRIC ACID, CARBONIC ACID, HYDROGEN CYANIDE, salicylic acid, LACTIC ACID, and TARTARIC ACID. Some examples of organic bases are PYRIDINE and ethylamine. Some of the common inorganic acids are HYDROGEN SULFIDE, PHOSPHORIC ACID, HYDROGEN CHLORIDE, and SULFURIC ACID. Some common inorganic bases are SODIUM HYDROXIDE, SODIUM CARBONATE, SODIUM BICARBONATE, CALCIUM HYDROXIDE, and CALCIUM CARBONATE. When an acid or base dissolves in water, a certain percentage of the acid or base particles will break up, or dissociate (see DISSOCIATION), into oppositely charged ions. The Arrhenius theory of acids and bases, named for the Swedish chemist Svante Arrhenius, defines an acid as a compound that can dissociate in water to yield hydrogen ions, H^+ , and a base as a compound that can dissociate in water to yield hydroxide ions, OH^- . For example, hydrochloric acid, HCl , dissociates in water to yield the required hydrogen ions, H^+ , and also chloride ions, Cl^- . The base sodium hydroxide, NaOH , dissociates in water to yield the required hydroxide ions, OH^- , and also sodium ions, Na^+ . Some substances act as acids or bases when they are dissolved in solvents other than water, such as liquid ammonia. The Brønsted-Lowry theory, named

for the Danish chemist Johannes Brønsted and the British chemist Thomas Lowry, provides a more general definition of acids and bases that can be used to deal both with solutions that contain no water and solutions that contain water. It defines an acid as a proton donor and a base as a proton acceptor. In the Brønsted-Lowry theory, water, H_2O , can be considered an acid or a base since it can lose a proton to form a hydroxide ion, OH^- , or accept a proton to form a hydronium ion, H_3O^+ (see AMPHOTERISM). When an acid loses a proton, the remaining species can be a proton acceptor and is called the conjugate base of the acid. Similarly when a base accepts a proton, the resulting species can be a proton donor and is called the conjugate acid of that base. For example, when a water molecule loses a proton to form a hydroxide ion, the hydroxide ion can be considered the conjugate base of the acid, water. When a water molecule accepts a proton to form a hydronium ion, the hydronium ion can be considered the conjugate acid of the base, water. Another theory that provides a very broad definition of acids and bases has been put forth by the American chemist Gilbert Lewis. The Lewis theory defines an acid as a compound that can accept a pair of electrons and a base as a compound that can donate a pair of electrons. Boron trifluoride, BF_3 , can be considered a Lewis acid and ethyl alcohol can be considered a Lewis base. Each of the three theories has its own advantages and disadvantages, each is useful under certain conditions. Acids, such as hydrochloric acid, and bases, such as potassium hydroxide, that have a great tendency to dissociate in water are completely ionized in solution; they are called strong acids or strong bases. Acids, such as acetic acid, and bases, such as ammonia, that are reluctant to dissociate in water are only partially ionized in solution; they are called weak acids or weak bases. Strong acids in solution produce a high concentration of hydrogen ions, and strong bases in solution produce a high concentration of hydroxide ions and a correspondingly low concentration of hydrogen ions. The hydrogen ion concentration is often expressed in terms of its negative logarithm, or pH (see separate article). Strong acids and strong bases make very good electrolytes (see ELECTROLYSIS), i.e., their solutions readily conduct electricity. Weak acids and weak bases make poor electrolytes. See CATALYST, TITRATION, INDICATORS, ACID-BASE, BUFFER.

Acireale (a'chērā'ā), city (1971 pop. 47,086), E Sicily, Italy. Beautifully situated on a volcanic plateau near Mt. Etna and near the Ionian Sea, Acireale has been frequented since Roman times for its warm sulfur springs and today is also a commercial center. The city was damaged by earthquakes in 1169 and 1693.

Acis (ā'sīs) see GALATEA 1.

Ackermann von Bohmer: see JOHANNES VON SAAZ

Acklins Island: see BAHAMA ISLANDS

acknowledgment, in law, formal declaration or admission by a person who executed an instrument (e.g., a will or a deed) that the instrument is his. The acknowledgment is made before a court, a notary public, or other authorized person. Acknowledgment permits the instrument to be given in evidence without further proof of its execution (e.g., witnesses).

Acmeists (āk'mēists), school of Russian poets started in 1912 by Sergei M. Gorodetsky and Nikolai Stepanovich GUMILEV as a reaction against the mysticism of the symbolists. The school aspired to concreteness of imagery and clarity of expression. The leading Acmeists were Gumilev, Anna AKHMATOVA, and Osip MANDELSTAM. See L. I. Strakhovsky, *Graftsmen of the Word: Three Poets of Modern Russia*.

acne, common inflammatory disease of the SEBACEOUS GLANDS characterized by blackheads, whiteheads, and pimples and, in the more severe forms, by cysts and scarring. The lesions appear on the face, neck, back, chest, and arms. Acne is most prevalent among adolescents. Although its exact cause is not known, it is undoubtedly related both to genetic predisposition and to the increased hormonal activity that occurs at puberty, which causes an overproduction of sebum, the oily secretion of the sebaceous glands. Cleanliness of the skin is essential when acne is present, and a mild soap and water should be used several times a day. The contents of blackheads and pustular lesions should be evacuated only by a physician under proper aseptic conditions to lessen the possibility of scarring. Astringent lotions may help to counteract the oiliness of the skin usually present in this condition. Foods rich in carbohydrate and fat, such as chocolate and nuts, should be eliminated from the diet. The more severe

cases of acne may require antibiotic and hormonal treatment. It is possible to improve the appearance of acne-scarred skin by a method of surgical abrasion in which the skin is frozen and anesthetized and then abraded with fine sandpaper or special brushes.

Aco or Accault, Michel (both mēshēl'ākō'), fl. 1680-1702, French explorer. He became La Salle's lieutenant, being favored by that explorer because of his courage, prudence, and wide acquaintance with Indian languages. When LA SALLE reached the mouth of the Illinois River on his famous voyage down the Mississippi, he sent Aco with two companions to explore the upper reaches of the Mississippi. One of the companions was Father Louis HENNEPIN, who in his *Nouvelle Decouverte* made himself the hero of the expedition. Near the Falls of St. Anthony, which they were the first Europeans to see, the three were captured by Sioux Indians and were released only through the energy and influence of Daniel Greysolon DULUTH. Little is known of Aco's subsequent life except that he was a trader on the Illinois for many years and that in 1693 he married the daughter of a Kaskaskia chief. His name also appears as Ako.

Acoma or Ácoma (both āk'āma), pueblo (1970 est. pop. 2,750), alt. c. 7,000 ft (2,130 m), Valencia co., W central N. Mex., founded c. 1100-1250. This "sky city" on top of a steep-sided sandstone mesa, 357 ft (109 m) high and difficult of access, is considered to be the oldest continuously inhabited community in the United States. The residents, who speak a Western Keresan language (see PUEBLO INDIANS), are skilled pottery makers. Below the mesa are the cultivated fields and grazing grounds that help support the community. The pueblo's location has astonished visitors from Fray Marcos de Niza in 1539 and Coronado's men in 1540 to tourists of today. Juan de Oñate was allowed entry in 1598, but the Indians revolted fiercely in 1599 and were subdued only after severe fighting. The missionary Fray Juan Ramirez arrived in 1629. The Acoma people joined in the revolt of the Pueblo Indians in 1680, were forced to submit to Diego de Vargas in 1692, joined in the later uprising of 1696, and were subdued again in 1699. They were later Christianized. Their chief festival is held on Sept. 2, the feast of St. Stephen, their patron saint. See study by L. A. White (1932, repr. 1973).

Acominatus, Michael (ākōmīnā'tās) or **Michael Choniates** (kōnēā'tēz), c. 1140-1220, Byzantine writer and metropolitan of Athens. Acominatus' speeches, poems, and letters give much information about medieval Athens, which he, a classicist, found barbarous and degenerate. His important history of the Byzantine Empire covers the period 1180 to 1206. After the capture (1204) of Athens by the army of the Fourth Crusade, he retired to the island of Kea, where he died. His first name is also written as Nicetas.

Aconcagua (ākōnka'gwa), peak, 22,835 ft (6,960 m) high, Mendoza prov., W Argentina, in the Andes, near the Chilean border. It is the highest peak of the Western Hemisphere. The snow-capped Aconcagua was first scaled in 1897. Uspallata Pass is nearby. See also OJOS DEL SALADO.

aconite (āk'ānīt), **monkshood**, or **wolfsbane**, any of several species of the genus *Aconitum* of the family Ranunculaceae (BUTTERCUP family), hardy perennial plants of the north temperate zone, growing wild or cultivated for ornamental or medicinal purposes. They contain violent poisons that were recognized from early times and were mentioned by Shakespeare (2 King Henry IV, iv 4), more recently they have been used medicinally in a liniment, tincture, and drug, and in India on spears and arrows for hunting. The drug aconite, the active principle of which is the alkaloid aconitine, is used as a sedative, e.g., for neuralgia and rheumatism, and is obtained from *A. napellus*. Aconites are erect or trailing, with deeply cut leaves and, in late summer and fall, hooded showy flowers of blue, yellow, purple, or white. The name wolfsbane derives from an old superstition that the plant repelled werewolves. Winter aconite is a name for plants of the genus *Eranthis*, wild or garden perennials of the same family. Aconites are classified in the division MAGNOLIOPHYTES, class Magnoliopsida, order Ranunculales, family Ranunculaceae.

Acontius (ākōn'shās), in Greek mythology, young man who loved Cypippe. He met her at a festival of Artemis and threw before her an apple inscribed, "I swear by the temple of Artemis to marry Acontius." She read the inscription aloud. The goddess accepted her words as an oath and brought about the marriage of the lovers.

Açores: see AZORES, Portugal

acorn: see OAK

acorn worm: see HEMICHORDATA

Acosta, Joaquín (hwakēn' akō'sta), 1800-1852, Colombian historian and scientist. He served under Simon Bolívar in the revolution against Spanish rule and remained active in Colombian politics, holding various political positions. His scientific knowledge was broad, and he wrote about many aspects of Colombia, constituting himself a sort of intellectual publicity agent for his country.

Acosta, José de, c 1539-1600, Spanish Jesuit missionary to Peru. He wrote a well-known history of the Spanish colonial period, *The Natural and Moral History of the Indies* (1590, tr 1604, 1880, repr 1970).

Acosta, Uriel (ōōr'yēl), or **Uriel da Costa**, c 1585-1640, Jewish rationalist, b Oporto, Portugal. His original name was Gabriel da Costa, and his family had been converted to Roman Catholicism. When he reached manhood, he was restive in the Christian faith and persuaded his family to move to Amsterdam, where all of them returned to Judaism. In a work in 1624, he expressed rationalistic doctrines, criticized rabbinical Judaism, and demanded a return to the teachings of the Sadducees. He was tried, imprisoned, and excommunicated. In 1633 he recanted, but soon he again offended and was excommunicated. After seven years, he once more recanted and was subjected to public humiliation. Rather than endure further trouble he committed suicide. He left an autobiographical sketch, *Exemplar humanae vitae* (1687, tr *Specimen of Human Life*, 1695). Karl Ferdinand Gutzkow wrote a tragedy about him, *Uriel Acosta*.

acoustics (akōō'stiks) [Gr, =the facts about hearing], the science of SOUND, including its production, propagation, and effects. Various branches of acoustics that deal with different aspects of sound and hearing include bioacoustics, physical acoustics, ULTRASONICS, and architectural acoustics. One important practical application of architectural acoustics is in the designing of auditoriums, which requires a knowledge of the characteristics and behavior of sound WAVES. The most important factors to be considered are reverberation and INTERFERENCE. Reverberation is the persistence of sound in an enclosed space caused by repeated reflections of the sound waves back and forth by the walls. Reflection of sound sometimes causes an ECHO. Some reverberation in auditoriums is desirable, especially where music is performed, to avoid deadening of the sound to a degree that is unpleasant to the human ear. Depending on the location of the listener and the frequency of the sound, varying degrees of interference between the primary sound and its reflections will be produced. In a good auditorium these variations are minimized. Reflection can be reduced by the use of sound-absorbent materials, which are usually soft and porous, such as draperies, upholstery, carpets, acoustic tile, or plaster. In a room reflection is decreased by the presence of people and open windows and doors. See John Backus, *The Acoustical Foundations of Music* (1969), R B Lindsay, *Acoustics: Historical and Philosophical Development* (1973).

acquired characteristics, modifications produced in an individual plant or animal as a result of mutilation, disease, use and disuse, or any distinctly environmental influence. Some examples are docking of tails, malformation due to disease, and muscle atrophy. Although belief in inheritability of acquired characteristics was accepted by Lamarck, it was later challenged by Darwin and Mendel. Modern geneticists have affirmed that inheritance is determined solely by the reproductive cells and is unaffected by somatic (body) cells. Belief in the inheritance of acquired characteristics is therefore rejected.

Acre (ak'rā), state (1970 pop 216,200), 58,915 sq mi (152,590 sq km), W Brazil, on the borders of Peru and Bolivia. RIO BRANCO is the capital.

Acre, Israel see AKKO

acre, measure of land area used in the ENGLISH UNITS OF MEASUREMENT. The acre was originally the area a yoke of oxen could plow in a day and therefore differed in size from one locality to another. It is now fixed as 10 square chains or 160 square rods, i.e., 4,840 sq yd, 43,560 sq ft, or 1/640 sq mi. It is equal to about 4047 of a hectare or 4,046.9 sq m.

Acrisius (akrīs'ēās) see DANAE and PERSEUS

Acrocorinth (āk'rōkōrīn'thās), acropolis, or citadel, of CORINTH, overlooking the ancient city. Some ruins of the acropolis remain. The Acrocorinthus was the site of a temple of Aphrodite. It was strongly fortified in the Middle Ages. Below gushed the

fountain of Pirene, from which, in legend, PEGASUS was drinking when captured by Bellerophon.

acromegaly (āk'rōmēg'ālē), adult endocrine disorder resulting from hypersecretion of growth hormone produced by the pituitary gland. Since the bones cannot increase in length after full growth is attained, there is a disproportionate thickening of bones, predominantly in the skull and small bones of the hands and feet. Fingers and toes become broadened and spadelike, the skull increases in size, and the cheek bones and jaws protrude. Many of the soft tissues, such as the tongue and liver, enlarge. Frequently glucose metabolism is disturbed, leading to diabetes mellitus. Acromegaly is usually caused by a tumor of the pituitary, treatment consists of irradiation or surgical removal of the tumor. Onset of the disease can also occur in children, before the epiphyses of the bones are closed. In such cases the disorder leads to GIGANTISM.

acropolis (akrōp'alis) [Gr, =high point of the city], elevated, fortified section of various ancient Greek cities. The Acropolis of Athens, a hill c 260 ft (80 m) high, with a flat oval top c 500 ft (150 m) wide and 1,150 ft (350 m) long, was walled before the 6th cent. B C by the Pelasgians. Devoted to religious rather than defensive purposes, the area was adorned during the time of Cimon and Pericles with some of the world's greatest architectural and sculptural monuments. The top was reached by a winding processional path at the west end, where the impressive Propylaea (see under PROPYLAEUM) stood. From here, the Sacred Way led past a colossal bronze statue of Athena (called Athena Promachus) and the site of the old temple of Athena to the PARTHENON. To the north was the ERECHTHEUM and to the southwest the temple of Nike Apteros (Wingless Victory). On the southern slope were the Odeum of Herodes Atticus and the theater of Dionysus. Although the Acropolis was laid waste by the Persians in 480 B C, remains of the Parthenon, Erechtheum, and Propylaea still stand. Many of its treasures are in the national museum of Greece, in Athens. See R J Hopper, *The Acropolis* (1971).

acrostic (akrō'stik), arrangement of words or lines in which a series of initial, final, or other corresponding letters, when taken together, stand in a set order to form a word, a phrase, the alphabet, or the like. A famous acrostic was made on the Greek for Jesus Christ, God's Son, Savior. *I*esous *C*hristos, *T*heou *U*lios, *S*oter (*ch* and *th* being each one letter in Greek). The initials spell *ichthys*, Greek for fish, hence the frequent use of the fish by early Christians as a symbol for Jesus. There are several alphabetic acrostics (pertaining to the Hebrew alphabet) in the Bible, e.g., in Ps 119 and LAMENTATIONS. Acrostic verses are common, and very elaborate puzzles have been devised combining several schemes.

Acrux (āk'raks) [from the Bayer designation α Crucis], brightest star in the constellation CRUX (Southern Cross), 1970 position R A 12h24.9m, Dec -62°56'. Its apparent MAGNITUDE of 0.86 makes it one of the 20 brightest stars in the sky, although its location in the far southern sky prevents it from being seen by most observers in the United States. Acrux is a visual BINARY star, with components of SPECTRAL CLASSES B1 and B3, each component itself being a spectroscopic binary. Its distance is about 400 light-years.

acrylic, man-made fiber made from a special group of vinyl compounds, primarily acrylonitrile. Acrylic fibers are thermoplastic, have low moisture regain, are low in density, and can be made into bulky fabrics. They wash and dry easily and are dimensionally stable. They are resistant to bleaches, dilute acids, and alkalies, and to weathering and microbiological attack.

acrylic plastics see POLYACRYLICS

act, in law, anything done by a person, group, or body to which legal consequences attach. The term also refers to decrees, judgments, and awards handed down by an individual in an official position or by an official body (e.g., a judge or a legislature). In this sense it is often synonymous with statute, meaning a bill that has been enacted into law by the legislature. Public acts are those that relate to the entire community, whereas private acts operate only on particular persons or private concerns.

acta (āk'ta), official texts of ancient Rome, written or carved on stone or metal. Usually acta were texts made public, although publication was sometimes restricted. Acta were first posted or carved for general reading c 131 B C. They were accounts of general interest and were later called *Acta diurna*, and they have been compared to modern newspapers. There were special acta of municipal, legal, or mili-

tary content. The *Acta senatus*, according to a Roman administrative tradition, were for many years kept secret so that the public should have no knowledge of senatorial debate. In 59 B C, Julius Caesar, as consul, ordered their publication along with the *Acta diurna*, but later the publication was censored. Acta was also the term used for the laws themselves, primarily those promulgated by the emperors.

Actaeon (āktē'an), in Greek mythology, son of Aristaeus. Because he saw Artemis bathing naked, she changed him into a stag, and his own dogs killed him.

ACTH, see ADRENOCORTICOTROPIC HORMONE

actin, one of the two major protein constituents of muscle, the other being MYOSIN. Actin occurs in two forms: G-actin (globular actin) and F-actin (fibrous actin). G-actin is a globular protein each molecule of which seems to bind one calcium ion and one ADENOSINE TRIPHOSPHATE (ATP) or adenosine diphosphate (ADP) molecule very tightly. If the ionic strength of a solution of G-actin is raised to a value comparable to that found in muscle, it polymerizes into a high molecular weight protein, F-actin, which has a double-stranded helical structure. The polymerization reaction is accompanied by the hydrolysis of each bound ATP molecule to ADP, releasing an inorganic phosphate. This hydrolysis is not necessary for polymerization, however. Actin and myosin together form the myofibril, which in the presence of ATP is the fundamental contractile unit of muscle.

acting. At its highest levels of accomplishment acting involves an almost total imaginative identification on the part of the actor with the character he is portraying. Only in this way will the full emotional weight of situations on stage be communicated to the audience. The actor must be a sharp observer of life and thoroughly trained in voice projection and enunciation and in body movement. In the ancient Greek theater, acting was stylized, indeed, the large outdoor theaters made subtlety of speech and gesture impossible. The actors, all men, wore comic and tragic masks and were costumed grotesquely, wearing padded clothes and, often, artificial phaluses. Nevertheless, there were advocates of naturalistic acting even at that time, and actors were held in high esteem. In the Roman period actors were slaves, and the level of performance was low, broad farce being the most popular dramatic form. The tragedies of Seneca were probably read in declamatory style, rather than acted on stage. During the Christian period in Rome, acting almost disappeared, the tradition being upheld by traveling mimes, jugglers, and acrobats who entertained at fairs. Nor did the rise of medieval religious drama produce an uplift in the quality of acting. An actor's every gesture and intonation was carefully designated for performance in church, and, as with the later pageants under the auspices of the trade guilds, the actors were amateurs. Modern professional acting began in the 16th cent. with the Italian COMMEDIA DELL'ARTE, whose actors improvised convincing and entertaining situations from general outlines. In England the Elizabethan stage, which featured male actors in all parts, apparently presented a good deal of bombastic acting. During the Restoration period, however, Thomas Betterton and his wife Mary were famous for their naturalness of delivery, as was Edward Kynaston. Their contemporary Charles Hart, however, was well known for his lofty, heroic acting, a style that became dominant in the first third of the 18th cent. Among its chief practitioners were Barton Booth and James Quin. In the mid-18th cent. Charles Macklin and his pupil David Garrick introduced a more naturalistic style, and similar movements took place in France and Germany. However, the old declamatory method never really died out until the early 20th cent., and such great 18th- and 19th-century actors as Lekain, Sarah Siddons, Edmund Kean, and Junius Brutus Booth would probably seem overly histrionic to modern audiences. Part of the reason for the persistence of bombastic acting was the star system that existed until high standards of ensemble playing were set by the MEININGEN PLAYERS in 1874. Important late 19th-century actors, varying considerably in the naturalism of their acting styles, were Edwin Booth, Dame Ellen Terry, Henry Irving, Eleanora Duse, and Sarah Bernhardt. Acting in the 20th cent has been greatly influenced by the theories of the Russian director Constantin STANISLAVSKY. An advocate of ensemble playing, he believed that an actor must strive for absolute psychological identification with the character he is portraying and that this identification is at least as important as mastery of voice projec-

tion or body movement. Stanislavsky's theories were popularized in the United States by the GROUP THEATRE and later by the Actors' Studio, which produced a generation of extremely naturalistic actors, notably Marlon Brando. The emergence of motion pictures and television presented unprecedented opportunities for actors, the sensitivity of camera and microphone making subtlety of voice, expression, and movement absolutely essential. In spite of changing acting styles, however, great acting remains a highly individual achievement. The effectiveness of a performance by Laurence Olivier—whether he be acting Heathcliff in the film *Wuthering Heights*, Othello in Shakespeare's tragedy, or James Tyrone in a television production of O'Neill's *Long Day's Journey into Night*—is dependent on neither the dramatic medium nor any formal theatrical training, but on the extraordinary sensitivity and talent of Olivier the actor. For further information, see DRAMA, WESTERN, ORIENTAL DRAMA, SCENE DESIGN AND STAGE LIGHTING, DIRECTING. See Toby Cole, ed., *Acting: A Handbook of the Stanislavski Method* (1955), Constantin Stanislavski, *Building a Character* (tr 1962) and *An Actor Prepares* (tr 1963), A. Hamerton, ed., *The Actor's Art* (1969), Toby Cole and H. K. Chinow, ed., *Actors on Acting* (rev ed 1970), Tyrone Guthrie, *Tyrone Guthrie on Acting* (1971), Michael Billington, *The Modern Actor* (1973).

actinide series, a series of radioactive metals in group IIIB of the PERIODIC TABLE. Members of the series are often called actinides. ACTINIUM (atomic number 89) is usually considered a member of the series. The series always includes the 14 elements with atomic numbers 90 through 103, which are (in order of increasing atomic number) THORIUM, PROACTINIUM, URANIUM, NEPTUNIUM, PLUTONIUM, AMERICIUM, CURIUM, BERKELIUM, CALIFORNIUM, EINSTEINIUM, FERMIUM, MENDELEVIUM, NOBELIUM, and LAWRENCIUM. Study of the properties of the actinides is hampered by their instability. It is known, however, that all members of the series resemble actinium in their chemical properties. The actinides are reactive and assume a number of different valences in their compounds. As the atomic number increases in this series, added electrons enter the 5f electron orbital. Elements in this series with atomic numbers greater than that of uranium (92) are called TRANSURANIUM ELEMENTS, they are not found (except in minute amounts) on earth, but have been prepared synthetically. Elements with atomic numbers greater than 103 are not members of the actinide series, element 104 is the first TRANSACTINIDE ELEMENT.

actinium (äktīn'ēəm) [Gr., = like a ray], radioactive chemical element, symbol Ac, at no 89, mass no of most stable isotope 227, m.p. about 1050°C, b.p. 3200°C ± 300°C, sp. gr. 10.07, valence +3. Actinium is a silver-white metal with a cubic crystalline structure. It is found with uranium minerals in pitchblende. The pure metal can be prepared by reducing its fluoride with lithium vapor at about 1200°C. Actinium-227, the most stable isotope, has a half-life of 21.6 years. All other isotopes of actinium have very short half-lives. Actinium is in group IIIB of the PERIODIC TABLE. Its chemical properties are similar to those of lanthanum and of members of the ACTINIDE SERIES, of which it is usually considered the first member. It reacts with water to form an insoluble hydroxide, with halides to form a trifluoride, trichloride, bromide, or iodide, with oxalic acid to form the oxalate, with oxygen or sulfur to form the sesquioxide or sesquisulfide. Actinium was first recognized in 1899 by Andre Debierne in uranium residues from pitchblende. It was later found to be identical with an element discovered in 1902 by Fritz Giesel and called by him emanium.

actinium series, natural radioactive decay series beginning with URANIUM-235 (also called actinouranium) and ending with LEAD-207. See RADIOACTIVITY.

actinolite (äktīn'älīt) see AMPHIBOLE.

actinometer (äkt'änöm'etər), instrument used to measure the heating power of radiation. Actinometers are used chiefly in meteorology to measure solar radiation as transmitted directly by the sun, scattered by the atmosphere, or reflected by the earth. A number of different designs have been developed. In one design a small bimetallic strip is heated by the radiation, and the subsequent bending is measured, from knowledge of such factors as the heat capacity of the strip, its surface area, its reflectivity, and the change in its curvature produced by a given change in temperature, the heating power of the radiation striking it can be found. In another design two bimetallic strips, one blackened and one white, are exposed to the radiation and the difference in their subsequent curvatures measured. In a third design a sheet of photographic paper is exposed to the

radiation to provide a measure of the total radiation over a period of time.

actinomycin (äkt'änöm'isən), any one of a group of ANTIBIOTICS produced by bacteria of the genus *Streptomyces*. Actinomycin was the first antibiotic reported to be able to halt cancer, however, it is not widely used to treat cancers because it is highly toxic to humans, interfering with the genetic material of cells. It is mainly used as an investigative tool in cell biology.

actinomycosis (äkt'änöm'ikō'sis), chronic suppurative fungus infection that occurs around the face and neck. The disease is characterized by the formation of abscesses, or pus-filled cavities, below the surface of the skin. These abscesses spread rapidly and form channels that discharge a yellow granular pus on the surface of the skin. In humans these granules consist of *Actinomyces israelii*, a fungus present in the normal flora of the mouth that becomes pathogenic in association with certain bacteria. Infection typically follows a tooth extraction or other trauma. The disease causes extensive tissue destruction and can prove fatal if it invades the abdomen or lungs. Treatment consists of prolonged massive therapy with penicillin. Actinomycosis also occurs in horses, cattle, and swine, it is caused by *A. bovis* and resembles human actinomycosis.

actinon (äkt'änōn') see RADON.

action, in law, see PROCEDURE.

action painting: see ABSTRACT EXPRESSIONISM.

Actium (äkt'ēəm, -shē ~), promontory, NW Acarnania, Greece, at the mouth of the Ambracian Gulf. There are vestiges of several temples and an ancient town. At Actium was fought the naval battle (31 B.C.) in which the forces of Octavian (later Augustus) under Agrippa defeated the sea and land forces of Antony and Cleopatra. The battle established Octavian as ruler of Rome. The Actian games, held at NICOPOLIS every four years, were established to commemorate the event.

activation energy, in chemistry, minimum ENERGY needed to cause a CHEMICAL REACTION. According to the KINETIC-MOLECULAR THEORY OF GASES, the atoms, ions, or molecules of a substance are constantly in motion, the HEAT energy present in a substance is embodied in this motion. A chemical reaction between two substances occurs only when an atom, ion, or molecule of one collides with an atom, ion, or molecule of the other. When the reactants collide, they may form an intermediate product whose chemical energy is higher than the combined chemical energy of the reactants. In order for this transition state in the reaction to be achieved, some energy must enter into the reaction other than the chemical energy of the reactants. This energy, supplied by the heat of the substance, is the activation energy. Once the intermediate product, or activated complex, is formed, the final products are formed from it. The path from reactants through the transition-state activated complex to the final products is known as the reaction mechanism. (Reaction mechanisms for complex reactions may involve several steps analogous to that described here.) If the chemical energy of the final products is greater than that of the reactants, some of the heat energy of the substance will be converted to chemical energy, and the reaction is called endothermic. The activation energy of an endothermic reaction is at least equal to the difference in chemical energy of the reactants and the products. If the chemical energy of the

products is less than that of the reactants, some chemical energy will be converted to heat energy in the course of the reaction, such a reaction is called exothermic. If the amount of heat energy in a system is increased, the temperature of the system increases. An exothermic reaction causes the temperature of the reaction system to rise, since the heat energy of the system is increased as the chemical energy is decreased. In general, the activation energies of exothermic reactions are lower than those of endothermic reactions. Because the heat energy of a substance is not uniformly distributed among its atoms, ions, or molecules, some may carry enough heat energy to react while others do not. If the activation energy is low, a greater proportion of the collisions between reactants will result in reactions. If the temperature of the system is increased, the average heat energy is increased, a greater proportion of collisions between reactants result in reaction, and the reaction proceeds more rapidly. A catalyst increases the reaction rate by providing a reaction mechanism with a lower activation energy, so that a greater proportion of collisions result in reaction. The activation energy and rate of a reaction are related by the equation $k = Ae^{-E_a/RT}$, where k is the rate constant, A is a temperature-independent constant (often called the frequency factor), e is the base of natural logarithms, E_a is the activation energy, R is the universal gas constant, and T is the temperature. This relationship was derived by Arrhenius in 1899. Because the relationship of reaction rate to activation energy and temperature is exponential, a small change in temperature or activation energy causes a large change in the rate of the reaction. Activation energies are usually determined experimentally by measuring the reaction rate k at different temperatures T , plotting the logarithm of k against $1/T$ on a graph, and determining the slope of the straight line that best fits the points, the activation energy is a constant multiple of the slope, with the value of the constant depending on the units of measure used.

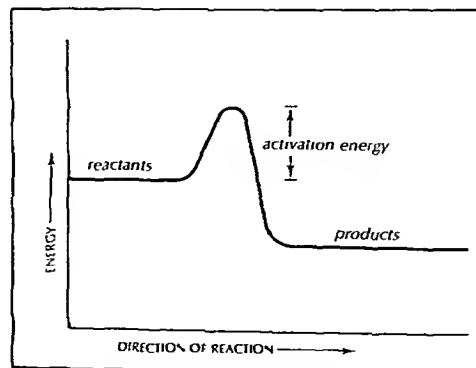
active see VOICE.

active site: see ENZYME.

act of God, in law, an ACCIDENT caused by the operation of extraordinary natural force. The effect of ordinary natural causes (e.g., that rain will leak through a defective roof) may be foreseen and avoided by the exercise of human care, failure to take the necessary precautions constitutes NEGLIGENCE, and the party injured in the accident may be entitled to damages. An act of God, however, is so extraordinary and devoid of human agency that reasonable care would not avoid the consequences, hence, the injured party has no right to damages. Accidents caused by tornadoes, perils of the sea, extraordinary floods, and severe ice storms are usually considered acts of God, but fires are not so considered unless they are caused by lightning.

Acton, John Emerich Edward Dalberg Acton, 1st Baron, 1834-1902, English historian, b. Naples, grandson of Sir John Francis Edward Acton and of Emmerich Joseph, duc de Dalberg. He became (1859) a Liberal member of Parliament and editor of the *Rambler*, a Roman Catholic monthly. William E. Gladstone, his close friend, nominated him to the peerage (1869), and in 1892, Acton was made lord-in-waiting. Acton's genuine and ardent liberalism gave frequent offense to Roman Catholic authorities. His hatred of arbitrary power and all forms of absolutism led him to oppose the syllabus of errors issued by Pius IX and the promulgation of the dogma of papal infallibility, but, as a sincere Catholic, he accepted them after their pronouncement rather than risk excommunication. In 1895 he was appointed professor of modern history at Cambridge and in the following years planned the *Cambridge Modern History*, of which only the first volume appeared before his death. Acton never completed a book, his influence was felt through his lectures, his writings for periodicals, and his personal contacts with the leading historians of his time. Many articles, essays, and lectures were brought together after his death in *Lectures on Modern History* (1906), *History of Freedom* (1907), and *Historical Essays and Studies* (1907). Some of these were reprinted in *Essays on Freedom and Power* (1948) and *Essays on Church and State* (1952). His impressive personal library, consisting of more than 59,000 volumes, was bought by Andrew Carnegie after his death and donated to Cambridge. See his correspondence with Richard Simpson, ed. by J. L. Altholz (2 vol., 1970-73), studies by Gertrude Himmelfarb (1962) and David Mathew (1968).

Acton, Sir John Francis Edward, 1736?-1811, Neapolitan statesman of British origin, b. Besançon,



Energy profile of an exothermic reaction. Although the total energy of the products is less than that of the reactants, the activation energy must be added to weaken or break existing bonds before the reaction can take place.

France. Called upon by Queen Marie Caroline and King Ferdinand IV of Naples (later FERDINAND I of the Two Sicilies) to reform the Neapolitan army and navy in 1779, Acton also served as minister of finance and as prime minister (1785-1806 with brief interruptions). With the assistance of Emma Lady HAMILTON, the queen's confidante, he rid Naples of Spanish influence and strengthened ties with Great Britain and with Austria. He shared the political vicissitudes of the royal family, going with them into exile in 1798 after Naples had been taken by the French. After the fall of the PARTHENOPEAN REPUBLIC (1799), he played a major role in the bloody reprisals and consolidated absolutism. In 1806, the French reconquest of Naples under Napoleon I forced Acton into exile again.

Acton, town (1970 pop 14,770), Middlesex co., E Mass., NW of Boston, settled c 1680, inc 1735. Among its manufactures are electrical machinery and chemicals. Points of interest include the Isaac Davis Home, residence of the first man to die at the battle of Concord during the Revolutionary War. The Acton Minutemen's march to the battle of Concord is reenacted in the town annually.

Actors' Studio, The. see STRASBERG, LEE

Acts of the Apostles, fifth book of the New Testament, between the Gospels and the Epistles. It is the only contemporary historical account of the expansion of Christianity in its earliest period. It was written in Greek between A.D. 60 and A.D. 80 as a sequel to the Gospel of St. Luke, and Luke is its traditional author. It falls into two divisions: the first 12 chapters, on the Palestinian church from Pentecost until Herod's death, having chiefly to do with St. Peter, and the rest of the book, dealing with the missionary work of St. Paul among the Gentiles (13-21:14) and his arrest, trial, and trip as prisoner to Rome (21:15-28). St. Luke was sometimes a companion of St. Paul, and the narrative is then in the first person plural (16:10-17, 20:5-21:18, 27:1-28:16). Three critical events are noteworthy—the descent of the Holy Ghost (2), the martyrdom of St. Stephen (6, 7), and the conversion of St. Paul (9). See H. J. Cadbury, *The Book of Acts in History* (1955); Jacob Jerrell, *Luke and the People of God* (1972); C. W. Cartel and Ralph Earle, *The Acts of the Apostles* (1973).

actuary, one who calculates the probabilities involved in any contingency for which INSURANCE is desired and establishes the premium necessary to cover such contingency. Originally, in England, the term was applied to a clerk or registrar appointed either to record court acts or to manage a joint stock company. Later it came to be used exclusively for managers of insurance companies. As insurance against loss of life is the most common type of policy, actuaries are particularly concerned with studying age, health, and other variables to predict the probable longevity of a person or group. The contingencies involved in fire, accident, or group health policies are also important parts of the actuary's work. An actuary also calculates the probabilities upon which annuities are based and the amount of money, at compound interest, necessary to cover them.

Acuña, Cristobal de (krēstō'bal dā akōō'nyā), 1597-1667?, Spanish Jesuit missionary and explorer in South America, rector of the Jesuit college at Cuenca, Ecuador. In 1638 he was sent by the viceroy to accompany TEIXEIRA on his return journey down the Amazon River. Acuña's *New Discovery of the Great River of the Amazons* (1639, modern tr. in C. R. Markham's *Expedition into the Valley of the Amazons*, 1859, repr. 1964) was the earliest firsthand description of the Amazon to be printed.

Acuña, Juan de (hwan), 1658?-1734, Spanish-American administrator, viceroy of New Spain (1722-34), marques de Casa Fuerte, b. Lima, Peru. After a distinguished career in Spain he was sent to Mexico, where his creole origin and his wise government made him popular. He extinguished favoritism and corruption, extended and consolidated Spanish territorial claims, and ordered the construction of many public works. In his term the *Gaceta de Mexico*, Mexico's first newspaper, appeared.

acupuncture, technique of medical treatment, based on traditional Chinese medicine, in which a number of very fine metal needles are inserted into the skin at especially designated points. In China acupuncture has been used, along with herbal medicine, for pain relief and treatment of various ailments. It has often been combined with moxibustion, the burning of leaves of moxa, the Chinese wormwood tree. Today it is widely used in China in the treatment of hay fever, headaches, and ulcers, and some types of blindness, arthritis, diarrhea, and

hypertension. Acupuncture has also recently come into use, especially in China, as a general anesthetic during childbirth and some types of surgery. Unlike conventional anesthesia, acupuncture does not reduce blood pressure or depress breathing, in addition, the patient stays fully conscious and there is no postoperative hangover or nausea. In the practice of acupuncture, needles varying in length from 1/2 in. (1.27 cm) to several inches are inserted in appropriate points of the body, not necessarily near the affected organ. The needles are twirled and vibrated in specific ways, the depth of insertion also affects the treatment. In modern applications, a battery-powered device is often used to provide electrical stimulation through the needles. The traditional acupuncture points (there are about 800) are arranged along 14 lines, or meridians, running the length of the body from head to foot. The traditional Chinese explanation of the effectiveness of acupuncture is based on the Taoist philosophy (see TAOISM), according to which good health depends on a free circulation of T'chi, or life force energy, throughout all the organs of the body, this force is controlled by two forms of energy, yin (negative) and yang (positive). The meridians are the main channels of flow. When energy flow is impeded at any point, e.g., because of a diseased organ or stress, illness in other organs may result. Piercing the channels at the proper points is believed to correct the imbalances. Western researchers have found that the acupuncture points correspond to points on the skin having less electrical resistance than other skin areas. It has been suggested that acupuncture works by stimulating or repressing the autonomic NERVOUS SYSTEM in various ways, and there is some evidence that stimulation of the skin can affect internal organs by means of nerve reflex pathways. In the United States, use of acupuncture has been generally confined to pain relief and anesthesia. In 1974 the National Institutes of Health approved the study of acupuncture for the possible management of chronic pain caused by cancer, neuralgia, and arthritis. See Marc Duke, *Acupuncture* (1972); Felix Mann, *Acupuncture* (rev. ed. 1973).

Ada, city (1970 pop 14,859), seat of Pontotoc co., S central Okla., inc. 1904. It is a large cattle market and the center of a rich oil and ranch area. The city is also a center for horsebreeding, and fine quarter horses are raised there. East Central State College and the Sciences and Natural Resources Center of Oklahoma are there, and the Robert S. Kerr Water Research Center (a federal laboratory) is just south of the city.

Adad see HADAD

Adadah (ād'ada), town of Judah in the southernmost part of Palestine. Joshua 15:22.

Adah (ā'dā) 1 Wife of Esau. Gen. 36:2-20. 2 Wife of Lamech. Gen. 4:19-23.

Adaiab (adā'ya) 1 Josiah's mother's father. 2 Kings 22:1. 2 Gershomite. Leviticus 1 Chron. 6:41. Iddo. 1 Chron. 6:21. 3 Benjamite. 1 Chron. 8:21. Shema. 1 Chron. 8:13. 4 Priest. 1 Chron. 9:12, Neh. 11:12. 5, 6 Men who had foreign wives. Ezra 10:29, 39. 7 Father of MAASEIAH. 2. 8 Ancestor of ASIAH. 4.

Adair, John, 1757-1840, American pioneer in Kentucky, b. North Carolina. He went into the Kentucky country in 1786 and became famous as an Indian fighter and as a political leader. In the War of 1812 he was a commander of Kentucky volunteers in the battle of New Orleans. As governor of Kentucky (1820-24) he adopted a vigorous program of internal improvement to fight hard times. He was (1831-33) a member of the House of Representatives.

Adak (ā'dāk, a'dak) see ALEUTIAN ISLANDS

Adalbert, Saint (ād'əlbərt), 956-97, bishop of Prague, b. Bohemia. He was a missionary in Russia, Prussia, and Poland and was martyred in Danzig. He is patron of Bohemia and Poland. Feast April 23.

Adalbert, d. 1072, German churchman, archbishop of Hamburg-Bremen, a diocese that included Scandinavia. He was a favorite of Holy Roman Emperor Henry III, who appointed Adalbert to the archbishopric in order to break the power of the dukes of N. Europe. He was a guardian of Henry's son and successor, Henry IV, but his relentless ambition to strengthen the church and the monarchy at the expense of the nobles (chiefly by annexing their lands) defeated itself. The nobles allied themselves with the abbots, who hated him for his efforts to subordinate the abbey, and with the bishops, who feared his increasing ecclesiastical power. They accomplished his dismissal in 1066, but Henry IV recalled him in 1069. One of the ablest statesmen of his time, Adalbert, though working mainly for selfish aims,

helped consolidate the imperial authority. See Adam of Bremen, *History of the Archbishops of Hamburg-Bremen* (tr. 1959).

Adalia (ādālī'a), one of Haman's sons. Esther 9:8.

Adalia, Turkey. see ANTALYA

Adam (Heb., =man), in the Bible, the first man. For the account of his creation, of that of his wife EVE, of their life in the Garden of Eden (see EDEN, GARDEN OF), of their first disobedience, and of their expulsion, see Gen. 1:26-5:5. The opening chapters of Genesis are very interesting to believers of the three principal monotheistic religions, for conceptions derived therefrom, see SIN and GRACE, for examples of the mass of legends that Judaism and Islam have collected about the biblical account, see LILITH and PSEUDEPIGRAPHIA. To St. Paul, Adam represented the earthy side of man, as in 1 Cor. 15:20-22, 42-58. The HIGHER CRITICISM has seen in Adam's story an attempt to harmonize Hebrew cosmogonic myths. Critics of that school compare Babylonian myths of creation, which are similar to the biblical account in many features.

Adam, Adolphe Charles (adōlf' sharl' adaN'), 1803-56, French composer of the popular song *Cantique de Noël*. He composed more than 50 stage works, including comic operas such as *Le Postillon de Longjumeau* (1836) and the ballet *Giselle* (1841).

Adam, Robert (ād'am), 1728-92, and **James Adam**, 1730-94, Scottish architects, brothers. They designed important public and private buildings in England and Scotland and numerous interiors, pieces of furniture, and decorative objects. Robert possessed the great creative talents, with his brother James serving chiefly as his assistant. Robert Adam designed his buildings to achieve the most harmonious relation between the exterior, the interior, and the furniture. His light, elegant, and essentially decorative style was a free, personal reconstitution of antique motifs. He drew upon numerous sources including earlier English Palladian architecture, French and Italian Renaissance architecture, and the antique monuments themselves as he knew them through publications and personal investigation. Adam himself contributed an important study, *Ruins of the Palace of the Emperor Diocletian at Spalatro in Dalmatia* (1764). For decorative painting, Adam employed such artists as Angelica Kauffmann and Antonio Zucchi. The Adam manner gained great favor in his day, and designs in the Adam style have never ceased to appear. Especially interesting examples of Adam planning and decoration are Osterly Park, Middlesex (1761-80), Syon House, Middlesex (1762-69), and Luton Hoo, Bedfordshire (1768-75). The brothers wrote *Works in Architecture of Robert and James Adam* (3 vol., 1778-1822). Robert was architect to the king from 1762 until 1768, when he was succeeded by James. Robert Adam was buried in Westminster Abbey. See John Fleming, *Robert Adam and His Circle* (1962) and D. Stillman, *The Decorative Work of Robert Adam* (1966); Doreen Yarwood, *Robert Adam* (1970).

Adam, town on the upper Jordan. Joshua 3:16.

Adamah (ād'amā), Naphtalite city. Joshua 19:36.

Adamawa Massif (adamawā', ād'ama'wā), plateau, c. 26,000 sq. mi. (67,300 sq. km), N. central Cameroon and E. Nigeria, W. central Africa. It is sparsely populated, and grazing is the chief occupation; bauxite is mined there. The Benue River rises on the plateau.

Adam de la Halle (adaN' də la al) or **Adam le Bossu** (lə bōsu'), c. 1240-1287, French dramatist and poet-musician, a great TROUVÈRE. Many of his songs and polyphonic motets are preserved, as is the pastoral comedy with music *Le Jeu de Robin et Marion* (c. 1283). Another work, *Jeu de la feuillie* (1262), was one of the earliest forerunners of comic opera.

Adami (ād'amī) or **Adami-nekeb** (-nē'kēb), border town of Naphtali. Adami-nekeb in RSV. Two towns, Adami and Nekeb, in AV. Joshua 19:33.

Adam le Bossu see ADAM DE LA HALLE

Adams, Abigail, 1744-1818, wife of President John ADAMS and mother of President John Quincy ADAMS, b. Weymouth, Mass. She was born Abigail Smith. A lively, intelligent woman, she was the chief figure in the social life of her husband's administration and one of the most distinguished and influential of the first ladies in the history of the United States. Her detailed letters are a vivid source of social history. The correspondence with her husband was edited in a number of volumes by Charles Francis Adams, her letters, as well as John's, are included in *The Adams-Jefferson Letters*, edited by Lester J. Cappon (1959), letters to her sister, Mary Smith Cranch, are in *New Letters of Abigail Adams, 1788-1801*, edited by Stewart Mitchell (1947, repr. 1973). See biogra-

phies by J. Whitney (1947, repr. 1970) and L. E. Richards (1917, repr. 1971), novel by I. Stone, *Those Who Love* (1965). See also bibliography for ADAMS, JOHN.

Adams, Ansel, 1902–, American photographer, b. San Francisco. Adams began taking photographs in the High Sierra and Yosemite Valley, with which his name is permanently associated, becoming professional in 1930. That year he published the first of many books of his photographs, *Taos Pueblo*. With Edward Weston and others he founded the Group f/64 in reaction against the painterly aesthetic then current. He specialized in characteristic regional landscape, particularly of the Southwest, emphasizing conservation of nature. Adams wrote numerous technical manuals, including the classic *Basic Photo-Books* series, and helped to found the first photographic art department of a museum at the Museum of Modern Art, New York City. His book *Born Free and Equal* (1944) was an effort to aid Japanese-Americans incarcerated during World War II. He began the first college department of photography (California School of Fine Art, 1946). Adams won two Guggenheim grants to photograph national parks and monuments. He published the first superb portfolio reproductions of his own and others' photographs. See *aperture* monograph (1972).

Adams, Brooks, 1848–1927, American historian, b. Quincy, Mass., son of Charles Francis ADAMS (1807–86). His theory that civilization rose and fell according to the growth and decline of commerce was first developed in *The Law of Civilization and Decay* (1895). Adams applied it to his own capitalistic age, of which he was a militant critic, but failed to find the universal law that he persistently sought. His ideas greatly influenced his brother Henry ADAMS, whose essays he edited in *The Degradation of the Democratic Dogma* (1919). In *America's Economic Supremacy* (1900), Brooks said that Western Europe had already begun to decline and that Russia and the United States were the only potential great powers left. His other chief works include *The Emancipation of Massachusetts* (1887), *The New Empire* (1902), and *Theory of Social Revolutions* (1913). See biography by A. F. Berengase (1955), J. T. Adams, *The Adams Family* (1930, repr. 1957), T. P. Donovan, *Henry Adams and Brooks Adams* (1961).

Adams, Charles Francis, 1807–86, American public official, minister to Great Britain (1861–68), b. Boston, son of John Quincy ADAMS. After a boyhood spent in various European capitals, he was graduated (1825) from Harvard and studied law under Daniel Webster. He practiced in Boston, looked after his father's business affairs, and wrote articles on American history for the *North American Review*. Adams served (1840–45) in both branches of the state legislature. He founded and edited the *Boston Whig* and became a leader of the Conscience Whigs. In 1848 he was the Free-Soil party candidate for the vice presidency. He represented (1858–61) his father's old district in Congress and assumed prominence as a Republican leader. On Seward's advice, Lincoln appointed him minister to Great Britain. In the face of English sympathy for the Confederacy, he maintained the Northern cause with wisdom and a bold dignity that won British respect, particularly in the serious *Trent and Alabama* incidents. He is credited with preventing British recognition of the Confederacy, thus contributing much to the Union victory. He later represented the United States in the settlement of the ALABAMA CLAIMS. He published many political pamphlets and addresses and was an editor of the works (10 vol., 1850–56) of his grandfather, John Adams, and of his father's diary (12 vol., 1874–77). See biography by M. B. Duberman (1961), W. C. Ford, ed., *A Cycle of Adams Letters, 1861–1865* (1920), J. T. Adams, *The Adams Family* (1930).

Adams, Charles Francis, 1835–1915, American economist and historian, b. Boston, son of Charles Francis Adams (1807–86). In the Civil War he fought at Antietam and Gettysburg and was brevetted brigadier general of volunteers. Adams became a railroad expert after the war, writing *Chapters of Erie* (1871), which exposed the corrupt financing of the Erie RR, and *Railroads: Their Origin and Problems* (1878). In 1869 he became a member, and from 1872 to 1879 was chairman, of the Massachusetts Board of Railroad Commissioners, the first such board in the nation. Adams was made chairman of the government directors of the Union Pacific in 1878 and became president in 1884, but he was ousted by the forces of Jay Gould in 1890. His reform of the public schools in the home town of the Adamses, Quincy, Mass., was described in *The New Departure in the Common Schools of Quincy* (1879), and the Quincy

system was widely adopted. Adams served 24 years on the Harvard Board of Overseers and was president (1895–1915) of the Massachusetts Historical Society. He wrote *Three Episodes of Massachusetts History* (1892), *Studies: Military and Diplomatic, 1775–1865* (1911), *Trans-Atlantic Historical Solidarity* (1913), which was a collection of lectures he had given at Oxford, and biographies of his father (1900) and Richard Henry Dana (1890). See his autobiography (1916, repr. 1973), W. C. Ford, ed., *A Cycle of Adams Letters, 1861–1865* (1920), J. T. Adams, *The Adams Family* (1930).

Adams, Charles Francis, 1866–1954, U.S. Secretary of the Navy (1929–33), b. Quincy, Mass., grandson of Charles Francis Adams (1807–86). He practiced law for a brief period in Boston but for most of his life was connected with a wide variety of business enterprises in that city and elsewhere. Adams served in the cabinet of Herbert Hoover.

Adams, Franklin Pierce, pseud. F. P. A., 1881–1960, American columnist and author, b. Chicago. He began (1903) work as a columnist on the *Chicago Journal* and continued it on the *New York Evening Mail*, the *Tribune*, the *World*, the *Herald Tribune*, and the *Post*. His column, "The Conning Tower," consisted of verse and humor by F. P. A. and his contributors, who included Ring Lardner and Dorothy Parker. On Saturdays his columns were accounts of his week's activities that imitated the style of Samuel Pepys. They were republished as *The Diary of Our Own Samuel Pepys 1911–1934* (1935). Adams's other works included *So There!* (1923), *Christopher Columbus* (1931), and *Nods and Becks* (1944).

Adams, Henry, 1838–1918, American writer and historian, b. Boston, son of Charles Francis Adams (1807–86). He was secretary (1861–68) to his father, then U.S. minister to Great Britain. Upon his return to the United States, having already abandoned the law and seeing no opportunity in the traditional Adams vocation of politics, he briefly pursued journalism. He reluctantly accepted (1870) an offer to teach medieval history at Harvard, but nonetheless stayed on seven years and also edited (1870–76) the *North American Review*. In 1877 Adams moved to Washington, D.C., his home thereafter. He wrote a good biography of Albert Gallatin (1879), a less satisfactory one of John Randolph (1882), and two novels (the first anonymously and the second under a pseudonym)—*Democracy* (1880), a cutting satire on politics, and *Esther* (1884). His exhaustive study of the administrations of Jefferson and Madison, *History of the United States of America* (9 vol., 1889–91, reprinted in a number of editions), is one of the major achievements of American historical writing. Famous for its style, it is deficient, perhaps, in understanding the basic economic forces at work, but the first six chapters constitute one of the best social surveys of any period in U.S. history. Never of a sanguine temperament, Adams became even more pessimistic after the suicide (1885) of his adored wife. He abandoned American history and began a series of restless journeys, physical and mental, in an effort to achieve a basic philosophy of history. Drawing upon the physical sciences for guidance and influenced by his brother, Brooks ADAMS, he found a satisfactory unifying principle in force or energy. He selected for intensive treatment two periods: 1050–1250, presented in *Mont-Saint-Michel and Chartres* (privately printed 1904, pub. 1913), and his own era, presented in *The Education of Henry Adams* (privately printed 1906, pub. 1918). The first is a brilliant idealization of the Middle Ages, specifically of the 13th-century unity brought about by the force of the Virgin, which was dominant then. The second was classified by his publishers as an autobiography, although it was written in the third person and was unrevealing about much of his life. It is, however, a tour de force, and describes his unsuccessful efforts to achieve intellectual peace in an age when the force of the dynamo is dominant. These two books, containing some of the most beautiful English ever written, rather than his monumental *History*, won Adams his lasting place as a major American writer. *The Degradation of the Democratic Dogma* (1919), edited by Brooks Adams and prefaced with a memoir by Henry Adams, contains three brilliant essays on his philosophy of history—"The Tendency of History," "A Letter to American Teachers of History" (pub. separately in 1910), and "The Rule of Phase Applied to History." Friendships, especially those with John Hay and Clarence King, played a large part in Adams's life, and his personal letters reveal a warmer man than one might suspect. See his letters (ed. by W. C. Ford, 2 vol., 1930–38), J. T. Adams, *Henry Adams* (1933, repr. 1970), Ward Thoron, ed.,

The Letters of Mrs. Henry Adams, 1865–1883 (1936), H. D. Cater, ed., *Henry Adams and His Friends: A Collection of His Unpublished Letters* (1947), Ernest Samuels, *The Young Henry Adams* (1948), Henry Adams, *The Middle Years* (1958) and *Henry Adams: The Major Phase* (1964), T. P. Donovan, *Henry Adams and Brooks Adams* (1961).

Adams, Herbert Baxter, 1850–1901, American historian, b. Shutesbury, near Amherst, Mass. In 1876, the year he received his doctorate at Heidelberg, he became one of the original faculty of Johns Hopkins Univ. There, in 1880, he began his famous seminar in history, where a large proportion of the next generation of American historians trained. Adams founded the "Johns Hopkins Studies in Historical and Political Science," the first of such series, and brought about the organization in 1884 of the American Historical Association, of which he was secretary until 1900. He wrote *The Germanic Origin of New England Towns* (1882), *Life and Writings of Jared Sparks* (1893), and many articles and reports on the study of the social sciences that were very influential in their day. See W. S. Holt, ed., *Historical Scholarship in the United States, 1876–1901, as Revealed in the Correspondence of Herbert B. Adams* (1938).

Adams, James Truslow (trū'slō), 1878–1949, American historian, b. Brooklyn, N.Y. *The Founding of New England* (1921), which brought him the Pulitzer Prize in history for 1922, was followed by *Revolutionary New England, 1691–1776* (1923) and *New England in the Republic, 1776–1850* (1926). Among the best of his many books are *Provincial Society, 1690–1763* (Vol. III in the "History of American Life" series, 1927) and *The Epic of America* (1931), which was widely translated. *The March of Democracy* (2 vol., 1932–33) and *America's Tragedy* (1934) were also popular. *The Adams Family* (1930) and *Henry Adams* (1933) were books on the famous Massachusetts clan, to which he was not related. Adams, who spent much of his time in London as representative of his publishers, Charles Scribner's Sons, also wrote *Building the British Empire: To the End of the First Empire* (1938) and *Empire on the Seven Seas: The British Empire, 1784–1939* (1940). He was editor in chief of *Dictionary of American History* (6 vol., 1940, rev. ed. 1942), *Atlas of American History* (1943), and *Album of American History* (4 vol., 1944–48), three valuable reference works. Some of his later writings reflect his obvious distaste for the New Deal, of which he was a vigorous critic. See biography by Allan Nevins (1968).

Adams, John, 1735–1826, 2d President of the United States (1797–1801), b. Quincy (then in Braintree), Mass., grad. Harvard, 1755. A lawyer, he emerged into politics as an opponent of the Stamp Act and, after moving to Boston, was a leader in the Revolutionary group opposing the British measures that were to lead to the American Revolution. Sent (1774) to the First Continental Congress, Adams distinguished himself, and in the Second Continental Congress he was a moderate but forceful revolutionary. He proposed George Washington as commander in chief of the Continental troops to bind Virginia more tightly to the cause for independence. He favored the DECLARATION OF INDEPENDENCE, was a member of the drafting committee, and argued eloquently for it. As a diplomat seeking foreign aid for the newly established nation, he had a thorny career. Appointed (1777) to succeed Silas Deane as a commissioner to France, he accomplished little before going home (1779) to be a major figure in the Massachusetts constitutional convention. He then returned (1779) to France, where he quarreled with VERGENNES and was able to lend little assistance to Benjamin Franklin in his peace efforts. His attempts to negotiate a loan from the Netherlands were fruitless until 1782. Adams was one of the negotiators who drew up the momentous Treaty of Paris (1783, see PARIS, TREATY OF) to end the American Revolution. After this service he obtained another Dutch loan and then was envoy (1785–88) to Great Britain, where he met with British coldness and unwillingness to discuss the problems growing out of the treaty. He asked for his own recall and ended a significant but generally discouraging diplomatic career. In the United States once more, he was chosen Vice President and served throughout George Washington's administration (1789–97). Although he inclined to conservative policies, he acted somewhat as a balance wheel in the partisan contest between Alexander HAMILTON and Thomas JEFFERSON. In the 1796 election Adams was chosen to succeed Washington as President despite the surreptitious opposition of Hamilton. The Adams administration

was one of crisis and conflict, in which the President showed an honest and stubborn integrity, and though allied with Hamilton and the conservative property-respecting Federalists, he was not dominated by them in their struggle against the vigorously rising, more broadly democratic forces led by Jefferson. Though the Federalists were pro-British and strongly opposed to post-Revolutionary France, Adams by conciliation prevented the near war of 1798 (see XYZ AFFAIR) from developing into a real war between France and the United States. Nor did the President wholeheartedly endorse the ALIEN AND SEDITION ACTS (1798), aimed at the Anti-Federalists. He was, however, detested by his Jeffersonian enemies, and in the election of 1800 he and Hamilton were both submerged in the tide of Jeffersonian democracy. After 1801, Adams lived in retirement at Quincy, issuing sober and highly respected political statements and writing and receiving many letters, notably those to and from Jefferson. Their famous correspondence was edited by Lester J. Cappon in *The Adams-Jefferson Letters* (1959). By remarkable coincidence he and Jefferson died on the same day, Independence Day, July 4, 1826. John Adams and his wife, Abigail ADAMS, founded one of the most distinguished families of the United States; their son, John Quincy ADAMS, was also President. A definitive edition of the voluminous writings of the Adams family was begun with four volumes (1961) containing the diary and autobiography of John Adams. Until completion of the definitive edition, see *Adams's Works* (10 vol., ed. by J. Q. Adams and C. F. Adams, 1850-56, repr. 1969, Vol. 1 is a biography by C. F. Adams), *The Selected Writings of John Adams and John Quincy Adams* (ed. by Adrienne Koch and William Peden, 1946). See also James Truslow Adams, *The Adams Family* (1930), Zoltan Haraszti, *John Adams and the Prophets of Progress* (1952), Manning J. Dauer, *The Adams Federalists* (1953, repr. 1968), Stephen G. Kurtz, *The Presidency of John Adams* (1957, repr. 1961), John R. Howe, Jr., *The Changing Political Thought of John Adams* (1966), biographies by John T. Morse (1884, repr. 1970), Gilbert Chinard (1933, repr. 1964), Page Smith (1962), and J. B. Peabody, ed. (1973).

Adams, John Couch, 1819-92, English astronomer, grad. St. John's College, Cambridge, 1843. By mathematical calculation based on irregularities in the motion of Uranus, he predicted the position of the then unknown planet Neptune. Because of delay in England in making a telescopic search for the planet, the credit for the discovery went to a Frenchman, Leverrier. In 1858, Adams became professor of mathematics at St. Andrews Univ., but he soon returned to Cambridge, to occupy the Lowndean chair of astronomy and geometry until his death. From 1861 he was also director of the university observatory, preferring this post to that of astronomer royal, which was offered to him in 1881. He made valuable studies of the moon's motions, of the Leonids in the great meteor shower of 1866, and of terrestrial magnetism. His collected papers, edited by his brother, were published (1896-1900) at Cambridge.

Adams, John Quincy, 1767-1848, 6th President of the United States (1825-29), b. Quincy (then in Braintree), Mass., son of John and Abigail Adams and father of Charles Francis Adams (1807-86). He accompanied his father on missions to Europe and gained broad knowledge from study and travel—he even accompanied (1781-83) Francis Dana to Russia—before returning home to graduate (1787) from Harvard and to study law. Washington appointed (1794) him minister to the Netherlands, and in his father's administration he was minister to Prussia (1797-1801). In 1803 he became a U.S. Senator as a Federalist, but his independence of mind led him to approve Jeffersonian policies in the Louisiana Purchase and in the Embargo Act of 1807; the Federalists were outraged, and he resigned (1808). Sent as minister to Russia in 1809, he was well received at court, but the wars of Napoleon eclipsed Russian-American relations. He then helped to draw up the Treaty of Ghent (1814), and his diplomatic training was completed as minister to Great Britain. As Secretary of State (1817-25) under President James Monroe, Adams gained an enduring fame. His best-known achievement was the MONROE DOCTRINE (1823). In 1824, Adams was a candidate for the U.S. presidency. Neither he, Andrew Jackson, nor Henry Clay received an electoral majority, and the election was decided in the House of Representatives. There Clay supported Adams and made him President. Adams then appointed Clay Secretary of State, but the Jacksonians' cry that the appointment fulfilled a cor-

rupt bargain was unfounded in fact. With little popular support and without a party, Adams had an unhappy, ineffective administration, despite his attempts to institute a broad program of internal improvements. After Jackson won the 1828 election, Adams retired to Quincy but returned to win new renown as U.S. Representative (1831-48); he was eloquent in attacking the gag rules and all measures that would extend slavery. His coldness and rather gloomy introspection still kept him from general popularity, but he was respected for his high-mindedness and his great knowledge. His interest in science led him to promote the Smithsonian Institution. His diary (selections ed. by C. F. Adams, 12 vol., 1874-77, repr. 1970, abridged by Allan Nevins, 1928 and 1951) is a valuable document. Most of his writings were edited by W. C. Ford (7 vol., 1913-17), and some appear in *The Selected Writings of John and John Quincy Adams* (ed. by Adrienne Koch and William Peden, 1946). See the definitive biography by Samuel Flagg Bemis (2 vol., 1949 and 1956), other biographies by John T. Morse (1883, repr. 1972) and Bennett Champ Clark (1932), James Truslow Adams, *The Adams Family* (1930).

Adams, Maude, 1872-1953, American actress, b. Salt Lake City, Utah. Her father's name was Kiskadden, but she used her mother's maiden name. She began acting at an early age and became leading lady to John Drew under the management of the Frohmans, an assignment that lasted for five years. In 1897 she had her first starring role in Barrie's *Little Minister*. Other Barrie plays she starred in include *Quality Street* (1901), *Peter Pan* (1905), the play for which she was most loved, and *What Every Woman Knows* (1908). In her retirement after 1918, Adams made valuable contributions to the development of stage lighting; in 1937 she became professor of drama at Stephens College. See biography by Phyllis Robbins (1956).

Adams, Robert McCormick, Jr., 1926-, American anthropologist, b. Chicago, Ill., grad. Univ. of Chicago (Ph.B., 1947, M.A., 1952, Ph.D., 1956). He joined the faculty of the Univ. of Chicago in 1955, and in 1962 he became director of the Oriental Institute there, a post he held until 1968. In 1970 he became dean of social sciences. He has done intensive, regionally oriented studies of long-term patterns of settlement and land-use in the Middle East and comparisons of the early growth of civilization in the Middle East and the New World. Among his writings are *Land Behind Baghdad* (1965), *The Evolution of Urban Society* (1966), and *The Uruk Countryside* (1972, with H. J. Nissen).

Adams, Samuel, 1722-1803, political leader in the American Revolution, signer of the Declaration of Independence, b. Boston, Mass., second cousin of John Adams. An unsuccessful businessman, he became interested in politics and was a member (1765-74) and clerk (1766-74) of the lower house of the Massachusetts legislature. As colonial resistance to British laws stiffened, Adams spoke for the discontented and replaced James Otis as leader of the extremists. He drafted a protest against the Stamp Act in 1765 and was one of the organizers of the non-importation agreement (1767) against Great Britain to force repeal of the TOWNSHEND ACTS, and drew up the Circular Letter to the other colonies, denouncing the acts as taxation without representation. More important, he used his able pen in colonial newspapers and pamphlets to stir up sentiment against the British. His polemics helped to bring about the BOSTON MASSACRE. With the help of such men as John Hancock he organized the revolutionary Sons of Liberty and helped to foment revolt through the Committees of Correspondence. He was the moving spirit in the BOSTON TEA PARTY. Gen. Thomas Gage issued (1775) a warrant for the arrest of Adams and Hancock, but they escaped punishment and continued to stir up lethargic patriots. Samuel Adams was a member (1774-81) of the Continental Congress, but after independence was declared his influence declined, the "radical" was replaced by more conservative leaders, who tended to look upon Adams as an irresponsible agitator. He later (1794-97) served as governor of Massachusetts. See writings ed. by H. A. Cushing (4 vol., 1904-8, repr. 1968), biographies by J. C. Miller (1936, repr. 1960), S. Beach (1965), W. V. Wells (2d ed. 1969), and N. B. Gerson (1973).

Adams, Samuel Hopkins, 1871-1958, American author, b. Dunkirk, N.Y., grad. Hamilton College, 1891. He was a reporter for the *New York Sun* (1891-1900) and then joined *McClure's Magazine*, where he gained a reputation as a muckraker for his articles on the conditions of public health in the United

States. Adams also wrote a series of articles for *Collier's Weekly*, in which he exposed patent medicines; these pieces were credited with influencing the passage of the first Pure Food and Drugs Act. Adams was a prolific writer, producing both fiction and nonfiction. His best-known novel, *Revelry* (1926), based on the scandals of the Harding administration, was later followed by *Incredible Era* (1939), a biography of Harding and his times. Among his other works are *The Great American Fraud* (1906), *The Harvey Girls* (1942), *Grandfather Stones* (1955), and *Tenderloin* (1959).

Adams, William (Will Adams), 1564?-1620, first Englishman to visit Japan. As pilot of a Dutch ship, he reached there in 1600. He soon became a favorite of the ruler IYASU, advising him on navigation, trade, and Western affairs. Many of the longer voyages that the Japanese made were in vessels constructed under his direction. Adams attempted to foster trade relations with England, and he himself made trading trips to the Ryukyu Islands, Siam, and Cochinchina. He married a Japanese woman, acquired a Japanese name (Anjin Sama, or Mr. Pilot), and was given an estate at Yokosuka. He remained in Japan until his death. See his letters (ed. by Thomas Randall, 1850) and his logbook (ed. by C. J. Purnell, 1916), R. Cocks, *Diary* (1964) and H. H. Gowen, *Five Foreigners in Japan* (1936, repr. 1967).

Adams, town (1970 pop. 11,772), Berkshire co., NW Mass., in the Berkshires, on the Hoosic River, inc. 1778. Its manufactures include lime products and decorative textiles (made there since 1862). The region attracts summer and winter vacationers. A Society of Friends meeting house (built 1782) is the site of annual Quaker meetings. Susan B. Anthony was born in Adams.

Adam's apple. see LARYNX

Adam's Bridge or Rama's Bridge, chain of shoals, c. 18 mi (30 km) long, in the Palk Strait between India and Sri Lanka (Ceylon). At high tide it is covered by c. 4 ft (1.2 m) of water. A train-ferry links Dhannushkodi, India, with Mannar, Sri Lanka. According to Hindu legend, the bridge was built to transport Rama, hero of the *Ramayana*, to the island to rescue his wife from the demon king Ravanna.

Adams National Historic Site. see NATIONAL PARKS AND MONUMENTS (table)

Adam's-needle. see YUCCA

Adamson, Robert see HILL, DAVID OCTAVIUS

Adam's Peak, Sinhalese *Sri Padastanaya* and *Samanaliya*, mountain, 7,360 ft (2,243 m) high, S central Sri Lanka (Ceylon). It is a sacred mountain, famous as a goal of pilgrimage for Buddhists, Hindus, and Muslims. On its summit is a large flat rock that bears the impression of a gigantic (c. 10 sq ft/93 sq m) human foot. This stone footprint is regarded as Buddha's by Buddhists, Siva's by Hindus, and Adam's by Muslims, who believe this to be the site of Adam's fall from Paradise.

Adana (a'dana), city (1970 pop. 351,655), capital of Adana prov., S Turkey, on the Seyhan River. The fourth largest city in Turkey, it is the commercial center of a farm region where cotton, grains, and fruits are grown. Manufactures include processed food, cotton textiles, cement, and soap. The city is a road and rail center. An ancient city probably founded by the Hittites, Adana was colonized (668 B.C.) by the Romans. It prospered under the Romans and then declined. The city was revived (A.D. c. 782) by Harun ar-Rashid. In the 16th cent. the city passed to the Ottoman Turks. Nearby is Karatepe, a Hittite archaeological site.

Adana, Plain of (a'dana'), fertile region along the Mediterranean coast, S central Turkey. It has a subtropical climate and receives rainfall mainly during the autumn and winter months. The plain, traversed and irrigated by the Seyhan River, is a major agricultural region, producing a large variety of crops including most of the cotton grown in Turkey. The city of Adana is the commercial and marketing center of the region.

Adapazarı (ada'pazar'a), city (1970 pop. 101,590), capital of Adapazarı prov., NW Turkey, on the Sakarya River. It is the trade center for a rich agricultural region where tobacco, sugar beets, and grains are produced. The city's manufactures include refined sugar, farm machinery, textiles, and cement.

adaptation, in biology, the adjustment of living matter to environmental conditions and to other living things. This ability is a fundamental property of protoplasm and constitutes a basic difference between living and nonliving matter. Most living things require free oxygen from the air or from water, but yeasts, many bacteria, and some other simple forms

obtain the oxygen required for oxidation from molecules of substances that contain the element. Various animals and plants are adapted for securing their food and for surviving the extremes of temperature and of water supply in desert, tropical, and polar regions. For most organisms the optimum temperature is between about 20°C (68°F) and 40°C (104°F). Some algae and protozoa live in hot springs, and some bacteria can survive freezing. The cactus can survive heat and drought. Certain fish and other aquatic animals live in deep water and are so specialized to withstand the great pressure that they burst if lifted to sea level. Animals show anatomical adaptations—e.g., the body of the fish is suited to life in the water, the body of the bird is adapted for flight, the land mammals show wide variation in the structure of limbs and body that enables some to run swiftly, some to climb, some to swing from tree to tree, some to glide through the air, and others to jump. The whale, an aquatic mammal, can adjust to great pressure changes at different levels in the water. The beaks of birds vary in shape and size according to the kinds of food they feed on—e.g., on seeds, on insects, on aquatic animals, and on small mammals. The feet and legs of birds also show modifications that fit them for perching, for wading, and for paddling through the water. Adaptive coloration is observed in many animals (see PROTECTIVE COLORATION). Among communal insects, such as ants and honeybees, the individuals are highly adapted to perform their functions in the community. It is believed by many scientists that life originated in the sea and that through gradual evolutionary changes some forms became adapted to life on land. Variations may arise as a result of MUTATION or of recombinations of the genes in the germ cells. Such variations are inherited (see GENETICS). Those that aid the organism to meet the conditions of a changing environment or help it in its competition with other living things enable it to survive and reproduce, the changes thus being passed on from one generation to another and in this way perhaps producing a new species. See ECOLOGY, EVOLUTION, SELECTION.

adaptive radiation, in biology, the evolution of an ancestral species, which was adapted to a particular way of life, into many diverse species, each adapted to a different habitat. Adaptive radiation has occurred in the evolution of many groups of orga-

nisms, and is clearly illustrated by Darwin's finches, 14 species of small land birds of the Galapagos Islands. All the birds on the islands are derived from a single species of ground-dwelling, seed-eating finch that probably emigrated from the South American mainland. Because the environmental niches, or habitats, were unoccupied on the isolated islands, the ancestral stock was able to differentiate into diverse species. Of the 14 species living on the islands, 3 species are ground-dwelling seedeaters, 3 live on cactus plants and are seedeaters, 1 is a tree-dwelling seedeater, and 7 are tree-dwelling insecteaters. See also COMPETITION.

Adar (ā'dar), in the Bible. See HAZAR-ADDAR.

Adasa (ād'āsā), town, near Beth-horon, place of encampment of Judas Maccabaeus. 1 Mac 7:40.

Adbeel (ād'bēēl), son of Ishmael. Gen 25:13, 1 Chron 1:29.

Adda (ād'da), river, 194 mi (312 km) long, rising in the Rhaetian Alps, N Italy, and flowing SW through Lake Como, then S into the Po River near Cremona. Its upper course furnishes much electric power, the lower river irrigates the Lombard plain. Many battles have been fought along its course, notably the Battle of Lodi (1796).

Addams, Charles Samuel, 1912–, American cartoonist, b. Westfield, N.J. Since 1935, Addams's work has appeared in the *New Yorker* magazine. His cartoons are famed for their wit, fantasy, and sense of the macabre. Members of a ghoulish family are his chief subject matter. His cartoons are collected in *Drawn and Quartered* (1942), *Addams and Evil* (1947), *Monster Rally* (1950), *Home Bodies* (1954), *Black Maria* (1960), *Charles Addams' Mother Goose* (1967), and *My Crowd* (1970).

Addams, Jane, 1860–1935, American social worker, b. Cedarville, Ill., grad. Rockford College, 1881. In 1889, with Ellen Gates Starr, she founded Hull House in Chicago, one of the first social settlements in the United States (see SETTLEMENT HOUSE). Based on the university settlements begun in England by Samuel Barnett, Hull House served as a community center for the neighborhood poor and later as a center for social reform activities. It was important in Chicago civic affairs and had an influence on the settlement movement throughout the country. An active reformer throughout her career, Jane Addams was a leader in the woman suffrage and pacifist move-

ments. She was the recipient (jointly with Nicholas Murray Butler) of the 1931 Nobel Peace Prize. Her books on social questions include *The Spirit of Youth and the City Streets* (1909), *A New Conscience and an Ancient Evil* (1912), and *Peace and Bread in Time of War* (1922). See her autobiographical *Twenty Years at Hull-House* (1910) and *The Second Twenty Years at Hull-House* (1930), biographies by her nephew, J. W. Linn (1935), and A. F. Davis (1973), study by Daniel Levine (1971).

Addan (ād'an), unidentified Palestinian town. Ezra 2:59. Addon Neh 7:61.

Addar: see ARD.

addax (ād'āks), large, desert-dwelling ANTELOPE. It is a single species, *Addax nasomaculatus*. The addax is yellowish-white in color, has a brown mane and throat fringe, and may stand as high as 42 in. (106 cm) at the shoulder. Both sexes bear long, spiraling horns reaching up to 43 in. (109 cm) in length. The addax is native to N African deserts, its short, thick legs and broad hooves are adapted to traveling on sand. It is able to survive only on the water obtained from dew or from forage and can scent grasses newly sprouted by recent rain. Addax are typically found in pairs or in small herds. They have been extensively hunted, and, with much of their habitat destroyed, the species is now much reduced in numbers. Addax are classified in the phylum CHORDATA, subphylum Vertebrata, class Mammalia, order Artiodactyla, family Bovidae.

adder: see VIPER.

adder's-tongue, name for several plants, among them DOGTOOTH VIOLET and a primitive fern genus (*Ophioglossum*). Adder's-tongues are classified in the divisions MAGNOLIOPHYTA and PTERIDOPHYTA, respectively.

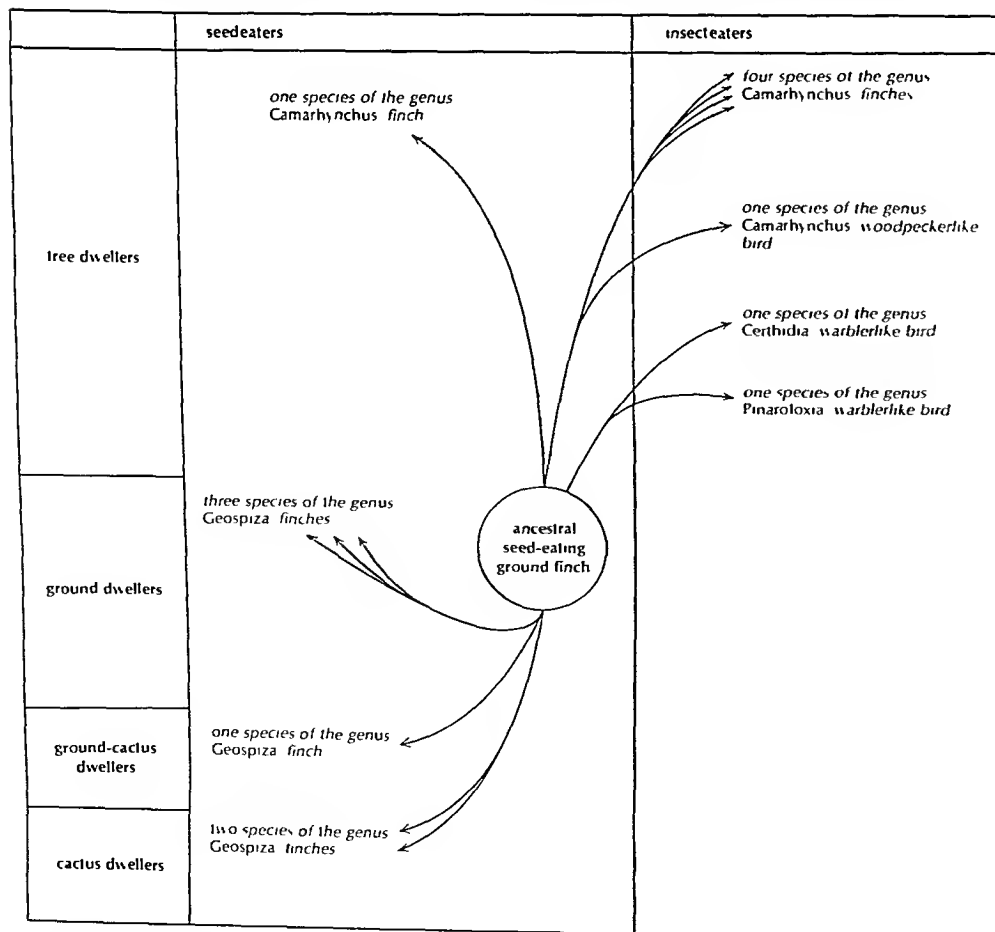
Addi (ād'i), name in Luke's genealogy. Luke 3:28.

adding machine: see CALCULATING MACHINE.

Addington, Henry: see SIDMOUTH, HENRY ADDINGTON VISCOUNT.

Addis Ababa (ād'is āb'ābə) [Amharic, = new flower], city (1971 est. pop. 795,000), capital of Ethiopia. It is situated at c. 8,000 ft (2,440 m) on a well-watered plateau surrounded by hills and mountains. Addis Ababa is Ethiopia's largest city and its administrative and communications center. It is the main trade center for coffee, the country's chief export, and for tobacco, grains, and hides. The major industries produce food, beverages, processed tobacco, textiles, and shoes. Addis Ababa has a large tourist industry. It is the hub of a highway network and a terminus of a railroad that runs to DJIBOUTI, French Territory of the Afars and the Issas. An international airport is near Addis Ababa. In 1886 the city, then known as Finfinnie, was chosen by MENELIK II as the capital of his kingdom of Shoa and was renamed Addis Ababa. In 1889 it was made the capital of Ethiopia. There, in 1896, Italy recognized Ethiopian independence. However, in 1936 (during the Italo-Ethiopian War), Italy captured Addis Ababa and made it the capital of ITALIAN EAST AFRICA. The city was recaptured by the Allies in 1941 and returned to Ethiopian rule. Major growth began after 1945; today the city has many modern buildings. The ORGANIZATION OF AFRICAN UNITY (OAU) and the UN Economic Commission on Africa are headquartered in Addis Ababa, which also hosts numerous international conferences; in 1972 the UN Security Council met in the city. Haile Selassie I Univ., whose Institute of Ethiopian Studies runs an ethnological and traditional arts museum, and Haile Selassie I National Theatre are in Addis Ababa. The OAU center, the imperial palace, the parliament building, and the Coptic and Roman Catholic cathedrals are notable buildings.

Addison, Joseph, 1672–1719, English essayist, poet, and statesman. He was educated at Charterhouse, where he was a classmate of Richard Steele, and at Oxford, where he became a distinguished classical scholar. His travels on the Continent from 1699 to 1703 were recorded in *Remarks on Italy* (1705). Addison first achieved prominence with *The Campaign* (1704), an epic celebrating the victory of Marlborough at Blenheim. The poem was commissioned by Lord Halifax, and its great success resulted in Addison's appointment in 1705 as undersecretary of state and in 1709 as secretary to the lord lieutenant of Ireland. He also held a seat in Parliament from 1708 until his death. Addison's most enduring fame was achieved as an essayist. In 1710 he began his contributions to the *Tatler*, which Richard STEELE had founded in 1709. He continued to write for successive publications, including the *SPECTATOR* (1711–12), the *Guardian* (1713), and the new *Spectator* (1714). His contributions to these periodicals raised the



Adaptive radiation in Darwin's finches

English essay to a degree of technical perfection never before achieved and perhaps never since surpassed. In a prose style marked by simplicity, order, and precision, he sought to engage men's thoughts toward reason, moderation, and a harmonious life. His works also include an opera libretto, *Rosamund* (1707), a prose comedy, *The Drummer* (1716), and a neoclassical tragedy, *Cato* (1713), which had an immense success in its own time, but has since been regarded as artificial and sententious. In his last years Addison received his greatest prominence. In 1717 he was made secretary of state, an office he resigned the following year. But the period (1714-19) was also marked by failing health, a supposedly unhappy marriage, and the severing of his relations with his good friend Richard Steele. See biography by P. H. O. Smithers (1954, repr 1968).

Addison, Thomas, 1793-1860, English physician, b. near Newcastle, grad Univ of Edinburgh (M.D., 1815). In 1837 he became a physician at Guy's Hospital, London, where he conducted important research on pneumonia, tuberculosis, and other diseases. He was the first to recognize (1855) the disease of the adrenal glands that later became known as Addison's disease, and he is equally famous for his description of pernicious anemia.

Addison, village (1970 pop. 24,482), Du Page co., NE Ill., inc. 1884. It has some light manufacturing.

Addison's disease [for Thomas Addison], progressive disease brought about by atrophy of the outer layer, or cortex, of the ADRENAL GLAND, it is also called chronic adrenocortical insufficiency. The deterioration of this tissue causes a decrease in the secretion of steroid hormones, many of which are necessary for the maintenance of life. In many cases of Addison's disease the cause of the wasting process is not known, in others the predominant cause is tuberculous destruction, the formation and infiltration of tumors, inflammatory disease, or surgery. Symptoms are increasing weakness, abnormal pigmentation of the skin and mucous membranes, weight loss, low blood pressure, dehydration, and gastrointestinal upsets. Once considered inevitably fatal, Addison's disease can now be treated with injections of adrenocortical hormones that enable its victims to lead a nearly normal life.

addition, fundamental operation of arithmetic. Given two collections, or SETS, of objects having no common members (disjoint sets), the operation of combining all members of both sets into another set is called addition, in terms of set theory, addition is the union of two disjoint sets. The sets combined under addition are known as the addends and the resulting set is called their sum. A name in the form of a cardinal NUMBER is associated with each set, e.g., the number 3 is used to indicate the set $\{x_1, x_2, x_3\}$, the number 4 is used for the set $\{y_1, y_2, y_3, y_4\}$, and the number 7 is used for the set $\{x_1, x_2, x_3, y_1, y_2, y_3, y_4\}$. In arithmetic addition follows the ASSOCIATIVE LAW, the COMMUTATIVE LAW, and, in combination with multiplication, the DISTRIBUTIVE LAW. Addition is also defined for other types of mathematical objects, for example, VECTORS and TENSORS. See also SUBTRACTION.

addition polymers: see POLYMER

Ad Diwanīyah (ad dēwan'ēya), city (1965 pop. 60,553), S central Iraq, on a branch of the Euphrates River. It is a market place for dates and grains.

Addon, variant of ADDAN

addra (ād'ra) see GAZELLE

Ade, George, 1866-1944, American humorist and dramatist, b. Kentland, Ind., grad Purdue Univ., 1887. His newspaper sketches and books attracted attention for their racy and slangy idiom and for the humor and shrewdness with which they delineated people of the Midwestern scene. He is best known for *Fables in Slang* (1899), other volumes include *People You Knew* (1903) and *Hand-made Fables* (1920). Ade also wrote several musical comedies and farcical plays, among them *The County Chairman* (1903) and *The College Widow* (1904). See *The America of George Ade* (selected writings ed. by Jean Shepherd, 1961), *Letters of George Ade* (ed. by Terence Tobin, 1973), study by Lee Coyle (1964).

Adelaide (ād'alād) or **Adelheid** (a'dēlhīt), c. 931-999, empress consort of Holy Roman Emperor Otto I, daughter of King Rudolf II of Arles. After the death (950) of her first husband, King Lothair of Italy, she was about to be forced into a marriage with the son of BERENGAR II, Lothair's successor. She appealed to OTTO I, who rescued and married her in 951. She was sole regent for her grandson, OTTO III, from 991 to 994. She was a great benefactor of religious houses.

Adelaide, city (1971 urban agglomeration pop. 809,466), capital and chief port of South Australia, S

Australia, at the mouth of the Torrens River on Gulf St. Vincent. It has automotive, textile, and other industries. Grains, wool, dairy products, and fruit are exported. Named for the consort of William IV, it was founded in 1836 and is the oldest city in the state. The Univ. of Adelaide (1874), a natural history museum (1895), and Anglican and Roman Catholic cathedrals are in the city. The Adelaide Festival of the Arts has been held biennially since 1960.

Adelard of Bath (ād'əlard'), fl. 12th cent., English scholastic philosopher, celebrated for his study of Arabic learning. He translated Euclid from Arabic into Latin. His major works were *Perdifficiles quaestiones naturales*, which embodied his scientific studies, and *De eodem et diverso*, his principal philosophical work, which attempts a solution to the problems of NOMINALISM and REALISM.

Adelheid: see ADELAIDE, empress

Adelie Coast (ā'dalē, adālē'), region, E ANTARCTICA, between George V Coast and Wilkes Land. It was discovered by Dumont d'Urville, a French explorer who landed in 1840 to collect rock samples, it was explored by an Australian geologist, Douglas Mawson, from 1911 to 1914. The French claim the area, which they call Terre Adelie, this was the first polar claim made without benefit of administration or occupation. The claim, however, was supported in 1950 when France established meteorological stations there.

Adelphi University, at Garden City, N.Y., coeducational, chartered 1896 as Adelphi College. Originally in Brooklyn, the school moved to its present location in 1929 and in 1963 achieved university status.

Ademar or Adhémar (both ād'əmar), d. 1098, French prelate, bishop of Le Puy. At the Council of Clermont (1095), he energetically promoted the First Crusade (see CRUSADES) and was designated as papal legate on that expedition. He distinguished himself in the sieges of Nicaea and Antioch and carried the Holy Lance (with which Christ's side had been pierced by a Roman soldier) after its discovery, although he at first doubted its authenticity. He died at Antioch.

Aden, city (1970 est. pop. 250,000), SW Southern Yemen, on the Gulf of Aden near the southern entrance to the Red Sea. It is the capital and chief port of Southern Yemen. Aden consists of two peninsulas, Aden and Little Aden, and an intervening stretch of the mainland. Each peninsula has a high volcanic headland (Aden rises to 1,742 ft/531 m, and Little Aden to 1,147 ft/350 m), which is linked to the mainland by a flat, sandy isthmus. The bay between the peninsulas is an excellent harbor. Aden peninsula contains most of the city's population and is divided into a number of districts that were once towns. Wells near Sheikh Othman, on the mainland, supply the city with water. Little Aden peninsula has the city's main industrial district and is the site of a large oil refinery, the manufacture of soap, cigarettes, and salt is also important there. Aden, a free port since 1850, has been the chief entrepôt and trading center of S Arabia since ancient times. It enjoyed commercial importance until the discovery (late 15th cent.) of an all-water route around Africa to India. With the opening of the Suez Canal (1869), Aden regained its importance and again became a major trading center and also an important refueling stop, the harbor was deepened to accommodate the largest vessels able to use the canal. Aden's economy, which heavily depends on canal traffic, suffered from the closing of the canal during and after the 1956 and 1967 Arab-Israeli wars. Aden's strategic location and its importance as a commercial center long made it a coveted conquest. Muslim Arabs held the region from the 7th to the 16th cent. The Portuguese failed in an attempt to capture it in 1513, but it fell in 1538 to the Ottoman Turks. At the end of the 18th cent., Aden's importance as a strategic post grew as a result of British policy to contain French expansion in the region. After the British capture of Aden in 1839, its administrative attachment to India, and the construction of the Suez Canal, Britain purchased areas on the mainland from local rulers and entered into protectionist agreements with them. The Perim, Kamaran, and Kuria Muria islands had been made part of Aden in the 1850s. Aden was formally made into a crown colony in 1935, and the surrounding region (now Southern Yemen) became known as the Aden Protectorate in 1937. Aden was granted a legislative council in 1944 and later received other rights of self-government. In 1963, Aden was joined to the Federation of the Emirates of the South, which then became the Federation of South Arabia (see SOUTH ARABIA, FEDERATION OF). The British-sponsored federation was opposed by nationalists in Aden who feared

domination by the tribal states. They emerged as two rival groups, the National Liberation Front (NLF) and the Front for the Liberation of Occupied Southern Yemen (FLOSY), and they conducted terrorist activities against the British and the federation administration. The NLF, which emerged as the dominant group, forced the collapse of the federal government. With the establishment (1967) of the independent country of Southern Yemen, Aden became the capital along with Madinat ash Shab. In 1970, Aden became the country's sole capital. See Gillian King, *Imperial Outpost, Aden* (1964), Julian Paget, *Last Post, Aden, 1964-67* (1969).

Aden, Gulf of (ā'dən, ā'-), western arm of the Arabian Sea, 550 mi (885 km) long, lying between Southern Yemen and the Somali Republic, connected with the Red Sea by the Bab el Mandeb. The gulf is on the great Mediterranean Sea-Indian Ocean trade route, the importance of which declined following the closing of the Suez Canal in 1967 and the construction of supertankers too large for the canal. After the 16th cent. Portugal, Turkey, and Great Britain were the chief contenders for control of the gulf, but by the 19th cent. Britain dominated the area. In the late 1960s, British military withdrawal E of Suez led to an increased Soviet naval presence in the gulf area.

Adenauer, Konrad (kón'rat ā'dənou'ər), 1876-1967, West German chancellor. A lawyer and a member of the Catholic Center party, he was lord mayor of Cologne and a member of the provincial diet of Rhine prov. from 1917 until 1933, when he was dismissed by the National Socialist (Nazi) regime. He was twice imprisoned (1933, 1944) by the Nazis. Co-founder of the Christian Democratic Union (1945) and its president from 1946 to 1966, he was elected chancellor of the German Federal Republic (West Germany) in 1949 and was reelected in 1953, 1957, and 1961. He also served (1951-55) as his own foreign minister, negotiating the West German peace treaty (1952) with the Western Allies and obtaining recognition of West Germany's full sovereignty through the Paris Pacts and through an agreement with the USSR in 1955. Adenauer's strong will and political wisdom helped to give *Der Alte* [the old man], as he was known, great authority in West German public life. The political architect of the astounding West German recovery, he saw the solution of German problems in terms of European integration, and he helped secure West Germany's membership in the various organizations of the EUROPEAN COMMUNITY. In 1961 his party lost its absolute majority in the Bundestag, and he formed a coalition cabinet with the Free Democrats. In 1962 a cabinet crisis arose over the government's raid of the offices of the magazine *Der Spiegel*, which had attacked the Adenauer regime for military unpreparedness. After agreeing to the Free Democrats' demands that he exclude his defense minister, Franz Josef Strauss, who was implicated in the affair, from a new cabinet, Adenauer succeeded in re-forming the coalition. At the same time Adenauer announced (Dec., 1962) his retirement as part of the agreement with the Free Democrats. He resigned in Oct., 1963. His writings include *World Indivisible* (tr. 1955). See his memoirs of the years 1945-53 (tr. by Beate Ruhm von Oppen, 1966), biography by T. C. F. Prittie (1972), Edgar Alexander, *Adenauer and the New Germany* (tr. 1957), Paul Weymar, *Adenauer* (tr. 1957), A. J. Heidenheimer, *Adenauer and the CDU* (1960).

adenine (ād'ənīn, -nīn, -nēn), organic base of the PURINE family containing carbon, hydrogen, and nitrogen. Adenine combines with the sugar ribose to form adenosine, which in turn can be bonded with from one to three phosphoric acid units, yielding the three nucleotides adenosine monophosphate, adenosine diphosphate, and ADENOSINE TRIPHOSPHATE. These adenine derivatives perform important functions in cellular metabolism. Adenine is one of four bases utilized in the synthesis of NUCLEIC ACIDS. A modified form of the substance is thought to be a secondary messenger in the propagation of many hormonal stimuli. Adenine is an integral part of the structure of many coenzymes.

adenocarcinoma: see NEOPLASM

adenoids, common name for the pharyngeal tonsils, spongy masses of lymphoid tissue that occupy the nasopharynx, the space between the back of the nose and the throat. Normally the adenoids, like the palatine tonsils located on either side of the throat, help prevent infection in the surrounding tissues. However, when they become enlarged they interfere with normal breathing and sometimes with hearing. When severely enlarged, adenoids can affect normal dental development, resulting in an al-

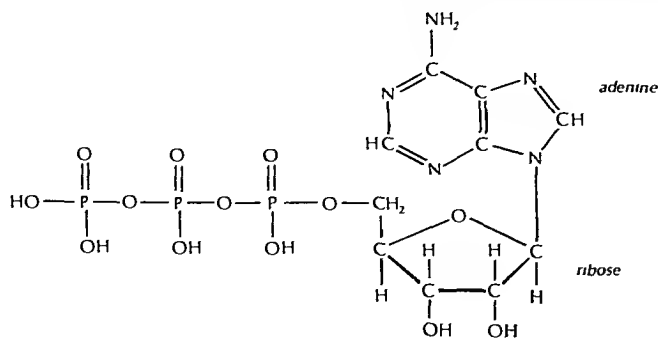
teration of facial expression. Infection of the adenoids is common, the symptoms resembling those of tonsillitis, with which it is frequently associated. Surgical removal of the adenoids is advisable when enlargement and repeated infection interfere with development and health. See RESPIRATION.

adenoma: see NEOPLASM

adenosine diphosphate: see ADENINE, ADENOSINE TRIPHOSPHATE

adenosine monophosphate (AMP) (ădĕn'ăsen mŏn'ăfŏs'fât), organic compound composed of ADENINE, the sugar ribose, and one phosphate unit. AMP is one of the possible products of the hydrolysis of ADENOSINE TRIPHOSPHATE (ATP) and is therefore important in the transfer of chemical energy during anabolism. The action of the enzyme adenylyl cyclase on ATP results in the formation of pyrophosphate and cyclic AMP, a very close structural relative of AMP containing an additional ester linkage between the phosphate and ribose units. American biochemist Earl W. Sutherland, Jr., received the 1971 Nobel Prize in Physiology and Medicine for showing that the hormone epinephrine changes the cellular concentration of cyclic AMP and that this change has a regulatory effect on the rates of certain enzymatic reactions. He thus proved that cyclic AMP acts as a secondary messenger for the hormone. Cyclic AMP has since been shown to play similar roles with norepinephrine, glucagon, and adrenocorticotrophic hormone. Although the exact chemistry of the steps leading from the arrival of a hormone at a cell's surface to a change in cyclic AMP levels in the cell and finally to a particular change in the cell's metabolism are often obscure, involvement of well-defined enzymes has in a few cases been clearly established. For example, epinephrine has been shown to stimulate adenylyl cyclase in the liver. The increased concentration of cyclic AMP produced by this enzyme stimulates protein kinase, an enzyme which catalyzes the first of a complicated series of enzymatic reactions, the last of which results in the splitting of glycogen into its constituent glucose units. Cyclic AMP is converted to AMP by the enzyme phosphodiesterase, which is inhibited by caffeine. This may account in part for the stimulatory effects of this drug.

adenosine triphosphate (ădĕn'ăsen trî'fŏs'fât), organic compound composed of adenine (containing carbon, hydrogen, and nitrogen), ribose (a sugar containing carbon, hydrogen, and oxygen), and three phosphate units (each containing hydrogen, oxygen, and phosphorus). Adenosine triphosphate (ATP) may undergo cyclic degradation and regeneration within the cell, during this process it is converted to adenosine diphosphate and adenosine monophosphate (with the controlled release of energy) and is returned to the original state by reattachment of the phosphate units. ATP is one of the most important intermediates in the metabolism of living cells; the energy resulting from its degradation may be employed in the synthesis of such macromolecules as polysaccharides, proteins, lipids, deoxyribonucleic acid, and ribonucleic acid. It is also believed to play a role in kidney function, in transmission of nerve impulses, and in MUSCLE contraction.



Adenosine triphosphate (ATP)

Ader (ă'dăr), Benjamite 1 Chron 8:15

Adernö. see ADRANO, Italy

ADH: see ANTIDIURETIC HORMONE

Adhara, bright star in the constellation CANIS MAJOR, Bayer designation ε Canis Majoris, 1970 position R.A. 6^h57^m4^s, Dec. -28°56'. A bluish-white giant (spectral class B2 II) with apparent MAGNITUDE 1.5, it is one of the 25 brightest stars in the sky. Adhara is a

visual BINARY with combined luminosity about 8,000 times that of the sun, its distance is about 700 light-years. The name is from the Arabic meaning "virgin."

Adhëmar: see ADEMAR

adhesion and cohesion, attractive FORCES between material bodies. A distinction is usually made between an adhesive force, which acts to hold two separate bodies together (or to stick one body to another), and a cohesive force, which acts to hold together the like or unlike atoms, ions, or molecules of a single body. However, both forces result from the same basic properties of MATTER. Were it not for adhesion and cohesion, solids and liquids would behave like gases, dispersing freely, since, according to the kinetic theory of matter, the particles making up any material body are in constant motion. In solids and liquids the tendency of all matter to disperse is overcome by the forces of adhesion and cohesion. A number of phenomena can be explained in terms of adhesion and cohesion. For example, SURFACE TENSION in liquids results from cohesion, and CAPILLARITY results from a combination of adhesion and cohesion. The hardness of a diamond is due to the strong cohesive forces between the carbon atoms of which it is made. FRICTION between two solid bodies depends in part upon adhesion.

adhesive, substance capable of sticking to surfaces of other substances and bonding them to one another. The term *adhesive cement* is sometimes used in place of *adhesive*, especially when referring to a synthetic adhesive. Animal glue, a gelatin made from hides, hooves, or bones, was probably known in prehistoric times; it remained the leading adhesive until the 20th cent. It is now used especially in cabinetmaking. Animal glue is sold both as a solid (either ground or in sheets, to be melted in a water-jacketed glue pot and applied while hot) and as liquid glue (an acidic solution). Adhesives from vegetable sources are also important; they include natural gums and RESINS, MUCILAGE, and starch and starch derivatives. They are commonly used for sizing paper and textiles and for labeling, sealing, and manufacturing paper goods. Other adhesives derived from animal and vegetable sources include blood glue, casein glue, fish glue, rubber adhesives, and cellulose derivatives. Adhesives having special properties are prepared from synthetic resins. Some synthetic adhesives, such as the epoxy resins, are strong enough to be used in construction in place of welding or riveting. Adhesive tapes have a coating of pressure-sensitive adhesive. See Irving Skeist, ed., *Handbook of Adhesives* (1962); N. A. de Bruyne and Roelof Houwink, ed., *Adhesion and Adhesives* (2 vol., 2d ed. 1965-67).

Adiel (ă'dîl), 1 Father of David's treasurer 1 Chron 27:25. 2 Simeonite 1 Chron 4:36. 3 Priest 1 Chron 9:12.

Adige (ă'dîjĕ), second-longest river of Italy, c. 225 mi (360 km) long, rising in the Tyrolean Alps, N Italy. It flows generally south, past Bolzano, Trent, and Verona, to the Po valley where it turns east to empty into the Adriatic Sea. The Adige is used for irrigation and hydroelectric-power production. Flood-control works protect the valley from sudden floods.

Adirondack Mountains (ăd'ărŏn'dăk), circular mountain mass, NE N.Y., between the St. Lawrence valley in the north and the Mohawk valley in the south, rising to 5,344 ft (1,629 m) at Mt. Marcy, the highest point in the state. Geologically a southern extension of the Laurentian Plateau, the Adirondacks are sometimes mistakenly included in the Appalachian system. Composed chiefly of metamorphic rock, the Adirondacks were formed as igneous rocks (mainly granite) intruded upward, doming the earth's surface, subsequent faulting of the earth's crust and surface erosion, particularly by the Pleistocene glaciers, have given the mountains a rugged topography. The glaciers also carved scenic gorges, waterfalls, and numerous lakes. The Hudson, Ausable, and Black rivers rise in the Adirondacks. The region is a year-round resort area, most of it has been set aside as Adirondack State Park. Lake Placid and Lake George are major resort centers. Lumbering, once a major occupation in the Adirondacks, declined after a forest preserve was established in 1892. Important mineral products of the mountains include iron ore, titanium, vanadium, and talc.

adit (ăd'it), in mining, underground passage excavated nearly horizontally, with one end open to the earth's surface, usually used to service a mine. The adit end is the furthestmost end from the surface, i.e., the location where miners work. The adit collar is the area where an adit opens to the surface and must be reinforced against any surface weakness.

Adithaim (ăd'thā'im), town of Judah, probably c. 10 mi (16 km) from the coast. Joshua 15:36.

adjective, English PART OF SPEECH, one of the two that refer typically to attributes. The other is the adverb. These two classes overlap with the form class marked by *-er* and *-est* (or *more* and *most*). They are functionally distinct in that adjectives never occur far from nouns or pronouns, while adverbs are associated primarily with verbs. There is a small class of words (e.g., *very* and *too*) that typically precede adjectives and adverbs; these words are also called adverbs. Many adverbs belong to a form class of words ending *-ly*. Adjective and adverb are typically Indo-European form classes, and probably most other languages lack specialized classes with analogous functions. See Paul Roberts, *Understanding Grammar* (1954) and *Modern Grammar* (1968).

Adlai (ăd'lāi), father of SHAPATH 4. 1 Chron 27:29.

Adler, Alfred (ăd'lăr), 1870-1937, Austrian psychiatrist, founder of the school of individual psychology. Although one of Freud's earlier associates, he soon rejected the Freudian emphasis upon sex. He maintained that all personality difficulties have their roots in a feeling of inferiority (see INFERIORITY COMPLEX) derived from physical handicaps or from conflict with the environment that restricts an individual's need for power and self-assertion. Thus he saw behavior disorders as overcompensation for deficiencies. In later life he lectured and practiced in the United States. Besides *The Practice and Theory of Individual Psychology* (1923), he wrote *The Neurotic Constitution* (1909) and *Understanding Human Nature* (1927). See biography by Phyllis Bottome (1939), studies by H. H. Mosak, ed. (1973) and Manes Sperber (1974).

Adler, Cyrus, 1863-1940, American Jewish educator, grad. Univ. of Pennsylvania, 1883, Ph.D. Johns Hopkins, 1887. He taught Semitic languages at Johns Hopkins Univ. from 1884 to 1893. He was for a number of years librarian and then secretary of the Smithsonian Institution, was the founder of the American Jewish Historical Society, was one of the editors of the *Jewish Encyclopedia*, and edited the *American-Jewish Year-Book* after 1899. He was president of Dropsie College from 1908 to 1940 and of the Jewish Theological Seminary after 1924. He was a founder of the American Jewish Committee and of the Jewish Welfare Board. His writings include a number of articles on comparative religion, Assyriology, and Semitic philology, *Jews in the Diplomatic Correspondence of the United States* (1906), and, with Allan Ramsay, *Told in the Coffee House* (1898). See biography by A. A. Neuman (1942).

Adler, Elmer, 1884-1962, American bibliophile and printer, b. Rochester, N.Y. From 1930 to 1940 he published *The Colophon*, a highly regarded quarterly of bibliographic research and information for book collectors; it was produced with fine printing. Adler became curator of the graphic arts department of Princeton Univ. in 1940, retiring in 1952.

Adler, Felix, 1851-1933, American educator and leader in social welfare, founder of the ETHICAL CULTURE MOVEMENT, b. Germany. He was brought to the United States as a small child, was graduated from Columbia in 1870, and afterward studied in Ger-

Adin (ă'dîn), family that returned from Exile. Ezra 2:15, 8:6, Neh 7:20, 10:16.

Adina (ăd'ănă, ăd'ī-), Reubenite captain 1 Chron 11:42.

Adino (ăd'ănŏ, ăd'ī-), the EZRITE, one of David's men 2 Sam 23:8.

adipose tissue (ăd'ăpŏs') see CONNECTIVE TISSUE

many. In 1876 he established the New York Society for Ethical Culture and, in connection with the Ethical Culture School, the first free kindergarten in New York City. Adler organized the Workingmen's Lyceum, helped to establish the Workingmen's School and the Manhattan Trade School for Girls, and founded (1883) the first child study society in the United States. He was a member (1885) of New York state's first tenement house commission and served for many years as chairman of the National Child Labor Committee. He became professor of political and social ethics at Columbia in 1902 and was Roosevelt professor (1908-9) at the Univ. of Berlin and Hibbert lecturer (1923) at Oxford. Among his books are *Creed and Deed* (1877), *An Ethical Philosophy of Life* (1918), and *The Reconstruction of the Spiritual Ideal* (1924). See H. J. Bridges, *Humanity on Trial* (1971).

Adler, Viktor (vīk'tōr), 1852-1918, Austrian socialist politician and journalist, founder and leader of the Austrian Social Democratic party. A prominent figure in the Second International of socialist parties, he entered parliament in 1905. When the Austro-Hungarian empire was collapsing, he was named foreign secretary of German Austria, but he died on Nov. 11, 1918, one day before the republic was proclaimed.

Admah (ăd'mă), city destroyed with SODOM.

Admatha (ădmă'thă), counselor of Ahasuerus. Esther 1:14.

Admetus (ădmē'təs) see ALCESTIS.

administration, public: see ADMINISTRATIVE LAW.

administrative law, law governing the powers and processes of administrative agencies. In the United States it deals primarily with questions of the propriety of granting powers to agencies as well as with the judicial checks upon the activities of governmental agencies. Administrative agencies are part of the executive branch of government and are created either by statute, by executive order authorized by statute, or by constitutional provisions. The use of administrative agencies in the United States dates back to 1789, when the original legislative provisions were made for the administration of customs laws, the regulation of oceangoing vessels and the coastal trade, and the payment of pensions to veterans. It was, however, with the growth of public utilities and public transportation that administrative agencies began to play a major role in American life. The passage of the Interstate Commerce Act and the establishment of the INTERSTATE COMMERCE COMMISSION in 1887 marked the start of administrative law in the United States as we know it today. The administrative process involves rule making, adjudication, investigating, supervising, prosecuting, and advising. Agencies have assumed legislative and judicial functions—the day-to-day supervision of details—for which neither Congress nor the courts are adapted. This has resulted in a blurring of the traditional notion of separation of powers that is said to characterize the Federal government. With the growing complexity of modern economic and social life, administrative agencies, having overall knowledge of their fields, are therefore able to deal uniformly and quickly with the numerous complaints referred to them. The principle that Congress cannot delegate its legislative powers has been circumvented by having Congress set a primary standard and allowing the agency to fill in the gaps. As a result of the powers that have been granted the older agencies and the recent proliferation of agencies, administrative agencies have come to participate in nearly every aspect of American life. Administrative agencies affect activities ranging from collective bargaining to television programming. Because of the vast range of subjects dealt with by the agencies the Federal Administrative Procedure Act was enacted (1946) to provide uniform standards of procedure that would be common to all agencies. The act guaranteed the right of judicial review to any person "suffering legal wrong because of any agency action." In general, administrative procedure would be set aside only for abuse of discretion. Under European legal codes, special administrative courts review the activities of administrative agencies. This is in contrast to common law, whereby the ordinary courts have complete jurisdiction over controversies involving the validity of acts of agencies. See FEDERAL COMMUNICATIONS COMMISSION, FEDERAL POWER COMMISSION, FEDERAL TRADE COMMISSION, NATIONAL LABOR RELATIONS BOARD, SECURITIES AND EXCHANGE COMMISSION. See Peter Woll, *Administrative Law, the Informal Process* (1963), M. M. Shapiro, *The Supreme Court and Administrative Agencies* (1968), R. S. Lorch, *Democratic Process and Administrative Law* (1969, repr. 1973).

Admiral's Men, theatrical company of players, officially designated the Admiral's Men in 1585. They were rivals of the CHAMBERLAIN'S MEN and performed at the theaters of PHILIP HENSLOWE. Their leading actor was Edward ALLEYN.

admiralty, in British government, department in charge of the operations of the Royal Navy until 1964. Originally established under Henry VIII, it was reorganized under Charles II. Five lords commissioners composed the board of admiralty, each gradually developing his own field of specific responsibility, with the first lord responsible to Parliament. In 1832 it absorbed the navy board, previously responsible for the administrative organization. In 1964 the admiralty became the navy department, coequal with the other service departments, of the ministry of defence. The admiralty board still exists within the navy department, but its functions are undefined.

Admiralty Inlet: see PUGET SOUND.

Admiralty Islands, group of 40 volcanic islands (1969 pop. 22,035), c. 800 sq. mi. (2,070 sq. km), SW Pacific, in the BISMARCK ARCHIPELAGO and part of Papua New Guinea. Lorengau, the chief port and administrative center of the group, is on Manus, the largest island. Copra, pearls, and marine shells are the principal products. Discovered by the Dutch navigator Willem SCHOUTEN in 1616, the group became part of German New Guinea in 1884 and an Australian League of Nations mandate in 1920.

admiralty law. see MARITIME LAW.

Adna (ăd'nă), name of two Israelites of the returned community. Ezra 10:30, Neh. 12:15.

Adnah (ăd'nă) 1. Deserter from Saul. 1 Chron. 12:20. 2. Officer under Jehoshaphat. 2 Chron. 17:14.

Ado (a'dō), city (1969 est. pop. 183,000), SW Nigeria. Located in a region where rice and yams are grown, the town has rice mills and also manufactures textiles, bricks, tile, and pottery. Ado was the capital of the YORUBA Ekiti state that was probably founded in the 15th cent. It alternated between independence and subjection to BENIN until the British gained control in 1894. The city is sometimes known as Ado-Ekiti.

adobe (ădō'bē) see RAMMED EARTH.

adolescence, time of life from onset of puberty to full adulthood. The exact period of adolescence, which varies from person to person, falls approximately between the ages 12 and 21. Adolescence is characterized by physical changes leading to sexual maturity, problems of identity and achievement of an appropriate sex role, movement toward personal independence, and social changes in which, for a time, the most important fact is peer group relations. Psychologists regard adolescence as a by-product of social pressures specific to the society, not as a unique period of biological turmoil.

Adolf of Nassau, d. 1298, German king (1292-98). He owed his election to the ecclesiastical electors, who, fearing the growing power and ambition of the HAPSBURGs, chose him rather than Albert of Austria (later King ALBERT I), son of Rudolf I of Hapsburg. Seeking to strengthen his kingship by establishing a territorial power of his own, Adolf seized Meissen and Thuringia. He entered into an alliance with Edward I of England against Philip IV of France in an effort to halt French encroachment of German territory, the alliance produced no results, however, and led to Adolf's deposition (1298) and the election of Albert. Soon afterward he was defeated and killed by an army commanded by Albert.

Adonai see GOD.

Adoni-bezek (ădō'nī-bē'zēk, ăd'-), king of Bezek, captured and mutilated by the Judahites. Judges 15:7.

Adonijah (ăd'ōnī'jah, ădōn'jah) 1. Son of David. He sought the throne that David gave to the younger son, Solomon. 2 Sam. 3:4, 1 Kings 1:21-25. 2. Teacher of the law. 2 Chron. 17:7-9. 3. Sealer of the Covenant after the return from the Exile. Neh. 10:16. Perhaps the same as Adonikam, a name in the lists of families. Ezra 2:13, 8:13, Neh. 7:18.

Adoniram (ăd'ōnī'rām), tax overseer. 1 Kings 4:6. Adoram. 2 Sam. 20:24, 1 Kings 12:18. Hadoram. 2 Chron. 10:18.

Adonis (ădō'nīs, ădōn'īs), in Greek mythology, beautiful youth beloved by Aphrodite and Persephone. He was born of the incestuous union of Myrrha (or Smyrna) and Cinyras, king of Cyprus. Aphrodite left Adonis in the care of Persephone, who raised him and made him her lover. Aphrodite later demanded the youth for herself, but Persephone was unwilling to relinquish him. When Adonis was gored to death by a boar, both Persephone and Aphrodite claimed him. Zeus settled the dispute by

arranging for Adonis to spend half the year (the summer months) above the ground with Aphrodite and the other half in the underworld with Persephone. Adonis' death and resurrection, symbolic of the yearly cycle of vegetation, were widely celebrated in ancient Greece in the midsummer festival Adonia. As part of this worship, his image was surrounded by beds of plants (the gardens of Adonis), which quickly grew and withered. The worship of Adonis corresponds to the cults of the Phrygian ATIS and the Babylonian TAMMUZ. See Sir J. G. Frazer, *Adonis, Attis, Osiris* (1907, new ed. 1961).

Adoni-zedec (ădō'nī-zē'dēk, ăd'-), chief at Jerusalem, leader of the allies routed at Gibeon. Joshua 10:1-27.

adoption, act by which the legal relation of PARENT AND CHILD is created. Adoption was recognized by Roman law but not by COMMON LAW. Statutes first introduced adoption into U.S. law in the mid-19th cent. and today it is allowed in all states of the United States and in Great Britain. Adoption is generally a judicial proceeding, requiring a hearing before a judge. Adoption statutes usually provide that the consent of the parents or guardian of the child—and that of the child, if above a certain age—must be obtained. An adopted child generally assumes the rights and duties of a natural legitimate child. Similarly, the rights and duties accompanying natural parenthood generally accompany adoptive parenthood (e.g., the right of custody and the obligation of support). The natural parents have no right to control an adopted child, nor have they any duties toward it, but in some states the child does not lose the right to inherit from them. Many states permit unmarried adults to adopt. See Margaret Kornitzer, *Adoption* (2d ed. 1967), M. L. Leavy, *Law of Adoption* (3d ed. 1968).

adoptionism, Christian heresy taught in Spain after 782 by Elipandus, archbishop of Toledo, and Felix, bishop of Urgel. They held that Christ at the time of his birth was purely human and only became the divine Son of God by adoption when he was baptized. Variations of this doctrine had been held as early as the 3d cent. by the THEODOTIANS, PAUL OF SAMOSATA, and by the Nestorians. It reappeared in the neo-adoptionist heresy among the followers of Peter Abelard. Elipandus and Felix were condemned at Frankfurt (794). The vigorous refutation of ALCUIN had much to do with the sect's disappearance in the early 9th cent. See also MONARCHIANISM.

Adoraim (ăd'ōr'ăim), town, E of Hebron. 2 Chron. 11:9. Adora. 1 Mac. 13:20.

Adoram (ădō'rām), the same as ADONIRAM.

Adoula, Cyrille (sērīl' ădō'la), 1922-, African statesman in the Republic of the Congo (now Zaïre). He was an early associate of Patrice Lumumba in the independence movement, although he later supported Lumumba's rival, Joseph Kasavubu. Adoula was elected to the senate when the Congo achieved (1960) independence and held the ministries of interior and of defense under President Kasavubu. Adoula became prime minister (1961) but was replaced (1964) by Moïse Tshombe.

Adour (ădō'r'), river, 210 mi. (338 km) long, rising in the Pyrenees of Gascony, SW France. It flows north and then west in a wide arc past Bagneres-de-Bigorre, Aire, and Dax and enters the Bay of Biscay near Bayonne.

Adowa, Ethiopia. see ADUWA.

Adra (a'thṛa), town (1970 pop. 16,283), Almería prov., S Spain, in Andalusia, on the Mediterranean Sea. Adra, a port, is the center of a fertile agricultural region. At the foot of a hill below the present town stood Abdera, founded by Phoenician traders and which later became a Roman colony. Adra was the last stronghold of the Moors under Boabdil.

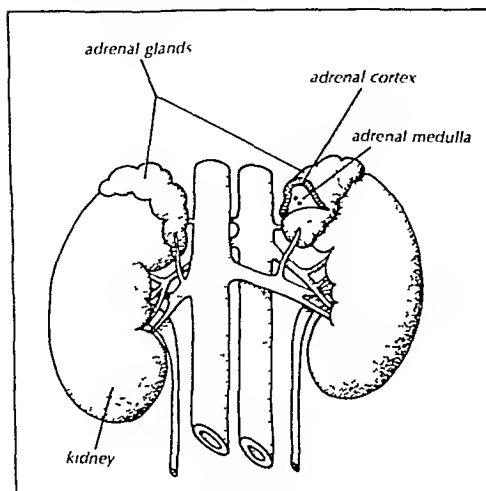
Adrammelech (ădrām'elēk) 1. God of a Samartian cult. 2 Kings 17:31. 2. One of the two men named as murderers of their father, Sennacherib, Sharezer was the other. Babylonian sources mention one son. 2 Kings 19:37 (the same in Isa. 37:38).

Adramyttium (ăd'rāmīt'ēəm), place, the modern Edremit, NW Turkey. Here St. Paul's ship was built. Acts 27:2.

Adrano (ădra'nō), town (1971 pop. 32,270), E Sicily, Italy, at the foot of Mt. Etna, near the confluence of the Simeto and Salso rivers. It is the commercial center for a region where olives and citrus fruit are grown. Adrano was founded c. 400 by Dionysius the Elder near a temple of the god Hadranus. Fierce fighting took place in Adrano during World War II. Of note are the ruins of the town's ancient walls and an imposing 11th-century Norman castle. The town was known as Aderno until 1929.

Adrastus (adrās'tas), in Greek legend, king of Argos. He organized the ill-fated SEVEN AGAINST THEBES expedition and was the only survivor. Ten years later he successfully assisted the sons of the Seven, the EPI-
GONI, in their attack on Thebes.

adrenal gland (adrēn'əl) or **suprarenal gland** (sōprārēn'əl), endocrine gland (see ENDOCRINE SYSTEM) about 2 in. (5.1 cm) long situated atop each kidney. The outer yellowish layer (cortex) of the adrenal gland secretes about 30 steroid hormones, the most important of which are ALDOSTERONE and CORTISOL. Aldosterone regulates water and salt balance in the body and its secretion is controlled by the output of ADRENOCORTICOTROPIC HORMONE (ACTH) from the pituitary gland. Cortisol regulates



Adrenal glands. The cross-sectioned area shows the adrenal cortex and medulla.

carbohydrate, protein, and fat metabolism, its secretion is only slightly influenced by the pituitary. Steroid hormones also counteract inflammation and allergies and influence the secondary sex characteristics to a limited degree. The adrenal cortex controls metabolic processes that are essential to life and if it ceases to function death ensues within a few days. Artificial synthesis of the steroid hormones has made it possible to treat many conditions related to underactivity of the adrenal cortex, e.g., ADDISON'S DISEASE. The inner reddish portion (medulla) of the adrenal gland, which is not functionally related to the adrenal cortex, secretes EPINEPHRINE (adrenaline) and norepinephrine. The release of these hormones is stimulated when an animal is excited or frightened, causing increased heart rate, increased blood flow to the muscles, elevated blood sugar, dilation of the pupils of the eyes, and other changes that increase the body's ability to meet sudden emergencies.

adrenaline (adrēn'əlīn, -lēn) see EPINEPHRINE

adrenocorticotrophic hormone (adrē'nōkōr'tr'ikōtōp'ik), polypeptide hormone secreted by the anterior PITUITARY GLAND. Its chief function is to stimulate the cortex of the ADRENAL GLAND to secrete adrenocortical steroids, chiefly CORTISONE. The release of adrenocorticotrophic hormone (ACTH), also known as corticotropin, is stimulated by corticotropin-releasing factor (CRF), a secretion of the hypothalamus. ACTH secretion is an excellent example of the regulation of a biological system by a negative-feedback mechanism; high levels of adrenocortical steroids in the blood tend to decrease ACTH release, whereas low steroid levels have the opposite effect. ACTH has the same pharmacologic and clinical effects as cortisone when given intravenously or intramuscularly, however, it has no value when applied externally and cannot be taken orally since it is deactivated by digestive enzymes. The action of ACTH is contingent upon normally functioning adrenal glands and is therefore useless in disorders caused by adrenal insufficiency, e.g., as replacement therapy where both adrenal glands have been removed.

Adria (ādrēa), ancient name of the Adriatic, extended to mean the central Mediterranean in Acts 27:27.

Adrian I, d. 795, pope (772-95), a Roman, successor of Stephen IV. At Adrian's urging, CHARLEMAGNE crossed the Alps and defeated the Lombard king, DESIDERIUS, who had annexed papal territory. That defeat marked the end of the Lombard kingdom. Charlemagne, during the siege of Pavia, went to Rome (774) and there confirmed the donation of Pepin to the PAPAL STATES and joined additional prov-

inces to it. Adrian in turn confirmed Charlemagne's title of patrician of the Romans, thereby acknowledging Charlemagne's protectorate over all Italy. Adrian supported Empress Irene in her struggle against iconoclasm, and he sent legates to the Second Council of Nicaea. The great Roman water systems were built during his rule. He was succeeded by St. Leo III.

Adrian IV, d. 1159, pope (1154-59), an Englishman (the only English pope), b. Nicholas Breakspear at Langley, near St. Albans. He was successor of Anastasius IV. At an early age he went to France. There he became an Austin canon and later an abbot. Pope Eugene III made him cardinal bishop of Albano and sent him to Scandinavia to organize the church. After his election to the papacy, Adrian defeated (1155) opposition of ARNOLD OF BRESCIA. He crowned (1155) FREDERICK I but fell into conflict with Frederick when the emperor, disregarding the Concordat of Worms, invested (1158 or 1159) imperial favorites in the archbishoprics of Cologne and Ravenna. To make peace (1156) with William of Sicily, who had invaded papal territory, Adrian acknowledged William's titles to Sicily, Apulia, and Capua. This angered Frederick, who had designs on the Two Sicilies, but it served to protect the Papal States against further imperial encroachments. Frederick's expressed intention to assume the government of Rome almost brought him excommunication. Adrian, forced by imperial intrigues to leave Rome, died before he could pronounce sentence. The historicity of Adrian's donation of Ireland, as a papal fief, to Henry II of England has been the subject of scholarly dispute. He was succeeded by Alexander III.

Adrian VI, 1459-1523, pope (1522-23), a Netherlander (b. Utrecht) named Adrian Florensz, successor of Leo X. He was the most recent non-Italian pope. He taught at Louvain and was tutor of the young prince, later Holy Roman Emperor CHARLES V. This was a time when Roman life was most extravagant, papal expenditures on worldly objects were at their height, and the Curia most needed drastic reform. Adrian, an ascetic and a pious man, did his best to curb the abuses he found, but he died after 20 months. He was succeeded by Clement VII.

Adrian, Roman emperor see HADRIAN

Adrian, Edgar Douglas Adrian, Baron, 1889-, English physiologist, M.D. Trinity College, Cambridge, 1915. He was research professor (1929-37) of the Royal Society and professor of physiology (1937-51) at Cambridge. In 1951 he became master of Trinity College. His research was chiefly on the physiology of the nervous system. He wrote *The Basis of Sensation* (1928), *The Mechanism of Nervous Action* (1932), and, with others, *Factors Determining Human Behavior* (1937). With Sir Charles S. Sherrington he shared the 1932 Nobel Prize in Physiology and Medicine for work on the function of the neuron. He was awarded a barony in 1955.

Adrian, Gilbert: see under FASHION

Adrian, city (1970 pop. 20,382), seat of Lenawee co., SE Mich., on the Raisin River, inc. 1836. It is a manufacturing and trading center for a fertile farm region, its many products include automobile and aircraft parts, metalware, chemicals, and paper goods. The city is known for its chrysanthemums and for the beautiful maples that line its streets. It is the seat of Adrian College and Siena Heights College. Numerous lakes are in the area.

Adrianople, Turkey see EDIRNE

Adrianople, Treaty of, 1829, peace treaty between Russia and the Ottoman Empire (see RUSSO-TURKISH WARS). Turkey gave Russia access to the mouths of the Danube and additional territory on the Black Sea, opened the Dardanelles to all commercial vessels, granted autonomy to Serbia, promised autonomy for Greece, and allowed Russia to occupy Moldavia and Walachia until Turkey had paid a large indemnity.

Adriatic Sea (ādrēā'tik), arm of the Mediterranean Sea, between Italy and the Balkan Peninsula. It extends c. 500 mi (800 km) from the Gulf of Venice, at its head, SE to the Strait of Otranto, which leads to the Ionian Sea. It is from 58 to 140 mi (93-225 m) wide, with a maximum depth of c. 4,100 ft (1,250 m). The Po and Adige rivers of Italy are the chief affluents. The Italian coast (west and north) is low, Venice and Bari are the principal ports. Trieste, at the northern end of the sea, was once the chief Adriatic port. Yugoslavia and Albania border the irregular eastern shore, Rijeka and Split, Yugoslavia, are the main ports. The Yugoslavian coast (see DALMATIA), which is rugged and has many offshore islands and sheltered bays, is a popular tourist resort. Fishing is

an important activity in the Adriatic Sea, lobsters, sardines, and tuna are the chief catch.

Adriel (ā'drīəl), husband of MERAB 1 Sam. 18:17-19.

adsorption, adhesion of the molecules of liquids, gases, and dissolved substances to the surfaces of solids, as opposed to ABSORPTION, in which the molecules actually enter the absorbing medium (see ADHESION AND COHESION). Certain solids have the power to adsorb great quantities of gases. Charcoal, for example, which has a great surface area because of its porous nature, adsorbs large volumes of gases, including most of the poisonous ones, and is therefore used in gas masks. Certain finely divided solids have great adsorptive properties, for example, minute particles of platinum attract and hold multitudes of hydrogen molecules on their surfaces. Its ability to adsorb other gases makes platinum very useful in the production of sulfuric acid by the contact process and in the preparation of ammonia. Adsorption occurs also in solutions, colloidal particles suspended in a solution may adsorb much of the solvent (see COLLOID). Bone black and charcoal are used in industry to remove colors from solutions, since they adsorb many coloring materials and carry these with them when separated from the solution. Liquid dye held to the surface of cloth by adsorption permeates the fibers so that when the liquid has evaporated the dye still remains. Adsorption is employed in the hydrogenation of oils, in gas analysis, and in chromatography, a method used in the chemical analysis of closely related substances.

Adullam (adūl'am), border town of Judah, SW of Jerusalem. Joshua 15:35, 2 Chron. 11:7, Neh. 11:30. David hid in the Cave of Adullam when he fled from Saul. From here three of his men went to get him water from the well at Bethlehem. 1 Sam. 22, 2 Sam. 23:13-17, 1 Chron. 11:15-19.

adult education, extension of educational opportunities to those adults beyond the age of general public education who feel a need for further training of any sort, also known as continuing education. Only in the past two centuries has the field of adult education acquired definite organization. Its relatively recent development results from various social trends—the general spread of public education, the intensification of economic competition with its premiums for skills, the complexities of national and international politics demanding constant study, the stimulating effects of urbanization, opportunities offered by increased leisure time, and increased interest in educational activities on the part of many married women. Modern and formal adult education probably originated in European political groups and, after the Industrial Revolution, as vocational classes for workers. Continuation schools for workers in Germany and Switzerland were common. The FOLK HIGH SCHOOL in Denmark, founded by Bishop Brundtvig, stressed intellectual studies, and the Adult Schools of the Society of Friends in England (1845) fostered the education of the poor. Early American forms of adult education were the public lectures given in the LYCEUM (c. 1826) and the Lowell Institute of Boston endowed by John Lowell (1836). In 1873 the CHAUTAUQUA MOVEMENT introduced the discussion group and modified lecture system. Free public lectures under the department of education of New York City were inaugurated in 1904. Through the merger (1951) of the American Association for Adult Education and the National Education Association's Department of Adult Education, the Adult Education Association of the U.S.A. was founded. This group, through its publications and its research, has worked to systematize the methods and philosophy of the field. The Economic Opportunity Act (1964) provided funds for adult education, as did the later Adult Education Act (1966). Both of these acts, however, have been designed to help disadvantaged and illiterate adults only. Most important, public schools have been active in furnishing facilities and assistance to private adult education groups in many communities. Contemporary adult education can take on many different forms. Colleges have instituted evening programs, extension work, courses without credit, and correspondence courses. COMMUNITY COLLEGES have been especially active in this area. Organizations designed to relieve ILLITERACY are instrumental in adult education, as are the schools established to teach the English language and American customs to the foreign-born. A large amount of adult education is carried on in the field of worker education by labor unions and in VOCATIONAL EDUCATION programs. Community centers, political and economic action associations, and dramatic, musical and artistic groups are regarded by many as adult education activities. Great Books groups (est. 1947), in which

ADULTERATION OF FOOD

adults read and discuss a specified list of volumes, grew out of great books seminars at Chicago and Columbia universities and St John's College. In many places the public library sponsors the group. See PARENT EDUCATION. See C H Grattan, *In Quest of Knowledge* (1955), *Handbook of Adult Education in the United States* (ed by Malcolm S Knowles, 1960), Malcolm S Knowles, *The Adult Education Movement in the United States* (1962), P E Bergevin et al., *Adult Education Procedures* (1963), R W Axford, *Adult Education: The Open Door* (1968), Darrell Anderson, *Adult Education and the Disadvantaged Adult* (1969).

adulteration of food. see FOOD ADULTERATION

Adummim (ədūm'īm), ascent in the Jericho road Joshua 15:7, 18:17

Aduwa or Adowa (both a'dāwa), Ital Adua, town (1970 est pop 16,000), Tigre prov., N Ethiopia. Aduwa was the most important commercial center of Tigre in the 19th cent., but declined in the 1870s as a result of the dislocation caused by the fighting between Ethiopia and Egypt. In 1896, Aduwa was the site of the battle in which Menelik II decisively defeated Italian invaders and forced them out of Ethiopia. The name is also spelled Adwa.

advaita: see VEDANTA

Advent [Lat. = coming, i.e., of Jesus], season of the Christian ecclesiastical year, lasting in the West from the Sunday nearest Nov. 30 (St Andrew's) until Christmas. It is a season of penitence, to prepare for the holy day, and its liturgical color is purple. The first Sunday of Advent is the first day of the church calendar. In the Roman Catholic Church it was until recently a period of fasting, but now, as in the Anglican and Lutheran churches, its observance is primarily liturgical.

Advent Christian Church: see ADVENTISTS

Adventists (ăd'ven'tists) [advent, Lat. = coming], members of a group of related religious denominations whose distinctive doctrine centers in their belief concerning the imminent second coming of Christ (see JUDGMENT DAY). The name Adventism is specifically applied to the teachings of William Miller (1782-1849), who predicted the end of the world for 1843, then for 1844. When it did not occur, the Millerites, or Second Adventists, at a meeting at Albany, N.Y., in 1845 adopted a statement declaring their belief in the visible return of Christ at an indefinite time, when the resurrection of the dead would take place and the millennium would have its beginning. Later this body took the name Evangelical Adventists. Another and larger branch of the original Adventist group became known in 1861 as the Advent Christian Church. This branch was formed as a result of a controversy over the question of the soul's immortality. The largest Adventist body, the Seventh-Day Adventists, under the leadership of Joseph Bates and James and Ellen White, adopted in 1844 the observance of Saturday as the Sabbath. Formally organized in 1863, they are fundamentally evangelical, taking the Bible as the sole rule of faith and practice. Fundamental to their doctrine is their belief in the imminent, premillennial, personal, and visible return of Christ. The Seventh-Day Adventists carry on worldwide missionary work, they number some 1.6 million. Another Adventist group is the Church of God, which was organized as Churches of God in Christ Jesus in 1888 and then permanently organized as Church of God in 1921, its members number some 75,000. The Advent Christian Church, organized in 1861, has a membership of about 31,000 (the Life and Advent Union, which was organized in 1863, merged with the Advent Christian Church in 1964). See M E Olsen, *A History of the Origin and Progress of Seventh-Day Adventists* (1925, repr. 1972), Le Roy E. Froom, *Movement of Destiny* (1972).

adverb. see PART OF SPEECH, ADJECTIVE

advertising, in general, any openly sponsored offering of goods, services, or ideas through any medium of public communication. At its inception advertising was merely an announcement, for example, entrepreneurs in ancient Egypt used criers to announce ship and cargo arrivals. The invention of printing, however, may be said to have ushered in modern advertising. After the influence of salesmanship began to insert itself into public notice in the 18th cent., the present elaborate form of advertising began to evolve. The advertising agency, working on a commission basis, has been chiefly responsible for this evolution. The largest group of advertisers are the food marketers, followed by marketers of drugs and cosmetics, soaps, automobiles, tobacco, appliances, and oil products. The major U.S. advertising media are newspapers, magazines,

television and radio, business publications, billboards, and circulars sent through the mail. Since many large advertising agencies were once located on Madison Avenue in New York City, the term "Madison Avenue" is frequently used to symbolize the advertising business. The major criticisms of advertising are that it creates false values and impels people to buy things they neither need nor want and that, in fact, it may be actually harmful (such as cigarettes). In reply, its defenders say that advertising is meant to sell products, not create values, that it can create a new market for products that fill a genuine, though latent, need, and that it furthers product improvement through free competition. The Association of National Advertisers and the American Association of Advertising Agencies, both founded in 1917, are the major associations. See Martin Mayer, *Madison Avenue, USA* (1958), S W Dunn, *Advertising: Its Role in Modern Marketing* (2d ed. 1969), A W Frey, *Advertising* (4th ed. 1970), Robert Glazer, *The New Advertising* (1970).

advocate: see ATTORNEY

Ady, Endre (ĕn'drĕ ô'dĕ), 1877-1919, Hungarian poet. He abandoned his studies in law for a career in journalism and literature. His first volume of poetry, *Versek*, appeared in 1899. After 1903 he spent most of his time in Paris, where he fell in love with a woman who became the subject of many poems. A lyric poet noted for an original and creative use of language, Ady was influenced by the French Symbolists. He became a leader of the politically and artistically radical Hungarian writers who attacked the complacent materialism of Hungary's upper classes. Ady's poetry was published in 12 volumes and his prose works in 7. See his poems, ed. by A N Nyerges (1969).

Adyge Autonomous Oblast (ădgyĕ'), administrative division (1970 pop. 386,000), c. 2,935 sq mi (7,600 sq km), Krasnodar Krai, SE European USSR, at the northern foothills of the Greater Caucasus. MAIKOP is the capital. Agriculture is the chief occupation, wheat, maize, and rice are the leading food crops. Valuable forests in the Caucasian foothills have made lumbering a major industry. The Adyge region has rich oil and natural gas deposits. Oil refining, food processing, furniture making, and the production of machinery, machine tools, and building materials are leading industries. The Muslim Adyge people, related to the Circassians, are known for their tapestries and other handicrafts. Russian immigration has made them a minority in their oblast. The region was conquered (1830-64) by the Russians from the Turks, who had introduced Islam. The autonomous oblast was created in 1922.

adze, tool similar in purpose and use to an axe but with the cutting edge at right angles to the handle rather than aligned with it. The details of construction of a particular adze will depend on its intended application. Some types have a single cutting edge with the rear side of the head formed into a hammer or a picklike tool. Other types have a head with two identical cutting edges back to back. The principal use of the adze is in dressing and squaring large timbers. However, since these two processes are now usually performed by machine tools in factories, the adze is no longer commonly used.

Adzhār Autonomous Soviet Socialist Republic (ăjār') or **Adzhāristan**, autonomous region (1970 pop. 310,000), c. 1,160 sq mi (3,000 sq km), SE European USSR, on the Black Sea, bordering Turkey on the south. The capital is BATUMI. Mountainous and forested, the region has a subtropical climate, and there are many health resorts. Tobacco, tea, citrus fruits, and avocados are leading crops; livestock raising and copper mining are also important. Industries include tea packing, tobacco processing, fruit and fish canning, oil refining, and shipbuilding. The Adzhars, a mainly Muslim people of the South Caucasian linguistic family, constitute the bulk of the population, the remainder are Georgians, Armenians, Russians, and Greeks. Colonized by Greek merchants in the 5th and 4th cent. B.C., the region later came under Roman rule and after the 9th cent. A.D. was part of Georgia. The Turks conquered Adzhāristan in the late 17th and early 18th cent. and introduced Islam. Acquired by Russia in 1878, the region became an autonomous republic in 1921.

A. E. see RUSSELL, GEORGE WILLIAM

Aeacus (ē'ăkəs), in Greek mythology, son of Zeus and the nymph Aegina. He was the father of Peleus and Telamon. After a plague had nearly wiped out the inhabitants of his land, Zeus rewarded the pious Aeacus by changing a swarm of ants to men (known as Myrmidons). According to one legend, Aeacus and his people assisted Apollo and Poseidon in

building the walls of Troy. After Aeacus' death, Zeus made him one of the three judges of Hades.

Aedon (ăĕ'dən), in Greek legend, the wife of Zethus, king of Thebes. She had only one son, while her sister-in-law, NIOBE, had many. Her jealousy increased until, in trying to murder Niobe's oldest son, she killed her own child. She was changed to a nightingale, and her song was a mournful call for her son, Itys or Itylus.

Aedui (ĕ'dyōōi) or **Haedui** (hĕ'dyōōi), Gallic people, occupying in the 1st cent. B.C. a part of what later became Burgundy. Defeated by ARIOVISTUS and at odds with their Gallic neighbors, they were allies of the Romans. The Aedui at first aided Julius Caesar in the GALLIC WARS and later were not wholehearted in their support of Vercingetorix's revolt against Caesar. Their early capital was BIBRACTE.

Aeetes (ē-ĕ'tēz) see JASON

AEE see WORLD WAR I

Aegadian Isles: see EGADI ISLANDS, Italy

Aegates: see EGADI ISLANDS, Italy

Aegean civilization (ĕjĕ'ăn), term for the Bronze Age cultures of pre-Hellenic Greece. The complexity of those early civilizations was not suspected before the excavations of archaeologists in the late 19th cent. The most remarkable of the cultures was perhaps that of Crete, which was flourishing by the beginning of the 3d millennium B.C., this was the MINOAN CIVILIZATION. On the mainland of Greece excavations have uncovered the remains of MYCENAEAN CIVILIZATION. The exploration of the ruins of Troy provided knowledge of another culture, and ruins in the Cyclades have demonstrated remarkable early development there. The exact relationships of these different centers are not yet known, and there are many subjects of conjecture, such as the role of the Achaeans and the causes of the decline of Crete before 1100 B.C. See V. R. d'Arbo Desborough, *The Greek Dark Ages* (1972), Colin Renfrew, *The Emergence of Civilisation* (1972).

Aegean Sea, Gr. *Aigaion Pelagos*, Turkish *Ege Denizi*, arm of the Mediterranean Sea, c. 400 mi (640 km) long and 200 mi (320 km) wide, off SE Europe between Greece and Turkey. Crete and Rhodes mark its southern limit. Irregular in shape, it is dotted with islands, most of which belong to Greece, they include Évoia, the Sporades, the Cyclades, Samos, Khios, Lesbos, Thasos, and the Dodecanese. The Aegean Sea's greatest depths (more than 6,600 ft/2,010 m) are found off N. Crete. The Dardanelles strait connects the Aegean Sea with the Sea of Marmara and the Black Sea. Sardines and sponges taken from the Aegean are economically important, natural gas has been found off NE Greece. The name Aegean has been variously derived from Aegae, a city of Évoia, from Aegeus, father of Theseus, who drowned himself in the sea believing his son had been slain by the Minotaur, and from Aegya, an Amazon queen who drowned in it. The sea's ancient name, Archipelago, now applies to its islands and, generally, to any island group.

Aegeus (ĕ'jōs, -jĕs) see THESEUS

Aegina or **Āiyina** (ă'yĕnă), island (1971 pop. 5,704), 32 sq mi (83 sq km), off SE Greece, in the Gulf of Aegina or Saronic Gulf, near Athens. Sponge fishing and farming (figs, almonds, grapes, olives, and peanuts) are the most important occupations. The chief town is Aegina on the northwest shore. The island, inhabited from late Neolithic times, was named for the mythological figure Aegina. Its culture was influenced by Minoan Crete. Conquered by Dorian Greeks, it grew rapidly as a commercial state and struck the first Greek coins. In 431 B.C. the Athenians, against whom Aegina sided in the Peloponnesian War, expelled the population of the island, and Aegina fell into insignificance. In the 12th cent. it served as a haven for pirates, and the Venetians, in suppressing the outlaws, conquered the island. Albanians settled there in the 16th cent. During the Greek War of Independence the town of Aegina was (1828-29) the capital of Greece. Points of interest include the temple of Aphaia, where the AEGINETAN MARBLES were discovered in 1811.

Aegina (ĕj'ĭnă), in Greek mythology, river nymph, daughter of the river god Asopus. She was abducted by Zeus to the island Oenone, where she bore him a son, Aeacus. Aeacus later renamed the island in her honor.

Aegina, Gulf of: see SARONIC GULF, Greece

Aegineta, Paulus: see PAUL OF AEGINA

Aeginetan marbles (ĕ''jĭnĕ'tən), archaic Greek sculptures, c. 500-480 B.C., from the temple of Aphaia at Aegina, discovered in 1811 and erroneously restored by Thorvaldsen. Now in the Glyptothek at

Munich, they originally decorated the pediments of the temple. They represent scenes from the Trojan War.

aegis (é'jís), in Greek mythology, weapon of Zeus and Athena. It possessed the power to terrify and disperse the enemy or to protect friends. The aegis was usually described as a garment made of goat-skin slung over the shoulder or as a piece of armor. The aegis of Athena was a breastplate covered with goatskin and bordered with snakes, bearing in the center the head of the Gorgon Medusa.

Aegisthus (éjís'thas), in Greek mythology, according to most legends the incestuous offspring of Thyestes and his daughter Pelopia. At Thyestes' behest Aegisthus revenged the murder of his brothers by killing his uncle ATREUS. Later, he was known as the paragon of Clytemnestra and aided her in the murdering of her husband, Agamemnon. He was killed in revenge by Clytemnestra's son, Orestes.

Aegospotamos (é'gaspótámas), river of ancient Thrace flowing into the Hellespont. At its mouth in 405 B.C. occurred the culminating battle of the PELLONNESIAN WAR. Lysander and his Spartan fleet had come north to cut the grain supply of Athens. The Athenian fleet under Conon came to Aegospotamos and at first vainly tried to induce the Spartans to fight. Despite the warnings of ALKIBIADES, Conon and his men did not take proper precautions. Lysander fell upon them and completely destroyed the Athenian fleet.

Aegyptus (éj'p'tas) see DANAUS

Aehrenthal, Alois Lexa, Graf von (a'löes lāk'sā graf fən ā'rantal), 1854-1912, Austro-Hungarian foreign minister (1906-12). The chief event of his ministry was the Austrian annexation (1908) of BOSNIA AND HERCEGOVINA. The Russian foreign minister, IZVOLSKY, had given his formal agreement to the annexation in a secret meeting at Buchlau, Moravia, in return, Aehrenthal promised Austrian support for the opening of the Dardanelles to Russian warships. The annexation followed promptly, whereas Izvolsky was frustrated in his Dardanelles plan by English opposition. Serbian indignation at the annexation as well as belated Russian opposition almost led to a European war in 1909. Aehrenthal, with difficulty, restrained the Austrian war party led by Conrad von Hotzendorf. At last the crisis was ended by German mediation. The signatory powers of the Congress of Berlin (1878), including Russia, ratified the annexation.

Aeken, Jerom van: see BOSCH, HIERONYMUS

Ælfric (āl'frík), c. 955-1020, English writer and Benedictine monk. He was the greatest English scholar during the revival of learning fostered by the Benedictine monasteries in the second half of the 10th cent. His aim was to educate the laity as well as the clergy. He wrote in English a series of saints' lives and homilies—designed for use as sermons by the preachers who were generally unable to read Latin. Ælfric was also the author of a grammar, a glossary, and a colloquy, which were for many years the standard texts for Latin study in English monasteries. Among his other writings are the *Heptateuch*, a free English version of the first seven books of the Bible. Ælfric is considered the chief prose stylist of the period. His later writings were strongly influenced by the balance, alliteration, and rhythm of Latin prose. See *Selected Homilies* (ed. by Henry Sweet, 1922) and the *Heptateuch and Other Writings* (ed. by Early English Text Society, 1922), study by James Hurt (1972).

Aelian (ē'lēan), fl. 2d cent. A.D., Roman author, his original name was Claudius Aelianus. He lived in Praeneste and taught rhetoric in Rome. His works, all in Greek, include *Historical Miscellanies*, anecdotes about celebrities of the day, and *On the Characteristics of Animals*. Both of these are largely extant. He also wrote *Peasant Letters*, 20 epistles attributed to farmers from Attica.

Aemilian Way. see ROMAN ROADS

Aeneas (ē'nēas, īnē'-), pious man whom Peter cured. Acts 9:33,34.

Aeneas (īnē'ās), in classical legend, a Trojan, son of ANCHISES and Venus. After the fall of Troy he escaped, bearing his aged father on his back. He stayed at Carthage with Queen Dido, then went to Italy, where his descendants founded Rome. The deeds of the "pious" Aeneas are the substance of the great Roman epic, the *Aeneid* of VERGIL.

Aeneas Silvius Piccolomini: see PIUS II

Aenesidemus (ēnēs'idē'mās), Greek skeptic philosopher, fl. probably 1st cent. B.C. Thought to be a native of Knossos, Crete, he taught in Alexandria. Although his writings have been lost, it is known that his main contributions were 10 tropoi (ways to

conduct arguments) that appeared in *Pyrrhonian Discourses*. His arguments, which asserted the impossibility of knowledge, made him one of the leading skeptics.

Aenon (ē'nōn), unidentified place, where John the Baptist baptized people. John 3:23.

Aeolia: see AEOLIS

Aeolian Islands: see LIPARI ISLANDS, Italy

Aeolians: see GREECE

Aeolis (ē'alīs) or **Aeolia** (ēō'lēā), ancient region of the west coast of Asia Minor (in present-day Turkey). Aeolis was not a geographic term but a collective term for the cities founded there by the Aeolians, a branch of the Hellenic peoples. The 12 southern cities were grouped in the Aeolian League; these were Temnos, Smyrna, Pitane, Neonteichos, Aegirusa, Notium, Cilla or Killa, Cyme, Gryneum, Larissa, Myrina, and Aegae.

Aeolus (ē'ālās), in Greek mythology. 1 The wind god. He lived on the island of Aeolia, where he kept the winds in a cave. 2 Son of Hellen and ancestor of the Aeolian branch of the Hellenic race.

Aepinus, Franz Ulrich Theodosius (frānts ōōl'rīkh tā'ōdō'zēōs āpē'nōs), 1724-1802, German physicist. He studied at Jena and Rostock and taught mathematics at Rostock from 1747 to 1755. After a brief stay in Berlin he went to St. Petersburg as professor of physics and academician, remaining there until 1798 and rising to a high position as courtier to Catherine the Great. He made experimental and theoretical contributions to the study of electricity, including work on the thermoelectric properties of tourmaline and the invention, with J. C. Wilche, of the air capacitor. A consideration of the implications of this device led him to reject then current mechanical theories of electricity and to elaborate in his *Tentamen Theoriae Electricitatis et Magnetismi* (1759) a theory of electrostatics similar to Newton's gravitational theory.

aerial see ANTENNA, in electronics

aerial photography, technology and science of taking still or moving-picture photographs from an aircraft in flight. It was tried before the advent of the airplane by using kites and balloons. World War I demonstrated its tremendous military value, and during the ensuing peacetime years methods were so far perfected for taking still pictures that photography, the science of measurement from photographs, became an important tool of agencies making any type of surface map. During World War II and subsequent conflicts, aerial photographs were a most important source of intelligence. The quality of these photographs is now so good that the rank of a foot soldier can be determined from photographs taken at altitudes of c. 100,000 ft (30,500 m). The pilot sets his aircraft on the correct speed and course before entering the area to be photographed to insure uniformity of speed and altitude. The camera is activated before the area is entered and remains in operation until the plane is well past the area. This is done to insure longitudinal overlapping between this area and any adjacent area to be subsequently photographed so that the photographs may later be joined together. Aerial photographs may be high oblique (including the horizon), low oblique (below the horizon), or vertical (perpendicular to the earth). Only the vertical may be accurately scaled for mapping purposes. Often a multilens camera is used to photograph one section vertically and the adjacent areas obliquely. The individual oblique exposures are then corrected, scaled, and joined to the vertical section to form one continuous photograph. A photograph formed by fitting together several overlapping vertical photographs is called a mosaic. By viewing two overlapping photographs through a stereoscope, a three-dimensional image of a region can be obtained. A reproduction of a photograph to which grid lines, place names, and the like have been added is called a photomap. In addition to its military uses, aerial photography has proved valuable in such fields as archaeology, geology, forestry, highway plotting and construction, mapping, and land conservation. See W. H. Baker, *Elements of Photogrammetry* (1960), Beaumont Newhall, *Airborne Camera* (1969), Grover Heiman, Jr., *Aerial Photography* (1972).

aerodynamics, study of gases in motion. As the principal application of aerodynamics is the design of aircraft, air is the principal gas with which the science is concerned. One of the phenomena studied in aerodynamics is the lift exerted on an aircraft's wings as they move through the atmosphere. BERNOULLI'S PRINCIPLE, which states that the pressure of a moving gas decreases as its velocity increases, has been used to explain the lift produced by a wing

having a curved upper surface and a flat lower surface. Since the flow is faster across the curved surface than across the plane one, a greater pressure is exerted in the upward direction. This principle, however, does not explain how an airplane can fly upside down. A more general explanation accounting for this phenomenon is that the wing of an aircraft in flight intersects the air at an angle that causes air to be deflected downward. It is easily shown that any heavier-than-air craft must divert air downward in order to stay aloft. It is almost as easily shown that a force that retards the forward motion of the aircraft is developed by diverting air in this way. This force is known as drag due to lift. It decreases with gains in speed and loss of altitude, for subsonic flight, i.e., at speeds less than the speed of sound, it decreases with increasing wingspan, while the reverse is true for supersonic flight, i.e., at speeds greater than the speed of sound. This explains the advantage of swept-back wings for supersonic flight and why some planes are designed with wings that can be fully extended for subsonic flight and swept back for supersonic flight. The slowing of air very near to the aircraft's surface results in a drag caused by friction, which can be reduced by making the surface area of the craft as small as possible. As speeds close to the speed of sound, or Mach 1, are approached, the compressibility of the air, negligible at lower speeds, becomes a factor. There is in the neighborhood of Mach 1 a large and sudden increase in drag, which has been called the sonic, or sound, barrier. While the practical problems that made this drag a barrier have been largely solved through the choice of proper shapes and the use of more powerful propulsion systems, the general phenomena associated with these speeds are still of interest to scientists. One of the troublesome phenomena still associated with supersonic flight is the SHOCK WAVE that trails after the craft. Odd as it may seem, no sound from an aircraft at supersonic speed is heard ahead of it, it literally outruns its own sound. It is also true that craft in supersonic flight experience aerodynamic forces in different locations than in subsonic flight. This can greatly alter the effects of controls. Early supersonic craft were often subject to control reversal, a condition in which a control had exactly the opposite effect from what was expected. Modern jet aircraft have been designed so that these conditions do not arise. For flight at hypersonic speeds, i.e., speeds five times or more the speed of sound, aircraft must be built to withstand the extremely high temperatures created by the air flowing along its surface. Aerodynamics is not solely concerned with flight, it is used in designing automobile bodies and trains for minimum drag and in computing wind stresses on bridges, buildings, smokestacks, trees, and the like. It is also used in charting flows of pollutants in the atmosphere and in determining frictional effects in gas ducts. The WIND TUNNEL is one of the aerodynamicist's basic experimental tools. See Theodore Von Karman, *Aerodynamics* (1963).

aeroembolism: see DECOMPRESSION SICKNESS

aerolite (ār'ālī'') see METEORITE

aeronautical engineering see ENGINEERING

aeronautics see AERODYNAMICS, AIRPLANE, AVIATION

aerosol (ār'ēsōl,-sōl) see COLLOID

aerosol dispenser, device designed to produce a fine spray of liquid or solid particles that can be suspended in a gas such as the atmosphere. The dispenser commonly consists of a container that holds under pressure the substance to be dispersed (e.g., paints, insecticides, medications, and hair sprays) and a liquefied-gas propellant. When a valve is released, the propellant forces the substance through an atomizer out of the dispenser in the form of a fine spray. These devices are more properly termed spray dispensers rather than aerosol dispensers because the particles of the dispersed substance are usually larger than the particles of a true aerosol, such as a fog or a smoke.

aerospace medicine see AVIATION MEDICINE, SPACE MEDICINE

aerovane (ār'ōvān'), WEATHER VANE with a propeller attached to measure wind speed. By means of a system of synchronous motors and electric circuitry, both wind direction and speed are monitored on a remote indicator. See WIND.

Aertsen or Aertzen, Pieter (both pē'tər art'sən), 1503?-1575, Dutch painter, b. Amsterdam. Aertsen painted genre scenes (see GENRE) that are lighthearted in spirit and realistic in style. He also painted religious subjects, including a few surviving altarpieces. Aertsen's works reveal his rich sense of color and attention to homely detail.

Aeschines (ē'skīnēz), c 390-314? B C, Athenian orator, rival of DEMOSTHENES. Aeschines rose from humble circumstances and became powerful in politics because of his oratorical gifts. At first he opposed Philip II of Macedon, then later changed sides, arguing that resistance to Macedonian power was useless. Both he and Demosthenes were members of the embassy to Philip in 348 B C, and afterward Demosthenes bitterly and baselessly accused Aeschines of accepting Macedonian bribes. He was to have been joined in his action by Timarchus, but Aeschines prevented this by his oration *Against Timarchus* (345 B C). Aeschines defended himself well in his oration *On the False Legation* (342 B C)—a title also used by Demosthenes in his accusatory oration. The trouble between the orators grew and culminated in a dispute over a gold crown that the orator Ctesiphon proposed should be given Demosthenes in 330 B C. Aeschines brought suit with *Against Ctesiphon*. Demosthenes replied with his sturdy defense *On the Crown*. Aeschines lost and was fined, and retired to Asia Minor where, according to Plutarch, he lived as a professional Sophist.

Aeschylus (ēs'kīlās, ēs'-), 525-456 B C, Athenian tragic poet, b. Eleusis. The first of the three great Greek writers of tragedy, he was the predecessor of SOPHOCLES and EURIPIDES. He fought at Marathon and at Salamis. In 476 B C he went to Sicily to live at the court of Hiero I, and he died at Gela. He wrote perhaps 90 plays (7 survive in full) and won 13 first prizes at the Greater Dionysia, the spring festival of Dionysus. In each case 4 connected plays were submitted (a tragic trilogy and a lighter satyr play). Aeschylus is often credited with the invention of tragedy, as tragedy previously had been merely a dialogue between a chorus and one actor—a dramatically limited form. Aeschylus added an actor, thus increasing the potentialities of his vehicle immeasurably. (Though only two actors and the chorus appeared on the stage at the same time, an actor often took more than one part.) Aeschylus introduced costumes, decorated his scene, and placed supernumeraries on the stage. By his supreme poetic ability and his piety he made Athenian tragedy more of an artistic and intellectual creation than it had been before. His choral lyrics are, at their best, rivals of the odes of Pindar. The choruses, more important in Aeschylus than in his successors, are both ethical commentaries on the action and the means for its presentation. Vivid in its character portrayal, majestic in its tone, and captivating in its lyricism, Aeschylus' tragic poetry is esteemed among the greatest of all time. He alone of Greek tragedians was honored at Athens by having his plays performed repeatedly after his death. His extant plays are hard to date. The earliest is probably *The Suppliants*, simple in plot (on the marriage of the 50 daughters of Danaus) and with only one actor besides the chorus. *The Persians* (472? B C), glorifying the Athenian victory over Persia at Salamis, has two actors, but the new form is still unpolished. *The Seven against Thebes* can be dated in 467. *Prometheus Bound* (see PROMETHEUS), of uncertain date, is striking for its bald attack on the vengefulness of the gods toward man, but the later two parts of its trilogy, which are lost, may have portrayed Zeus as just. The last three tragedies of Aeschylus compose the only extant ancient trilogy, called the *Oresteia*, a history of the house of Atreus, with which the poet won first prize in 458. The three plays are *Agamemnon*, *The Choephoroe* (The Libation Bearers), and *The Eumenides*, in each play three actors are used—an innovation of Sophocles. Because of its scope, complexity, and the profundity of its themes (the significance of human suffering and the true meaning of justice) the *Oresteia* as a whole is considered by many to be the greatest Attic tragedy. Browning's *Agamemnon* is a poetic translation of the first play, and Eugene O'Neill's *Mourning Becomes Electra* is an American version of the trilogy. The translation by David Grene and Richmond Lattimore in *The Complete Greek Tragedies* is one of many English translations of his plays. See studies by Gilbert Murray (1940), J. H. Finley (1955), A. J. Podlecki (1966), and M. H. McCall, ed. (1972).

Aesculapius: see ASCLEPIUS

Aesir (ē'sār) see GERMANIC RELIGION

Aesop (ē'sāp, ē'sōp), semilegendary Greek fabulist. According to Herodotus, he was a slave who lived in Samos in the 6th cent. B C and who was eventually freed by his master. Other accounts state that he was deformed, associate him with many wild adventures, and connect him with such rulers as Solon and Croesus. The fables called Aesop's fables were preserved principally through BABRIUS, PHAEDRUS,

and PLANUDES MAXIMUS. The most famous of these fables include "The Fox and the Grapes" and "The Tortoise and the Hare." See FABLE.

aesthetics (ēsthēt'iks), the branch of philosophy that is concerned with the nature of art and the criteria of artistic judgment. The classical conception of art as the imitation of nature was formulated by Plato and developed by Aristotle in his *Poetics*, while modern thinkers such as Immanuel Kant, F. W. Schelling, Benedetto Croce, and Ernst Cassirer have emphasized the creative and symbolic aspects of art. The major problem in aesthetics concerns the nature of the beautiful. Generally speaking there are two basic approaches to the problem of beauty—the objective, which asserts that beauty inheres in the object and that judgments concerning it may have objective validity, and the subjective, which tends to identify the beautiful with that which pleases the observer. Outstanding defenders of the objective position were Plato, Aristotle, and G. E. Lessing, and of the subjective position, Edmund Burke and David Hume. In his *Critique of Judgment*, Kant mediated between the two tendencies by showing that aesthetic judgment has universal validity despite its subjective nature. Among the modern philosophers interested in aesthetics, the most important are Croce, Robin Collingwood, Cassirer, John Dewey, and George Santayana. See K. E. Gilbert and Helmut Kuhn, *A History of Esthetics* (rev. ed. 1953, repr. 1972), M. C. Beardsley, *Aesthetics from Classical Greece to the Present* (1965), Harold Osborne, *Aesthetics and Art Theory* (1970), George Dickie, *Aesthetics: An Introduction* (1971).

aestivation (ē's'tāvā'shan) see HIBERNATION

Aeta: see PYGMY

Æthelbald (ē'thælbôld, ā'-), d. 757, king of Mercia (716-57), grandson of a brother of Penda. He spent many years in exile before he became king. A strong ruler, by 731 he controlled all England S of the Humber River, and he led expeditions into Northumbria (740) and against the Welsh (743). He was murdered by his own bodyguard.

Æthelbert (ē'thælbært, ā'-), d. 616, king of Kent (560?-616). Although defeated by the West Saxons in 568, he later became the strongest ruler in England S of the Humber River. His wife, Bertha, daughter of a Frankish king, was a Christian. Æthelbert received (597) the missionaries sent by Pope Gregory I to England and was converted by St. Augustine of Canterbury. The first Christian king in Anglo-Saxon England, he made his capital, Canterbury, a great Christian center. The code of laws issued by him is the earliest surviving document in the Anglo-Saxon vernacular.

Æthelbert, d. 865, king of Wessex (860-65), son of Æthelwulf. After the death of his father in 858 he ruled Kent, Surrey, Sussex, and Essex, and he reunited them with Wessex when in 860 he succeeded his brother Æthelbald in that kingdom. Throughout his reign the attacks of the Danes were severe, and they continued through the reign of his brother and successor, Æthelred.

Æthelflæd (ē'thælfled, ā'thælfled) or **Ethelfleda** (-flē'da), d. 918, daughter of King Alfred the Great of Wessex and wife of Æthelred, ealdorman of Mercia. After her husband's death in 911, she ruled the semi-independent Mercia alone and was known as the Lady of the Mercians. Campaigning with her brother, EDWARD THE ELDER, she helped to recover the Danish-held lands S of the Humber River. After her death Mercia was fully incorporated into the kingdom of Wessex.

Æthelfrith (ē'thælfriþ, ā'-), d. 616, king of Northumbria (c 593-616). He was the first great leader to arise among the northern English, and he ruled over both Bernicia and Deira, uniting them into the kingdom of Northumbria. He repulsed an attack by the Scots in 603 and about 10 years later defeated the Welsh at Chester. During Æthelfrith's lifetime (if not solely as a result of the battle of Chester) the English penetrated to the Irish Sea, thus separating the Welsh in Wales from the Welsh in SW Scotland. Æthelfrith forced his brother-in-law EDWIN, who was heir to the throne in the Deiran line, into a long exile. Edwin found a protector in Rædwald of East Anglia, who fought against Æthelfrith and killed him in battle at the Idle River near the present-day town of Nottingham.

Æthelmar of Valence: see AYMER OF VALENCE

Æthelred (ē'thælrēd, ā'-), d. 871, king of Wessex (865-71), son of Æthelwulf and brother of ALFRED. He succeeded his brother Æthelbert as king of Wessex and as overlord of Kent and possibly of East Anglia. Æthelred spent much of his short reign gather-

ing forces to oppose the Danes, who occupied York (866) and ravaged much of England. Alfred was important as his second in command in a series of battles (870-71) and succeeded him in April, 871. **Æthelred**, 965?-1016, king of England (978-1016), called Æthelred the Unready [from Old Eng. *un-ræd*=without counsel]. He was the son of Edgar and the half brother of EDWARD THE MARTYR, whom he succeeded. Æthelred began his reign under a cloud of suspicion because of the murder of Edward. He was a weak king, but his efforts to resist the Danes, who resumed their raids on England in 980, were also considerably hampered by the frequent treachery of his commanders. In 991 he began paying tribute to the Danes, which he raised by the DANEGELD, but his tributary status did not prevent the Danes from returning. In 997 they came not only to raid but to remain and plunder the rich realm until 1000. A massacre of Danes in England in 1002 (possibly on the king's order) provoked another major raid (1003) led by the Danish king SWEYN. Æthelred tried to defend his kingdom. In 1002 he married Emma, sister of Richard II, duke of Normandy, perhaps in an attempt to gain an ally, in 1007 the army was placed under a single commander, by 1009 a navy had been built, but many of its commanders took to piracy. A severe harrying (1009-12) by the Danes left England disorganized and without hope, and when Sweyn returned in 1013 to conquer, he was well received in the DANELAW, and London capitulated with little resistance. Æthelred fled to Normandy. Upon Sweyn's death in 1014, Æthelred's restoration was negotiated in the first recorded pact between an English king and his subjects. Sweyn's son, CANUTE, withdrew, but he returned with a powerful army in 1015. War was in progress when Æthelred died in April, 1016. His son EDMUND IRONSIDE was declared his successor, but after concluding a treaty with Canute, he died in November. Æthelred's heirs were restored to the throne only with EDWARD THE CONFESSOR.

Æthelstan: see ATHELSTAN

Æthelwulf (ē'thælwôlf, ā'-), d. 858, king of Wessex (839-56), son and successor of Egbert, father of Æthelbert, Æthelred, and Alfred. He was lord of Kent, Surrey, Sussex, and Essex before his father's death in 839. As king of Wessex he was compelled to defend his realm against constant Danish attacks, and he won a notable victory over them at Aclea in 851. He also campaigned against the Welsh. A man of great piety, he went with his son Alfred to Rome in 855. In 856 he took as his second wife Judith, daughter of Charles II (Charles the Bald) of France. Learning before his return to England that his son Æthelbald, who had ruled in his absence, would resist his resumption of the kingship, Æthelwulf left his son as king of Wessex and himself ruled only in Kent and its dependencies, where Æthelbert succeeded him.

aether: see ETHER, in physics and astronomy

Aetius (āē'shēās), d. 367, Syrian theologian. He became prominent (c 350) as an exponent of the extreme ARIANISM developed mainly by his secretary EUNOMIUS. Members of his party were called Aetians and Anomoeans.

Aetius, c 396-454, Roman general. At first unfriendly to VALENTINIAN III, he later made his peace with Valentinian's mother, GALLA PLACIDIA, and was given a command in Gaul. An ambitious general, he was embroiled in difficulties with his rival BONIFACE, who defeated him near Rimini in 432. Aetius went briefly into exile among the Huns but returned in 433 and rose to be the chief ruler of the Western Empire. He defeated the Germans in Gaul, then crowned his career by commanding (451) Roman and Visigothic troops in the repulse of Attila and the Huns in the battle near the modern Châlons-sur-Marne—a battle generally said to have saved the West. Valentinian, presumably jealous of Aetius' success, had him murdered.

Aetna, volcano. See ETNA, Italy.

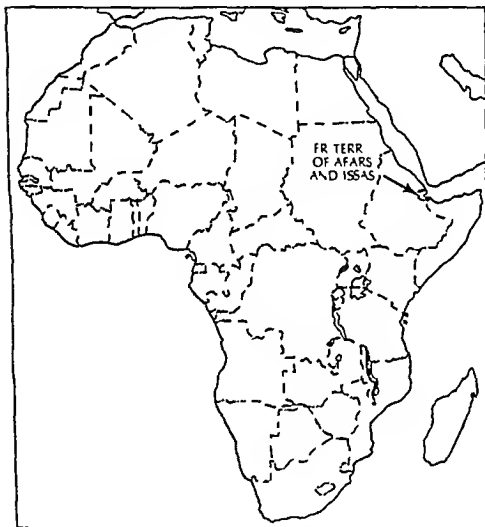
Aetolia (ētō'lyā), region of ancient Greece, N of the Gulf of Corinth and the Gulf of Calydon, E of the Achelous River (separating it from Acarnania). Little is known of the early population of Aetolia, but later Aetolians, though they had coastal cities, were primarily an inland farming and pastoral people. They had famous shrines at Calydon (to Artemis) and at Thermum (to Apollo). Aetolia was of little significance in Greek history until the rise of the AETOLIAN LEAGUE. After the downfall of that confederation, Aetolia was absorbed by the Romans into Achaea.

Aetolian League, confederation centering in the cities of Aetolia. It was formed in the 4th cent. B C.

and began to gain power in the 3d cent in opposing the ACHAEN LEAGUE and the Macedonians. At its height, the league stretched across Greece from sea to sea, including Locris, Malis, Dolopes, part of Thessaly, Phocis, and Acarnania. In alliance with the Romans, the Aetolians helped to defeat Philip V of Macedon at Cynoscephalae in 197 B.C. The Aetolians, dissatisfied, turned against Rome and allied themselves with Antiochus III of Syria. His defeat (189 B.C.) spelled the ruin of the league. Although formally it continued, its power had vanished.

Afanasyev, Aleksandr Nikolayevich (alyk'sän'där nykäl'i'ävich afäna'syäf), 1826-71, Russian folklorist. His collections, published from 1866 on, were instrumental in introducing Russian popular tales to world literature. A selection was translated into English as *Russian Fairy Tales* (1945).

Afars and the Issas, French Territory of the (äf'arz, ä'saz), overseas territory of France (1970 est. pop. 95,000), c. 8,500 sq mi (22,020 sq km), E Africa, on the Gulf of Aden. DJIBOUTI is the capital. It is bounded on the N and W by Ethiopia, on the S by the Somali Republic, and on the E by the Gulf of Aden. Largely a stony desert with isolated plateaus and highlands, it has a generally dry and torrid climate. The territory is economically underdeveloped, and nomadic pastoralism is the chief occupation; exports are hides, cattle, and coffee (transhipped from Ethiopia). Some revenue is derived from the port of Djibouti. Manufacturing is limited to shipbuilding and repair, building and construction, production of compressed or liquid gas, and the manufacture of foodstuffs. The population is almost evenly divided between Somali (Issas and others) and Afars, both of whom are Muslim. Strategically



situated, the territory commands the strait between the Gulf of Aden and the Red Sea. France first obtained a foothold there in 1862, French interest centered around Djibouti, the French commercial rival to Aden. By 1896 the present territory was organized as a colony. It remained a colony until 1946, at which time it became a territory within the French Union. Membership in the French Community followed in 1958. The political status of the territory was determined by a referendum in March, 1967, in which the Afar population, until then the group that had the lesser voice in government, gained political ascendancy with French support. The Afars opted for the continuation of the connection with France, whereas the Somalis voted for independence and eventual union with the Somali Republic. France retains control of foreign and defense matters. The territory was formerly known as French Somaliland. See V. M. Thompson and Richard Adloff, *Djibouti and the Horn of Africa* (1968), I. M. Lewis, *Peoples of the Horn of Africa* (1969), H. G. Marcus, *The Modern History of Ethiopia and the Horn of Africa* (1972).

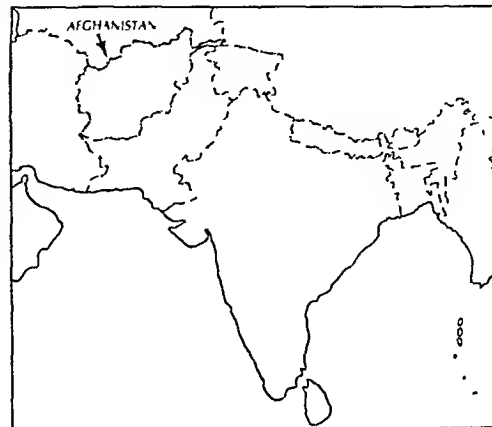
affenpinscher (äf'änpin'shar), breed of TOY DOG perfected in Europe at the end of the 19th cent. It stands from 8 to 10 in. (20.3-25.4 cm) high at the shoulder and weighs about 8 lb (3.6 kg). Its wiry coat is short and dense over most of the body, but grows longer and shaggier on the legs and around the eyes, nose, and chin. It is usually solid black or black with tan, red, or gray markings. Believed by many authorities to have existed as a distinct breed as early as the 17th cent., the affenpinscher is alert and lively and makes a devoted pet. See DOG.

affine geometry. see GEOMETRY

Afghan hound (äf'gän), breed of tall, swift hound originating about 5,000 years ago in ancient Egypt. Its modern ancestors were perfected in the northern part of Afghanistan and introduced into England after World War I. The Afghan hound stands between 24 and 28 in. (61-71 cm) high at the shoulder and weighs between 50 and 60 lb (22.7-27.2 kg). The long, silky coat is very fine in texture and may be any color. Its unique appearance is partly the result of the position of its hipbones, which are set wider apart and higher than in most other breeds. This hip conformation enables the Afghan to cover uneven country swiftly and contributes to its effectiveness as a sight hunter in the mountainous terrain of its native Afghanistan. Today it is rapidly gaining popularity as a house pet. See DOG.

Afghanistan (äfgän'istän', äfgän'istan'), republic (1973 est. pop. 18,100,000), 249,999 sq mi (647,497 sq km), S central Asia. The capital is KABUL. Afghanistan is bordered by Iran on the west, by Pakistan on the east and south, and by the USSR on the north. A narrow strip, the Vakhān, extends in the northeast to touch Kashmir and the Sinkiang Uigur Autonomous Region of China. The great mass of the country is steep-sloped with mountains, the ranges fanning out from the towering Hindu Kush (reaching a height of more than 24,000 ft/7,315 m) across the center of the country. There are, however, within the mountain ranges and on their edges, many fertile valleys and plains, with fields of wheat, corn, barley, and rice, and orchards yielding fine fruits, such as the famous peaches and grapes of KANDAHAR. In the south, and particularly in the southwest, are great stretches of desert, including the regions of Seistan and Registan. To the north, between the central mountain chains (notably the Selseleh-ye Kuh-e Baba, or Koh-i-Baba, and the Paropamisus) and the Amu Darya (Oxus) River, which marks part of the boundary with the USSR, are the highlands of Badakhshan (with the finest lapis lazuli in the world), Afghan Turkistan, the Amu Darya plain, and the rich valley of HERAT on the Hari Rud (Arius) River in the northwest corner of the country (the heart of ancient ARIANA). The regions thus vary widely, although most of the land is dry. The rivers are mostly unnavigable, the longest is the Helmand, which flows generally southwest from the Hindu Kush to the Iranian border. Its water has been used since remote times for irrigation, as have the waters of the Hari Rud and of the Amu Darya. The Kabul River, on which the capital stands, is particularly famous because it leads to the Khyber Pass and thus S to India. This has been the traditional route of conquerors, and the incursions of various invaders from prehistoric days until relatively recent times has helped to make the population of present-day Afghanistan almost as variegated as its regions. Tadjiks live around Herat, Uzbeks and nomadic Turkmen in the Vakhān. In the central mountains are the Hazararas, of Mongolian origin. In the east and south are the Afghans and their almost indistinguishable kinsmen, the Pathans (a name used particularly for those in the North-West Frontier Province of Pakistan). There are many other groups in Afghanistan, but Afghan and Iranian are the country's principal languages. A unifying factor is religion, almost all the inhabitants being Muslim, the large majority are Sunni, the minority (perhaps numbering as many as a million), Shiite. Agriculture is the main occupation, but less than 10% of the land is cultivated. Grazing is also of great importance in the economy, the fat-tailed sheep, a staple of Afghan life, supplies skins and wool for clothing and meat and fat for food. Fine horses are the pride of many tribesmen. Mineral wealth is being developed, and there are deposits of iron ore, coal, copper, and sulfur, oil and natural gas fields are found in the north. Industry is still only in the beginning stages. Cotton and other fabrics, cement, and processed agricultural goods are the main products. Fruits and lambskins (Karakul) are the main exports, manufactured goods and foodstuffs the main imports. Imports greatly exceed exports. The USSR, India, the United States, and Japan are the chief trading partners. Road communications are good, but there are no railroads. There are universities at Kabul (1933) and JALALABAD (1963). **History.** The location of Afghanistan astride the land route to India has enticed conquerors throughout history. But its high mountains, while hindering unity, have helped the hill tribes to preserve their independence. It is probable that there were well-developed civilizations in S Afghanistan in prehistoric times, but the archaeological record is not clear. Certainly cultures had flourished in the north and east before Darius I (c. 500 B.C.) by conquest

annexed these areas to the Persian Empire. Later, Alexander the Great conquered (329-327 B.C.) them on his way to India. After Alexander's death (323 B.C.) the region at first was part of the Seleucid empire. In the north, BACTRIA became independent, and the south was acquired by the MAURYA dynasty. Bactria expanded southward but fell (mid-2d cent. B.C.) to the Parthians and rebellious tribes (notably the Saka). Buddhism was introduced from the east by the Yüechi, who founded the Kushan dynasty (early 2d cent. B.C.). Their capital was PESHAWAR. The Kushans declined (3d cent. A.D.) and were supplanted by the Sassanids, the Mongol Epthalites, and the Turkish Tu-Kiue. The Arab conquest of Afghanistan began in the 7th cent. Several short-lived Muslim dynasties were founded, the most powerful of them having its capital at GHAZNI. MAHMUD OF GHAZNI, who conquered the lands from Khurasan in Iran to the Punjab in India early in the 11th cent., was the greatest of Afghanistan's rulers. Jenghiz Khan (c. 1220) and Tamerlane (late 14th cent.) were subsequent conquerors of renown. BABUR, a descendant



of Tamerlane, used Kabul as the base for his conquest of India and the establishment of the Mogul empire in the 16th cent. In the 18th cent. the Persian NADIR SHAH extended his rule to N of the Hindu Kush. After his death (1747) his lieutenant, AHMAD SHAH, an Afghan tribal leader, established a united state covering most of present-day Afghanistan. His dynasty, the Durani, gave the Afghans the name (Durani) that they themselves frequently use. The reign of the Durani line ended in 1818, and no predominant ruler emerged until DOST MUHAMMAD became emir in 1826. During his rule the status of Afghanistan became an international problem, as Britain and Russia contested for influence in central Asia. Aiming to protect the northern approaches to India, the British tried to replace Dost Muhammad with a former emir, subordinate to them. This policy caused the first Afghan War (1838-42) between the British and the Afghans. Dost Muhammad was at first deposed but, after an Afghan revolt in Kabul, was restored. In 1857, Dost Muhammad signed an alliance with the British. He died in 1863 and was succeeded, after familial fighting, by his third son, SHER ALI. As the Russians acquired territory bordering on the Amu Darya, Shere Ali and the British quarreled, and the second Afghan War began (1878). Shere Ali died in 1879. His successor, Yakub Khan, ceded the Khyber Pass and other areas to the British, and after a British envoy was murdered the British occupied Kabul. Eventually ABD AR RAHMAN KHAN was recognized (1880) as emir. In the following years Afghanistan's borders were more precisely defined. Border agreements were reached with Russia (1885 and 1895), British India (the Durand Agreement, 1893), and Persia (1905), although the line with what is now Pakistan remained disputed. The Anglo-Russian agreement of 1907 guaranteed the independence of Afghanistan under British influence in foreign affairs. Abd ar-Rahman Khan died in 1901 and was succeeded by his son Habibullah. Despite British pressure, Afghanistan remained neutral in World War I. Habibullah was assassinated in 1919. His successor, AMANULLAH, attempting to free himself of British influence, invaded India (1919). This third Afghan War was ended by the Treaty of Rawalpindi, which gave Afghanistan full control over its foreign relations. The attempts of Amanullah (who, after 1926, styled himself king) at westernization—including reducing the power of the country's religious leaders and increasing the freedom of its women—provoked opposition that led to his deposition in 1929. A tribal leader, Bacha-i Saka, held

Africa, second largest continent, c 11,677,240 sq mi (30,244,050 sq km) including adjacent islands, 1971 est pop 354,000,000. Broad to the north (c 4,600 mi/7,400 km wide), Africa straddles the equator and stretches c 5,000 mi (8,050 km) from Cape Blanc (Tunisia) in the north to Cape Agulhas (South Africa) in the south. It is connected with Asia by the Sinai Peninsula (which is crossed by the Suez Canal) and is bounded on the N by the Mediterranean Sea, on the W and S by the Atlantic Ocean, and on the E and S by the Indian Ocean. The largest offshore island is Madagascar (see MALAGASY REPUBLIC), other islands include St Helena and Ascension in the S Atlantic Ocean, São Tome, Principe, Annobon, and Fernando Póo in the Gulf of Guinea, the Cape Verde, Canary, and Madeira islands in the N Atlantic Ocean, and Mauritius, Reunion, Zanzibar, Pemba, and the Comoro and Seychelles islands in the Indian Ocean. Most of Africa is a stable, ancient plateau that has been warped into a series of basins, low in the north and west and higher (rising to more than 6,000 ft/1,830 m) in the south and east. The plateau is composed mainly of metamorphic rock that has been overlaid in places by sedimentary rock. The escarpment of the plateau is in close proximity to the coast, thus leaving the continent with a generally narrow coastal plain, in addition, the es-



carpment forms a barrier of falls and rapids in the lower course of rivers that impedes their use as transportation routes into the interior North Africa, a region composed mainly of folded sedimentary rock, is, geologically, more closely related to Europe than to the rest of Africa, the Atlas Mts., which occupy most of the region, are a part of the Alpine mountain system of S Europe. The entire African continent is surrounded by a narrow continental shelf. The lowest point on the continent is 436 ft (133 m) below sea level in the Qattarah Depression, NW Egypt, the highest point is Mt. Kibo (19,340 ft/5,895 m), a peak of Kilimanjaro in NE Tanzania. From north to south the principal mountain ranges of Africa are the Atlas Mts. (rising to more than 13,000 ft/3,960 m), the Ethiopian Highlands (rising to more than 15,000 ft/4,570 m), the Ruwenzori mts. (rising to more than 16,000 ft/4,880 m), and the Drakensberg Range (rising to more than 11,000 ft/3,350 m). The continent's largest rivers are the Nile (the world's longest river), the Congo (or Zaïre), the Niger, the Zambezi, the Orange, the Limpopo, and the Senegal. The largest lakes are Victoria Nyanza (the world's second largest freshwater lake), Tanganyika, Albert, Rudolf, and Nyasa (or Malawi), all in E Africa, shallow Lake Chad, the largest in W Africa, shrinks considerably in the dry season. The lakes and major rivers (most of which are navigable in stretches above the escarpment of the plateau) form an important inland transportation system. Geologically, recent major earth disturbances have been confined to areas of NW and E Africa. Geologists have long noted the excellent fit (in shape and geology) between the coast of Africa at the Gulf of Guinea and the Brazilian coast of South America, and they now have evidence that Africa formed the center of a large ancestral supercontinent known as Pangaea. Pangaea began to break apart in the Jurassic period to form Gondwanaland, from which Africa, the other southern continents, and India were formed. South America was separated from Africa c 76 million years ago, when the floor of the S Atlantic Ocean was opened up by sea-floor spreading, Madagascar was separated from it c 65 million years ago, and Arabia was separated from it c 20 million years ago, when the Red Sea was formed. There is also evidence of one-time connections between NW Africa and E North America, N Africa and Europe, Madagascar and India, and SE Africa and Antarctica. Similar large-scale earth movements (see PLATE TECTONICS) are also believed responsible for the formation of the GREAT RIFT VALLEY of E Africa, which is the continent's most spectacular land feature. From c 40 to c 60 mi (60–100 km) wide, it extends in Africa c 1,800 mi (2,900 km), from the Red Sea to near the mouth of the Zambezi River, the eastern branch of the rift valley is occupied in sections by lakes Nyasa and Rudolf, and the western branch, curving north from Lake Nyasa, is occupied by lakes Tanganyika, Kivu, Edward, and Albert. The lava flows of the recent and subrecent epochs in the Ethiopian Highlands, and volcanoes farther south, are associated with the rift, among the principal volcanoes are Kilimanjaro, Kenya (now extinct), Nyamulagira, Elgon, Meru, and the Virunga range with Mt. Karisimbi. A less spectacular rift, the Cameroon Rift, is associated with volcanic activity in W Africa and trends NE from St. Helena Island to São Tome, Principe, Fernando Poo, and near the Tibesti Massif in the Sahara. Africa's climatic zones are largely controlled by the continent's location astride the equator and its almost symmetrical extensions into the northern and southern hemispheres. Thus, except where altitude exerts a moderating influence on temperature or precipitation (permanently snow-capped peaks are found near the equator), Africa may be divided into six general climatic regions. Areas near the equator and on the windward shores of SE Madagascar have a tropical rain forest climate, with heavy rain and high temperatures throughout the year. North and south of the rain forest are belts of tropical savanna climate, with high temperatures all year and a seasonal distribution of rain during the summer season. The savanna grades poleward in both hemispheres into a region of semiarid steppe (with limited summer rain) and then into true desert conditions in the extensive Sahara (north) and the smaller Kalahari (south). Belts of semiarid steppe with limited winter rain occur on the poleward sides of the desert regions. At the northern and southern extremities of the continent are narrow belts of Mediterranean type climate with subtropical temperatures and a concentration of rainfall mostly in the autumn and winter months. African peoples, who account for about 10% of the world's population, are divided into more than 50 different

political units and are further fragmented into a larger (and disputed) number of linguistic and cultural groups. The Sahara forms a great ethnic divide. North of it Caucasoids, mostly Arabs along the coast and Berbers, Tuareg, and Tibbu in the interior regions, predominate. The southern (or sub-Saharan) sections of the continent are occupied by a diverse group of predominantly Negroid peoples, mostly Bantu-speaking (see AFRICAN LANGUAGES). Numerous other groups, of mixed and often disputed origin, occupy transitional areas S of the Sahara and include, among others, the Mossi, Fulani, Yoruba, Ibo, Masai, and Hausa. Europeans are concentrated in areas with subtropical climates or tropical climates modified to temperate by altitude, in the south are persons of Dutch and British descent and in the northwest are persons of French, Italian, and Spanish descent. Indians are an important minority in many coastal towns of S and E Africa. As a whole, Africa is sparsely populated, the highest densities are found in the lower Nile valley, along the Guinea coast, around Victoria Nyanza, along the coast of E Africa S of Mombasa, and along the Mediterranean fringe of NW Africa. The principal cities of Africa are usually the national capitals and the major ports, and they usually contain a disproportionately large percentage of the national populations, Cairo, Alexandria, Johannesburg, Casablanca, and Algiers are the largest cities of Africa. About three quarters of Africa's population is rural, but, except for cash crops, such as cacao and groundnuts (peanuts), agricultural production is low by world standards. Africa produces three quarters of the world's cocoa beans and about one third of its groundnuts, but only small percentages of the world's corn, wheat, meat, and eggs. Rare and precious minerals (including most of the world's diamonds) are abundant in the continent's ancient crystalline rocks, which are found mostly to the south and east of a line from the Gulf of Guinea to the Sinai Peninsula, extensive oil, gas, and phosphate deposits occur in sedimentary rocks to the north and west of this general line. Manufacturing is concentrated in the Republic of South Africa and in N Africa (especially Egypt and Algeria), with only small-scale production in the other countries. Despite Africa's enormous potential for hydroelectric power production, only a small percentage of it has been developed. Africa's fairly regular coastline affords few natural harbors, and the shallowness of coastal waters makes it difficult for large ships to approach the shore, deepwater ports, protected by breakwaters, have been built offshore to facilitate commerce and trade. Major fishing grounds are found over the wider sections of the continental shelf as off NW, SW, and S Africa and NW Madagascar.

Outline of History Africa's history is long, complex, and only partly known. Man's oldest ancestor, discovered (1959) by Louis S. B. Leakey, the British anthropologist, lived in E Africa's Olduvai Gorge at least 1,750,000 years ago, agriculture, brought from SW Asia, appears to date from the 6th or 5th millennium B.C. Africa's first civilization began in Egypt in 3400 B.C., other ancient centers were Kush and Aksum. Phoenicians established Carthage in the 9th cent. B.C. and probably explored the northwestern coast as far as the Canary Islands by the 1st cent. B.C. Romans conquered Carthage in 146 B.C., controlled N Africa until the 4th cent. A.D., and, in the 1st or 2nd cent. A.D., were probably the first Europeans to cross the Sahara into tropical Africa. Arabs began their conquest in the 7th cent. and, except in Ethiopia, extended Arabic and the religion of Islam across N Africa and S across the Sahara into the great medieval kingdoms of the W Sudan. The earliest of these kingdoms, which drew their wealth and power from the control of a lucrative trans-Saharan trade in gold, salt, and slaves, was ancient Ghana, already thriving when first recorded by Arabs in the 8th cent. In the 13th cent. Ghana was conquered and incorporated into the kingdom of ancient Mali, famous for its gold and its wealthy capital of Timbuktu. Mali in turn was conquered and incorporated into the Songhai empire in the late 15th cent. There are few written accounts of the interior of the continent before 1500, but it appears from available evidence that the original San, Pygmy, and Azanian inhabitants were displaced beginning in the 1st cent. A.D. by the Bantu, a group of black African peoples speaking related languages. The Bantu spread over most of the continent south of the equator, probably from an original homeland in modern S Zaïre, and established small villages and, in places, powerful kingdoms, such as Kongo, Mwata Yamvo, and Monomotapa. Prior to 1500 pastoralists moved south until they encountered the various

Bantu groups and founded the kingdom of Kitara in the 16th cent. and, subsequently, the kingdoms of Bunyoro, Buganda, Rwanda, and Ankole, all of which had elaborate social structures based on a cattle-owning aristocracy with Bantu serfs. The Portuguese began to explore the coasts of Africa in the 15th cent. in an attempt to establish a safe route to India and to tap the lucrative gold trade of the Sudan and the east coast trade in gold, slaves, and ivory conducted for centuries by Arabs, Persians, and Indians. In 1488, Bartolomeu Dias rounded the Cape of Good Hope, in 1498, Vasco da Gama reached the east coast and, the following year, India. In the centuries that followed, coastal trading stations were established by Portugal and later by the Dutch, English, French, and other European maritime powers, under them the slave trade rapidly expanded. At the same time Ottoman Turks extended their control over N Africa and the shores of the Red Sea, and the Omani Arabs established suzerainty over the east coast as far south as Cape Delgado. Before 1800 few Europeans had penetrated the interior of the continent, and Africa was largely controlled by numerous African states, some of whom were weakened and some strengthened by European intervention. Explorations in the 18th and 19th cent. by Mungo Park, James Bruce, John Speke, David Livingstone, Henry Stanley, Heinrich Barth, and others reported the great natural wealth of the continent. Between 1880 and 1912 all of Africa except Liberia and Ethiopia passed under the control or protection of European powers, the boundaries of the new colonies and protectorates often bearing no relationship to the realities of geography or to the political and social organization of the indigenous population. This created a major problem throughout the continent, continuing during independence, when some governments sought to control the movement of peoples across political boundaries in an attempt to assimilate various ethnic groups into national units. This resulted in refugee movements, often of massive proportions, as one group fled the domination of another or as members of a group, scattered throughout a region, sought to concentrate in one area and thereby strained local resources—these movements taking place both within national boundaries and across them. In the northwest and west, France ultimately acquired regions that came to be known as French West Africa, French Equatorial Africa, and the French Cameroons, and established protectorates in Algeria, Morocco, and Tunisia. Other French territories were French Somaliland, French Togoland, Madagascar, and Reunion. The main group of British possessions was in E and SE Africa, it included the Anglo-Egyptian Sudan, British Somaliland, Uganda, Kenya, Tanganyika (after World War I), Zanzibar, Nyasaland, Northern and Southern Rhodesia, Bechuanaland, Basutoland and Swaziland. Following Britain's victory in the South African War (1899–1902), its South African possessions (Transvaal, Orange Free State, Cape Colony, and Natal) became a dominion within the British Commonwealth of Nations. Gambia, Sierra Leone, the Gold Coast, and Nigeria were British possessions on the west coast. Portugal's African empire was made up of Portuguese Guinea, Angola, and Mozambique, in addition to various enclaves and islands on the west coast. Belgium held the Belgian Congo and, after World War I, Ruanda-Urundi. The Spanish possessions in Africa were the smallest, being composed of Spanish Guinea, Spanish Sahara, Ifni, and the protectorate of Spanish Morocco. The extensive German holdings—Togoland, the Cameroons, German South-West Africa, and German East Africa—were lost after World War I and redistributed among the Allies. Italy's empire included Libya, Eritrea, Italian Somaliland, and, briefly after 1936, Ethiopia. The Union of South Africa was formed and became virtually self-governing in 1910, Egypt achieved a measure of sovereignty in 1922, and in 1925, Tangier, previously attached to Morocco, was made an international zone. Beginning in 1950, in the face of rising nationalism, the former colonies and protectorates were granted independence by all the European powers except Portugal, which began to grant its territories independence in 1974. The sequence of change included independence for Libya in 1951, independence for Eritrea in 1952 in a federation with, and in 1962 merged with, Ethiopia, in 1956 independence for Morocco, Sudan, and Tunisia and the return of Tangier to Morocco, in 1957 independence for Ghana, in 1958 independence for Guinea and the return of Spanish Morocco to Morocco. In 1960 independence was granted to the former French colonies of Cameroon, the Central African Republic, Chad, Republic of the Congo—

Brazzaville (renamed People's Republic of the Congo in 1970), Dahomey, Gabon, Ivory Coast, the Malagasy Republic, Mali (briefly merged in 1959-60 with Senegal as the Sudanese Republic), Mauritania, Niger, Senegal, and Upper Volta, also newly independent in 1960 were the Republic of the Congo (renamed Zaire in 1971), Nigeria, Somali Democratic Republic, and Togo. In 1961, Sierra Leone and Tanganyika (renamed Tanzania in 1964) became independent, the Portuguese enclave of São João Baptista de Ajudá was seized by Dahomey, the former British Cameroons were divided between Nigeria and the Republic of Cameroon (thereafter the Federal Republic of Cameroon and, in 1972, renamed the United Republic of Cameroon), and the Union of South Africa became a republic. In 1962, Uganda, Algeria, Rwanda, and Burundi became separate and independent nations. Remaining British possessions after 1962 were Zanzibar, which gained independence in 1963 and joined with Tanganyika to form Tanzania in 1964, Gambia and Kenya, which became independent in 1963, Malawi (formerly Nyasaland) and Zambia (formerly Northern Rhodesia), independent in 1964, Lesotho (formerly Basutoland) and Botswana (formerly Bechuanaland), independent in 1966, and Mauritius and Swaziland, independent in 1968. Rhodesia (formerly Southern Rhodesia) unilaterally declared itself independent in 1965, but Great Britain termed the act illegal and imposed trade sanctions against the country, the UN Security Council ordered a trade embargo in 1968. In the mid-1970s Great Britain retained control of the islands of St. Helena, Ascension, and the Seychelles and Dependencies. Remaining French territories included the Comoro Islands, Reunion, and the French Territory of the Afars and the Issas (formerly French Somaliland), which elected in a referendum (1967) to remain French. In 1968, Spain granted independence to Equatorial Guinea, including Rio Muni on the mainland and the islands of Fernando Poo and Annobon, and in 1969 returned Ifni to Morocco, it retained the Canary Islands, Spanish Sahara, and Ceuta and Melilla, two small enclaves on Morocco's coast. Portugal retained most of its territories, including Angola, Cabinda, Mozambique, Portuguese Guinea, Cape Verde Islands, and the islands of São Tomé and Príncipe until the early 1970s, in 1974 Portuguese Guinea became independent as Guinea-Bissau, and Mozambique was scheduled to become independent in mid-1975. South West Africa (Namibia) has been administered by South Africa since 1922 under an old League of Nations mandate, South Africa's continued administration of the territory was declared illegal by the UN Security Council in 1970 and by the International Court of Justice in 1971. The African states wield considerable voting power in the UN General Assembly, where, in the mid-1970s, they made up about one third of the membership. Recognition among the new states that greater power was to be found in increased unity and cooperation has aided the cause of Pan-Africanism, and in 1963 at Addis Ababa the Organization of African Unity was established. The most pressing problems facing new African states are their need for aid for the development of natural resources, for education, and for the improvement of living standards, threats of secession and military coups, and shifting alliances among the states and with outside powers. Beginning in the late 1960s and continuing through the mid-70s, a severe drought desiccated the Sahel region S of the Sahara. The drought, along with belated and sporadic heavy rainfall that did more harm than good, had a particularly devastating effect on the people and economy of Senegal, Mauritania, Mali, Upper Volta, Niger, N. Nigeria, the Sudan, and Ethiopia. Along with the resulting famine, disease, and poverty, it caused the death of thousands of people and forced the southward migration of additional hundreds of thousands to areas less affected by the drought. See separate entries on individual African states. See Raymond Furon, *Geology of Africa* (tr 1963), R. I. Rotberg, *A Political History of Tropical Africa* (1965), Basil Davidson, *Africa: History of a Continent* (1966), Anthony Silley, *Africa: A Social Geography* (2d ed 1972), J. F. A. Ajayi and Michael Crowder, *History of West Africa* (2 vol., 1972 and 1973), G. S. P. Freeman-Greville, *Chronology of African History* (1974), W. A. Hance, *The Geography of Modern Africa* (rev ed 1975).

African art, traditional art created by the peoples S of the Sahara. The predominant art forms are masks and figures, which were generally used in religious ceremonies. The decorative arts, especially in textiles and in the ornamentation of everyday tools, were a vital art in nearly all African cultures. Estab-

lished forms had evolved long before the arrival (late 15th cent.) of the Portuguese in Africa, but because of its perishable nature little work that is more than 150 years old has survived. No effort was made to preserve these works, as their creators valued them for ritual use rather than for aesthetic accomplishment. Wood—often embellished by clay, shells, beads, ivory, metal, feathers, and shredded raffia—was the dominant material. The discussion here is limited to the works of the peoples of W and central Africa—the regions richest in indigenous art. **Western Sudan and Guinea Coast.** Here the style of wood carving is highly abstract. Distortion is often used to emphasize features of cultic significance. The figures of the Dogon tribe of central Mali stress the cylindrical shape of the torso. The Bambara of W Mali are famous for their striking wooden head-dresses in the form of stylized antelope heads. The art of the Baga of NW Guinea includes snake carvings, drums supported by small free-standing figures, and spectacular masks. The Poro society of Liberia made ceremonial masks notable for their massiveness, color, and vitality of expression. The Baule of the Ivory Coast created figurines to house the spirits of the dead or to represent their gods. These have precise renderings in high relief of ornate hairdresses and scarification patterns (see BODY-MARKING). The art of the Guro of the Ivory Coast consists almost entirely of human masks and of weaving pulleys. Guro figures are characterized by slanting eyes and a carved zig-zag design just above the forehead. The southern groups of the Senufo of the Ivory Coast produced an art akin to that of the Baule, but more simplified and geometric. Senufo masks represent human features with geometric projections and have legs jutting out from each side of the face. The ASHANTI kingdom of Ghana employed (18th and 19th cent.) a system of brass weights based on a unit that was used to weigh gold dust, the state currency. These weights are small figures, many less than 2 in. (5.1 cm) high, which were cast in the CIRE PERDUE (lost wax) process indigenous to many W African regions. They portray simplified human and animal forms with a spontaneity unusual in African art. The sculptors of Dahomey also cast (16th-19th cent.) figures in brass by the cire perdue process. Their work is notable for its naturalism and finely chased metal surfaces. Figures are shown in everyday activities. This art was purely aesthetic, and the statues were reserved for the enjoyment of royalty.

Nigeria. From the north, the remarkable Nok terra-cotta heads, most of them fragments of figures, are the earliest African sculpture yet found (c. 500-200 B.C.). Characteristic are the impressive simplification of facial features and the pierced pupils of the eyes. The art of S. Nigeria reveals considerable contrast. Yoruba work is often brilliantly polychromed. The world-famous Ife portrait heads in bronze and terra-cotta are unique in Africa because of their naturalistic detail, perfection of modeling, and control over the cire perdue process. Nothing certain is known of the artistic sources or, in fact, of the culture that produced them. The art of BENIN arose from the needs of the royal household. It was largely commemorative, ritualistic, and ceremonial in function. Models of human heads were considered to be reincarnations of past kings, or Obas, and held to be divine. Abundant descriptive detail and sharp, precise lines are characteristic of Benin art. The Ibo, Ibibio, Ekoi, and Ijaw of SE Nigeria carved wooden masks for use in their rites and secret societies. Ibo masks were modeled after human skulls, with deep eye sockets, carved exposed teeth, and emaciated faces. On the banks of Middle Cross River are about 300 monolithic carvings, supposedly Ekor ancestor figures from between 1600 and 1900.

Cameroon. The small tribes of the Cameroon grasslands display a fairly homogeneous style. Sculpture is bold in execution and vital in expression. Wood carvings include large house posts, masks, and other ritual objects.

Gabon. Among the Fang tribes, the decorative motifs on stringed musical instruments, drums, and spoons emphasize the human figure, often elongated with smooth surface planes. Some figures are said to act as guardian spirits over ancestors whose bones are kept in boxes. The art of the Bakota tribes consists almost entirely of highly stylized wood and metal figurines that were placed in reliquaries.

The Congo Region. The sculpture of the Bakongo kingdom is usually characterized by naturalism. Each of the ancestor figures represents a personalized portrait and reveals details of body decoration and dress. The best-known art works of the Bateke of the W Congo are small fetish figures. These asex-

ual figures stand with arms close to the body in a stiff, frontal pose. The Bapende sculptors of the W Congo give a fluid surface to their ivory pendants, which portray human faces. In the Bushongo kingdom statues of royalty were carved (17th to 19th cent.). The king was shown in a pose of static aloofness, wearing a flat crown and often holding a ritual sword. The Basonge of the central Congo carved small, standing fetish figures and masks, bold in proportion and suggestive of cubism. The Baluba of the SE Congo produced bowls and stools supported by slender figures. Small ivory masks and neck rests were made in the E Congo. The art of the Badjokwe of S. Congo and Angola consists of free-standing figures, ceremonial staff heads, masks, and carved stools. The dynamic and aggressive figures are particularly outstanding.

Influence. African art came to European notice c. 1905, when artists began to recognize the aesthetic value of African sculpture. Such artists as Vlaminck, Derain, Picasso, and Modigliani were influenced by African art forms. In the United States, fine collections of African art can be found in the Museum of Primitive Art, New York, the Natural History Museum, Chicago, the Peabody Museum, Harvard, and the Univ. Museum at the Univ. of Pennsylvania. See general books on African art by Pierre Meauze (1968), Michel Leiris and Jacqueline Delange (tr 1968), Frank Willett (1971), Ely Leuzinger (tr 1972), M. W. Mount (1973), and W. L. D'Azevedo, ed (1973).

African buffalo see CAPE BUFFALO

African languages, geographic rather than linguistic classification of languages spoken on the African continent. These languages do not belong to a single family, but are divided among several distinct linguistic stocks having no common origin. It is estimated that more than 800 languages are spoken in Africa, however, they belong to comparatively few language families. Some 50 African tongues have more than half a million speakers each, but many others are spoken by relatively few people. Unlike the American Indian languages, which on the whole seem to be dying out, the African tongues appear vigorous. In the last few decades great strides have been made in the study and classification of the African languages, although the results are still far from definitive. The principal linguistic families of Africa are now generally said to be HAMITO-SEMITIC (recently renamed Afroasiatic in some scholarly circles), Niger-Kordofanian (including Niger-Congo), Nilo-Saharan, and Khoisan, or Click, two other stocks, INDO-EUROPEAN and MALAYO-POLYNESIAN, are also represented. Niger-Kordofanian and Nilo-Saharan are the two large families of languages native to about 160 million inhabitants of Africa and spoken exclusively by Negroes. These languages are spoken in all parts of the continent, from the extreme south up to the territory of the Hamito-Semitic languages of N. Africa. The Hamito-Semitic, or Afroasiatic, family has both Caucasian and Negro speakers, while the San and Khoikhoi, who are the principal speakers of the Khoisan languages, belong to a different race from that of the Negroes. Some authorities believe that the languages spoken in the Niger-Kordofanian and Nilo-Saharan families are sufficiently similar to suggest that both stocks had the same ancestor language.

Niger-Kordofanian. The largest language stock of the African Negroes, the Niger-Kordofanian family has two branches, Niger-Congo and Kordofanian. The Kordofanian tongues are spoken in the Sudan and form five small groups (Koalib, Tegali, Talodi, Tumtum, and Katla). Niger-Congo is an enormous branch whose languages are found throughout S and central Africa and in most of W Africa below the Sahara. It is generally subdivided into six groups: West Atlantic, Mande, Gur, or Voltaic, Kwa, Benue-Congo, and Adamawa-Eastern. The West Atlantic branch includes many languages, among them Wolof (in Senegal), Temne (in Sierra Leone), and Fula, the tongue of several million people inhabiting an area from Senegal to a region E of Lake Chad. The Mande group consists of languages prevalent in the Niger valley, Liberia, and Sierra Leone, such as Mende in Liberia and Malinke in Mali. Gur, or Voltaic, is made up of several language groups and includes Mossi, the dominant tongue of Upper Volta, as well as the Dagomba and Mamprusi of N. Ghana. The Kwa languages, spoken chiefly in Ghana, Ivory Coast, Dahomey, Nigeria, and Liberia, include Ewe, Yoruba, Ibo, Nupe, Bini, Ashanti, and possibly Ijo (which is sometimes considered a separate branch). Benue-Congo includes the huge Bantu group of hundreds of tongues found throughout central and S Africa (see BANTU LANGUAGES), as well as such non-

Bantu languages as Tiv, Jukun, and Efik, which are spoken in Nigeria and Cameroon. The Adamawa-Eastern branch, to which Banda, Zande, and Sango belong, is composed of a number of languages spoken in Nigeria, Cameroon, and an area north of the Bantu territory to the Sudan. A characteristic feature of most of the Niger-Congo languages is the use of tones. Case inflection is entirely lacking, and sex/gender is almost unknown in the Niger-Congo family. The verb root tends to remain unchanged, moods and tenses are denoted either by particles or by auxiliary verbs. For example, in a number of languages the verb "to come" is the auxiliary designating the future. Typical of the Niger-Kordofanian stock as a whole is the division of nouns, which has been compared to the gender system of the Indo-European tongues. However, Indo-European features only three classifications (masculine, feminine, and neuter), whereas some of the Niger-Kordofanian languages have as many as 20 noun classes. The formal basis for these class divisions is not known, except that one class designates human beings, another is used for liquids, and a third class is used for animals. Each class has its own pair of affixes to indicate the singular and the plural.

Nilo-Saharan. The other sizable language stock of Negro Africans, Nilo-Saharan, has six branches: Songhai (spoken in Mali), Saharan (including languages spoken both near Lake Chad, as in Kanuri, and in central Sahara), Maban (a group of tongues found E of Lake Chad), Furian (comprising only Fur, an important language of the Sudan), Coman (a group of languages of Ethiopia and the Sudan), and Chari-Nile, the principal branch of Nilo-Saharan, composed of the Eastern Sudanic languages, the Central Sudanic languages, and two additional tongues, Kunama and Berta; the Chari-Nile tongues are spoken in the Sudan, Zaïre, Uganda, Cameroon, Chad, the Central African Republic, Kenya, mainland Tanzania, and Ethiopia. The Eastern Sudanic subdivision of Chari-Nile itself has ten branches, the two most important of which are Nubian and Nilotic, both found in the Sudan. Nubian is unique among modern African Negro languages in that it has written texts of the medieval period. The Nilotic tongues include Shilluk, Dinka, Nuer, Masai, Turkana, Nandi, and Suk. The Central Sudanic subdivision of Chari-Nile consists of a number of languages, among them Mangbetu, spoken in the Congo, and Efe, used by the pygmies. Like the Niger-Congo languages, most of the Nilo-Saharan languages use tones, some Nilo-Saharan tongues inflect their nouns according to case, and still others have gender. The verb in many Nilo-Saharan languages has a system of verb derivation.

Khoisan. The Khoisan, or Click, linguistic family is made up of three branches: the Khoisan languages of the San (Bushmen) and Khoikhoi (Hottentots), spoken in various parts of S Africa, Sandawe, a language found in E Africa, and Hata, or Hadzapi, also spoken in E Africa. Tonality is a common feature of African languages. There are usually two or three tones (based on pitch levels rather than the rising and falling in inflections of Chinese tones) used to indicate semantic or grammatical distinction. All of the Khoisan languages appear to use tones to distinguish meanings. Grammatically, the Khoikhoi languages and some of the San languages inflect the noun to show case, number, and gender. The outstanding characteristic of the Khoisan tongues, however, is their extensive use of click sounds. (Examples of click sounds familiar to speakers of English are the interjection *tsk-tsk* and the click used to signal to a horse.) Click sounds, which are found only in Africa as parts of words, involve a sucking action by the tongue, but the position of the tongue and the way in which air is released into the mouth vary, just as in the formation of other sounds, thus clicks may be dental, palatal, alveolar, lateral, labial, or retroflex, voiced, voiceless, or nasal, and aspirated or glottal. Six types of clicks are known for the San languages as a whole, although no single tongue has all of them. The Khoikhoi languages have dental, palatal, retroflex, and lateral clicks. Some Bantu languages, notably Zulu and Xhosa, which are spoken near the Khoisan area, have borrowed click sounds from the Khoisan languages.

Indo-European and Malayo-Polynesian. Indo-European tongues used in Africa include AFRIKAANS and ENGLISH (native to many people in the Republic of South Africa and Rhodesia). American Negroes coming to Liberia in the 19th cent. introduced English there, and repatriated slaves who settled in Freetown, Sierra Leone, in the 19th cent. used a form of PIGDIN English, from which a creole English (now called Krio) developed. A form of creole Portuguese

is current in Guinea-Bissau. Many other African lands employ European languages, particularly French, Portuguese, and English, which is often found in schools and in government as a second language. The Malayo-Polynesian family is represented by Malagasy, which is spoken on the island of Madagascar.

Twentieth-Century Developments. Since the majority of Africans do not know a European tongue, the use of written African languages has become increasingly important for the growing field of mass communication. Most of the Niger-Kordofanian and Nilo-Saharan languages still have no writing except perhaps for translations of the Bible. An exception is Swahili, a Bantu tongue of the Niger-Kordofanian stock that was written before the European conquest of Africa (see SWAHILI LANGUAGE). Vai, a language belonging to the Mande subdivision of Niger-Congo, still employs a native script developed in the 19th cent. The Nilo-Saharan tongue Nubian, the only modern Negro language with early written records (dating from the 8th cent. A.D. to the 14th cent.), is of considerable linguistic interest. Its alphabet was derived from that of COPTIC. Both Arabic and Roman letters are now being used increasingly for languages of the Niger-Kordofanian and Nilo-Saharan stocks, but as yet no standardized writing for these tongues has been universally adopted. The International African Institute has had some success in promoting the use of the written form of native African languages. Many newspapers, magazines, and radio broadcasts now employ various vernaculars, and film theaters can switch sound tracks to accommodate the audience in a given language area. However, Africa's linguistic diversity can be a hindrance to mass communication, and European tongues (especially English and French) are still widely used in the mass media. The modern scientific study of the classification and distribution of African languages has thrown some light on the history of Africa and its inhabitants. More knowledge can be expected from the combined use in the future of evidence from linguistic sources, historical records, reliable traditions, and archaeology. For example, the study of loan words from languages such as Greek, Latin, Punic, Arabic, and Portuguese should reveal much about contacts between African and non-African cultures. The study of loan words of African origin that have been absorbed by English (such as *banjo*, *jigger*, *gumbo*, *okra*, and *voodoo*) has become of increasing interest to American linguists and scholars in the field of black studies. See DIEDRICH WESTERMANN and I. C. WARD, *Practical Phonetics for Students of African Languages* (1933), M. A. BRYAN, *Notes on the Distribution of the Semitic and Cushitic Languages of Africa* (1947), *Distribution of the Nilotic and Nilo-Hamitic Languages of Africa* (1948), and (ed.) *The Bantu Languages of Africa* (1959), J. H. GREENBERG, *The Languages of Africa* (2d ed. 1966), E. C. POLOME, *Swahili Language Handbook* (1967), DAVID DALBY, ed., *Language and History in Africa* (1971), W. E. WELMERS, *African Language Structures* (1974).

African lion hound. See RHODESIAN RIDGEBACK.

African Methodist Episcopal Church, one of the leading Negro denominations of METHODISM. It was established in 1816 with Richard ALEX as its first bishop. There are c. 1,100,000 members.

African Methodist Episcopal Zion Church, Negro Protestant denomination. It was founded in 1796 by Negro members of the Methodist Episcopal Church in New York City and was organized as a national body in 1821. The church operates in the United States, Africa, South America, and the West Indies and maintains Livingstone College in Salisbury, N.C. The membership of the church is about 900,000, making it one of the largest African Methodist bodies. See D. H. BRADLEY, *A History of the A.M.E. Zion Church* (2 vol., 1956-70).

African Negro literature. The earliest examples of this literature are to be found in those ancient Muslim religious books written by African Negroes in Swahili and Arabic. A great oral tradition exists in the seemingly inexhaustible folklore of the continent: myths, tales, legends, riddles, and proverbs. Throughout the history of Africa these have been used to instruct the young, and they have been transported to North and South America and to the Caribbean. The oral tradition remains strong in the 20th cent., and folktales now often concern contemporary events or political figures. The influence of the oral tradition can also be found in the works of many 20th-century African writers. Modern African Negro literature developed first in areas long in contact with European civilization. It is written in native

languages, notably the Bantu languages, and in French, Portuguese, and English. Important 19th-century African Negro writers were Koba Ntsikana, William W. Gqoba, and, most importantly, Thomas Mofolo, who wrote several novels, the best-known being *Chaka* (tr. 1931), about the famous Zulu chief. In the early 20th cent., Negro writers from the French colonies in Africa made Paris their center. There, during the 1930s, the concept of *négritude* was born. Led by the poet-statesman Leopold Sedar SENGHOR, the major adherents of *négritude* included AIME CÉSAIRE, LEON DAMAS, BIRAGIO DIOP, and DAVID DIOP. These writers rejected the French policy of assimilation and asserted the importance of their African Negro heritage. They also felt their sense of pride, dignity, and racial awareness should extend to Negroes in all parts of the world. In 1947, Césaire and Damas founded the *Presence Africaine*, which became Africa's leading literary journal. Other outstanding writers in French were René Maran, Paul Hazoume, Camara Laye, Ferdinand Oyono, Mongo Beti, and Edouard Maunick. After World War II certain themes were dominant in the literature of the emerging African nations: pride in being black and African and in becoming part of the modern world, castigation of the Europeans who had subjugated black Africa for so long, foreboding that blacks would now be prey to evils that had long been exclusive to white men, exploration of the conflict between old tribal values and customs and those of the modern Western world, and satire of old and new aspects of African life. During the 1950s and 60s strong national literatures began emerging in several nations, notably Nigeria, Senegal, and Cameroon. In 1966 the World Festival of Negro Arts was held in Dakar, Senegal. It was opened by a performance of the satiric comedy *Kong's Harvest* by the Nigerian playwright Wole Soyinka. Other important postwar writers include Mario de Andrade and Luis Bernardo Honwana, whose works are in Portuguese, James Mbotela, Omar Shariff, and Robert Shaaban, writing in Swahili, and numerous writers whose works are in English, including the Nigerians Amos Tutuola, Chinua Achebe, Cyprian Ekwensi, John Pepper Clark, and Gabriel Okara, the South African Ezekiel Mphahlele (author of the now classic autobiography, *Down Second Avenue* (1959)), the Gambian Lenrie Peters, the Ruandan J. Saverio Nguigiziki, and the Ghanaians Kofi Awoonor and Ama Ato Audoo. See also AFRICAN LANGUAGES, SOUTH AFRICAN LITERATURE. See LANGSTON HUGHES, ed., *An African Treasury* (1960), CLAUDE WAUTHIER, *The Literature and Thought of Modern Africa* (tr. 1967), WILFRED CARTEY, *Whispers from a Continent: The Literature of Contemporary Black Africa* (1968), JANHEINZ JAHN, *Neo-African Literature: A History of Black Writing* (1969), RUTH FINNEGAN, *Oral Literature in Africa* (1970), O. R. DATHORUE, *The Black Mind: A History of African Literature* (1974).

African Negro music. Although its details vary with cultural and linguistic boundaries, sub-Saharan African music has as its distinguishing feature a rhythmic complexity common to no other region. Polyrhythmic counterpoint, wherein two or more locally independent attack patterns are superimposed, is realized by handclaps, xylophones, rattles, and a variety of tuned and nontuned drums. The remarkable aspect of African polyrhythm is the discernible coherence of the resultant rhythmic pattern. Pitch polyphony exists in the form of parallel intervals (generally thirds, fourths, and fifths), overlapping choral antiphony and solo-choral response, and occasional simultaneous independent melodies. In addition to voice, many wind and string instruments perform melodic functions. Common are bamboo flutes, ivory trumpets, and the one-string ground bow, which uses a hole in the ground as a resonator. Scale systems vary between regions but are generally diatonic. Music is highly functional in tribal life, accompanying birth, marriage, hunting, and even political activities. Much music exists solely for entertainment, ranging from narrative songs to highly stylized musical theater. Similarities with other cultures, particularly Indian and Middle Eastern, can be ascribed primarily to the Islamic invasion (7th-11th cent.). How much the American Negro spiritual is indebted to African music is still a subject of inquiry. See JAZZ, AMERICAN NEGRO SPIRITUALS, GOSPEL MUSIC. See E. M. von Hornbostel, *African Negro Music* (1929), Percival Kirby, *Musical Instruments of the Native Races of South Africa* (1953), A. M. JONES, *Studies in African Music* (2 vol., 1959), ROSE BRANDEL, *The Music of Central Africa* (1961), FRED WARREN, *The Music of Africa* (1970), J. S. ROBERTS, *Black Music of Two Worlds* (1972), ORTIZ WALTON, *Music: Black, White and Blue* (1972).

Africanus, Sextus Julius (sɛk'stəs ʒoʊ'l'yəs afrikā'nəs), fl. 221, Christian historian, resident of Palestine. He wrote a history of the world from the creation to 221 (which was used by Eusebius of Caesarea), letters, and an anthology, mostly of materials on magic.

African violet* see *GESNERIA*

Afrikaans (äf'rikans'), member of the West Germanic group of the Germanic subfamily of the Indo-European family of languages (see *GERMANIC LANGUAGES*). Although its classification is still disputed, it is generally considered an independent language rather than a dialect or variant of Dutch (see *DUTCH LANGUAGE*). Afrikaans is spoken by close to 3 million people, most of whom live in the Republic of South Africa, where it is one of the official languages. It arose from the Dutch spoken by the Boers, who emigrated from the Netherlands to South Africa in the 17th cent., but in its written form it dates only from 1861. The grammar has been considerably simplified. Although its vocabulary is essentially similar to that of Dutch, Afrikaans has absorbed quite a few words from Hottentot and Bantu (such as words designating local flora and fauna) and also from English.

Afro-Asian Bloc. see *THIRD-WORLD*

Afroasiatic, another name for the Hamito-Semitic family of languages. See *HAMITO-SEMITIC LANGUAGES*

afterdamp: see *DAMP*

Afton, uninc. city (1970 pop. 24,898), St. Louis co., E. Mo., a suburb of St. Louis. The name is also spelled Afton.

Afyonkarahisar (äfyon'ka'rähisar') [Turkish, = black castle of opium], city (1970 pop. 51,660), capital of Afyonkarahisar prov., W. central Turkey, at an elevation of c. 3,500 ft (1,070 m). It is the commercial center of a region where opium poppies and grains are grown. Carpets are manufactured in the city, which is a major rail junction.

Afzelius, Arvid August (ar'ved ou'gast), 1785-1871, Swedish historian, mythologist, and song writer. He made a notable collection of folk material in *Swedish Folk Tunes from Olden Times* (3 vol., 1814-16). His autobiography was published in 1901.

Ag, chemical symbol of the element *SILVER*

Agabus (äg'äbas), prophet who foretold the famine in the time of Claudius Caesar and the imprisonment of Paul. Acts 11:27,28; 21:10,11.

Agade, ancient Mesopotamian city. see *AKKAD*

Agadès (agadēs'), town (1963 est. pop. 7,100), W. central Niger, in the Air Mts. A traditional, picturesque town, Agadès is a trade center visited by TUAREG pastoral nomads. Leather and silver handicrafts are made. Tin, tungsten, uranium, and salt are mined nearby. Founded by the 11th cent., Agadès developed mainly because of its location on trans-Saharan caravan routes linking Egypt and Libya with the Lake Chad area. Agadès was held by the MALI empire during part of the 14th cent., captured by the SONGHAI empire in 1515, and controlled by BORNU in the 17th cent. It remained a trade center until the late 19th cent. During much of this time it was a noted center of Islamic learning. The French occupied the town in the early 20th cent. Agadès has a 16th-century mosque.

Agadir (agadēr', ägädēr'), city (1970 est. pop. 34,000), SW Morocco, on the Atlantic Ocean. Agadir has metal-processing industries and exports of fruit and vegetables. While France was engaged in establishing a protectorate in Morocco, the German gunboat *Panther* appeared (1911) in Agadir with the intention of protecting German interests. For a time war seemed imminent, but the Germans agreed to drop their demands when France ceded to them a substantial part of the French Congo. In 1960, Agadir was almost completely destroyed by an earthquake.

Agag (äg'äg) 1 King of the Amalekites who was defeated and spared by Saul, but killed by Samuel. 1 Sam. 15:2. The allusion is not understood in Num. 24:7.

Agagite (äg'ägīt), a not necessarily ethnical term used of Haman because of his hatred of the Jews. Esther 3:1.

Aga Khan III (Aga Sir Sultan Mahomed Shah) (a'ga khan), 1877-1957, Muslim leader, b. Bombay, India. Hereditary ruler of the Muslim Ismaili sect, with followers in India, Pakistan, East Africa, and Central Asia, the Aga Khan was born to great power and wealth. He attempted to secure Muslim support for British rule in India, particularly by founding (1906) the All-India Muslim League, of which he served as president (1909-14). He was chairman of the British Indian delegation to the imperial conference in London in 1930-31. He also represented India at the Geneva disarmament conference (1932) and in the

League of Nations (1932, 1934-37), where he was (1937) president of the General Assembly. He was, however, perhaps best known for his fabulous wealth, for his liberal donations to Muslim causes, and for his interest in horse breeding and racing. Early in his rule he took up residence in Europe, where he died. He was succeeded by his grandson, Prince Karim, who became Aga Khan IV. See his memoirs (1954), biography by H. I. Greenwall (1952).

agaloch (ägäl'äk) see *ALOES*

Agamedes (äg'amē'dēz) see *TROPHONIUS*

Agamemnon (äg'amēm'nōn), in Greek mythology, leader of the Greek forces in the Trojan War, king of Mycenae (or Argos). He and Menelaus were sons of Atreus and suffered the curse laid upon PELOPS. Agamemnon married Clytemnestra, and their children were Iphigenia, Electra, and Orestes. To win favorable winds for the ships sailing against Troy, he sacrificed Iphigenia to Artemis and thus incurred the hatred of Clytemnestra. After arriving at Troy, he quarreled bitterly with Achilles over possession of the captive princess Briseis. Agamemnon was forced to yield the girl to Achilles after the latter withdrew, with his troops, from the war. On his return home, Agamemnon was treacherously murdered by Clytemnestra and her lover, Aegisthus. To avenge his death, Orestes and Electra killed their mother.

Aga Muhammad Khan or Agha Muhammad Khan (both a'gā mōhām'mad khān), 1742-97, shah of Persia, founder of the Kajar, or Qajar, dynasty. He was emasculated by family enemies at the age of five. He was vigorous and able, but his cruelty is proverbial. In 1794, he captured and killed the last ruler of the Zand dynasty and ended his campaign with a wholesale massacre in Kerman. He became shah in 1796. Aga Muhammad resisted a Russian invasion and himself invaded (1795) Georgia. Hated by his subjects, he was finally assassinated. His nephew Fath Ali succeeded him.

Agana (ägā'nyā), city (1970 pop. 2,119), capital of the island of GUAM, W. Pacific, in the MARIANAS ISLANDS. It is the administrative center of Guam, and most of the city's economic activities are related to the provision of goods and services to the large U.S. military bases on the island. Completely destroyed in World War II, Agana was subsequently rebuilt.

Aganippe (äg'anīp'ē), in Greek mythology, nymph. Her spring on Mt. Helicon, sacred to the MUSES, gave poetic inspiration to all who drank from it.

Agapemone (ägapēm'ōnē) [Gr. = abode of love], English religious community of men and women, holding all goods in common. It was founded (c. 1850) at the village of Spaxton, Somerset, by Henry James Prince (1811-99), Samuel Starky, and others. Prince and Starky were clergymen who had left (c. 1843) the Church of England after Prince claimed that the Holy Ghost had taken up residence in his body. The Agapemonites proclaimed the imminent second coming of Christ. Riotous conditions at the community caused scandal, and after Prince lost a lawsuit brought by two disenchanted followers in 1860 the community slipped from public notice. There was a period (c. 1890) of renewed activity when J. H. Smyth-Pigott, who believed himself to be Jesus Christ reincarnated, conducted meetings at an Agapemone branch establishment in Clapton, London. He succeeded Prince as leader of the sect, which soon vanished. See Donald McCormick, *Temple of Love* (1962).

Agar (ä'gər), the same as *HAGAR*

agar (ä'gär, ä'-, äg'är), product obtained from several species of red algae, or *SEAWEED*, chiefly from the Ceylon, or Jaffna, moss (*Gracilaria lichenoides*) and species of *Gelidium*. Although most agar comes from the Far East, California also is a source of supply. Chemically, agar is a polymer made up of subunits of the sugar galactose; it is a component of the algae cell walls. Dissolved in boiling water and cooled, agar becomes gelatinous; its chief uses are as a culture medium (particularly for bacteria) and as a laxative, but it serves also as a thickening for soups and sauces, in jellies and ice cream, for clarifying beverages, and for sizing fabrics. It is conveniently marketed in the form of dried flakes.

Agartala (ägür'tälä), city (1971 pop. 59,682), capital of Tripura state, NE India, near the Bangladesh border. It is a market town for rice, tea, jute, and oilseed.

Agasias (ägä'shēās), fl. 1st cent. B.C., Greek sculptor, commonly known as Agastias of Ephesus, son of Dositheus. His *Borghese Warrior*, discovered in the 17th cent., is in the Louvre.

Agassiz, Alexander (äg'äsē), 1835-1910, American naturalist and industrialist, b. Neuchâtel, Switzer-

land, son of Louis Agassiz, stepson of Elizabeth Cary Agassiz. He came to the United States in 1849 and studied at Harvard, receiving degrees in engineering (B.S., 1857) and natural history (B.S., 1862). Throughout his life he was connected in various capacities with Harvard. In 1871 he consolidated the Calumet and Hecla copper mines on Lake Superior and, as president, developed the combined interests with great success. He adopted safety and welfare measures relating to the mines. Agassiz contributed much of his fortune to science—chiefly in endowments to Harvard and to the Museum of Comparative Zoology founded there through his father's efforts. He also financed expeditions and publications of his own research. In 1877 he began his oceanographic explorations, including detailed observations of the Pacific and the Caribbean. Noting that the deep-sea animals of the two are similar, he suggested that the Caribbean was a bay of the Pacific that had been cut off in the Cretaceous period by the rise of the Panama isthmus. He also developed a theory of the formation of coral atolls that differed from that of Darwin. His chief work is *Revision of the Echini* (2 vol., 1872-74). See study by his son G. R. Agassiz (1913).

Agassiz, Elizabeth Cabot Cary, 1822-1907, American author and educator, b. Boston. In 1850 she married Louis Agassiz, and together they established the pioneering Agassiz School for girls in Boston (1856-65). She accompanied her husband on expeditions to Brazil (1865-66) and along the Atlantic and Pacific coasts of the Americas (1871-72). She was one of a group (along with Arthur Gilman and Alice Longfellow) influential in the founding of Radcliffe College, and was (1894-1903) its first president. Her writings include *A Journey in Brazil* (in collaboration with her husband, 1868), a biography of her husband (1885), and, with her stepson Alexander Agassiz, *Seaside Studies in Natural History* (1885). See study by L. A. Paton (1919), Louise Tharp, *Adventurous Alliance* (1959).

Agassiz, Louis (Jean Louis Rodolphe Agassiz) (zhān lwē rōdōl'f), 1807-73, Swiss-American zoologist and geologist, b. Môtiers-en-Vully, Switzerland. He studied at the universities of Zurich, Erlangen (Ph.D., 1829), Heidelberg, and Munich (M.D., 1830). Agassiz practiced medicine briefly, but his real interest lay in scientific research. In 1831 he went to Paris, where he became a close friend of Alexander von Humboldt and studied fossil fishes under the guidance of Cuvier. In 1832 he became professor of natural history at the Univ. of Neuchâtel, which he made a noted center for scientific study. Among his publications during this period were *Recherches sur les poissons fossiles* (5 vol. and atlas, 1833-44), a work of historic importance in the field (although his system of classification by scales has been discarded), studies of fossil echinoderms and mollusks, and *Étude sur les glaciers* (1840), one of the first expositions of glacial movements and deposits, based on his own observations and measurements. Agassiz came to the United States in 1846 and two years later accepted the professorship of zoology and geology at Harvard. His first wife died in Germany in 1848, and in 1850 in Cambridge he married Elizabeth Cabot Cary. In the United States he was primarily a teacher and very popular lecturer. Emphasizing advanced and original work, he gave major impetus to the study of science directly from nature and influenced a generation of American scientists. His extensive research expeditions included one along the Atlantic and Pacific coasts of the Americas from Boston to California (1871-72). His *Contributions to the Natural History of the United States* (4 vol., 1857-62) includes his famous "Essay on Classification," an extension of the theory of RECAPITULATION to geologic time. Despite his own evidences for evolution, Agassiz opposed Darwinism and believed that new species could arise only through the intervention of God. See biographies by Jules Marcou (including letters, 1896), J. D. Teller (1947), and Edward Lurie (1960, repr. 1967), Lane Cooper, *Louis Agassiz as a Teacher* (rev. ed. 1945).

Agassiz, Lake, glacial lake of the PLEISTOCENE EPOCH, c. 700 mi. (1,130 km) long, 250 mi. (400 km) wide, formed by the melting of the continental ice sheet some 10,000 years ago, covered much of present-day NW Minnesota, NE North Dakota, S Manitoba, and SW Ontario. The lake was named in 1879 in memory of Louis Agassiz for his contributions to the theory of the glacial epoch. Lake Traverse, Big Stone Lake, and the Minnesota River are in the channel of prehistoric River Warren. Lake Agassiz's original outlet to the south. As the ice melted, the water drained E into Lake Superior, and after the ice disappeared, N into Hudson Bay, leaving lakes Winnipeg, Mani-

toba, and Winnipegosis, Red Lake, Lake of the Woods, and many smaller lakes. The bed of the old lake, the Red River valley, has become an important wheat-growing region because of its rich, deep soil. See Warren Upham, *The Glacial Lake Agassiz* (1895, U.S. Geological Survey, Monographs, Vol. XXV).

agate, cryptocrystalline variety of QUARTZ banded in two or more different colors, extensively used as a semiprecious gemstone and in the manufacture of grinding equipment. The banded appearance owes its origin to the fact that agates are built up by the slow deposition of silica from solution into cavities in older rock—often igneous rocks. The layers differ in porosity, and the stones can be artificially stained to produce combinations of color more vivid and pleasing than those found in the natural state. The cutting and staining of agates has long had its center at Idar-Oberstein in Germany. Important sources of agate are Brazil, Uruguay, India, Mexico, and the United States (in the Lake Superior region and in some western states). The moss agate or mocha stone is so called because it contains dendritic inclusions resembling moss. See CHALCEDONY, ONYX, SARD.

Agate Fossil Beds National Monument. see NATIONAL PARKS AND MONUMENTS (table)

Agatha, Saint (äg'äthä), 3d cent., Sicilian virgin, martyred under Roman Emperor Decius. She is mentioned in the Canon of the Mass and is invoked against outbreaks of fire. She is also the patron saint of bell makers. Feast Feb. 5.

Agatharchus (äg'ätharkäs), fl. 5th cent. B.C., Greek painter of the Athenian school, b. Samos. He is credited with important discoveries in the application of shading and perspective and is said to have been the first painter of scenery for tragedies.

Agathon (äg'äthön), c. 450–c. 400 B.C., Athenian tragedian. Plato's *Symposium* has as its scene the celebration of Agathon's first dramatic victory. Less than 40 lines of his work survive.

Agave (ägä'vë) see PENTHEUS

agave* see AMARYLLIS

Agawam (äg'äwam), 1 town (1970 pop. 21,717), Hampden co., SW Mass., on the Connecticut River, settled 1636, inc. 1855. Leather goods, machinery, and electronic equipment are produced. 2 former name of IPSWICH, Mass.

Agboville (ägbö'vël'), town (1964 est. pop. 15,475), Ivory Coast. Situated in a forest zone, the town is the market center for a region producing plantains, yams, coffee, cassava, manioc, rice, and timber. Fishing is pursued in numerous family ponds nearby. Agboville is on the country's railroad line, which reached the town in 1907.

Agdistis. see ATTIS, CYBELE

age, in classical mythology, a period of the world's history, especially as systematized by the poets Hesiod and Ovid. The ages were the Golden Age, ruled by Cronus (Saturn), a period of serenity, peace, and eternal spring; the Silver Age, ruled by Zeus (Jupiter), less happy than the preceding, with luxury prevailing; the Bronze Age, a period of strife; and the Iron Age, the present, a time of travail, when justice and piety have vanished. Hesiod also included a Heroic Age before the Iron Age, during which the Trojan War was fought. The division of history into three technological ages (stone, bronze, and iron) was also present in ancient Greek and Roman writings. The sequence became more widely used in the 19th cent. as archaeological evidence confirmed the historical validity of the three stages. Artifacts were first arranged according to the three-age system in 1836 by C. J. Thomsen at the Museum of Northern Antiquities in Copenhagen.

Agee (äg'ë-ë), father of Shammah, a mighty man. 2 Sam. 23:11.

Agee, James (ä'jë), 1909–55, American writer, b. Knoxville, Tenn., grad. Harvard, 1932. He was a writer for *Fortune* magazine, a movie critic for *Time* and *The Nation*, and a film scriptwriter. His best-known work is the posthumously published novel *A Death in the Family* (1957, Pulitzer Prize), which recounts in poetic prose the tragic impact of a man's death on his wife and family. Agee's other works include *Let Us Now Praise Famous Men* (1941), a prose commentary on the tenant farmer; a novel, *The Morning Watch* (1954), a collection of reviews, comments, and scripts; *Agee on Film* (2 vol., 1958–60), a collection of letters to a former teacher; *Letters of James Agee to Father Flye* (1962); *Collected Poems* (1968); and *Collected Short Prose* (1969). See study by P. H. Ohlin (1966).

age grade or age set, in anthropology, differentiation of social role based on age. Entry into a grade may come about by the attainment of a certain bio-

logical state, especially puberty, or a socially recognized status change that typically occurs at certain age periods, notably marriage and the birth of a child. Persons of junior grade may give respect and some degree of obedience to those of more senior grade; the seniors expect deference but may also acknowledge obligations to assist, teach, test, or lead their juniors. The practice of age grading is found in some form in every society.

Ageladas (äj'älä'däs), c. 540–c. 460 B.C., Greek sculptor of the Argive school, famous for his statues of gods and Olympian athletes. A popular tradition, discredited by many authorities, names him as the teacher of the great sculptors, Polykleitos, the Elder, Phidias, and Myron.

Agen (azha'n'), town (1968 pop. 37,470), capital of Lot-et-Garonne dept., SW France, on the Garonne River, in GUYENNE. It is an agricultural market place in the center of a fruit-growing region and an industrial center where food products, clothing, agricultural machinery, bicycles, tiles, drugs, furniture, and musical instruments are manufactured. Originally a Gallic settlement, Agen was a crossroads in Roman times. It became the capital of the county of Agenois under the CAROLINGIANS. An episcopal see from the 10th cent., it passed (1154) to England with the rest of AQUITAIN. It was reconquered in the HUNDRED YEARS WAR (1337–1453) and incorporated into the province of Guyenne. Among the historic structures are chapels from the 13th and 14th cent., the Church of St. Jacobus (13th cent.), with its Gothic frescoes, the St. Hilaire Church (15th cent.), and the Romanesque and Gothic St. Caprais Cathedral.

Agency for International Development (AID), Federal agency in the State Dept. created by Congress (Sept., 1961) to consolidate U.S. nonmilitary foreign-aid programs. The agency incorporated the International Cooperation Administration, the Development Loan Fund, and related agencies such as the Office of Food for Peace. AID is organized into five divisions—one for each major underdeveloped area—East Asia, Vietnam, Near East and South Asia, Latin America, and Africa. AID offers technical, capital, and commodity assistance and gives priority to programs in agriculture, population-growth control, and education. AID stresses long-run development goals financed through long-term loans and encourages the investment of private capital through liberal investment guarantees. Countries applying for loans are required to show that they have made effective use of their human and material resources and have undertaken policies such as land reform so as to insure that AID benefits will reach the populace as rapidly as possible.

Agenor (äj'ënör), in Greek mythology, 1 King of Tyre, father of Cadmus and Europa. When Europa disappeared, Agenor sent Cadmus and his other sons in search of her. 2 Trojan hero, son of Antenor.

Ageo (a'gäo), city (1970 pop. 110,792), Saitama prefecture, central Honshu, Japan. It is an agricultural and communications center. Raw silk and sake are produced in the city.

age of consent, the age at which, according to the law, persons are bound by their words and acts. There are different ages at which one acquires legal capacity to consent to marriage, to choose a guardian, to conclude a contract, and the like. For marriage, the age may be higher for males than for females if the jurisdiction does not guarantee equal rights to men and women. Age of consent also means the age below which consent of the female to sexual intercourse is not a defense to a charge of RAPE. Under common law this age was 10; state statutes in the United States generally set it between 13 and 18. See also CONSENT.

ageratum (äj'ärä'täm, äjër'ä-) [Gr., =unaging], any plant of the genus *Ageratum*, tropical American annuals of the family Compositae (COMPOSITE family). The commonly cultivated species is the Mexican *A. houstonianum*, with thick terminal clusters of blue flowers. The similar mistflower, a *Eupatorium* (see BONESET), is a perennial sometimes called hardy ageratum. *Ageratum* is classified in the division MAGNOLIOPHYTES, class Magnoliopsida, order Asterales, family Compositae.

Agessander (äj'äsän'där) see LAOCOON

Agessilaus II (äj'ë'silä'äs), c. 444–360 B.C., king of Sparta. After the death of Agis I (398? B.C.), he was brought to power by Lysander, whom he promptly ignored. After the Peloponnesian War the Greek cities in Asia Minor had not been ceded to Persia despite Sparta's promises, and in 396 B.C. Agessilaus went there to oppose the Persian satraps TISSAPHERNES and PHARNABAZUS by attacking them. He managed to rout Tissaphernes, but Persian naval power

drove him back to Greece, where he won (394 B.C.) a hollow victory over the Thebans and their allies at Coronea, but he could not reestablish Spartan hegemony. By the King's Peace (or Peace of Antalcidas) in 386 B.C., the cities of Asia Minor were ceded to Persia. Thebes and Athens entered an alliance against Sparta, and war followed. When Agessilaus deliberately excluded Thebes from the peace talks, Thebes renewed the war and the Theban general Epaminondas won (371 B.C.) a resounding victory at LEUCTRA. Sparta did not recover. Agessilaus took Spartan mercenaries to Asia Minor and Egypt and died on the way back. His rule had seen the ruin of Sparta, although he was lauded by his contemporaries, notably Xenophon.

aggada: see HALAKAH

Aggeus (äg'ë'äs), Vulgate form of HAGGAI

agglutination, in biochemistry see IMMUNITY

agglutination, in linguistics see INFLECTION

aggression, a form of behavior characterized by forceful physical or verbal attack. It may be appropriate and self-protective, even constructive, as in healthy self-assertiveness, or inappropriate, destructive, or annihilatory. Aggression may be directed outward, against others, as in explosive personality disorders, or inward, against the self, leading to self-damaging acts or suicide. The directness and degree of hostility may vary from physical assault to gentle verbal criticism, and the means of expression may include deprecation, avoidance, teasing, provocation, and obstructiveness. In ordinary social life aggressive tendencies are restrained except in such ritualized situations as competitive sports. In adults physical aggression that is not a response to a clear threat or unusual provocation is usually considered a symptom of mental illness or character disorder and is attributed to pathological intensity of aggressive drives, weakness of controls, or both. Sadistic or masochistic acts are a combination of aggressive and affectionate behavior. Sigmund Freud postulated in 1920 the potential, present in humans at birth, of an aggressive drive, which together with the opposing sexual, or libidinal, drive contributed to the development of personality and found expression in behavior. However, many psychoanalysts who followed Freud have not accepted aggression as a primary drive and have instead viewed it as a reaction to frustration of primary needs. The ethologist Konrad Lorenz extrapolated from animal data that human aggression is an inborn legacy from man's prehuman primate ancestors. His colleague Nicholas Tinbergen traced this aggressiveness from the time when man ceased to be a vegetarian individualist like most of his primate cousins and became a carnivorous group hunter like the wolf. Tinbergen believes that there is a complex relationship between this innate aggressive potential and a social conditioning that evokes it. Other ethological data also suggest the presence of innate mechanisms to prevent or terminate aggressive behavior destructive to species. Anthropologists such as Montagu have argued that animal data cannot be applied directly to man's special situation, that man is largely instinctless, and that his aggressiveness is wholly a learned form of behavior. Some psychoanalysts share a similar view, holding that aggressive behavior is learned as a maladaptive means of coping with real and symbolic threats to the satisfaction of needs. Interest in the causes of violence, war, and assassination has led to wide inquiry into the social and biological roots of violence as a specific expression of aggression. The contributions of abnormal genetic endowment, learning difficulties, minimal brain damage, brain abnormalities, such as certain forms of temporal lobe epilepsy, and such social factors as crowding and poverty have been suggested in certain cases to have contributed to exaggeratedly aggressive behavior. But even if these factors were proved to be causative, each would have limited applicability to the range of aggressive phenomena in man. See Konrad Lorenz, *On Aggression* (tr. 1966), Alexander Alland, *The Human Imperative* (1972), R. N. Johnson, *Aggression in Man and Animals* (1972).

Agha Muhammad Khan. see AGA MUHAMMAD KHAN

Aghrim, Republic of Ireland see AUGHRIM

agilawood see ALOES

Agincourt (azhän'kōör'), modern Fr. Azincourt, village (1968 pop. 276), Pas-de-Calais dept., N France. There, on Oct. 25, 1415, Henry V of England defeated a much larger French army in the HUNDRED YEARS WAR (1337–1453). His success, which was due mainly to the superiority of the masses of English longbow men over the heavily armored French

knights, demonstrated the obsolescence of the methods of warfare of the age of chivalry. The victory enabled the English to conquer much of France. The battle is the central scene of Shakespeare's drama *Henry V*.

Agis (ā'jīs), name of four Spartan kings. Agis I, fl. late 10th cent. B.C., was the traditional founder of the Agiad dynasty, one of the two ruling dynasties of Sparta, which had a dual kingship. The other dynasty, the Eurypontids, fathered the succeeding Agises. Agis II, d. 398 B.C., acceded to the throne on the death (c. 427) of his father, Archidamus II. Agis led Spartan forces at the battle of Mantinea (418 B.C.) during the Peloponnesian War. Advised by Alcibiades, who had fled to Sparta to avoid trial at home, he quickly invaded Attica and established a post there. Later he quarreled with his adviser Agis aided Lysander in the final Spartan victories of the war. Agis III, d. 331 B.C., succeeded his father Archidamus III in 338. He led a revolt of Peloponnesian cities against Alexander the Great, who was in Asia. The rebels were crushed, and Agis was killed at Megalopolis. His death ended Greek revolts against Alexander. Agis IV, d. c. 240 B.C., son of Eudamidas II, succeeded his father c. 244 B.C. He tried to revitalize Sparta by reform and by returning to the constitution of Lycurgus. His efforts failed, and he was murdered.

Aglaia (āglā'ā) see GRACES

Aglipay, Gregorio (grāgō'rēō aglēp'i), 1860-1940, Philippine clergyman. A priest who joined the revolutionary forces of Emilio Aguinaldo, he was excommunicated (1902). He took his followers from the Roman Catholic Church to found the Philippine Independent Church. Bishop Aglipay attracted many followers, said to number more than 1 million. His church, which retained many of the forms of the Roman Catholic Church, discarded confession and celibacy for the priesthood. Later it established friendly relations with the Unitarians. After Aglipay's death dissension shook the organization. In 1961, however, full communion was established between the Philippine Independent Church and the American Episcopal Church. Aglipay was defeated by Manuel Quezon in the presidential election of 1935.

Aglipayans: see PHILIPPINE INDEPENDENT CHURCH

Agnes, Saint, 4th cent., virgin martyr. A noble Roman girl, she was martyred at the age of 13 after rejecting a well-born suitor. She is commemorated in the Canon of the Mass. On her feast two lambs are blessed and from their wool pallia (see PALLIUM) are made. Feast Jan. 21.

Agnes Scott College, at Decatur, Ga., Presbyterian, U.S., for women, founded 1889 as the Decatur Female Seminary, chartered 1906 as Agnes Scott College.

Agnew, Spiro Theodore (spēr'ō), 1918-, 39th Vice President of the United States (1969-73), b. Baltimore, Md. Admitted to the bar in 1949, he entered politics as a Republican and was elected (1961) chief executive of Baltimore co. He later became (1967) governor of Maryland, where he won passage of an open housing law and expanded the state's antipoverty programs. Nominated (1968) for the vice presidency on the Republican ticket with Richard M. Nixon, Agnew campaigned on a tough law-and-order platform. As Vice President, he sharply attacked opponents of the Vietnam War as disloyal, criticized intellectuals and college students for questioning traditional values, and frequently accused the news media of biased news coverage. In the 1970 congressional campaigns, he campaigned vigorously against liberals and antiwar candidates in both parties. Reelected with Nixon in 1972, Agnew was forced to resign on Oct. 10, 1973, after a Justice Dept. investigation uncovered evidence of corruption during his years in Maryland politics, his alleged acceptance of bribes overlapped with his tenure as Vice President. He pleaded no contest to the charge of Federal income tax evasion. He was sentenced to three years' probation and fined \$10,000, and he was later disbarred (1974) by the Maryland court of appeals. See biographies by Joseph Alright (1972), Theo Lipmann (1972), and Jules Witcover (1972).

Agni (āg'nē) see VEDA

Agnon, Shmuel Yosef (shmōō'ēl' yōsēf' agnōn'), 1888-1970, Israeli novelist and short-story writer, b. Galicia, Poland, as Samuel Josef Czaczkes. He changed his name after settling in Palestine in 1907, where he remained for the rest of his life, except for 10 years in Germany (1913-23). Although he initially wrote in both Hebrew and Yiddish, eventually he wrote in classical Hebrew alone. His works were thus difficult to translate and were not widely appre-

ciated for many years. He is now regarded as the greatest modern writer of fiction in Hebrew. Often containing symbolic and mystical elements, his novels and stories explore various aspects of Jewish life. They frequently focus on the problems of Jews assimilating into Western culture. His works include the novels *The Bridal Canopy* (1919, tr. 1937), *A Guest for the Night* (1938, tr. 1968), and *The Day Before Yesterday* (1945), the short-story collections *Forsaken Wives* (1908), *Two Tales* (tr. 1966), and *Twenty-One Stories* (tr. 1970), and *In the Heart of the Seas: A Story of a Journey to the Land of Israel* (1966). Agnon shared the 1966 Nobel Prize for literature with the poet Nelly Sachs.

agnosticism (āgnōs'tīzəm), form of skepticism that holds that the existence of God cannot be logically proved or disproved. Among prominent agnostics have been Herbert Spencer, T. H. Huxley (who coined the word *agnostic* in 1869), and Auguste Comte. Immanuel Kant was an agnostic who argued that belief in divinity can rest only on faith. Agnosticism is not to be confused with **ATHEISM**, which asserts that there is no God.

Agnus Dei (āg'nās dē'i, an'yōōs dā'ē) [Lat.], the Lamb of God, i.e., Jesus Christ. The lamb of the PASSOVER sacrifice is said to prefigure the crucifixion. Isaiah calls the expected Messiah the Lamb of God, and Jesus is met by John the Baptist with the words, "Behold, the Lamb of God, who takes away the sins of the world." In the Mass the Agnus Dei, or Lamb of God, is said or sung while the communion bread is being broken for distribution. It is usually the final movement of choral masses. In Anglican worship it is sung during communion. In iconography a lamb with halo and cross is called an Agnus Dei.

agora (āg'ərə) [Gr., =market], in ancient Greece, the public square or market place of a city. In early Greek history the agora was primarily used as a place for public assembly, later it functioned mainly as a center of commerce. Usually in a readily accessible part of the city, it was often surrounded by the public buildings, such as the royal palace, the law courts, the assembly house, and the jail. A favorite architectural device was the colonnade surrounding the agora. One of the highest honors was to be granted a tomb in the agora. The agora was similar to the Roman FORUM.

Agoracritus (āg'ōrāk'rītəs), fl. 5th cent. B.C., Athenian sculptor born on the island of Paros, said to have been the favorite pupil of Phidias. His best-known work was the colossal Nemesis at Rhamnus in Attica, erroneously ascribed by some to Phidias himself. Fragments of this statue and of its pedestal are in the British Museum and in the national museum in Athens.

Agostino di Duccio (agōstē'nō dē dōō'tchō), b. 1418, d. after 1481, Florentine sculptor. Agostino worked mainly in other parts of Italy; he carved marble narrative reliefs for the facade of the cathedral at Modena, decorated portions of the so-called Tempio Malatestiano at Rimini, and worked on the facade of San Bernardino at Perugia. Somewhat awkward in his rendering of anatomy, Agostino nevertheless developed a lively style. There are numerous charming reliefs by him of the *Madonna and Child* (Opera del Duomo, Florence, Louvre, National Gall. of Art, Washington, D.C.).

agouti (agōō'tē), name applied to rabbit-sized rodents of the genus *Dasyprocta*, found in Central and South America and in the West Indies. They have slender limbs with five front and three hind toes, rudimentary tails, and coarse rough hair that varies from reddish to dark brown depending upon the species. Agoutis are forest dwellers, they eat leaves, roots, nuts, fruits, and sugarcane. They are good swimmers and fast runners. *Agouti* is occasionally used instead of *Cuniculus* as the generic name of the related paca, or spotted CAVY. Agoutis are classified in the phylum CHORDATA, subphylum Vertebrata, class Mammalia, order Rodentia, family Dasyproctidae.

Agra (ā'grā, āg'rā), former province, N central India. The presidency, or province, of Agra was created in 1833 when the British partitioned the Bengal presidency. In 1836, Agra was renamed the North West Province. In 1877, Agra and Oudh were placed under one administrator, and in 1902 they became known as the United Provinces of Agra and Oudh. The city of Agra (1971 pop. 594,858), Uttar Pradesh state, is on the Jumna River. An important rail junction and commercial center and a district administrative headquarters, it is noted for its shoes, glass products, handicrafts, carpets, and especially its historic architecture. The present city was established (1566) by AKBAR and was for many years a Mogul

capital. In the reign of Shah Jehan (1628-58), the magnificent TAJ MAHAL was built. Other notable historic buildings are Akbar's fort, the Pearl Mosque, and the Great Mosque (within the fort). Agra's importance diminished after the Mogul court moved to Delhi in 1658. During the decline of the Mogul empire, the city frequently changed rulers until 1803, when it was annexed by the British. From 1836 to 1858 it was the capital of the North West Province. Agra Univ. is in the city.

Agramonte, Aristides (arē'stēdās agramōn'tā), 1869-1931, Cuban physician and pathologist, M.D. Columbia, 1892. A member of the medical corps of the U.S. army, he was appointed pathologist on the Commission on Yellow Fever in Havana, with Walter Reed and James Carroll, in 1900. He was professor of bacteriology and experimental pathology at the Univ. of Havana. Shortly before his death he undertook the organization of a department of tropical medicine at Louisiana State Univ.

Agramonte, Ignacio (ēgnā'syō), 1841-73, Cuban revolutionist. He played an important part in the Ten Years War. He became (1869) an official of the revolutionary government, but, disagreeing with Carlos Manuel de Céspedes, resigned. For a time commander in chief of the revolutionary forces, Agramonte died in battle.

agranulocytosis (āgrān'yālōsītō'sīs), disease in which the production of granulated white blood cells by the bone marrow is impaired. Although the disease may occur spontaneously it is usually induced by exposure to certain drugs, commonly antithyroid drugs, sulfonamides, and phenothiazines. Granulocytes are necessary to protect the body against infectious agents; their depletion results in severe respiratory infections, ulceration of the mouth and colon, high fever, and prostration. These symptoms may occur suddenly or over a period of days or weeks. Penicillin is usually the drug of choice to combat the bacterial invasion. The fatality rate is high (approaching 80%) in untreated cases, and deaths are common even with antibiotic treatment.

Aggrapha of Jesus (āg'rāfā) [Gr., =unwritten], sayings attributed to Jesus not found in the Gospels. There are quotations in the New Testament that do not appear in the Gospels (e.g., Acts 20:35), and in early Christian literature there are some Aggrapha from oral tradition. Thus the papyri found at Oxyrhynchus have given some new Aggrapha. Many may be PSEUDEPIGRAPHIA.

agrarian laws, in ancient Rome, the laws regulating the disposition of public lands (*ager publicus*). It was the practice of Rome to confiscate part of the land of conquered cities and states, and this was made public land. So long as it remained public land, it was occupied by tenants who paid rent, usually in produce, to the state. From the earliest times the patricians gained the largest part of the public lands, and the holding of public lands tended always in Italy to become the exclusive prerogative of the wealthy. There was also a tendency to consider land long occupied as real property of the occupier. The agrarian laws resulted from the continued efforts of the poorer classes to gain some share in the public lands. Since these lands were occupied without lease, the strictly legal aspects were not difficult, but inasmuch as most agrarian legislation challenged the lucrative privilege of the powerful of retaining the lands they held, the agrarian laws were often flagrantly disobeyed or calmly ignored. In 486 B.C., Spurius Cassius Viscellinus tried to pass a law assigning some new lands in Gaul to the poor of Rome and Latium, but Roman jealousy prevented its passage. The most famous of early agrarian laws were the Licinian Rogations (367 B.C.) of Caius Licinius Calvus Stolo (see under LICINIUS), which limited strictly the amount of land any citizen could hold and the number of sheep and cattle he could pasture on public land. These laws fell into disuse. About 233 B.C., Caius Flaminius succeeded in assigning some public lands to poor citizens. The next serious attempt to rectify an increasingly difficult situation was the Sempronian Law of 133 B.C. devised by Tiberius Sempronius Gracchus (see GRACCHI). This reenacted the provisions of the Licinian Rogations and added to the maximum allowance an extra amount for each son. The occupants were to be reduced to the legal maximum and the surplus given to the poor. The occupants were to receive in compensation full title to the land they retained. A commission was set up to execute the law, but the senate by its obstructionist tactics weakened the commission, thus rendering the law ineffective. In 123 B.C., Caius Gracchus revived the Sempronian

Law, but this time the senate ruined the reform by allowing the new tenants to sell their new land, which the wealthy bought up. From time to time newly acquired lands would be assigned to the poor, but as a rule they simply passed into the hands of the wealthy landholders. In the 1st cent. B.C. there were several assignments of public lands to veterans in Italy as well as on the borders of the empire. The wholesale confiscation and reassignment of private lands by Sulla (82 B.C.) and Octavian and Antony (43 B.C.) were called agrarian laws. The first step in the final collapse of the democratic effort that had resulted in the agrarian laws was the edict of Domitian (A.D. c.82) assigning the title of public lands in Italy to those who held them. The poorer classes were thus confirmed in a dependency on the powerful that foreshadowed the greater dependency of FEUDALISM.

agrarian reform, redistribution of the agricultural resources of a country. The traditional conception of agrarian, or land, reform is confined to the redistribution of land, in a wider sense it includes other related changes in agricultural institutions, such as credit, taxation, rents, and cooperatives. Reform of the conditions for land tenure has been one of the recurring themes in history. The history of the Greek city-states is filled with struggles between landowners and the landless. The land reform issue erupted into violence several times in Rome's history and was a major part of the Gracchan AGRARIAN LAWS. During the Middle Ages many peasant rebellions were triggered by demands for land reform, among the more famous were the Peasants' Revolt in England led by John Ball and Wat Tyler in 1381 and the German PEASANTS' WAR of 1524-26. In the 20th cent., with the successful revolution of the Bolsheviks in Russia, a new dimension to the concept of agrarian reform was added. The socialization of agriculture (i.e., the collective ownership of all land, partly through state farming but mainly through collective farming under state control) was regarded by the Marxists as vital to the realization of COMMUNISM. A major element in the success of the Russian Revolution was the desire for land among the peasantry, who formed 80% of the population. Shortly after he assumed power, Vladimir Ilyich Lenin, the Bolshevik leader, published his decree (1917) declaring all land to be state property. The landed estates belonging to the nobility and gentry were seized by peasants, and until 1929 there were approximately 25 million peasant holdings. Government propaganda urging the collectivization of farms had little effect, and, under Joseph Stalin, collectivization was enforced at the cost of much bloodshed. After World War II most of the countries of Eastern Europe under Communist governments experienced similar agrarian reforms. Large landed estates, operated by laborers whose social and economic status was little better than that of serfs, were broken up and redistributed, with a maximum size of 50 to 124 acres (20.2-50 hectares) imposed. Following the pattern established in the Soviet Union, however, this step toward individual small holdings was only a prelude to the introduction of compulsory collectivization, the ultimate goal of Communist land reform. In China, the successful revolution by the Communists in 1949 brought about a fundamentally more agrarian revolution than had occurred in the Soviet Union. Initially, 40% to 50% of the arable land was transferred from landlords and rich peasants to poor peasants and workers. By 1956 more than 95% of the peasant households had been organized into agricultural cooperatives. In 1958 it was decided to amalgamate these cooperatives into the larger people's communes, the main objective of the communes was to establish a collective socialist agriculture prior to mechanization, a decision much criticized by the Soviet Union. World pressure for land reform is most powerful in the underdeveloped areas, particularly in Asia and Latin America. In Asia, especially in densely populated areas such as the Indian subcontinent and Japan, agitation has been mainly for redistribution among landless laborers, for security of tenure, and for the elimination of middlemen rent receivers, oppressive rents, and usurious interest. Agrarian reforms began in Japan during the Meiji Restoration (1868-1912), when feudal fiefs and stipends were abolished and the land tax was revised. From this period until World War II agrarian disputes continued from time to time. After the war the U.S. occupation forces supervised further land reform so that by 1949 over 80% of Japan's tenanted land had been transferred from absentee landlords to tenant cultivators. In India and Pakistan similar programs of agrarian reform were instituted as well as programs of land donation

(see BHAVE, Vinoba). In Latin America land reform is a major problem. The agrarian structure in Latin America consists of enormous tracts of land (latifundios) concentrated in very few hands. Because of this degree of concentration, greater than that of any other world region of comparable size, there is a growing demand for expropriation and redistribution. Ownership is often of the absentee type, with laborers no better off than serfs. Although the revolution in Mexico resulted in a land reform (1917), the program of redistribution of land is still only partially completed. A land reform law also followed the Bolivian revolution of 1952, but by 1970 only 45% of the peasant families had received titles to land. One of the most complete agrarian reforms in Latin America has taken place in Cuba, where land reform was one of the main platforms of the revolution of 1959. Nearly all the large holdings subject to expropriation were taken over by the National Institute for Land Reform (INRA), which is responsible not only for administering land reform, but for planning and directing all agricultural policy. The remaining agricultural area is limited to a ceiling of about 166 acres (67 hectares) with the tenants having full ownership rights. Most of the land taken over by INRA has not been distributed to the peasants, but is being managed by officials of INRA or by army personnel. An agrarian reform program was conducted in Chile between 1970 and 1973 under the socialist government of Salvador Allende. All farms of over 198 acres (80 hectares) were expropriated, and redistribution to the peasants was begun, this program ceased (1973) with the downfall of Allende's government. See COLLECTIVE FARM. See United Nations, *Land Tenure, Land Reform. Defects in Agrarian Structure as Obstacles to Economic Development* (1951), Kenneth Parsons, ed., *Land Tenure* (1956), Clarence Senior, *Land Reform and Democracy* (1958), Kuo-chün Chao, *Economic Planning and Organization in Mainland China* (2 vol., 1959-60), J. R. Brown and Sein Lin, ed., *Land Reform in Developing Countries* (1967), Doreen Warriner, *Land Reform in Principle and Practice* (1969), E. H. Jacoby, *Man and Land* (1971).

Agricola (Cneius Julius Agricola) (ægrík'əla), A.D. c.40-A.D. 93, Roman general, the conqueror of Britain. After a distinguished military and political career (partly in Britain), he was made consul (A.D. 77) and was governor (A.D. 78?-A.D. 85?) of Britain. He pacified most of the island, conquering North Wales and advancing far into Scotland. He also circumnavigated the island. An enlightened governor, he sought to Romanize Britain without harshness or oppression. As portrayed in the biography by his son-in-law, Tacitus, Agricola was the finest exemplar of the old Roman virtues in his day. See A. R. Burn, *Agricola and Roman Britain* (1953, repr. 1965).

Agricola, Georgius, latinized from Georg Bauer (gä'örk bou'ər), 1494-1555, German physician and scientist, known as the father of mineralogy. He was a pioneer in physical geology and the first to classify minerals scientifically. His celebrated work *De re metallica* (1556) was a standard in metallurgy and mining for over a century and was translated into English (1912) by Herbert C. Hoover and Lou H. Hoover.

Agricola, Johann or Johannes (yō'hān, yōhā'nəs), c.1494-1566, German Protestant minister, whose family name was Schnitter (originally Schneider). He was born at Eisleben and is sometimes called Magister Islebius. He had an early association with Martin Luther and was active in the founding of Protestantism. In 1536 he espoused antinomianism, thus breaking with Luther. He was court preacher to Joachim II, elector of Brandenburg and helped draw up the Augsburg Interim. Agricola also made a collection of German proverbs.

Agricola, Rudolphus, 1443-85, Dutch humanist, whose real name was Roelof Huysman. He opposed scholasticism and spread the culture of the Renaissance throughout Germany.

Agricultural Adjustment Administration (AAA), former U.S. government agency established (1933) in the Dept. of Agriculture under the Agricultural Adjustment Act of 1933 as part of Franklin Delano Roosevelt's New Deal program. Its purpose was to help farmers by reducing production of staple crops, thus raising farm prices and encouraging more diversified farming. Farmers were given benefit payments in return for limiting acreage given to staple crops, in the case of cotton and tobacco coercive taxes forced (1934-35) farmers to cut the amounts that they marketed. In 1936 the Supreme Court declared important sections of the act invalid, but Congress promptly adopted (1936) the Soil Con-

servation and Domestic Allotment Act, which encouraged conservation by paying benefits for planting soil-building crops instead of staple crops. The Agricultural Adjustment Act of 1938 empowered the AAA in years of good crops to make loans to farmers on staple crop yields and to store the surplus produce, which it could then release in years of low yield. Soil conservation was continued and farmers could by two-thirds vote adopt compulsory marketing quotas (as they did for cotton and tobacco). In World War II the AAA turned its attention to increasing food production to meet war needs. It was renamed (1942) the Agricultural Adjustment Agency, and in 1945 its functions were taken over by the Production and Marketing Administration. See E. G. Nourse and others, *Three Years of the Agricultural Adjustment Administration* (1937, repr. 1971), G. S. Shepherd, *Agricultural Price and Income Policy* (3d ed. 1952), V. L. Perkins, *Crisis in Agriculture* (1969).

agricultural subsidies, financial assistance to farmers through government-sponsored price support programs. Since the 1930s most industrialized countries have developed agricultural price support policies to reduce the instability of farm prices and to raise farm income, the programs vary considerably by country. In food-importing countries, such as Great Britain and the nations of the Continent, agricultural price support programs are also aimed at encouraging domestic production to make the economies more self-sufficient. In food-exporting countries, such as the United States and Canada, agricultural subsidy programs are used primarily to increase farm income by raising the long-term level of prices above free-market levels. In the United States the federal government first assisted agriculture directly in the 1920s. During World War I farmers had been encouraged to increase production, and in the postwar period wartime levels of production were maintained, resulting in an oversupply that caused a disastrous collapse of prices. In Congress, in order to aid the farmer, a nonpartisan farm bloc attempted to promote favorable legislation. The Agricultural Credits Act (1923) expanded Federal credit available to farmers for intermediate loans, but the measure failed to solve the problem. Although President Coolidge vetoed the McNary-Haugen bills (1927, 1928), which featured price fixing of products and direct subsidies, the situation of the farmers had so worsened by 1929, even before the onset of the depression, that President Hoover signed the Agricultural Marketing Act (1929), initiating a program of direct aid to agriculture. The act established the Federal Farm Board with a fund of \$500 million to further farming cooperatives and to set up stabilization boards, which by their purchases on the open market were to fix the prices of grain and cotton. The purchases of the Farm Board, however, encouraged farmers to raise still larger crops in expectation of higher prices, the Farm Board failed and sold out its holdings at a loss of \$200 million. Between 1929 and 1932 the ratio of prices paid by farmers to that received by farmers fell to the lowest point on record. The Agricultural Adjustment Act of 1933, one of the first pieces of legislation passed under President Franklin Delano Roosevelt's New Deal program, attempted to control farm prices by reducing and controlling the supply of basic crops. Previous attempts to raise farm prices—such as the Farm Board—had failed because of the difficulty in controlling supply. Through the Agricultural Adjustment Administration (AAA) in the Dept. of Agriculture, the Secretary of Agriculture was empowered to fix marketing quotas for major farm products, to take surplus production off the market, and to cut the production of staple crops by offering producers payments for voluntarily reducing their acreage. It was hoped that these measures would not only provide farmers with immediate relief in the form of cash payments but would increase the prices for their products by reducing their surpluses. The Commodity Credit Corporation (CCC), also created in 1933, began making loans to farmers on corn and cotton and, later, on other basic farm commodities. These were nonrecourse loans for which borrowers gave no security except the commodities that were put in storage, if prices advanced above the loan value, the farmers could sell the products and repay the loan, and if they dropped below the loan level the CCC sold the commodities and absorbed the loss. Loans were granted only to farmers who agreed to sign production control agreements. Severe drought and the programs of the AAA led to the curtailment of the surpluses, and farm prices subsequently improved, between 1932 and 1937 the prices for major farm products increased by approximately 85%. In 1936 the Supreme Court de-

clared unconstitutional certain production control features of the Agricultural Adjustment Act. Later in 1936 the Soil Conservation and Domestic Allotment Act was passed, although it made for better land use, it provided inadequate authority for price and income stabilization operations. Heavy crops of wheat and cotton in 1937 led to passage of the Agricultural Act of 1937, in its amended form this act provided the framework for the major farm program since that time. The act made price support loans by the CCC mandatory on the designated basic commodities of corn, wheat, and cotton, optional support was authorized for other commodities. Under this act and related legislation, the CCC has supported more than 100 different commodities, including fruit, vegetables, and various types of seed. From 1941 to 1948, during and just after World War II, surpluses were being rapidly utilized and price supports were used as an incentive to stimulate production of agricultural commodities. The Steagall Amendment of 1941 made supports on many nonbasic commodities mandatory for the duration of the war and for two years after the end of hostilities. In 1948 price support levels were lowered for most of these commodities. By 1949 the agriculture of war-devastated Europe and Asia had recovered to a considerable extent, and demand for American farm products declined considerably. In the meantime, however, crop production in the United States had greatly increased, with the result that farm commodity prices dropped and surpluses began to build up. The Agricultural Act of 1948, which replaced wartime controls, maintained rigid support levels for the basic commodities. The Agricultural Act of 1949 retained mandatory supports for basic commodities and provided flexible support levels for a new list of nonbasic commodities. The Korean War strengthened farm prices, and most CCC stocks were sold, from the creation of the CCC in 1933 to the end of 1952 the CCC showed a profit on basic commodities of over \$13 million. The National Wool Act of 1954 provided mandatory price supports for wool and mohair. Mounting surpluses and increased costs of government programs led to the enactment of a flexible price support program in 1954, its objective was to decrease price support levels when large surpluses existed. Large quantities of surplus basic commodities were also moved overseas under the Agricultural Trade Development and Assistance Act of 1954, popularly known as Public Law 480. In 1956 the Soil Bank Program was created, which called for payment to farmers for reducing their acreage of major supported crops and required leaving idle the land removed from production. Price-support operations, as directed by the Congress, are financed by the CCC and constitute its major activity. The largest and probably the most effective programs used were the loan and storage programs of the CCC, in addition to the nonrecourse loan program of the CCC, in some cases direct purchases were made. The desired effect of control programs was largely being negated by the utilization by farmers of improved technology that made it possible to greatly increase yields per acre. In general, the price support levels were set above the market-clearing price and the disequilibrium between prices and quantities that might be offered has been handled by stock accumulation, land withdrawal programs, and export subsidies of various types. In the early 1960s there was a shift in emphasis. The market price supports on major commodities were dropped to or near market-clearing prices, and producer's incomes meanwhile were protected by direct payments on fixed quantities of products. This shift made possible the reduction of export subsidies on major price supported crops without inducing continual stock increases or applying compulsory production controls. Direct payments to farmers greatly increased in the 1960s and 70s. The feed grain, cotton, and wheat programs accounted for most of this increase. Subsidies to maintain prices, once introduced, have proved extremely difficult to end. Representatives of the farm states have fought for their continuation despite the high prices for farm commodities. See O. B. Jesness, *Readings in Agricultural Policy* (1947), M. R. R. Benedict, *Farm Policies of the United States* (1953) and *Can We Solve the Farm Problem?* (1955), Karl Fox, *The Contribution of Farm Price-Support Programs to General Economic Stability* (1954), C. M. Hardin, ed., *Agricultural Policy, Politics, and the Public Interest* (1960), M. C. Campbell, *The Farm Bureau and the New Deal* (1962), G. S. McGovern, ed., *Agricultural Thought in the Twentieth Century* (1967), Marion Clawson, *Policy Directions for U. S. Agriculture* (1968), R. J. Hildreth, ed., *Readings in Agricultural*

Policy (1968), Iowa State University Center for Agricultural and Economic Development, *Food Goals, Future Structural Changes and Agricultural Policy: A National Basebook* (1969), V. L. Perkins, *Crisis in Agriculture* (1969), D. F. Hadwiger, *Federal Wheat Commodity Programs* (1970), E. A. Heady, *Future Farm Programs* (1972).

agriculture, science of producing crops and livestock from the natural resources of the earth. The primary aim of agriculture is to cause the land to produce more abundantly and at the same time to protect it from deterioration and misuse. The diverse branches of modern agriculture include AGRONOMY, HORTICULTURE, entomology, animal husbandry, DAIRYING, agricultural engineering, soil chemistry, and agricultural economics. Early man depended for his life on hunting, fishing, and food gathering. To this day, some groups still pursue this simple way of life, and others have continued as roving herdsmen (see NOMAD). However, as various groups of men undertook deliberate cultivation of wild plants and domestication of wild animals, agriculture came into being. Cultivation of crops—particularly grains such as wheat, rice, rye, barley, and millet—encouraged settlement of stable farm communities, some of which grew to be towns and city-states in various parts of the world. Early agricultural implements—the digging stick, the HOE, the scythe, and the PLOW—developed slowly over the centuries, each innovation (e.g., the introduction of iron) causing profound changes in human life. From early times, too, men created ingenious systems of irrigation to control water supply, especially in semiarid areas and regions of periodic rainfall, e.g., the Middle East, the American Southwest and Mexico, the Nile Valley, and S. Asia. Farming was intimately associated with landholding (see TENURE) and therefore with political organization. Growth of large estates involved the use of slaves (see SLAVERY) and bound or semi-free labor. In the Western Middle Ages the MANORIAL SYSTEM was the typical organization of more or less isolated units and determined the nature of the agricultural village. In the Orient large holdings by the nobles, partly arising from feudalism (especially in China and Japan), produced a similar pattern. As the Middle Ages waned, increasing communications, the commercial revolution, and the steady rise of cities in Western Europe tended to turn agriculture away from subsistence farming toward the growing of crops for sale outside the community (commercial agriculture). In Britain the practice of INCLOSURE allowed landlords to set aside plots of land, formerly subject to common rights, for intensive cropping or fenced pasturage—leading to efficient production of single crops. In the 16th and 17th cent. horticulture was greatly developed and contributed to the so-called agricultural revolution. Exploration and intercontinental trade, as well as scientific investigation, led to the development of horticultural knowledge of various crops and the exchange of farming methods and products, such as the potato, which was introduced from America along with beans and corn (maize) and became almost as common in N. Europe as rice is in SE Asia. The appearance of mechanical devices such as the sugar mill and Eli Whitney's cotton gin helped to support the system of large plantations based on a single crop. The Industrial Revolution after the late 18th cent. swelled the population of towns and cities and increasingly forced agriculture into greater integration with general economic and financial patterns. In the American colonies the independent, more or less self-sufficient farm worked by the farmer and his family became the norm in the North, while the plantation, using slave labor, was dominant (although not universal) in the South. The free farm pushed westward with the frontier. In the N and W United States the era of mechanized agriculture began with the invention of such farm machines as the REAPER, the CULTIVATOR, the thresher, and the COMBINE. Other revolutionary innovations, e.g., the TRACTOR, continued to appear over the years, leading to a new type of large-scale agriculture. Modern science has also revolutionized food processing, refrigeration, for example, has made possible the large meat-packing plants and shipment and packaging of perishable foods. Urbanization has fostered the specialties of MARKET GARDENING and TRUCK FARMING. Harvesting operations (see HARVESTER) have been mechanized for almost every plant product grown. Breeding programs have developed highly specialized animal, plant, and poultry varieties, thus increasing production efficiency greatly. In the United States and other leading food-producing nations agricultural colleges and government agencies attempt to increase output by dis-

seminating knowledge of improved agricultural practices, by the release of new plant and animal types, and by continuous intensive research into basic and applied scientific principles relating to agricultural production and economics. These changes have, of course, given new aspects to agricultural policies. Most of the governments of the world face their own type of farm problem, and the attempted solutions vary as much as does agriculture itself. The modern world includes areas, such as Denmark, where specialization and conservation have been highly refined, as well as areas such as N. Brazil and parts of Africa where forest peoples still employ "slash and burn" agriculture—cutting down and burning trees, exhausting the ash-enriched soil, and then moving to a new area. In other regions, notably SE Asia, dense population and very small holdings necessitate intensive cultivation, using manpower and animals but few machines, here the yield is low in relation to energy expenditure. In many countries extensive government programs control the planning, financing, and regulation of agriculture. See also DRY FARMING, GRANGER MOVEMENT, GREEN REVOLUTION, RANCH, RANGE.

Agriculture, United States Department of, Federal executive department established in 1862, whose head was made a cabinet member in 1889. The department is charged with administering Federal programs related to food production and rural life. Although the department's principal duty is to aid farmers through research, planning, service, and regulatory agencies, it also serves consumers by inspecting and grading certain products, and administers Federal food programs designed to alleviate hunger. Divisions of the Dept. of Agriculture are Rural Development (which includes the Farmers Home Administration and the RURAL ELECTRIFICATION ADMINISTRATION), Marketing and Consumer Services (which includes the Food Stamp Program and agencies overseeing government inspection of meat, poultry, and dairy products), International Affairs and Commodity Programs, Conservation, Research and Education (which includes the Agricultural Research Service, the Forest Service, and the Soil Conservation Service), and Agricultural Economics. The publications of the department are of great value to farmers, horticulturists, and others. See Ferdie Deering, *USDA, Manager of American Agriculture* (1945), U. S. Department of Agriculture, *Century of Service* (1963), study by J. U. Terrell (1966).

Ağrı Dağı (arū' da-ū') see ARARAT

Agrirento (agrē'jān'tō), Lat. *Agrirentum*, city (1971 pop. 49,174), capital of Agrirento prov., S. Sicily, Italy, on a hill above the Mediterranean Sea. It is an agricultural market and a tourist center. Sulfur, salt, and gypsum are produced. Founded c. 580 B.C. as Acragas (or Akragas) by Greek colonists of GELA, the city became one of the most prosperous in the Greek world, as is indicated by the imposing ruins that remain. It was destroyed c. 406 B.C. by Carthage but recovered. During the first of the PUNIC WARS the city suffered at the hands of both the Romans and the Carthaginians. It fell definitively to Rome in 210 B.C. during the Second Punic War. After the fall of Rome, Agrirento passed to the Byzantines and then to the Arabs (9th cent.) and to the Normans (11th cent.). Of note in the city are the remains of several Doric temples (6th–5th cent. B.C.), Roman ruins, Christian catacombs, and archaeological and art museums.

agrimony (āg'rīmō'nē), any plant of the genus *Agri- monia*, perennials of the family Rosaceae (ROSE family) native to north temperate zones, to Brazil, and to Africa. They are found wild in the N. and central United States. Agrimony is sometimes cultivated in herb gardens for its small yellow flowers and aromatic leaves, used for an astringent tea. Agrimony is classified in the division MAGNOLIOPHYTES, class Magnoliopsida, order Rosales, family Rosaceae.

Agrippa (āgrīp'ə), in Palestinian history see HEROD **Agrippa**, **Marcus Vipsanius** (mar'kəs vīpsā'nēəs), c. 63 B.C.–12 B.C., Roman general. A close friend of Octavian (later Emperor AUGUSTUS), he won a name in the wars in Gaul before becoming consul in 37 B.C. He organized Octavian's fleet and is generally given much credit for the defeat (36 B.C.) of Sextus Pompeius in the naval battles at Mylae and Naulochus (N. Sicily). Agrippa took part in the war against Antony, and his naval operations were the basis of Octavian's decisive victory at Actium in 31 B.C. He was perhaps the most trusted of all Augustus' lieutenants and rendered many services, notably in putting down disorders in both the East and West. His third wife was Augustus' daughter Julia. See biography by Meyer Reinhold (1933).

Agrippina I (äg'ripī'nā), d. A.D. 33, Roman matron, daughter of Agrippa and Julia and granddaughter of Augustus. She was the wife of GERMANICUS CAESAR and accompanied him on his provincial duties. After her husband's death (A.D. 19), she accused TIBERIUS of having Germanicus poisoned, and thereafter she was consistently on bad terms with the emperor. Exiled to Pandateria Island in the Bay of Naples, she starved herself to death. She is also called Agrippina Major or Agrippina the Elder. Her son Caius Caesar Germanicus became the emperor CALIGULA.

Agrippina II, d. A.D. 59, Roman matron, daughter of Germanicus Caesar and Agrippina I. By her first husband, Cn. Domitius Ahenobarbus, she was the mother of NERO. After her brother Caligula became emperor, she had some power until she was discovered conspiring against him. She achieved her ambitions for her son after her uncle Emperor CLAUDIUS I took her as his third wife. She dominated the emperor and persuaded him to advance the interests of Nero at the expense of his own son, BRITANNICUS. She almost certainly poisoned Claudius, thus bringing Nero to power. She quarreled with Seneca, with Claudius' secretary Narcissus, and with the other ministers. Her son, weary of her intrigues, had her murdered. Colonia Agrippinensis (modern Cologne) was named for her.

agronomy (əgrŏn'əmē), branch of agriculture dealing with soil management and production of major field crops. It embraces a variety of physical and biological disciplines, e.g., soil fertility and conservation, plant breeding and physiology, and climatology. Its aim is to provide food and fiber for mankind, and it thus comprises the world's largest single industry. Agronomy deals primarily with the production of large-scale crops, e.g., wheat, barley, corn, oats, rice, soybeans, and cotton, as opposed to HORTICULTURE, which is concerned with fruits, vegetables, flowers, and ornamental plants.

Agua (a'wa, a'gwa), inactive volcano, 12,310 ft (3,752 m) high, S Guatemala. In 1541, climaxing several days of unceasing rain and earthquakes, a wall of water, whose origin is not scientifically explained, swept down from its slopes, completely destroying Ciudad Vieja. Over 1,000 inhabitants were drowned, including the governor, Doña Beatriz de la Cueva. The flood resulted in the founding of Antigua.

Aguadilla (a'gwadē'yā, a'wa-), town (1970 pop. 21,031), NW Puerto Rico, a port on Mona Passage. It is the trade center for an agricultural region. Columbus reputedly landed at the site of Aguadilla in 1493.

Aguascalientes (a'gwaskalyān'tās, a'was-) [Span. = "hot waters"], state (1970 pop. 334, 936), 2,499 sq mi (6,472 sq km), central Mexico, on the Anahuac plateau, a fertile agricultural region. AGUASCALIENTES is the capital. Cattle are raised on the wide plains and in the foothills, and there is some mining in the mountainous areas, though much of the mineral wealth, especially copper, remains unexploited. Aguascalientes is noted for the warm mineral springs, for which it is named, and for a fine climate.

Aguascalientes, city (1970 pop. 173,126), capital of Aguascalientes state, central Mexico. The city is a pleasant health resort, noted for its mineral waters. Its industries include smelting and the manufacture of textiles. Aguascalientes is built over an ancient, intricate system of tunnels constructed by early, still unidentified, inhabitants. Founded in 1575, the city was long a Spanish outpost against hostile Indians; railroad development in the late 19th cent. gave it commercial importance.

Aguesseau, Henri François d' (aNre' fraNswa' dāgēsō'), 1668-1751, French lawyer. He became procureur general in the Parlement of Paris (1700) and chancellor of France (1717). Because of his opposition to John LAW he was briefly exiled to his estates. He served as chancellor again (1720-22, 1737-50) and devoted himself to judicial reform. The name also appears as Daguesseau.

Aguinaldo, Emilio (āmē'lyō agēnāl' dō), 1869-1964, Philippine leader. In the insurrection against Spain in 1896 he took command, and by terms of the peace that ended it he went into exile at Hong Kong. After the outbreak of the Spanish-American War, Aguinaldo returned to the Philippines and led a Philippine insurrection in concert with U.S. attacking forces. He set up a republic with its capital at Malolos and himself as president, and when Philippine independence was brushed aside in the peace treaty that ended the Spanish-American War, he headed (1899-1901) a rebellion against U.S. occupying forces until he was captured by Frederick Funston. Aguinaldo took the oath of allegiance to the United States, was briefly imprisoned, and retired to private life. In 1935 he ran for president but was

defeated by Manuel Quezon. Aguinaldo was charged with cooperating with the Japanese occupying the Philippines in World War II, in 1945 he was taken into custody, but he was not tried. With V. A. Pacis he wrote *A Second Look at America* (1957). See his memoirs (tr. 1967), biography by Carlos Quirino (1969).

Aguirre, Lope de (lō'pā thā agē'rā), c. 1510-1561, Spanish rebel and adventurer in colonial South America. He was often involved in violence and sedition before joining (1560) the expedition of Pedro de URSUA down the Marañon and the Amazon. He was one of the men who overthrew and killed Ursua, then he killed Ursua's successor, Fernando de Guzmán, and took command himself. He and his men reached the Atlantic—probably by the Orinoco River—and on the way wantonly laid waste Indian villages. In 1561 he seized Margarita island and held it in a grip of terror. He then crossed to the mainland in an attempt to take Panama, openly proclaiming rebellion against the Spanish crown. Surrounded at Barquisimeto, Venezuela, Aguirre in desperation crowned his infamous life by the murder of his own daughter. He surrendered and was shot. See Walker Lowry, *Lope Aguirre, the Wanderer* (1952), A. F. Bandler, *The Gilded Man* (1893, repr. 1962).

Agulhas, Cape (əgū'lās) [Port. = needles], W Cape Province, Republic of South Africa, the southernmost point of Africa. Its name refers to the saw-edged reefs and sunken rocks that run out to sea and make navigation hazardous. A powerful lighthouse on the cape alerts ships. The meridian of Cape Agulhas, long 20° E, is used to divide the Atlantic and Indian oceans.

Agur (ā'gər), unidentified author of Prov. 30.

Agusan (agoō'san), river, c. 240 mi (390 km) long, rising in the mountains of SE Mindanao, the Philippines, and flowing N past Butuan to Butuan Bay. It is navigable for small craft c. 160 mi (260 km) upstream. The Agusan valley is very fertile and is one of the Philippines' chief rice-growing regions.

Agustini, Delmira (dēlmē'ra agoōstē'nē), c. 1886-1914, Uruguayan poet. Essentially a poet of ideas, Agustini combined deep spiritual and erotic yearnings in bold and expressive imagery. She abandoned traditional forms in her strongly controlled verses. After a brief and unhappy marriage she was murdered by her estranged husband. *El Rosario de Eros* (1914) is one of her best-known collections; her complete works were published in 1924.

Ahab (ā'hāb), d. c. 853 B.C., king of Israel (c. 874-c. 853 B.C.), son and successor of OMRI 1. Ahab was one of the greatest kings of the northern kingdom. He consolidated the good foreign relations his father had fostered, and Israel was at peace during much of his reign. His marriage with JEZEBEL helped his friendship with Tyre, and his alliance with JEHOASHAPATH 1, king of Judah, made Ahab sure of his less powerful neighbor to the south. Ahab's prestige is seen in Assyrian inscriptions mentioning his alliance against SHALMANESER III, who won an indecisive victory (c. 854 B.C.) at Karkar on the Orontes. After this campaign Ahab and BENHADAD 2 of Damascus went to war over the country E of the Jordan. Ahab was killed in battle. The biblical account of Ahab's reign (1 Kings 16:28-22:40) is most interesting in its religious aspects. To the devout, Ahab's foreign wife, with her Tyrian cults and behavior, represented evil. Besides, she was a willful woman and entertained exalted ideas of royal prerogative. She met her match in ELIJAH, the champion of Israel's God. He was an important factor in the discontent that began to develop in Israel at this period. Ahab was succeeded by his sons, first Ahaziah, then Jehoram. The ruins of his palace have been excavated at SAMARIA. The Ahab of Jer. 29:21,22 is a different person, a lying prophet.

Ahad Ha-Am (akhād' ha-am), 1856-1927, Jewish thinker and Zionist leader, b. Russia. Originally named Asher Ginsberg, he adopted the pen name of Ahad Ha-Am [One of the People] when he published his first and highly controversial essay "The Wrong Way" (1889), in which he criticized those who sought immediate settlement in Palestine, advocating instead Jewish cultural education as the basis for building a strong people for later settlement. At first he received a traditional Hasidic education. His later philosophic and literary studies (in Russian, German, French, English, and Latin) led him to develop a strong rationalist attitude that resulted in his rejection first of Hasidism and then of religion itself. Not a political Zionist, he saw Palestine as the "spiritual center" in which the best in Jewish life would be revived and strengthened, giving strength and direction to Jews in the Diaspora.

Since he regarded religion as no longer valid in a modern age, he saw the chief obligation of Jewish life as fulfillment of the ethical demands of the Old Testament prophets. He spent his last years in Palestine and died there. A number of his essays have been anthologized in *Selected Essays of Ahad Ha-Am* (tr. and ed. by Leon Simon, 1912, repr. 1962). See biography by Leon Simon (1960).

Ahaggar, mountains, Africa. See SAHARA.

Aha of Shabcha (a'ha, shab'kha) or **Achai of Shabcha** (a'khī), c. 680-c. 762, Babylonian rabbi. He settled (c. 752) in Palestine after being passed over for appointment as head of the rabbinic academy of Pumbedita for political reasons. His major work, *Sheilthoth* [Questions], reflects both the Babylonian Talmud of his earlier years and the influence of the Palestinian Talmud, with which he became familiar at this later period. It is a collection of legal and ethical sermons or treatises intended to be of use to laymen as well as to the scholars for whom most of the learned Jews wrote. Aha is the first scholar after the close of the compilation of the Talmud of whom there is record. His work emphasizes the value of the basic virtues and everyday morals.

Aharah (āhār'ā), the same as AHIRAM.

Aharhel (āhar'hēl), Judahite family. 1 Chron. 4:8.

Ahasai (āhās'āi, āhā'sī), priest. Ahazai. RSV. Neh. 11:13. Jahzerai. 1 Chron. 9:12.

Ahasbai (āhās'bāi, -bī), father of ELIPHELET 3.

Ahasuerus (āhās'yōōē'rās), Hebrew form of the name Xerxes, as used in the Bible. The Ahasuerus of Esther is probably Xerxes I. That of Tobit 14:15 may be Cyaxares I, destroyer of Nineveh. The name of the father of DARIUS THE MEDE is also given as Ahasuerus.

Ahava (āhā'vā), unidentified place, where Ezra collected one of his expeditions. Ezra 8:15,21,31.

Ahaz (ā'hāz), d. c. 727 B.C., king of Judah (c. 731-727 B.C.), son of Jotham. His reign marked the end of the real independence of Judah. A coalition of Pekah of Israel and Rezin of Syria attacked him and nearly took Jerusalem. Ahaz appealed for help to Tiglathpileser III of Assyria, who defeated Ahaz's enemies but demanded tribute of Judah. Ahaz sent some Temple gold as payment. The greatest figure of that time in Judah was the prophet Isaiah, who opposed the Assyrian alliance. Ahaz is denounced in the Bible for his heathen abominations and his sacrilege with the Temple gold. In Ahaz's reign Judah lost Elath, its Red Sea port, permanently. Ahaz was succeeded by Hezekiah. 2 Kings 16, 2 Chron. 28, Isa. 7. Ahaz. Mat. 1:9. A different Ahaz, otherwise unknown, is mentioned in 1 Chron. 8:35 and 9:42.

Ahaziah (āhāz'ā), 1. King of Israel, son of Ahab. He was a worthy successor of his father only in that he followed Ahab's religious views. He was succeeded by his brother JEHOHAM 1. 1 Kings 22:51-53, 2 Kings 1, 2 Chron. 20:35-37. 2. King of Judah, son of JEHOHAM 2 and ATHALIAH 1. He was considered a typical descendant of Ahab. He was killed in Jehu's coup d'état while visiting at Jezreel. His mother succeeded him. 2 Kings 8:25-29, 9, 2 Chron. 22. He is called Azariah in 2 Chron. 22:6 and Jehoahaz in 2 Chron. 21:17 and 25:23.

Ahban (a'bān), Jerahmeelite. 1 Chron. 2:29.

Aher (ā'hār), Benjamite. 1 Chron. 6:12. Perhaps the same as AHIRAM.

Ahi (ā'hī), 1 Gadite. 1 Chron. 5:15. 2. Asherite. 1 Chron. 7:34.

Ahiah (āhī'ā), variant of AHIAH.

Ahiam (āhī'ām), one of David's men. 2 Sam. 23:33, 1 Chron. 11:35.

Ahian (āhī'an), Manassite. 1 Chron. 7:19.

Ahidjo, Ahmadou (ama'dō ahē'jōō), 1924-, president of the United Republic of Cameroon (1960-). The son of a Muslim Fulani chief, he served with the French during World War II. Entering politics in the French Cameroons after the war, he became vice premier (1957) and then premier (1958) of the territory. With the independence (1960) of the Cameroonian Republic, he was elected its first president. He also became president of the Mouvement d'Union Camerounaise, a political party affiliated with the Rassemblement Démocratique Africain (RDA), both of which favored continued strong ties with France. As a result of his efforts, the British-administered Southern Cameroons voted (1961) to unite with the Cameroonian Republic in the Federal Republic of Cameroon. He was reelected president in 1965 and 1970 as the candidate of the country's sole political party. In 1972 he secured adoption of a new unitary constitution, creating the United Republic of Cameroon.

Ahiezer (āhīē'zār) 1 Prince of Dan Num 112
2 Chief of David's bowmen 1 Chron 123

Ahihud (āhī'hād) 1 Prince of Asher Num 3427
2 Benjamite 1 Chron 83

Ahijah (āhī'jā), common name in the Bible, occasionally spelled Ahiah 1 Prophet from Shiloh 1 Kings 1129, 1215, 141-18, 2 Chron 1015 2 Priest in the time of Saul, perhaps the same as AHIMELECH 1. 1 Sam 143 3 One of David's captains 1 Chron 1122 4 Scribe 1 Kings 43 5 Father of King BAASHA 6 Jerahmeelite 1 Chron 225 7 Benjamite 1 Chron 87 Ahoah 1 Chron 84 8 Levite 1 Chron 2620 9 Sealer of the covenant Neh 1026

Ahikam (āhī'kām), protector of Jeremiah and the father of Gedaliah 2 Kings 2212, 14, 2 Chron 3420, Jer 2624, 405

Ahilud (āhī'lād) 1 Father of JEHOSHAPHAT 2 2 Father of BAANA 3

Ahimaaz (āhīm'āz) 1 Father of AHINOAM 1. 2 One of the men set to spy on Absalom 2 Sam 1527, 1717-21, 1819-32 3 Husband of BASMATH and perhaps the same as 2

Ahiman (āhīm'an) 1 Son of ANAK 2 Family of porters 1 Chron 917

Ahimelech (āhīm'elēk) 1 Priest at Nob, brother of, or perhaps the same as, AHIAH 2. He befriended David, and Saul had him killed 1 Sam 229-19 Abimelech 1 Chron 1816 Name reversed with that of his son, Abiathar 2 Sam 817, 1 Chron 1816, 246 2 Hittite in David's camp 1 Sam 266

Ahimoth (āhīm'ōth), Merarite Levite 1 Chron 625
ahimsa (āhīm'sa) [Sanskrit, =noninjury], ethical principle of noninjury to both men and animals, common to Buddhism, Jainism, and Hinduism Ahimsa became influential in post-Vedic India, contributing to the spread of vegetarianism Political implications of ahimsa were developed in the non-violence movement of Mohandas GANDHI

Ahinadab (āhīn'adāb), one of Solomon's stewards 1 Kings 414

Ahinoam (āhīn'ōam) 1 A wife of Saul 1 Sam 1450 2 One of David's early wives 1 Sam 2543, 273, 305, 2 Sam 22, 32

Ahio (āhī'ō) 1 One of those who drove the cart that carried the Ark 2 Sam 63, 4, 1 Chron 137 2 Uncle of Saul 1 Chron 831, 937 3 Benjamite 1 Chron 814

Ahira (āhī'rā), prince of Naphtali Num 115

Ahiram (āhī'rām), son of Benjamin Num 2638 Ehi Gen 4621 Aharah 1 Chron 81 AHER may be the same

Ahisamach (āhīs'amāk), father of AHOLIAB

Ahishahar (āhīsh'ahar, āhī'-), Benjamite 1 Chron 710

Ahishar (āhī'shar), royal steward 1 Kings 46

Ahitophel (āhīth'afēl), David's counselor who joined with Absalom against David He killed himself when Absalom ignored his counsel He may have been the grandfather of Bath-sheba 2 Sam 1512, 1620-1723, 2334 The Vulgate form of the name is Achitophel

Ahitub (āhī'tāb) 1 Father of AHIMELECH 1 and AHIAH 2. 2 Father, or grandfather, of ZADOK 1. 3 Father of ZADOK 5

Ahlab (a'lāb), town of Asher Judges 131

Ahlai (a'lāi) 1 Jerahmeelite 1 Chron 231,34 2 Father of one of David's men, Zabad 1 Chron 1141

Ahlin, Lars (larsh alēn'), 1915-, Swedish novelist Ahlin's works are marked by great creative vitality, psychological realism, and a concern with spiritual values Although his novel *If* (1946) was criticized for narrative meandering and excessive religious theorizing, *The Cinnamon Stick* (1953) won him critical acclaim His baring of human foibles and self-deceptions and his vision of life as bizarre are reminiscent of Dostoyevsky

Ahmad. For Ottoman sultans thus named, see AH-MED

Ahmad al-Mansur (a'mād al-mansūr', Arabic akhmad') [al-Mansur, =the victorious], d 1603, emir of Morocco (1578-1603) Proclaimed ruler after his brother's death at the battle of ALCAZARQUIVIR, he gained great prestige from the victory over Portugal In addition, the ransom of the Portuguese captives made him wealthy He was able to give Morocco a quarter-century of relative peace and prosperity His conquest of Timbuktu (1590-91) marked the peak of Morocco's extension into the territory south of the Sahara The cost of maintaining an army as great a distance prevented him from gaining any permanent benefit from the conquest He engaged in a commercial correspondence with Queen Elizabeth I of England and encouraged foreign trade

Ahmad Khan, Sir Sayyid (sa'yēd akhmad' khan), 1817-98, Indian Muslim educator His family was long connected with the Mogul court, but he entered the service of the British East India Company Convinced of the futility of revolt, he remained loyal to the British during the Indian Mutiny (1857-58) and saved the lives of many Europeans Seeking to revitalize the Muslim community by the introduction of Western ideas, Sayyid Ahmad Khan organized societies for the translation of English works into Urdu and for the teaching of civics to the Indian public In 1875 he established the Muslim Anglo-Oriental College at Aligarh, which later became Aligarh Muslim University He was knighted in 1888 Among his works are *Loyal Mohammedans of India* (1860-61) and *Causes of the Indian Revolt* (1873) See J M S Baljon, *Reforms and Religious Ideas of Sir Sayyid Ahmad Khan* (1949)

Ahmad Mirza (akhmad' mērza'), 1898-1930, shah of Persia (1909-25), son of Muhammad Ali The last of the Kajar, or Qajar, dynasty, he came to power as a result of a coup d'état against his father A regent initially ruled for him A weak figure, Ahmad was overthrown in 1921 in a military coup by Reza Khan (later REZA SHAH PAHLEVI) The shah, unable to oppose the new government, left (1923) for Europe, where he died

Ahmadnagar or Ahmednagar (both amādnūg'ar), city (1971 pop 117,275), Maharashtra state, W central India, on the Sina River It is a district administrative center and has textile manufacturing and some light industry Founded in 1490, it was the capital of a kingdom that lasted until 1600 Sivaji, leader of the Marhattas, was born in Ahmadnagar

Ahmad Shah, c 1723-1773, Afghan ruler (1747-73), founder of the Durani dynasty His success in commanding Afghan forces in India for Nadir Shah of Iran won him the rule of Afghanistan on Nadir's death (1747) He invaded India several times and twice (1756, 1760) occupied and sacked Delhi, the capital of the Mogul empire He conquered a vast territory, extending roughly from the Oxus to the Indus rivers and from Tibet to Khurasan, but he was unable to consolidate this empire and it soon disintegrated He united and strengthened Afghanistan, however, and is therefore often considered its modern founder His family retained power until the rise of Dost Muhammad

Ahmed. For some names beginning thus, see AH-MAD

Ahmed I (a'mēd, akhmēt'), 1589-1617, Ottoman sultan (1603-17), son and successor of Muhammad III to the throne of the Ottoman Empire (Turkey) The chief event of his reign was the Treaty of Szatvatorok (1606), which supplemented the Treaty of Vienna between Archduke (later Holy Roman Emperor) MATTHIAS and Prince Stephen BOCSKAY of Transylvania By the treaty, the emperors, as kings of Hungary, ceased to pay tribute to the sultan, and Transylvania was recognized as independent The treaty also marked the first time the sultan recognized other European rulers as his equals In the Asian provinces disorders were suppressed by Ahmed's vizier, the Croatian Murad Pasha, but after Murad's death (1611) they broke out again, allowing Shah Abbas I of Persia to retain Tabriz On becoming sultan Ahmed had not killed his brother Mustafa as was the custom Therefore Mustafa I succeeded as the oldest male in the ruling family

Ahmed II, 1642-95, Ottoman sultan (1691-95), brother and successor of Sulayman II to the throne of the Ottoman Empire (Turkey) Soon after his reign began, the Turkish defeat at SLANKAMEN (1691) heralded the start of the conquest of Hungary by Austria His nephew, Mustafa II, succeeded him

Ahmed III, 1673-1736, Ottoman sultan (1703-30), brother and successor of Mustafa II to the throne of the Ottoman Empire (Turkey) He gave asylum to CHARLES XII of Sweden and to MAZEPA after Peter the Great of Russia had defeated (1709) them at Poltava Charles's advice helped to bring about war between Turkey and Russia (1710-11) By the Treaty of the Pruth (1711), Turkey recovered Azov and the surrounding territory from Russia Ahmed seized (1715) the Peloponnesus and the Ionian Isles (except Corfu) from Venice, but he was defeated by the Austrians under Prince EUGENE OF SAVOY in 1716-18 By the Treaty of Passarowitz (1718), Banat, Lesser Walachia, and N Serbia, including Belgrade, were lost to the Hapsburg emperor Ahmed's grand vizier (chief executive officer) after 1718 was Ibrahim, who encouraged learning by establishing several notable libraries and favored the rise of Greek Phanariots (see under PHANAR) to high offices The sultan and his minister were overthrown by the JANISSARIES, who

were jealous of the new aristocracy Ahmed's nephew Mahmud I became sultan, and Ahmed died in prison

Ahmedabad or Ahmadabad (both a'mādābad'), city (1971 pop 1,588,378), capital of Gujarat state, NW India, on the Sabarmati River An industrial center noted for its cotton mills, Ahmedabad is also a transportation hub and a commercial center Founded in 1412 by Ahmad Shah, it fell to Akbar in 1573 and enjoyed great prosperity under the Mogul empire The British opened a trading post there in 1619, by the early 19th cent they controlled the city The cultural center of Gujarat, Ahmedabad has many outstanding mosques and tombs It is also sacred to the Jains, who have more than 100 temples there The Jama Masjid, an ancient Hindu temple converted (15th cent) to a mosque, is one of the city's most beautiful buildings Mahatma Gandhi lived for a while in Ahmedabad Gujarat Univ (1950) is in the city

Ahmed Shah: see AHMAD SHAH

Ahoah (āhō'ā), the same as AHIAH 7. The patronymic Ahoite suggests this name, it occurs with the names of DODO 2 and ILAI

Aholah (āhō'lā) and **Aholibah** (āhōl'ibā), the sisters in an allegory on Israel's idolatry Ezek 23

Aholiab (āhō'lēāb), specially chosen worker on the Tabernacle Ex 316, 3534, 361,2, 3823

Aholiab see AHOLAH

Aholibamah (āhō'lībā'mā, ā'hālīb'ā-) 1 One of Esau's wives Gen 362 2 Duke of Edom Gen 3641

Ahome (aō'mā), city (1970 pop 165,612), Sinaloa state, W Mexico, on the Pacific Ocean Ahome lies along the Inter-American Highway and is linked by rail with Mexico City Sugarcane, grains, and cotton are grown in the region, which is irrigated by the Fuerte River The city also has an important fishing industry, based mainly on shrimp

Ahriman (a'rīmān) see ZOROASTRIANISM

Aht Confederacy: see NOOTKA INDIANS

Ahuachapán (awachapan'), city (1968 est pop 26,000), W El Salvador, near the Guatemalan border It is the westernmost city in the country and is the center of an agricultural region producing coffee, sugar, grain, and fruit There are thermal springs nearby

Ahumai (āhūō'māi, -mī), Judahite 1 Chron 42

Ahura Mazda (a'hōōrā mād'zā) see ZOROASTRIANISM

Ahuzam (āhūō'zām), Judahite 1 Chron 46

Ahuzzath (āhūz'āth), friend of Abimelech of Gerar Gen 2626

Ahvaz or Ahwaz (both awaz'), city (1971 est pop 215,000), SW Iran, on the Kurun River It is an oil center, a transportation hub, and an industrial city that has petrochemical, textile, and food-processing industries An ancient city, Ahvaz was rebuilt (3d cent AD) by Ardashir I, who named it Hormuzd-Ardashir In the 4th cent Ahvaz became the seat of a bishopric, and a large church was built there It was an important Arab trading center in the 12th and 13th cent but later declined The discovery of oil nearby in the early 20th cent restored the city to its former importance The new part of Ahvaz, the administrative and industrial center, is on the right bank of the Kurun, but the population is still concentrated in the old section on the left bank

Ahvenanmaa Islands (a'venanma'') or **Åland Islands** (a'lānd, ō'-), Swed Ålandsoerna (ō'lāntsū-urna), archipelago (1970 pop 21,010), 581 sq mi (1,505 sq km), in the Baltic Sea between Sweden and Finland, at the entrance of the Gulf of Bothnia It belongs to Finland The archipelago consists of about 7,000 islands, but fewer than 100 are inhabited The climate is mild The chief town is MAARIAN HAMINA, a port on Åland, the largest of the islands Shipping, fishing, forestry, farming, and tourism are the chief occupations Swedish is the main language The islands, colonized by Swedes, are of strategic importance With Finland, they were ceded by Sweden to Russia in 1809 In the Crimean War the Russian fortifications were destroyed (1854), and remilitarization was forbidden by the Treaty of Paris (1856) At the end of World War I, the islanders sought to join Sweden The League of Nations in 1921, however, recognized Finland's sovereignty, but guaranteed the autonomous status of the islands and confirmed their demilitarization After the Finnish-Russian War (1939-40) Finland and Russia signed a demilitarization agreement that was renewed after World War II Under pressure from Russia, Finland's parliament renounced the League guarantee of autonomy in 1951 but at the same time accorded the islanders additional rights of self-gov-

ernment Pro-Swedish sentiment continues, however, and emigration to Sweden has caused a population decline in recent years

AI (ā'i) 1 Canaanite royal city, E of Bethel Abraham pitched his tent there when he arrived in Canaan It is probably the modern et-Tell, near Bethel (Jordan) Excavations have revealed a strongly fortified city situated there AI was in ruins at the time of Joshua's conquest The account in Joshua 7 possibly refers instead to BETHEL 1, whose people may have used the nearby ruins of AI as a bastion against the invading Israelites Hai Gen 12:8, 13:3 Aith Isa 10:28 Aija Neh 11:31 2 City of the Ammorites, near Heshbon Jer 49:3

Aiah (ā'ā) 1 Edomite 1 Chron 1:40 Ajah Gen 36:24 2 Father of RIZPAH

Aiath (ā'āth), the same as AI 1.

Aichi (i'chē), prefecture (1970 pop 5,386,116), 1,962 sq mi (5,082 sq km), central Honshu, Japan NAGOYA is the capital Bounded on the E by Ise Bay and on the S by the Philippine Sea, Aichi consists of a coastal plain and a mountainous, forested interior It is drained by the Kiso River, an important source of hydroelectric power The major industrial centers are Nagoya, Toyohashi, Okazaki, Ichinomiya, Toyota, Tanjo, and Seto Agricultural products and raw silk are produced, and lignite and quartz are mined

aids, in FEUDALISM, type of feudal due paid by a vassal to his suzerain (overlord) Aids varied with time and place, although in English-speaking countries aids were traditionally due on the knight of the lord's eldest son, on the marriage of the lord's eldest daughter, and for ransom of the lord from captivity These are the three aids specified in the MAGNA CARTA (1215), which forbade the king to levy aids from the barons on occasions other than these, except by the "common counsel" of the realm It is difficult to distinguish aids from other feudal dues such as SCUTAGE and TALLAGE The term had a much wider scope than was indicated in the Magna Carta In general, aids fell into disuse with the decline of feudalism, although they continued nominally in most places On the Continent, the aids often became land or justice taxes due the local lords In France, the aids were converted later into a royal tax that continued until the French Revolution

Aiea (ā'ēā'), city (1970 pop 12,560), Honolulu co., Oahu, Hawaii, a residential suburb of Honolulu, on the eastern shore of Pearl Harbor Once a quiet sugarcane town with a sugar refinery, it is now the site of numerous housing developments and a shopping center Many residents work at nearby military installations Between Aiea and Honolulu are the U S Army Tripler General Hospital and U S Fort Shafter, headquarters of the Army of the Pacific

Aiglon, L': see NAPOLEON II

Aija (ā'jā), the same as AI 1

Aijal (i'jāl), city (1971 pop 31,436), capital of the union territory of Mizoram, NE India Situated on a ridge in the Lushai Hills that is 3,500 ft (1,067 m) high, Aijal is an important trade center for the surrounding area

Aijalon (ā'jālōn, i'-, ā'-) 1 Town, on the border between Philistia and Israel, the modern Yalo (Israel), NW of Jerusalem Judges 1:35, 2 Chron 11:10 Aijalon Joshua 19:42, 2 Chron 28:18 In the Tel-el-Amarina letters it is called Aialuna 2 Town in Zabulon Judges 12:12 3 Valley over which Joshua commanded the moon to stand still Joshua 10:12

Ajeleth Shahar (ā'jēlēth shā'hār), superscription of Ps 22, probably the tune to which it was to be sung, named from the first words of some other verse set to it Other superscriptions of similar explanation are Al-taschith Pss 57, 58, 59, 75 Jonath-elem-rechokim Ps 56 Mahalath Ps 53 Mahalath Leanoth Ps 88 Shoshannim Pss 45, 69 Shoshannim-Eduth Ps 80 Shushan-eduth Ps 60

Aiken, Conrad (ā'kīn), 1889-1973, American author, b Savannah, Ga., grad Harvard, 1912 His writings reveal a concern for the workings of the mind and for the evolution of personal identity Aiken is best known for his poetry, which is often preoccupied with the sound and structure of music, his volumes of verse include *The Camel Rose* (1918), *Selected Poems* (1929, Pulitzer Prize), *Brownstone Eclogues* (1942), *Collected Poems* (1953), *A Letter from Li Po* (1956), *A Seizure of Limericks* (1964), and *The Clerk's Journal* (1971) In 1924 he edited Emily Dickinson's *Selected Poems*, which established her literary reputation Aiken's interest in psychopathology is evident in the novels *Blue Voyage* (1927) and *Great Circle* (1933) His collected critical essays, *A Reviewer's ABC*, appeared in 1958, his collected short stories—including "Mr Arcularis" and "Silent

Snow, Secret Snow"—in 1961 From 1950 to 1952, Aiken held the poetry chair at the Library of Congress In 1969 he was awarded the National Medal for Literature See his autobiography, *Ushant* (1952, repr 1971), studies by Jay Martin (1962) and F J Hoffman (1962)

Aiken, city (1970 pop 13,436), seat of Aiken co., W S C, inc 1835 It is a fashionable resort and polo center located in the midst of sand hills and pine forests Aiken is also an industrial city, with textile and lumber mills and a large fiberglass plant, kaolin mines are nearby A branch of the Univ of South Carolina is located in the city Nearby is the Atomic Energy Commission's Savannah River Plant, which produces nuclear materials Aiken State Park is to the east

ailanthus (ālān'thəs), any tree of the genus *Ailanthus*, native to the warm regions of Asia and Australia Ailanthus wood is sometimes used for cabinet-making and for the manufacture of charcoal The leaves are a source of food for silkworms, and the bark and leaves are used medicinally Females of a species called tree of heaven, native to China, are widely grown in European and American cities because of their attractive foliage and their resistance to smoke and soot, the male flowers, however, have a disagreeable odor Ailanthus is classified in the division MAGNOLIOPHYTA, class Magnoliopsida, order Sapindales, family Simarubaceae

ailanthus moth: see SILKWORM

aileron: see AIRFOIL, AIRPLANE

Ailey, Alvin, 1931-, American modern dancer and choreographer, b Rogers, Tex Ailey studied in Los Angeles with Lester HORTON, whose strong, dramatic style influenced his choreography In the late 1950s he formed his own company, the American Dance Theater, which has been internationally acclaimed His best-known works include *Creation of the World* (1960), *Roots of the Blues* (1961), *Hermit Songs* (1962), and *Revelations*, as well as works he created for other companies, such as *Macumba* for the Harkness Ballet

Ailly, Pierre d' (pyēr dā'yē'), 1350-1420, French theologian and writer, cardinal of the Roman Catholic Church He was the teacher of John Gerson and was Gerson's predecessor as chancellor at the Univ of Paris (1385-95) Ailly figured prominently among the conciliarists working to end the Great Schism (see SCHISM, GREAT) He urged that in order to name a new pope a general council be called as the only means of settling the schism He seems to have been more concerned with a practical solution than with the implications of the conciliar theory He participated in both the Council of Pisa (see PISA, COUNCIL OF) and the Council of Constance (see CONSTANCE, COUNCIL OF) In the latter Ailly took part in the trial and condemnation of John Huss His vast writings embrace theology, philosophy, cosmography, plans for ecclesiastical reform, and French religious verse His best-known work, the *Imago mundi*, an astronomical compendium, was studied by Columbus See studies by J P McGowan (1936) and Francis Oakley (1964)

Ailsa Craig (āl'sā), island, c 1 sq mi (2.6 sq km), off SW Scotland, W of Girvan in the Firth of Clyde, it rises to 1,114 ft (340 m) It has granite quarries and a lighthouse and is a sanctuary for sea birds

Ain (ā'n), department (1968 pop 339,262), E central France, in BURGUNDY, bordering on Switzerland BOURG-EN-BRESSE is the capital

Ain (ā'in) 1 Town, N Palestine Num 34:11 2 See EN-RIMMON

Aintab, Turkey see GAZIANTEP

Ainu (i'nō), aborigines of Japan who may be descended from the Caucasoid people who once lived in N Asia The more powerful Oriental invaders from the Asian mainland gradually forced the Ainu to retreat to the northern islands, where today, they reside on the N Japanese island of Hokkaido and in Sakhalin and the Kuril Islands, now part of the Soviet Union Reduced in number, they live by hunting, fishing, and small-scale farming On Hokkaido, the Ainu have attracted the attention of tourists, and some now make a living by selling reproductions of their cultural artifacts Physically, they seem related to European peoples, i.e., they have much more body hair than Orientals, but intermarriage with Asians has introduced Oriental traits among them Contact with the Orientals has led to culture change and assimilation, which the Ainu have resisted in the past, with decreasing success Their religion is highly animistic and centers on a bear cult, a captive bear is sacrificed at an annual winter feast and his spirit, thus released, is believed to guard the Ainu

settlements See N G Munro, *Ainu Creed and Cult* (1963), Inez Hilger, *Together with the Ainu* (1971)

Aioi (i-oi'), city (1970 pop 40,657), Hyogo prefecture, W Honshu, Japan, on the Inland Sea and Aioi Bay It is a major port with a good natural harbor and a flourishing shipbuilding industry

air: see ATMOSPHERE, LIQUID AIR, VENTILATION

air, law of the, in the broadest sense, all law connected with the use of the air, including radio and telegraph communications More commonly, it refers to laws concerning civil aviation The development of large-scale air transport after World War I brought with it the need for regulation, both national and international In 1919 a meeting of the victorious nations of World War I resulted in the International Convention for Air Navigation, commonly called the Paris Convention The convention was a compromise between two contradictory views some nations held that a state had sovereignty over the air above it, others that there should be freedom of the air comparable to the freedom of the seas The convention recognized the sovereignty of each state over its own air space without prejudice to innocent passage by aircraft of another state It further provided that each aircraft (like each ship) must have a registered nationality Rules were adopted as to the airworthiness of aircraft, certification of pilots as competent, and licensing of pilots Among the 33 signatory nations were Great Britain, France, Italy, and Japan The United States signed but did not ratify the convention Nevertheless U S air laws were modeled on it These laws are administered by the CIVIL AERONAUTICS BOARD and the FEDERAL AVIATION ADMINISTRATION Other countries adopted legislation modeled on the Paris Convention There were also many bilateral agreements among nations as well as general conventions—notably the Pan American Convention on Air Navigation (1925) World War II emphasized the need for sounder regulation of international air transport and for uniformity of equipment, laws, and regulations Even before the war's end an international civil aviation conference met in Chicago in Nov., 1944 Representatives of 52 nations attended, but the USSR did not take part There was much discussion of the "five freedoms of the air"—freedom to fly across the territory of a state without landing, freedom to land for nontraffic purposes, the right to disembark in a foreign country traffic from the country of registry of the aircraft, the right to pick up in a foreign country traffic destined for the country of registry, and the right to carry traffic between two foreign countries The first two were accepted, but the fifth was bitterly opposed, only the first two were included in the International Air Services Transit Agreement, which was generally signed Authorization to carry traffic between two nations is given through an agreement between those two nations The conference, after considerable debate, set up the Provisional International Civil Aviation Organization, which had its seat at Montreal In 1947 this organization became the INTERNATIONAL CIVIL AVIATION ORGANIZATION, affiliated with the United Nations There have been several general conferences since the Chicago Convention to interpret its provisions, and many bilateral agreements have been concluded by parties to the convention The successful launching of satellites necessitated the development of SPACE LAW

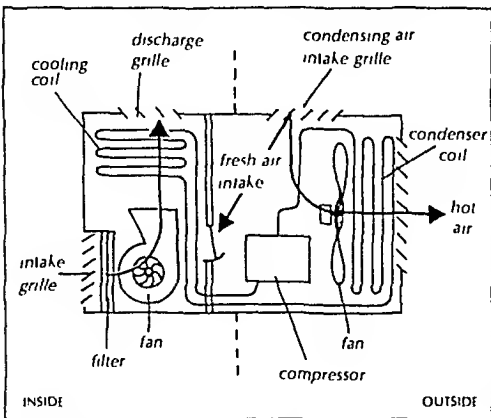
air bladder, in fish see SWIM BLADDER

air brake: see BRAKE

air cargo: see AVIATION

air conditioning, mechanical process for controlling the humidity, temperature, cleanliness, and circulation of air in buildings and rooms Indoor air is conditioned and regulated to maintain the temperature-humidity ratio that is most comfortable and healthful In the process, dust, soot, and pollen are filtered out, and the air may be sterilized, as is sometimes done in hospitals and public places Most air-conditioning units operate by ducting air across the colder, heat-absorbing side of a refrigeration apparatus and directing it back into the air-conditioned space (see REFRIGERATION) The refrigeration apparatus is controlled by some form of thermostat In water-cooled air-conditioning units, the waste heat is carried away by a flow of water For recirculation in water-cooled units, a cooling tower is used This apparatus maintains a constant level of water in the system and replaces water lost by evaporation The development of small, self-contained systems has greatly expanded the use of air conditioning in homes A portable or window-mounted unit drawing 7.5 amperes or less from a 117-volt power line is usually adequate for one room Often domestic

heating systems are converted to provide complete air conditioning for a home. In the construction of office buildings in the United States, air-condition-



Cross section of air conditioning unit

ing systems are commonly included as integral parts of the structure. First used c 1900 in the textile industry, air conditioning found little use outside of factories until the late 1920s. It is of great importance in chemical and pharmaceutical plants, where air contamination, humidity, and temperature affect manufacturing processes. See A. D. Althouse et al., *Modern Refrigeration and Air Conditioning* (1968), E. P. Anderson, *Air Conditioning* (1969), Ernest Tricomi, *A B C's of Air Conditioning* (1970).

aircraft carrier, ship designed to carry aircraft and to permit takeoff and landing of planes. The carrier's distinctive features are a flat upper deck (flight deck) that functions as a takeoff and landing field, and a main deck (hangar deck) beneath the flight deck for storing and servicing the aircraft. The aircraft carrier emerged after World War I as an experimentally modified cruiser. The first aircraft carrier built (1925) from the keel up as an aircraft carrier for the U.S. navy was the USS *Saratoga*. The aircraft carrier remained an experimental and untested war vessel until World War II, when the Japanese destroyed or drove out of the Far Eastern waters the British, Dutch, and U.S. navies with carrier-borne aircraft. By 1942 the aircraft carrier had replaced the battleship as the major unit in a modern fleet, and in World War II it was indispensable in naval operations against a sea- or land-based enemy. The battle of the Coral Sea (1942) was fought by naval aircraft, and the two opposing fleets never came within gunshot range of each other. After World War II aircraft carriers were enlarged and improved by the British and U.S. navies. With the introduction of nuclear-powered carriers in the 1960s, extremely lengthy voyages became possible because such carriers do not need regular refueling. See Norman Polmar, *Aircraft Carriers* (1969), G. L. Pawlowski, *Flat-Tops and Fledglings* (1971).

air-cushion vehicle, abbr. ACV, device designed to travel close to but above ground or water. It is also called a ground effect machine or hovercraft. These vehicles are supported in various ways. Some of them have a specially designed wing that will lift them just off the surface over which they travel when they have reached a sufficient horizontal speed. Others are supported by fans that force air down under the vehicle to create lift. In a plenum chamber vehicle the rate of leakage of this air from underneath the vehicle is reduced by placing a skirt around the lower edge of the craft. In an annular jet vehicle the rate of leakage is reduced by directing the air downward and inward from the outer edges of the vehicle. Air propellers, water propellers, or water jets usually provide forward propulsion. Most early vehicles of this type came into existence in the late 1950s. In 1962 a British vehicle became the first to go into active service on a 19-mi (31-km) ferry run. The maximum size of air-cushion vehicles is now over 100 tons, some of them travel at over 100 mi (160 km) per hr. Ships of several thousand tons and special trains, both employing air cushions, are under development. The advantages expected from air-cushion vehicles include higher speeds than those of ships and most land vehicles and lower power requirements than for helicopters of the same weights. However, a relatively smooth land or water surface below is a necessity, most of these vehicles cannot clear waves higher than 3 to 5½ ft (1-1½ m). See Jane's *Surface Skimmer Systems* (annually, 1968-), W. T. Gunston, *Hydrofoils and Hovercraft* (1969), Garry Hogg, *The Hovercraft Story* (1970).

Airdrie (âr'drê), burgh (1971 pop. 37,736), Lanarkshire, S. central Scotland. Chemicals and electrical and electronic equipment are produced, and there are facilities for electronic research. Airdrie's free library was the first established in Scotland.

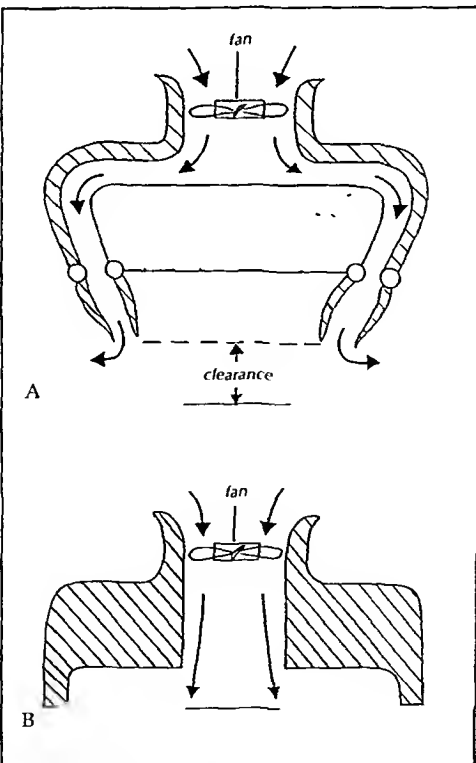
airedale terrier (âr'däl), breed of dog developed in England in the 19th cent. It is the largest of the TERRIER group, standing about 23 in. (58.4 cm) high at the shoulder and weighing from 40 to 50 lb (18.1-22.7 kg). Its dense, wiry, close-lying coat is a mixture of tan, black, and grizzle in color. Although little can be said with certainty of its history prior to 1850, authorities generally believe the airedale was produced from crosses of the extinct black-and-tan terrier and the otterhound. It has been used to hunt a variety of game, trained as a police dog and dispatch bearer in war, bred for show competition, and kept as a pet. See DOG.

air embolism: see EMBOLUS

airfoil, surface designed to develop a desired force by reaction with a fluid, especially air, that is flowing across the surface. For example, the fixed wing surfaces of an airplane produce lift, which opposes gravity. Airfoils that are manipulated to produce variable forces are called control surfaces. Ailerons, control surfaces hinged to the trailing edges of wings, can produce rolling, which is rotational motion of the aircraft about a line running through its fuselage, or yawing, which is rotational motion about a line running from the top to the bottom of an aircraft. Modern aircraft have fairly complex arrays of control surfaces, including elevators, a rudder, and flaps. Elevators, which are hinged to the rear of the horizontal airfoil of the tail assembly, are used to produce pitching, which occurs when an airplane in level flight points its nose upward or downward. The rudder, which is hinged to the rear of the vertical airfoil of the tail assembly, is used to produce yawing. Flaps are located near the ailerons to increase lift for takeoff and landing. Spoilers, which can be made to protrude from lifting surfaces to give controlled reduction of lift, often replace ailerons and elevators. In aircraft of the swing-wing type, in which the sweep of the wings is variable, the entire wing can be considered a control surface. Other airfoils include propeller blades and the blades utilized in turbojet engines.

Air Force, United States Department of: see DE FENSE, UNITED STATES DEPARTMENT OF

air forces. The history of air forces begins with the use of balloons by French forces in Italy in 1859 and



Air-cushion vehicle. In vehicles modified with a trunk or skirt (A), the rate of leakage is reduced and less power is needed to maintain the cushion. Vehicles designed to travel over deep water (B) have sides extending into the water so that the vehicle actually rides on an air bubble.

by Union forces in the U.S. Civil War. Balloons thereafter proved useful as a means of observation, but air forces in the modern sense date from World War I, when the offensive capabilities of the airplane were first demonstrated. The airplane was first used for war purposes by Italy against the Turks in Tripoli in 1911, but until World War I it had served mainly for reconnaissance. Germany, with a large number of airplanes and airships, established its superiority in the air at the beginning of the war. The German Fokker monoplane, with a fixed machine gun that could fire forward through the propeller blades, quickly assured Germany's superiority and inspired Allied efforts toward better aircraft. Indeed, throughout World War I such development and counterdevelopment accounted for the rapid advance of military aeronautics. The initial use of aircraft for reconnaissance made control of the skies essential to military operations. As a result, aerial combat developed, which in turn led to formation flying, dogfights, and the bombing of enemy lines of communication and munitions depots. Throughout most of the war the air forces were considered an extension of the nations' armies and were mostly employed tactically in support of the ground forces. As the effectiveness of aircraft as a tactical weapon increased, consideration was given to the establishment of air forces independent of a nation's ground forces. Giulio DOUHET, an Italian, was the first to develop a full-scale theory of strategic AIR POWER and to suggest the primacy of an independent air force. Douhet and others, such as Gen. William MITCHELL of the United States, called for the development of strong independent air forces to gain control of the air over an enemy's homeland and to destroy the enemy's means of resistance by intensive aerial bombardment of his industrial centers. Their urgings, combined with the rapid and extensive advance in aeronautical knowledge and technique that followed World War I, brought about a much broader application of air power in World War II. During the 1930s, Germany devoted great efforts to air armament and in the early years of World War II held a marked superiority over the Allies. The first great air battle in history was the BATTLE OF BRITAIN, in which the British Royal Air Force defeated the German Luftwaffe (1940) over Britain. In the Pacific, Japan entered the war with a stunning air attack launched from aircraft carriers (see AIRCRAFT CARRIER) on PEARL HARBOR. The subsequent development of air power greatly altered the nature of warfare, and the use of aircraft to control the air over both land and sea was decisive in nearly all major engagements of World War II. Airplanes were used for strategic and tactical bombing, attacking of naval and merchant ships, transportation of personnel and cargo, mining of harbors and shipping lanes, anti-submarine patrols, photographic reconnaissance, and support of ground, naval, and amphibious operations. Throughout the war the British and U.S. air forces conducted strategic bombardment of Germany, which led to the destruction of the Luftwaffe and the crippling of German industry, transportation, and communications. In the Pacific, U.S. carrier-based aircraft by the end of 1944 had destroyed the Japanese fleet and air force. In the last months of the war Japan itself was subjected to massive strategic bombardment, ending with the dropping of atomic bombs on Hiroshima and Nagasaki. Major developments of World War II included improved techniques of flying and aircraft design and an accumulation of geographical and technological knowledge essential to modern aviation. The development of nuclear weapons, jet propulsion, and the GUIDED MISSILE have combined to widen the concept of air power and the role of air forces. Wars in Korea and Vietnam were limited wars, in which tactical air operations were more important than strategic operations. However, air forces have come to assume a primary strategic role in deterring major war by employing in readiness a second-strike retaliatory force. In the United States this mission is carried by the Strategic Air Command and by the Aerospace Defense Command as well as by the Tactical Air Command. See H. B. Hinton, *Air Victory: The Men and the Machines* (1948), A. P. De Sevresky, *Air Power: Key to Survival* (1950), Quentin Reynolds, *They Fought for the Sky* (1957), Jane's *All the World's Aircraft* (pub. annually since 1911), Johnnie Johnson, *Full Circle: The Story of Air Fighting* (1964), Robert B. Casari, *Encyclopedia of U.S. Military Aircraft* (2 vol., 1970).

air gas: see FUEL

airglow, faint diffuse illumination of the night sky originating in the tenuous upper atmosphere. The energy in the form of visible light is derived from

the sun's ultraviolet light, which ionizes atoms and dissociates molecules at heights between 40 and 200 mi (64-322 km) above the earth's surface. When the fragments collide and recombine, some atoms and molecules are left with excess energy, which they release as light at characteristic wavelengths. Most prominent in the visible spectrum are the red and green light of oxygen and the yellow light of sodium. In polar regions the airglow is masked by the aurora, this is caused by charged particles spiraling into the atmosphere along magnetic lines of force.

air lock, compartment connecting two different environments, usually at different pressures, that enables personnel to transfer from one environment to the other. Space capsules have air locks to enable astronauts to move between the pressurized cabin and the near vacuum of space. A more common example is the air lock between the outer atmosphere and the working chamber of a CAISSON. By its means access can be gained to the working chamber without loss of pressure. It is also used at the head of tunnel excavations under water. There is a door at each end. When the outer door of the air lock is opened, men or material may be admitted into the compartment. After the outer door is closed, compressed air is admitted to raise pressure in the air lock to the level of the pressure in the working chamber, and the inner door can be opened. The reverse of this procedure takes place on leaving the working chamber. Great care must be exercised in passing workmen through an air lock, so that the change of atmospheric pressure takes place gradually. Too sudden a change of pressure may cause DECOMPRESSION SICKNESS.

airmail, transport of mail by airplanes. Demonstration flights that showed the feasibility of carrying mail by air were made in Great Britain and in the United States in 1911. In the United States, after money for experimentation was appropriated by Congress in 1918, the first regular airmail service for carrying civilian mail began on May 15, 1918. Army pilots and army equipment were used. The first flight was from Washington, D.C., to New York City, although the pilot got lost and never completed the trip, regular airmail service was soon established. The Post Office Dept. took over operation of the line in 1920, but in 1921 the line was discontinued. In May, 1920, the transcontinental route from New York City to San Francisco was completed. On July 1, 1924, coast to coast service by air was scheduled for the first time (before then the mail had been transferred to trains at night). Transpacific airmail was introduced in 1935 and transatlantic airmail in 1939. The Civil Aeronautics Authority, established in 1938, took over the work of the Bureau of Air Mail (created in the Interstate Commerce Commission in 1934). In the United States today, the Civil Aeronautics Board determines the rates to be paid by the U.S. Postal Service for the carriage of mail by air. Airmail service now extends to most parts of the world.

air mass, large body of air within the earth's atmosphere in which temperature and humidity, although varying at different heights, remain similar throughout the body at any one height. Air masses form over parts of the earth's surface called source regions, which are large, relatively uniform expanses, often ranging hundreds of thousands of square miles in area. Stable atmospheric conditions, e.g., high-pressure systems, are conducive to their formation. When a body of air remains over a source region for days or weeks, it reaches an equilibrium with the surface, radiation and convection exchanges between the earth's surface and the air, as well as evaporation and condensation, determine the air's temperature and humidity distribution. As a result of these exchanges, air masses formed over oceans generally contain more moisture than those formed over continental regions, and air masses formed in polar latitudes are colder than those from the tropics. As an air mass moves away from its source region, it brings its particular weather conditions to the areas over which it travels. At the same time, its characteristic properties are slowly modified by exposure to new environments. The boundaries between air masses, called FRONTS, are, typically, zones of rapid transition from cold to warm or from dry to moist air. This turbulence at the boundary often breeds low-pressure storms.

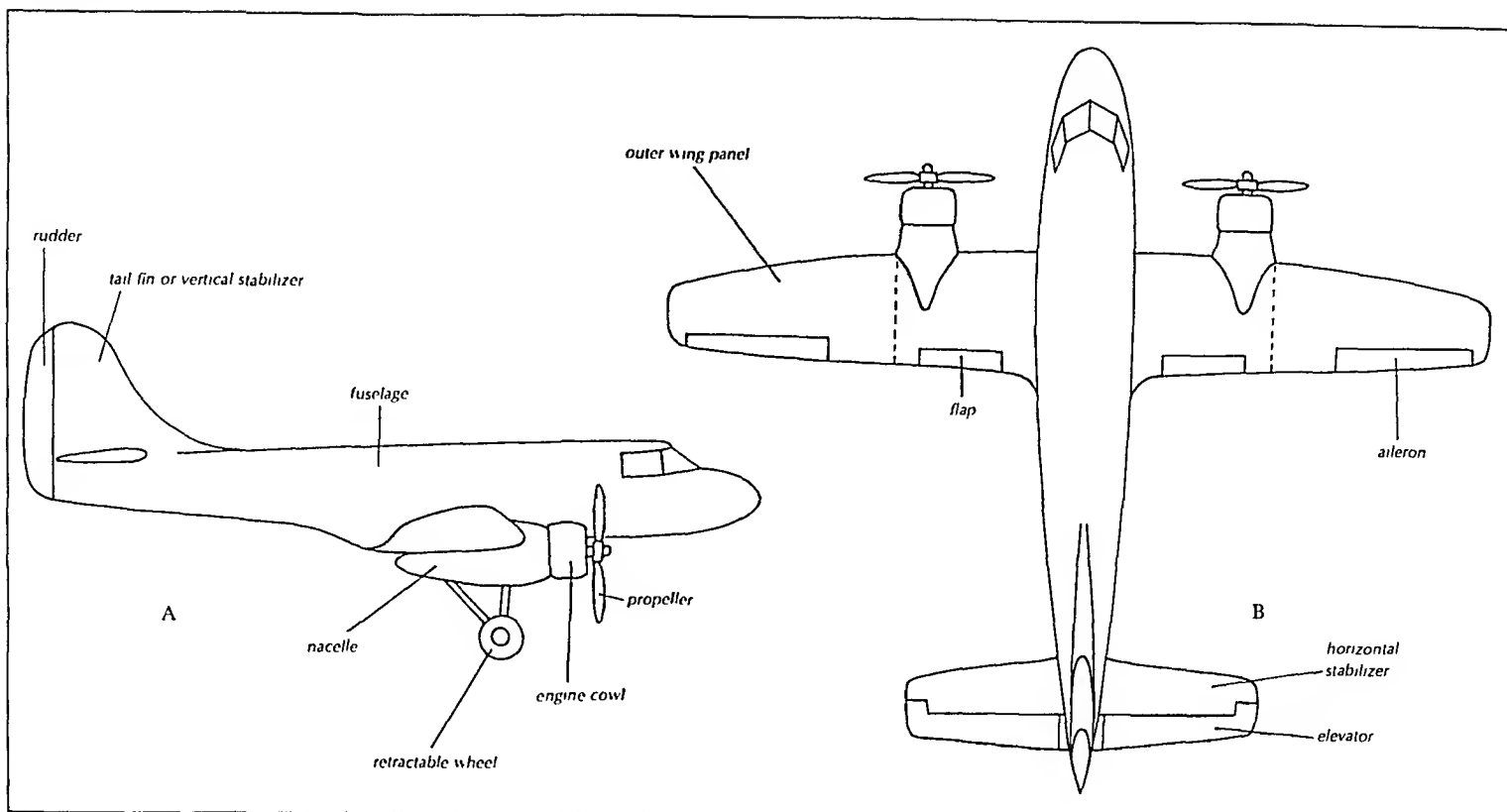
Air Mountains, Africa. see SAHARA

air navigation, science and technology of determining the position of an aircraft with respect to the surface of the earth and accurately maintaining a desired course (see NAVIGATION). Because of the relatively high speeds of aircraft and the intense

congestion of airways, the pilot of an aircraft must be able to determine quickly and accurately his position, course, and speed. The simplest and least sophisticated way in which this can be done is by pilotage, a method in which landmarks are noted and compared with an aeronautical chart. A craft flown by this technique is usually subject to visual flight regulations (VFR). These establish the minimum weather conditions under which navigation by visual reference to points outside the cockpit is permissible. Sometimes pilotage is carried on by means of electronic aids to navigation, e.g., a ground-looking radar, with which landmarks can be observed and later identified by reference to a radar map. Pilotage is not satisfactory for long trips, especially over water or terrain lacking distinctive features. In these cases, or when weather conditions do not permit navigation by visual reference, recourse to instruments is necessary. Air navigation by instruments is governed by instrument flight regulations (IFR), which require that the aircraft be equipped with the necessary instruments and that the pilot be trained in operating those instruments. Also required under IFR is the filing of a flight plan with air traffic control authorities at the departure point. The aircraft is then cleared for a given course and a given altitude. Air traffic controllers monitor the craft until it reaches its destination. Basic to air traffic control are special air routes called AIRWAYS. Airways are defined on charts and are provided with RADIO RANGES, devices that allow the pilot whose craft has a suitable receiver to determine his bearing from a fixed location. This fixed location is the site of a radio transmitter sending a specially modulated signal via a directional antenna. A second type of radio range, the VHF omnidirectional radio range, operates at very high frequencies and emits a signal that varies according to the direction in which it is transmitted. Using a special receiver, an air navigator can obtain an accurate bearing on the transmitter. For long distances LORAN, another electronic navigation system, has been developed. Other electronic aids include the radio ALTIMETER, a radar device that indicates the distance of the plane from the ground, and the ground-speed indicator, which operates by measuring the Doppler shift in a radio wave reflected from the ground. The advent of computers small enough to be airborne has made possible systems that perform astronomical observations automatically and give the pilot a readout of his position. Other similar systems use inertial devices such as free-swinging pendulums and gyroscopes as references in determining position. In addition, computer systems can be used to carry out the position-determining technique called dead reckoning by monitoring all course and speed changes of the aircraft. Pressure-based systems use the difference in reading between a radio altimeter and an aneroid altimeter as a basis for computing the local wind velocity. These automated and semiautomated procedures free the pilot from some of the activities necessary to control the aircraft and thus allow him to concentrate on actual flying of the aircraft. Another device which is useful in this way is the automatic pilot, which interprets data on direction, speed, attitude, and altitude to maintain an aircraft in straight, level flight on a given course at a given speed. Light aircraft, flown by pilotage, may have quite a simple set of navigational instruments. These would include an airspeed indicator (see PITOT STATIC SYSTEM), an aneroid altimeter, and a magnetic compass. An airspeed indicator is included in a sophisticated set of instruments to help the pilot maintain an airspeed above the value at which the airplane stalls. For supersonic and hypersonic aircraft the airspeed indicator is altered to show the airspeed as a Mach number, which is the ratio of the speed of an aircraft to the speed of sound. Advanced aircraft also use electronic systems that give the pilot highly accurate positional information for use during landing. In many cases the pilot is guided by radio communication from a controller observing the plane via ground-based radar. Some systems actually land the plane automatically, although the pilot always has the option of overriding manually.

airplane, aeroplane, or aircraft, heavier-than-air vehicle, mechanically driven and fitted with fixed wings that support it in flight through the dynamic action of the air. Early attempts were made to build flying machines according to the principle of bird flight, but these failed, it was not until the beginning of the 20th cent. that flight in heavier-than-air craft was achieved. On Dec. 17, 1903, Americans Orville and Wilbur WRIGHT produced the first manned, power-driven, heavier-than-air flying machine near Kitty Hawk, N.C. The first flight lasted 12 sec, but

later flights on the same day were a little longer, a safe landing was made after each attempt. The machine was a biplane (an airplane with two main supporting surfaces, or wings) with two propellers chain-driven by a gasoline motor. Modern airplanes are monoplanes (airplanes with one wing) and may be high-wing, mid-wing, or low-wing. Airplanes may be further classified as driven by propeller, jet, turbojet, or rocket. The airplane has six main parts—fuselage, wings, stabilizer (or tail plane), rudder, one or more engines, and landing gear. The fuselage is the main body of the machine, customarily streamlined in form. It usually contains control equipment, and space for passengers and cargo. The wings are the main supporting surfaces. The objects, such as fuel tanks and engines, that are carried outside the fuselage are enclosed in structures called nacelles, or pods, to reduce air drag. The lift of an airplane, or the force that supports it in flight, is basically the result of the direct action of the air against the surfaces of the wings, which causes air to be accelerated downward. The lift varies with the speed, there being a minimum speed at which flight can be maintained. This is known as the stall speed. At the trailing edge of the wings are auxiliary hinged surfaces known as ailerons that are used to gain lateral control and to turn the airplane. Directional stability is provided by the tail fin, a fixed vertical AIRFOIL at the rear of the plane. The stabilizer, or tail plane, is a fixed horizontal airfoil at the rear of the airplane used to suppress undesired pitching motions. To the rear of the stabilizer are usually hinged the elevators, movable auxiliary surfaces that are used to produce controlled pitching. The rudder, generally at the rear of the tail fin, is a movable auxiliary airfoil that gives the craft a yawing movement in normal flight. The rear array of airfoils is called the empennage, or tail assembly. Some aircraft have additional flaps near the ailerons that can be lowered during takeoff and landing to augment lift at the cost of increased drag. On some airplanes hinged controls are replaced or assisted by spoilers, which are ridges that can be made to project from airfoils. Until recently, most engines were of the internal-combustion, piston-operated type, which may be air- or liquid-cooled. During and after World War II, duct-type and gas-turbine engines became increasingly important, and since then JET PROPULSION has become the main form of power in most commercial and military aircraft. This has had a major effect upon airplane design, which is closely associated with the ratio between power load (horsepower) and weight. The Wright brothers' first engine weighed about 12 lb (5.4 kg) per horsepower. The modern piston engine weighs about 1 lb (0.4 kg) or less per horsepower, and jet and gas-turbine engines are much lighter. With the use of jet engines and the resulting higher speeds, airplanes have become less dependent on large values of lift from the wings. Consequently, wings have been shortened and swept back so as to produce less drag, especially at supersonic speeds. In some cases these radically backward wings have evolved into a single triangular lifting surface, known as a delta wing, that is bisected by the fuselage of the plane. Similar alterations have been made in the vertical and horizontal surfaces of the tail, again with the aim of decreasing drag. The lessened lift associated with swept-back designs increases the length of runway needed for takeoffs and landings. To keep runway lengths within reasonable limits the variable-sweep, or swing, wing has been developed. A plane of this type can extend its wings for maximum lift in taking off and landing, and swing them back for travel at high speeds. A proposed variant of the swing wing, in which one wing sweeps to the rear and another forward, produces an arrangement that causes a minimum shock wave at supersonic speeds. It is thought that if this modification is applied to supersonic transport (SST) designs it will somewhat lessen their objectionable noise levels. No solution has been proposed to lessen their high fuel consumption. Recent developments in fan-jet engines, in which a turbine powers a set of vanes that drive air rearward to augment thrust, have made supersonic flight possible at low altitude. Much research has also gone into reducing the noise and air pollution caused by jet engines. The landing gear is the understructure that supports the weight of the craft when on the ground or on the water and that reduces the shock on landing. There are five common types—the wheel, float, boat, skid, and ski types. For certain applications, e.g., short-haul traffic between small airports, it is desirable to have airplanes capable of operating from a runway of minimum length. Two approaches to the problem have been tried. One,



A Side view of propeller-driven airplane B Top view of propeller-driven airplane

the VERTICAL TAKEOFF AND LANDING (VTOL) approach, seeks to produce craft that take off and land like HELICOPTERS, but that can fly much faster. The other approach, SHORT TAKEOFF AND LANDING (STOL), seeks to design more conventional aircraft that have reduced runway requirements. See AERODYNAMICS, AIRPORT, AVIATION, AUTOGIRO, GLIDER, SEAPLANE. See bibliography under AVIATION.

air plant. See EPIPHYTE

air pollution, contamination of the air by noxious gases and minute particles of solid and liquid matter (particulates) in concentrations that endanger health. The major sources of air pollution are transportation, which is responsible for more than 50% by weight of all air pollution in the United States, power and heat generation, industrial processes, and the burning of SOLID WASTE. The combustion of GASOLINE and other hydrocarbon fuels in AUTOMOBILES, trucks, and jet airplanes produces several primary pollutants: nitrogen oxides, gaseous hydrocarbons, and carbon monoxide, as well as large quantities of particulates, chiefly lead. In the presence of sunlight, nitrogen oxides combine with hydrocarbons to form a secondary class of pollutants, the photochemical oxidants, among them OZONE and the eye-stinging peroxyacetyl nitrate (PAN). Nitrogen oxides also react with oxygen in the air to form nitrogen dioxide, a foul-smelling brown gas. In urban areas like Los Angeles where transportation is the main cause of air pollution, nitrogen dioxide tints the air, blending with other contaminants and the atmospheric water vapor to produce brown SMOG. In cities, air may be severely polluted not only by transportation but also by the burning of fossil fuels (oil and coal) in generating stations, factories, office buildings, and homes, and by the incineration of garbage. The massive combustion produces tons of ash, soot, and other particulates responsible for the gray smog of cities like New York and Chicago, along with enormous quantities of sulfur oxides. These oxides rust iron, damage building stone, decompose nylon, tarnish silver, and kill plants. Like photochemical pollutants, sulfur oxides contribute to the incidence of respiratory diseases such as emphysema, bronchitis, asthma, and even influenza and the common cold. When a weather condition known as a TEMPERATURE INVERSION prevents dispersal of smog, inhabitants of the area, especially children and the elderly and chronically ill, are warned to stay indoors and avoid physical stress. The dramatic and debilitating effects of severe air pollution episodes in cities throughout the world—such as the London smog of 1952 that resulted in 4,000 deaths—have alerted governments to the necessity for crisis procedures. But even everyday air pollution may insidiously affect health

and behavior. Carbon monoxide, for example, by driving oxygen out of the bloodstream, causes apathy, fatigue, headache, disorientation, and decreased muscular coordination and visual acuity. Air pollution may possibly harm populations in ways so subtle or slow that they have not yet been detected. For that reason research is now under way to assess the long-term effects of chronic exposure to low levels of air pollution—what most people experience—as well as to determine how air pollutants interact with one another in the body and with physical factors such as nutrition, stress, alcohol, cigarette smoking, and common medicines. Another subject of investigation is the relation of air pollution to cancer, birth defects, and genetic mutations. Every industrial process exhibits its own pattern of air pollution. Petroleum refineries are responsible for extensive hydrocarbon and particulate pollution. Iron and steel mills, metal smelters, pulp and paper mills, chemical plants, cement and asphalt plants—all discharge vast amounts of various particulates. Uninsulated high-voltage power lines ionize the adjacent air, forming ozone and other hazardous pollutants. Airborne pollutants from other sources include INSECTICIDES, HERBICIDES, radioactive FALLOUT, and DUST from fertilizers, mining operations, and livestock feedlots. The yearly economic toll exacted by air pollution from all sources has been estimated at more than \$16 billion in the United States alone. To combat pollution in the United States, the Clean Air Act Amendments of 1970 gave the Environmental Protection Agency (EPA) the authority to establish and enforce air pollution standards. National "ambient air quality standards" describe the concentrations of various pollutants allowable in the air. To meet those standards, the states are required to regulate the emissions of various pollutants from existing stationary sources, such as power plants and incinerators. The EPA itself determines emission standards for new factories and new motor vehicles and for certain extremely hazardous industrial poisons such as asbestos, beryllium, mercury, and lead. The law then requires that local governments, public utilities, and factories install pollution control devices such as smokestack scrubbers, electrostatic precipitators, and filters that will prevent gases and particulates from reaching the environment. Auto manufacturers must install exhaust controls or develop an improved engine that will not generate gaseous or particulate contaminants. In the long run the most satisfactory solutions to the air pollution problem may well be the elimination of fossil fuels and the ultimate replacement of the INTERNAL COMBUSTION ENGINE. To these ends efforts have begun in the United States, Japan, and Europe to develop alternative energy sources, such as nuclear fusion and solar heat (see ENERGY, SOURCES OF), as well as differ-

ent kinds of transportation engines, perhaps powered by electricity or steam. See ENVIRONMENTALISM, POLLUTION. See R. G. Bond et al., *Air Pollution* (1972); U.S. Council on Environmental Quality, *Environmental Quality* (3d Annual Report, 1972); S. J. Williamson, *Fundamentals of Air Pollution* (1973).

airport or airfield, place for landing and departure of aircraft, usually with facilities for housing and maintaining planes and for receiving and discharging passengers and cargo. The essential requirements in airport construction are that the field be as level as possible, that the ground be firm and easily drained, that approaches to runways be free of trees, hills, buildings, and other obstructions, and that the site be as free as possible of smoke and weather that produces low-visibility conditions. The runways of large airports vary from 2,500 to 12,000 ft (762–3,658 m) in length and 100 to 200 ft (30–61 m) in width. Narrower paved strips called taxiways that connect the runways to other parts of the airport are entered by aircraft as soon as possible after landing, thus freeing the runways for use by other traffic. A taxiway and a runway are usually connected at each end and at several intermediate points. Besides the hangars (buildings for housing and servicing aircraft), airports are usually provided with office and terminal buildings which house administrative, traffic control, communication, and weather observation personnel. The rapid development of aircraft, especially after the introduction of jet propulsion, has created problems for all major airports. Greater speed and weight of aircraft have made longer and more durable runways necessary. The increasing number of high-speed jet aircraft has caused problems of noise control and has led many communities to reject plans to build an airport within their boundaries. Locating airports away from densely populated areas can alleviate noise problems, but this solution makes it difficult for passengers and others to reach the airport. In England airports are sometimes called aerodromes. See B. J. Hurren, *Airports of the World* (1971); G. E. Campbell, *Airport Management and Operation* (1972); E. G. Blankenship, *Airports*, (1974).

air power, concept that achieved progressive importance in military strategy with the rapid development of aviation and the increased use of aircraft in war during the 20th cent. (see AIR FORCES). The somewhat tentative use of scout planes at the beginning of World War I was followed by the creation of small forces of fighter planes that engaged in aerial combat and some bombing. The Germans took the lead in air strategy, but the Allies soon closed the gap. After the war a few Allied strategists, among them Gen. William Mitchell, Air Chief Marshal Sir Hugh Montague Trenchard, and Gen. Giu-

lio DOUHET, fought for the intensive development of air power and pleaded for large air forces, arguing that future wars would be won by strategic bombardment of an enemy's industrial centers, thereby destroying the economic means of conducting a war. Their theories were controversial, and many continued to see air power as merely an adjunct to ground power. However, Great Britain, France, and Italy established separate departments of government for air strategy, and by 1935 the U.S. Air Corps Tactical School had developed and was teaching a full-blown theory of high-level precision bombardment. Adolf Hitler effectively intimidated other nations by the threat of air war, and the early days of World War II seemed to uphold Hitler's boasts of the effectiveness of the Luftwaffe under Hermann Goering. Aircraft were to a great extent responsible for German victories in Poland, Norway, the Low Countries, and France. However, Germany suffered a setback with the failure of the Luftwaffe to destroy the Royal Air Force in the BATTLE OF BRITAIN. The capture of Crete (1941) by air-transported troops seemed to bear out some of the more extreme claims of air power enthusiasts. The effect of air power in revolutionizing naval warfare was demonstrated by the attack by Japanese aircraft, launched from aircraft carriers, on PEARL HARBOR. Extensive use of the AIRCRAFT CARRIER was decisive in the battles of the CORAL SEA and MIDWAY, and thereafter aircraft were employed in all major naval battles. Throughout the war the Allies conducted an intensive campaign of strategic bombardment against Germany and wrought enormous destruction in German cities, postwar studies, however, have cast doubt on the effectiveness of this campaign. Aircraft also provided invaluable support to ground forces throughout the war by attacking enemy troops, transport, and supply bases. And it was, of course, aircraft that delivered the atomic bombs that finally ended World War II. After the war, moderates argued that no major battle had been won by air forces alone, but only by air forces combined with land or naval forces. Air-power advocates argued that air power should have been used as the primary strategic weapon instead of being used mainly to support ground troops seeking to occupy territory. The importance of air power was, however, accepted by all. In Korea air forces of the United Nations Command effectively enveloped the North Korean army and later cut supply arteries to Chinese Communist troops so that an armistice could be negotiated. Similar ground-air tactics were employed by the United States in Vietnam, while the North Vietnamese made effective use of Soviet-built ground-to-air missiles and tactical air support. After World War II the GUIDED MISSILE came to surpass the airplane as a strategic weapon, but manned bombers as well as offensive and antiballistic missiles have had an important role in the building and maintenance of air power by major nations. There is continued controversy over the number and types of strategic missiles and bombers to be designed and built, but the primary role of air power as a deterrent to attack is hardly contested. See Giulio Douhet, *Command of the Air* (1927, tr 1942), W. F. Craven and J. L. Cate, ed., *The Army Air Forces in World War II* (7 vol., 1948-58), C. K. Webster and Noble Frankland, *The Strategic Air Offensive against Germany, 1939-1945* (4 vol., 1961), S. M. Ulanoff, *True Stories of Strategic Air Power from World War I to the Present* (1971).

airship or **dirigible balloon** (dir'əjəbəl), aircraft consisting of a cigar-shaped balloon that carries a propulsion system, a steering mechanism, and accommodations for passengers, crew, and cargo. Although sails, paddles, and flapping wings were tried, propellers proved to be the most suitable means of propulsion. The balloon section is filled with a lighter-than-air gas, either helium or hydrogen, to give the airship its lift, helium, although lesser in lifting power, has the decided advantage of being nonflammable. In the nonrigid type of airship the balloon maintains its form by the internal gas pressure. In the semirigid type the form is maintained in a similar manner with addition of a rigid keel. The rigid type maintains its form by having a balloonlike hull of metal that holds its shape regardless of the internal gas pressure, inside the hull are a number of small balloons called gas cells that hold a lifting gas. The first successful power-driven airship was built by the French inventor Henri Giffard in 1852. Many experimenters, including the Tissandier brothers of France, followed his efforts. In 1884, Charles Renard and Artur Krebs, also of France, built and successfully operated an airship, *La France*, with propulsion obtained from electric storage batteries. The Brazilian Alberto Santos-Dumont was prominent in the

early development of the nonrigid airship. This type, sometimes called a blimp, is simple in construction and very light. It proved useful during World War II for coastal patrol and antisubmarine warfare, before the war it was used commercially in such activities as advertising, traffic control, and mail delivery. Blimps were kept in use by the U.S. navy until the early 1960s. Count Ferdinand von ZEPPELIN of Germany invented the first rigid airship, which was completed in 1900. Except for the *Mayfly*, which met with disaster upon completion, the building of rigid airships was not undertaken in England until World War I, when the *R33*, *R34*, and others were built. The *R34* was the first airship to cross (1919) the Atlantic, returning in 75 hr. Postwar airships constructed in England were the *R100* and *R101*, which were built as commercial vessels. The *Graf Zeppelin*, built in Germany in 1926-27, traveled 20,000 mi (32,000 km) around the world in 1929. The first rigid airship built in the United States, the *Shenandoah*, completed in 1923, was the first vessel to use helium as a lifting gas. She was wrecked by a violent storm in 1927. The *Los Angeles*, built by Germany as part of her reparations payment to the United States and completed in 1924, was successfully navigated across the Atlantic late in 1924 by Capt. Hugo Eckener of Germany. The German airship *Hindenburg*, built in 1936, and those aboard burned at its mooring mast at Lakehurst, N.J., in 1937. No rigid airship survived World War II. See M. M. Mooney, *The Hindenburg* (1972), Patrick Abbott, *Airship* (1973), Robert Jackson, *Airships* (1973), D. H. Robinson, *Giants in the Sky* (1973).

airsickness: see MOTION SICKNESS

airspeed indicator, instrument that indicates the speed of a vehicle, especially an aircraft, relative to the speed of the surrounding air. See AIR NAVIGATION, PITOT STATIC SYSTEM.

air transportation. See AVIATION.

airway, air route between air traffic centers that is over terrain best suited for emergency landings, with landing fields at intervals equipped with aids to air navigation and with a communication system for the transmission of information pertinent to the operation of aircraft. Airways do not always follow a straight line, since it is often advisable to detour in order to avoid mountains or certain localities where weather conditions are generally unfavorable. Definite flying rules have been established that require all aircraft to keep to the right of an airway and to observe regulations governing minimum altitudes, approaching and overtaking other aircraft, and acrobatic flying.

Airy, Sir George Biddell, 1801-92, English astronomer. The son of a poor farmer, he distinguished himself as Senior Wrangler at Cambridge, where he was elected fellow of Trinity College (1824) and appointed professor (1826). As Astronomer Royal and director of the Royal Greenwich Observatory from 1835 to 1881, he organized the efficient and accurate observation of stellar positions. Airy wrote many governmental reports on astronomical and other subjects, published works on celestial mechanics, and made discoveries in theoretical and practical optics, including the cylindrical lens for correcting astigmatism, an eye defect he himself possessed. See his autobiography (1896).

Aisha (ī'shā, a'īshā'), c. 614-678, favorite wife of MUHAMMAD the Prophet. She was the daughter of Abu Bakr and was married to the Prophet soon after the hegira. A brilliant, astute woman, she was devoted to her husband and his teachings, and after his death she exerted considerable influence, especially against Ali. She fomented an unsuccessful revolt during Ali's tenure of the caliphate. The name also appears as Ayesha or Aishah. See Nabia Abbott, *Aishah, the Beloved of Mohammed* (1942, repr. 1973).

Aisne (ēn), department (1968 pop. 526,346), NE France, in ÎLE-DE-FRANCE, PICARDY, and CHAMPAGNE, touching the Belgian border. LAON is the capital.

Aix-en-Provence (ēk-sān-prōvāns'), city (1968 pop. 93,671), Bouches-du-Rhône dept., in Provence, SE France. It is a commercial center in an area producing olives, grapes, and almonds. Its manufactures include food products, wine-making equipment, and electrical apparatus. Founded (123 B.C.) by the Romans near the site of mineral springs, it has long been a popular spa. There, in 102 B.C., Marius defeated the Teutons. It became an archiepiscopal see in the 5th cent. It has been the capital of Provence since the 12th cent. (except when replaced by Arles), and passed with Provence to the crown in 1487, becoming the seat of a provincial PARLEMENT. A music center since the 11th cent. and a focus of PROVENÇAL LITERATURE, Aix has a university (founded

1409, recently combined with one at Marseilles). A notable structure is the Cathedral of Saint-Sauveur (13th-14th cent.). A picturesque town, Aix has become a favorite sojourn for painters. A music festival is held each summer. Cézanne was born and died there.

Aix-la-Chapelle: see AACHEN, West Germany.

Aix-la-Chapelle, Treaty of (ēks-lā-shapēl'),

1 Compact of May 2, 1668, that ended the French invasion of the Spanish Netherlands (see DEVOLUTION, WAR OF). France kept most of its conquests in Flanders, Cambrai, Aire, Saint-Omer, and the province of Franche-Comte were returned to Spain, and the remainder of Spain's possessions in the Low Countries were guaranteed by the TRIPLE ALLIANCE. 2 Treaty of 1748, ending the War of the AUSTRIAN SUCCESSION. In general, it restored the status quo ante, but it awarded Silesia and Glatz to Prussia and conferred the duchies of Parma, Piacenza, and Guastalla on the Spanish infante Philip. It confirmed the PRAGMATIC SANCTION of 1713, and it renewed Britain's privilege (acquired 1713) over transporting slaves to Spanish America, the trade agreements with Britain regarding the Spanish colonies, and the recognition of the Protestant succession in England.

Aix-les-Bains (ēks-lā-bān'), town (1968 pop. 20,718), Savoie dept., SE France, situated on Lake Bourget at the foot of the Alps. It is a popular resort and spa. The town's alum and sulphur springs have been frequented since Roman times. There are ruins of Roman baths.

Aizu-Wakamatsu (ī'zōō-wakamat'sōō), city (1970 pop. 101,065), Fukushima prefecture, N Honshu, Japan. Its major products are wooden items, sake, rice, and persimmons. The capture of its castle by imperial forces in 1868 marked the end of civil war in Honshu.

Ajaccio (ayāt'chō), town (1968 pop. 42,300), capital of Corsica, France, on the Gulf of Ajaccio, an inlet of the Mediterranean. A fortified seaport, it is an important market town, an active industrial center, and a year-round tourist attraction. Its present site was established by Genoese colonists in 1492. Ajaccio was the birthplace of Napoleon I, the house where he was born is preserved. Other points of interest are the old cathedral (16th cent.) and St. Erasmus Church (17th cent., restored). In World War II, Ajaccio was occupied by the Italians until the people successfully revolted (Sept., 1943) with the aid of Free French troops.

Ajah (ā'jā), variant of AIAH 1.

Ajalon (ā'jālōn, ā'-), variant of AJALON.

Ajanta (ājūn'tā), village, Maharashtra state, W central India, in the Ajanta Hills. The famous Ajanta caves, discovered in 1819, contain remarkable examples of Buddhist art. The caves, carved out of the side of a steep ravine, consist of chapels and monasteries dating from c. 200 B.C.-A.D. 650 with magnificent frescoes and sculpture depicting scenes from the life of Buddha.

Ajax (ā'jāks), Gr. Aias, in Greek mythology. 1 Hero of the Trojan War, son of TELAMON, thus called the Telamonian Ajax, also called Ajax the Greater. In the *Iliad* he is represented as a gigantic man, slow of thought and speech, but quick in battle and always showing courage. He led the troops of Salamis against Troy and was one of the foremost Greek warriors, fighting both Hector and Odysseus to draw. He and Odysseus rescued the corpse of Achilles from the Trojans, but when the armor of Achilles was awarded to Odysseus, the disappointment of Ajax was so great that he went mad and committed suicide. The Ajax of Sophocles deals with the madness and death of the great warrior. Ajax had hero cults at Salamis, Attica, and Troas. 2 Leader of the forces from Locris in the Trojan War, called the Locrian Ajax, Ajax of Oileus (after his father, Oileus), or Ajax the Lesser, because he was not the equal of the Telamonian Ajax. In the sack of Troy he violated Cassandra at the altar of Athena, and Athena caused him to be shipwrecked on the way home. Poseidon saved him, but Ajax, boasting of his own power, defied the lightning to strike him down and was instantly struck by it. Other versions of the story say that he stole the PALLADIUM and that later Poseidon destroyed him for blasphemy.

Ajivika (ajē'vīkā), religious sect of medieval India, once of major importance. The Ajivikas were an ascetic, atheistic, anti-Brahmanical community whose pessimistic doctrines are related to those of JAINISM. Its founder, Gosala (d. c. 484 B.C.), was, it is said, a friend of Mahavira, the founder of Jainism. Gosala denied that a man's actions could influence the process of transmigration, which proceeded according to a rigid pattern, controlled in the smallest detail by

an impersonal cosmic principle, *Niyati*, or destiny. After a period of prosperity under Asoka, the sect rapidly declined and only retained local importance in SE India, where it survived until the 14th cent. See A. L. Basham, *History and Doctrines of the Ajivikas* (1951).

Ajman (ajman'), sheikhdom (1968 pop 4,245), c 100 sq mi (260 sq km), part of the federation of UNITED ARAB EMIRATES, E Arabia, primarily on the Persian Gulf. The smallest member of the federation, Ajman consists principally of a town (pop 3,725) of the same name and two mountain villages. Oil production in Ajman began in 1964. A former British protectorate, it joined the United Arab Emirates in 1971.

Ajmer (ājmer', aj-), former state, NW India. Now part of Rajasthan state, it formerly consisted of two detached areas surrounded by Rajasthan and was identical with the former British province of Ajmer-Merwara. The city of Ajmer (1971 pop 262,480), the former capital and now a district administrative center, was founded in the 12th cent. The city is a trade center and has cotton mills and railroad shops. Marble is quarried nearby. Ajmer was a Mogul military base, it was there that Jehangir received Sir Thomas Roe, ambassador of James I of England. A Jain temple (constructed 1153, now a mosque), the tomb of the Muslim saint Muin-al-din Hasan Chishti, and a palace of AKBAR are the most notable historic buildings. Mayo Rajkumar College is in Ajmer.

Ajodhya (əjōd'yə) or **Ayodhya** (əyōd'yə), village, Uttar Pradesh state, N India, on the Gogra River. It is a joint municipality with Faizabad. Ajodhya was the capital of the kingdom of Kosala (7th cent. B.C.). Long associated with Hindu legend, the town is a center of pilgrimage and is one of the seven sites sacred to Hindus. It is also called Oudh.

Akaba: see AQABA, Jordan.

Akademgorodok (akadāmgō'rōdōk), city, W central Siberian USSR, near NOVOSIBIRSK. A scientific center begun in 1959, it is the site of 15 institutes of the Soviet Academy of Sciences.

Akan (āk'kän), descendant of Esau. Gen. 36:27. Jakin 1 Chron. 1:42.

Akan (akan', ak'an), people of W Africa, primarily in S Ghana, E Ivory Coast, and parts of Togo. They speak languages of the Twi branch of the Kwa subfamily. Although patrilineal descent is recognized, matrilineal descent is more important, social organization is through clans. The ASHANTI and the FANTI, both of Akan stock, developed powerful confederacies in the 17th and 18th cent.

Akashi (a'ka'shē), city (1970 pop 206,525), Hyogo prefecture, W Honshu, Japan, on the Harima Sea and the Akashi Channel. It is a fishing port and industrial center where electrical machinery is produced.

Akbar (āk'bar), 1542-1605, Mogul emperor of India (1556-1605), son of Humayun, grandson of Babur. He succeeded to the throne under a regent, Bairam Khan, who rendered loyal service in expanding and consolidating the Mogul domains before he was summarily dismissed (1560) by the young king Akbar, however, continued the policy of conquest. A magnetic personality and an outstanding general, he gradually enlarged his empire to include Afghanistan, Baluchistan, and nearly all of the Indian peninsula north of the Godavari River. To unify the vast state, he established a uniform system of administration throughout his empire and adopted a policy of religious toleration. Having defeated the Rajputs, the most militant of the Hindu peoples, he allied himself with them, giving their chiefs high positions in his army and government, he twice married Rajput princesses. Although he was himself illiterate, Akbar's courts at Delhi, Agra, and FATEHPUR SIKRI were centers of the arts, letters, and learning. He was much impressed with Persian culture, and because of him the later Mogul empire bore an indelible Persian stamp. At his sumptuous courts, where he reigned as a philosopher-king, Akbar surrounded himself with Muslim divines, Hindu Brahmins, and Jesuits. Apparently disillusioned with orthodox Islam and hoping to bring about religious unity within his empire, he promulgated (1582) the Din-i-Ilahi [divine faith], an eclectic creed derived from Islam, Hinduism, Zoroastrianism, and Christianity. A simple, monotheistic cult, tolerant in outlook, it centered on Akbar as prophet. This religious revolution led to serious rebellions by outraged Muslims. The Din-i-Ilahi never took hold in India and disappeared soon after Akbar's death. Akbar, generally considered the greatest of the Mogul emperors, was succeeded by his son Jahangir. See biographies by Laurence Binyon (1930) and V. A. Smith (2d rev. ed. 1966), R. Krishnamurti, *Akbar, the Religious Aspect* (1961).

Akeldama (akēl'dāma), variant of ACELDAMA.

Akeley, Carl Ethan (āk'lē), 1864-1926, American naturalist, animal sculptor, and author, b. Orleans, N.Y. He served (1887-95) at the Museum of Milwaukee, from 1895 to 1909 he was at the Field Museum, Chicago (now the Chicago Natural History Museum), and from 1909 he was affiliated with the American Museum of Natural History, New York City. His principal contribution was in the field of taxidermy, his system of mounting specimens by applying the skin to a finely contoured model is still used by museums. His animal sculptures and paintings may be seen in Akeley Hall in the Museum of Natural History and in the Chicago Natural History Museum. The extraordinary realism of Akeley's displays derived from his wide field experience, he made numerous expeditions to Africa to collect specimens. He invented the cement gun for use in his own work, and the Akeley camera is widely used by naturalists. His influence led to the establishment in 1926 of the Albert National Park, an animal sanctuary in Zaire. He wrote *In Brightest Africa* (1923).

Akenside, Mark (āk'insid), 1721-70, English poet and physician. His chief literary work was the didactic poem *The Pleasures of Imagination* (1744). Among his other works are the neoclassical *Odes on Various Subjects* (1745) and the *Epistle to Curio* (1744), a vigorous political satire. Akenside's conversion to Tory principles at the accession of George III earned him the appointment of physician to the queen. See biography by C. T. Houpt (1944).

Akershus (a'kars-hōs'), county (1972 est. pop. 332,000), 1,895 sq mi (4,908 sq km), SE Norway, bordering on the Oslofjord in the south and on Sweden in the east. The capital is Oslo. The county has productive farms and extensive forests. Manufactures include processed food, textiles, metals, and forest products.

Akhelōs or **Achelous** (akhēlō'ōs), river, 137 mi (221 km) long, rising in the Pindus Mts., NW Greece, and flowing generally south, traversing many mountain gorges, and emptying into the Ionian Sea opposite Kefallinia. It is used for floating logs and is an important source of hydroelectric power. It formed a part of the boundary between ancient Aetolia and Acarnania and was formerly called Aspropotamos.

Akhenaton: see IKHNATON.

Akhetaton: see TEL EL AMARNA.

Akhisar (ak'hī'sar'), city (1970 pop. 47,856), W Turkey. It is in a region where tobacco, cotton, and grapes are grown. The city is noted for its rugs. It is the biblical THYATIRA.

Akhmatova, Anna (an'nā akhma'tava), pseud. of **Anna Andreyevna Gorenko** (āndrā'avnā gōryēng'kō), 1888-1966, Russian poet of the ACMEIST school. Her brief lyrics, simply and musically written in the tradition of Pushkin, attained great popularity. Her themes were personal, emotional, and often ironic. Among her most popular volumes are *Chiotki* [the rosary] (1914) and *Iva* [the willow tree] (1940). She was married to the Acmeist poet Gumilev until 1918. Akhmatova remained silent for two decades. She began writing again at the outbreak of World War II, after which her writings regained popularity. She was harshly denounced by the Soviet regime in 1946 and 1957 for "bourgeois decadence." See her *Selected Poems* (Fr. 1969) and *Poems of Akhmatova* (tr. 1973), study by S. N. Driver (1972).

Akhmim (ākhmēm'), city (1966 pop. 44,800), E central Egypt, on the Nile. Textiles and handicrafts are produced. The ancient Chemmis and Panopolis, the city was long noted for its linen and limestone, the temple of Pan is there.

Akiba ben Joseph (ākē'bā), A.D. c. 50-A.D. c. 135, Palestinian rabbi. He was one of the first Jewish scholars to make a systematic compilation of the Hebrew oral laws. This compilation, known as the *Mishna of Rabbi Akiba*, exercised a profound influence upon the development of Mishnaic doctrines. Akiba believed in the Messianic mission of BAR KOKBA and sided with him in his revolt against Rome. He was idolized by the people, and the facts of his life are obscured with legends. He was incarcerated and, it is said, tortured to death by the Romans; he is one of the martyrs mentioned in the Jewish penitential prayer. See study by Louis Finkelstein (1936, repr. 1970).

Akihito (ākē'hēto), 1933-, Japanese crown prince, son of HIROHITO. In 1952 he was officially proclaimed heir to the throne. A popular figure, he has traveled widely, visiting Great Britain, Canada, the United States, and many countries of South America and Asia. In April, 1959, he married Michiko Shoda, a commoner, it was the first time that an heir to the

Japanese throne had wed outside of the court nobility. They have three children, the oldest, a son, was born in 1960.

Akimiski, island. See JAMES BAY, Canada.

Akita (a'kēta), city (1970 pop. 235,879), capital of Akita prefecture, NW Honshu, Japan, on the Sea of Japan. An oil-refining center, it is also a large port that exports lumber and rice. It became an important feudal town in the 8th cent., and its castle-fort (733) still stands. Akita prefecture (1970 pop. 1,241,261), 4,503 sq mi (11,663 sq km), contains Japan's largest oil field and copper mine. The prefecture's mountains have extensive stands of quality timber, and its fertile lowlands yield crops of rice, tobacco, and fruit. Akita (the capital), Noshiro (the chief port), Tsushisoki, and Yokote are centers of population.

Akita (akē'ta), breed of large dog developed in Japan from ancient ancestry and used originally as a hunter of such game as deer, wild boar, and bear. It stands from 20 to 27 in. (50.8-68.6 cm) high at the shoulder and weighs from 75 to 110 lb (34.1-49.9 kg). Its double coat consists of a thick, furry underlayer and a medium-length, harsh, straight topcoat which may be any shade of cream, brown, red, gray, black, silver, or brindle. A muscular dog with erect ears and tail curved over its back, the Akita has been used in the 20th cent. as a police and war dog and as a companion and watchdog. It is rapidly gaining popularity in the United States and is presently exhibited in the miscellaneous class at the dog shows sanctioned by the American Kennel Club. See DOG.

Akka: see PYGMY.

Akkad (āk'ād, a'kad), ancient region of Mesopotamia, occupying the northern part of later Babylonia. The southern part was SUMER. In both regions city-states had begun to appear in the 4th millennium B.C. In Akkad a Semitic language, Akkadian, was spoken. Akkad flourished after SARGON began (c. 2340 B.C.) to spread wide his conquests, which ranged from his capital, Agade, also known as Akkad, to the Mediterranean shores. He united city-states into a vast organized empire. Furthermore, he was overlord of all the petty states of Sumer and Akkad, as were his successors, most notably Naramsin. The merit of Sargonic art can be seen in the stele of Naramsin. The naturalistic sculpture, depicting a wide range of mythological scenes, reflected a high achievement in glyptic art. After more than a century the empire declined and was overrun by mountain tribes. When the Akkadian empire had fallen, Mesopotamia was in chaos. Peace was maintained only in the south in the city-state of Lagash under Gudea. Lagash was later absorbed by the 3d dynasty of Ur, which governed both Akkad and Sumer. Toward the end of the 3d millennium Elam took over most of the power as a new wave of Semitic-speaking peoples entered Mesopotamia. It was by defeating the Elamites that Hammurabi was able to create Babylonia. The name Akkad also appears as Accad.

Akkadian (ākādēan), language belonging to the Northeast Semitic subdivision of the Semitic subfamily of the Hamito-Semitic family of languages (see HAMITO-SEMITIC LANGUAGES). Also called Assyro-Babylonian, Akkadian (or Accadian) was current in ancient Mesopotamia (now Iraq) from about 3,000 B.C. until the time of Christ. The earliest surviving inscriptions in the language go back to about 2,500 B.C. and are the oldest known written records in a Semitic tongue. Old Akkadian is the earliest period of the language and can be dated from its appearance in Mesopotamia c. 3000 B.C. to c. 1950 B.C., when the 3d dynasty of Ur fell. Thereafter, Akkadian evolved into two dialects, Assyrian, the tongue of ancient Assyria, and Babylonian, the language of ancient Babylonia. The history of both Assyrian and Babylonian can be roughly divided into three successive periods designated as Old (beginning c. 1950 B.C.), Middle (c. 1500-c. 1000 B.C.), and New or Late (after c. 1000 B.C.). Around 1500 B.C., Babylonian began to be widely used, both in the Near East and in international diplomacy. As time went on, Babylonian even replaced Assyrian to a large extent in the written records and literature of the Assyrian civilization. By the beginning of the Christian era, however, Babylonian had died out, and it remained a lost language until modern times, when it was deciphered during the first half of the 19th cent. Unlike the other Semitic languages, which employed an alphabetic writing system, Akkadian and its later forms, Assyrian and Babylonian, were written in CUNEIFORM. The Akkadians adopted cuneiform c. 2500 B.C. from the Sumerians, a non-Semitic people who are believed to have invented it. See AKKAD. See I. J. Gelb, *Old Akkadian Writing and Grammar* (2d ed.

1961), Erica Reiner, *A Linguistic Analysis of Akkadian* (1966)

Akkerman: see BELGOROD DNESTROVSKY, USSR

Akko (āk'ō) or **Acre** (ā'kar, ā'-), Fr. *Saint-Jean d'Arce*, Arab. Acca, city (1970 est. pop. 33,900), NW Israel, a fishing port on the Bay of Haifa (an arm of the Mediterranean Sea). Its manufactures include iron and steel, chemicals, and textiles. The city was captured (A.D. 638) by the Arabs, who developed its natural harbor. In 1104 it was captured in the First Crusade and was held by Christians until 1187, when it was taken by Saladin. In the Third Crusade it was won back (1191) by Guy of Lusignan, Richard I of England, and Philip II of France, who gave it to the Knights Hospitalers (the Knights of St. John, hence its French name). For the next century it was the center of the Christian possessions in the Holy Land. Its surrender and virtual destruction by the Saracens in 1291 marked the decline of the Latin Kingdom of Jerusalem and the Crusades. Akko was taken by the Ottoman Turks in 1517 and was revived in the late 18th cent. under Dahir al-Umar, the local Ottoman ruler. In 1799, Ottoman forces, with the aid of Great Britain, withstood a 61-day siege by Napoleon I. The city was taken in 1832 by Ibrahim Pasha for Muhammad Ali of Egypt, but European and Ottoman forces won it back for the Ottoman Empire in 1840. British troops captured the city in 1918. Akko was assigned to the Arabs in the 1948 partition of Palestine, but it was captured by Israeli forces in the Arab-Israeli war of that year.

Akkub (āk'ub) 1 Descendant of David 1 Chron. 3:24. 2 Levitical family 1 Chron. 9:17, Ezra 2:42, Neh. 7:45, 11:19, 12:25. 3 One of the Nethinim. Ezra 2:45. 4 One who explained the Law. Neh. 8:7.

Aklavik (āk'lā'vik), settlement (1971 pop. 677), Mackenzie dist., Northwest Territories, Canada, on the west channel of the Mackenzie River. The unsuitability of the land at the site led to the construction of INUVIK.

Akmoilinsk. see TSELINOGRAD, USSR

Ako, Michel. see ACO, MICHEL

Ako (āk'ō), city (1970 pop. 45,942), Hyogo prefecture, W Honshu, Japan, on the Harima Sea. It is an industrial city where fire bricks, fishing nets, medicine, and cement are produced. Ako is famous for its Oishi (Shinto) shrine and Kogakuji (Buddhist) temple.

Akola (āk'ō'lā), town (1971 pop. 168,454), Maharashtra state, W central India, on the Morna River. It is a district administrative center and a market town. Cotton and groundnuts are the chief products of the region. A citadel built by the Mogul emperor Akbar Shah II in the 19th cent. stands in Akola.

Akosombo Dam, Ghana. see VOLTA, river

A-k'o-su (a-kō-sōō), town, SW Sinkiang Uygur Autonomous Region, China, on the A-k'o-su River. The center of an oasis at the foot of the Tien Shan mts., it is a caravan hub on the Old Silk Road. Industries include textile and carpet manufacturing, jade carving, tanning, and metalworking. Iron deposits are in the area. A-k'o-su has ancient Buddhist statues and caves, but most are in poor condition. The name is sometimes spelled Aksu or Aqsu.

Akrabbim (āk'rāb'im) see MAALEH-ACRABBIM

Akranes (a'krānēs'), town (1969 est. pop. 4,245), SW Iceland, on a peninsula in the Faxaflói. It is a fishing port and industrial center, with a huge cement plant.

Akron (āk'rān), city (1970 pop. 275,425), seat of Summit co., NE Ohio, on the Little Cuyahoga River, on the highest point of the Ohio and Erie Canal, inc. 1825. It is a port of entry, an important industrial and transportation center, and the heart of the country's rubber industry. In addition to its enormous variety of rubber products, its many manufactures range from fishing tackle to plastics, missiles, and heavy machinery, the dirigibles *Akron* and *Macon* were built there. The Ohio and Erie Canal (opened 1827) and later the railroad spurred the city's growth. The first rubber plant was established in 1870. The city is the seat of the Univ. of Akron and the Institute of Rubber Research. It has an art institute, a music center, and a symphony orchestra. Points of interest include a giant dirigible airdock, one of the world's largest buildings without inner supports, the John Brown home, where the abolitionist lived from 1844 to 1846 (now housing a museum), and several old mansions.

Akron, University of, at Akron, Ohio, coeducational, established 1870 as Buchtel College, transferred 1913 as the nucleus of the Municipal Univ. of Akron. In 1967 the school became a state university. During World War II scientists connected with the university worked on the critical development of

synthetic rubber, similar scientific programs are now carried on by the Institute of Polymer Science. The university has an extensive adult education system.

Aksakov, Konstantin Sergeyevich, 1817-60, Russian critic and writer, son of Sergei Timofeyevich Aksakov. Like his brother Ivan, he was an ardent Slavophile and strongly idealized the village community as a voluntary association. His literary criticism was devoted mainly to urging writers to seek closer ties with the Orthodox religion and with the peasantry. He wrote *O vnutrennem sostoyanii Rossii* [on the internal situation of Russia] in 1855.

Aksakov, Sergei Timofeyevich, 1791-1859, Russian writer, known for his nostalgic descriptions of the Orenburg region. Aksakov's chief work is *Family Chronicle* (1856, tr. 1924), a picture of country life in the days of serfdom. His *Years of Childhood* (1858, tr. 1960) vividly describes his joyous youth.

Aksu: see A-K'O SU, China

Aksum or **Axum** (both āksōm'), town (1970 est. pop. 12,800), Tigre prov., N Ethiopia. Aksum was the capital of an empire (c. 1st-8th cent. A.D.) that controlled much of what is now N Ethiopia. In the 4th cent. the emperor Ezana was converted to Christianity, and today Aksum is a major center of Ethiopian Christianity. The Ark of the Covenant is said to have been brought there from Jerusalem and placed in the church of St. Mary of Zion, where Ethiopia's emperors were crowned. There are gigantic carved obelisks dating from pre-Christian times.

Akte, Greece. see ATHOS

Aktyubinsk (āktyōō'bīnsk), city (1970 pop. 550,000), capital of Aktyubinsk oblast, Kazakhstan, S European USSR, on the Ileik River and the Kazalinsk RR. Aktyubinsk has an important ferroalloy plant and chromium complex based on nearby ore deposits. Founded in 1869, the city grew rapidly with the expansion of metallurgical industries during World War II.

Akure (ākōō'rā), town (1969 est. pop. 82,000), S Nigeria. Timber is cut nearby and processed in Akure. The town is also a cacao marketing center. Akure was a small independent YORUBA kingdom until it was conquered by BENIN in the early 19th cent. Great Britain gained control in 1894. Akure has a school of agriculture.

Akureyri (ā'kurā'rē), city (1970 pop. 10,735), N Iceland, at the head of the Eyjafjörður. The second largest city of Iceland, it is a fishing, commercial, and industrial center. It was settled A.D. c. 900 and chartered in 1786. The modern Lutheran Church is a landmark.

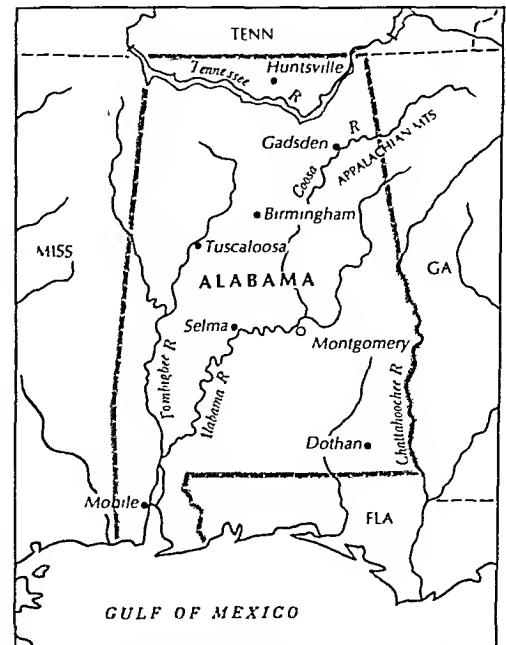
Akyab see SITWE, Burma

al- For some Arabic names beginning thus, see second part of name, e.g., for Anwar al-Sadat, see SADAT ANWAR AL-

Al, chemical symbol of the element ALUMINUM

Alabama (ālābām'ā), state (1970 pop. 3,444,165), 51,609 sq. mi. (133,667 sq. km), SE United States, admitted as the 22d state of the Union in 1819. The capital is MONTGOMERY, the largest city is BIRMINGHAM, and the major seaport is MOBILE. Alabama is bounded on the N by Tennessee, on the E by Georgia, on the S by Florida and the Gulf of Mexico, and on the W by Mississippi. Except for the mountainous section in the northeast (the southern end of the Cumberland Plateau) the state is a rolling plain with a mean elevation of c. 500 ft (150 m) in two geologic regions—the Appalachian Piedmont above the FALL LINE and the coastal plain below. These plains, drained by the ALABAMA and the TOBIEGEE rivers and their tributaries, are primarily devoted to agriculture. The central BLACK BELT, formerly a principal cotton-growing area, is now a center for raising cattle and poultry. Alabama's most valuable agricultural products are cotton, grown in the Tennessee River valley, is still the chief crop. Other important crops are peanuts, soybeans, and hay. Although about half of Alabama's area is devoted to agriculture, manufacturing accounts for a larger share of the state's income. Where the Tennessee River loops across the north, hydroelectric power from the TENNESSEE VALLEY AUTHORITY has been increasingly turning an agricultural land into an industrial section. The mineral riches of coal, oil, stone, and iron also contribute to the state's industries, and Birmingham is a leading U.S. iron and steel center. Other major industries produce chemicals, textiles, paper products, and processed foods. In addition Gulf fishing and lumbering add to the wealth of Alabama, pine plywood is also an important product. Agriculture was known to the four great Indian groups of the region (Creek and Cherokee in the east, Choctaw

and Chickasaw in the west) when the Spanish explorers arrived. Cabeza de Vaca (and possibly Panfilo de Narvaez) visited Alabama in 1528, and Her-



nando De Soto spent some time in the region in 1540. White settlement was begun, however, not by the Spanish but in 1702 by the French under the sieur de Bienville in the Mobile area. The French and British contended for the furs gathered by the Indians, and the region passed (1763) to the British, who were victorious over France and Spain in the French and Indian Wars. At the close of the American Revolution, Great Britain ceded (1783) to the United States all lands E of the Mississippi except the Floridas (see West Florida Controversy). The territory of Mississippi, which included parts of present-day Alabama, was set up in 1798, but the land was still largely wilderness with a considerable fur trade, centered at Saint Stephens, and with only the beginnings of cotton cultivation. Both were interrupted during the War of 1812, when part of the Creek Confederacy began attacking under William Weatherford. Andrew Jackson decisively defeated the Indians at Horseshoe Bend on March 27, 1814. That Jackson victory, coupled with the British demand for cotton, ushered in a period of heavy settlement. New settlers poured into the Alabama region, especially from Georgia and Tennessee. The wealthy newcomers settled in the fertile bottomlands and established great plantations based on slave labor, which helped to produce cotton for the markets of Southern ports. Poorer newcomers took over less fertile uplands, where they eked out a living. The population grew to such an extent that the Territory of Alabama, taking Saint Stephens as its capital, was set up in 1817 with William W. Bibb as governor, two years later it became a state. In Alabama the slave-owning planters were dominant because of the prosperous cotton crop, and as the Civil War loomed closer the support of Southern rights and secession sentiment grew under the urging of "fire-eaters" such as William L. Yancey. Alabama broke away from the Union on Jan. 11, 1861, when its second constitutional convention passed the ordinance of secession. The government of the Confederacy was organized at Montgomery on Feb. 4, 1861. Federal troops held the Tennessee valley after 1862. One of the great naval battles of the war was won by Admiral D. G. Farragut in Mobile Bay in 1864, but most of the state was not occupied in force until 1865. Alabama ratified the Thirteenth Amendment to the U.S. Constitution in 1865, but in 1867 it refused to ratify the Fourteenth Amendment and was placed under military rule. That rule ended the following year when a new state legislature operating under a new constitution approved the Fourteenth Amendment. However, Federal troops did not leave Alabama until 1876. In the RECONSTRUCTION era Alabama's government was filled with CARPETBAGGERS and SCALAWAGS, and corruption was widespread. Few reforms emerged during the period, but the mining of coal and iron was expanded by Daniel Pratt and his successor, H. F. De Bardeleben, marking the rise of industry in Alabama. Railroads built during Reconstruction also encouraged industrialization. BIRMINGHAM was founded in 1870, and its first blast furnace began operations in 1880.

The cotton textile industry developed in the 1880s. At that time farming was still dominant, and the fortunes of the state rose and fell with the market price of cotton, however, constant use and erosion began to exhaust the land. Diversification of crops, much advocated in the 20th cent., was accelerated when the boll weevil invaded the cotton fields and the great demand during World War I brought high prices for food crops. The Great Depression and the agricultural program of President Franklin D. Roosevelt's New Deal caused more farmers to produce subsistence crops and took more land away from the wasting cotton culture. Industrialization was greatly increased during World War II with the appearance of factories producing machines, munitions, powder, and other war supplies. HUNTSVILLE became a center for rocket research, and its population more than quadrupled between 1950 and 1960. Industrialization and commerce increased throughout the state. Adding impetus to that growth was an ambitious development program of Alabama's inland waterways to provide cheap water transportation, more hydroelectric power, and flood-control measures. In 1954 the U.S. Supreme Court handed down a decision ruling racial segregation in public elementary and secondary schools unconstitutional, and the decision was followed by a severe rise in racial tension (see INTEGRATION). Alabama has witnessed many civil rights protests, including a year-long black boycott of public buses in Montgomery in 1955-56 to protest segregated seating and a Freedom March from Montgomery to Selma in 1965. Alabama's constitution, adopted in 1901, provides for an elected governor, who may not succeed himself in office. The legislature is made up of a 35-member senate and a 106-member house of representatives. The state elects 2 Senators and 7 Representatives to the U.S. Congress and has 9 electoral votes. Although Republicans gained in the state in the 1960s, Alabama is still predominantly Democratic. George C. Wallace, a Democrat, was elected governor in 1962 and again in 1970 and entered the U.S. presidential race in 1968 as the candidate of the American Independent party. He ran for the presidency again in 1972 and was reelected governor in 1974. In 1966 his wife, Lurleen Wallace, was elected governor. Alabama contributed such important figures to the country as Hugo L. Black and Helen Keller. Places of interest in the state include Russell Cave National Monument, near Bridgeport, the site of caves that were inhabited almost continuously from 6000 B.C. to A.D. 1650, and Mound State Monument, near Tuscaloosa, the site of numerous early Indian mounds. Among Alabama's educational institutions are the Univ. of Alabama, at University, Auburn Univ., at Auburn, Birmingham-Southern College and Howard College, at Birmingham, Huntingdon College, at Montgomery, the Univ. of Montevallo, at Montevallo, and Tuskegee Institute, at Tuskegee. See W. L. Fleming, *Civil War and Reconstruction in Alabama* (1905), W. T. Jordan, *Antebellum Alabama, Town and Country* (1957), T. P. Abernethy, *The Formative Period in Alabama, 1815-1828* (2d ed. 1965), V. B. Haagen, *Alabama, Portrait of a State* (1968), C. P. Denman, *The Secession Movement in Alabama* (1933, repr. 1971), Lucille Griffith, *Alabama: A Documentary History to 1900* (rev. ed. 1972), Federal Writers' Project, *Alabama: A Guide to the Deep South* (1941, repr. 1973).

Alabama, river, 315 mi (507 km) long, formed in central Ala. by the confluence of the Coosa and Tallapoosa rivers N of Montgomery, Ala., and flowing SW to Mobile, Ala., where it joins the Tombigbee to form the Mobile River, drains c. 22,600 sq mi (58,500 sq km). In the 1800s the Alabama played an important role in the development of the region's economy as a transporter of goods. It remains an important mover of farm products, lumber, and manufactured goods, especially textiles and iron and steel products. The Cahaba River, its chief tributary, is the source of water for Birmingham, Ala.

Alabama, ship see CONFEDERATE CRUISERS

Alabama, University of, mainly at University, near Tuscaloosa, state supported, coeducational, chartered 1820, opened 1831. An experimental station of the U.S. Bureau of Mines, the state natural history museum, the state geological survey, and a business research bureau are there. The university also has a campus at Huntsville and a branch offering medical programs at Birmingham.

Alabama claims, claims made by the U.S. government against Great Britain for the damage inflicted on Northern merchant ships during the American Civil War by the *Alabama* and other CONFEDERATE CRUISERS that had been built, fitted out, and other-

wise aided by British interests. William H. Seward failed to reach a settlement while he was Secretary of State. However, his successor, Hamilton Fish, brought about the Treaty of Washington (1871), which provided for arbitration. Charles Francis Adams for the United States, Alexander J. E. Cockburn for Great Britain, and three members from neutral countries constituted the tribunal, which met at Geneva in 1871-72. The arbitrators threw out American claims for indirect losses, but they awarded the United States \$15.5 million for all the direct damage done by the *Alabama* and the *Florida* and for most of the damage caused by the *Shenandoah*. The British were absolved of blame in the cases of several less important cruisers. See study by T. W. Balch (1900, repr. 1969).

Alabama Indians or Alibamu Indians (ālībām'ōō), North American Indians whose language belongs to the Muskogean branch of the Hokan-Siouan linguistic stock (see AMERICAN INDIAN LANGUAGES). They lived in S. Alabama in the early 18th cent. and were members of the Creek confederacy. During the 19th cent. they moved to W. Louisiana and E. Texas. The state of Alabama takes its name from them. The Alabama share a reservation with the Coushatta Indians in Texas where together they number some 380; they are often referred to jointly as the Alabama-Coushatta Indians.

Alabama Polytechnic Institute: see AUBURN UNIVERSITY

alabamine (āl'abām'ēn) see ASTATINE

Alabaster, William, 1567-1640, English theologian and poet. Although he wrote two epic poems in Latin, he is remembered for his theological studies, including *Spiraculum Tubarum* (1633). Alabaster converted to Roman Catholicism in Spain in 1597 and was imprisoned on his return to England in 1598. He reconverted to Protestantism and was chaplain to James I.

alabaster, fine-grained, massive, translucent variety of GYPSUM, pure white or streaked with reddish brown, used in statuary and for other decorative purposes. It is soft enough to be scratched with the fingernail and hence is easily carved, but it is also easily broken, soiled, and weathered. It is quarried in England and also in Italy. Vases and statuettes of Italian alabaster are sold as "Florentine marbles." The alabaster of the ancients, called Oriental alabaster and onyx marble, to distinguish it from true alabaster, is MARBLE, a calcium carbonate, whereas gypsum is a calcium sulphate. The calcium carbonate form occurs both in spring deposits (TRAVERTINE) and in cave formations (see STALACTITE AND STALAGMITE). Important sources of supply are Algeria, Egypt, Iran, and Mexico (from which it is exported under the name Mexican onyx); in the United States there are important sources in Utah and Arizona. Oriental alabaster (marble) was extensively used by the Egyptians in sarcophagi, in the linings of tombs, in the walls and ceilings of temples, and in vases and sacrificial vessels. The Romans worked the Algerian and Egyptian quarries and used the stone for similar purposes. In modern times it was used by Muhammad Ali for his mosque in Cairo. The French make extensive use of alabaster in interior decoration. See R. Webster, *Gems* (1970), J. L. Gillson, *Industrial Minerals and Rocks* (1960).

Alacoque, Margaret Mary: see MARGARET MARY SAINT

Alagez, Mount see ARAGATS, MOUNT, USSR

Alagoas (alagō'ās) [Port. = lagoons], state (1970 pop. 1,589,605), 10,707 sq mi (27,331 sq km), NE Brazil, on the Atlantic Ocean. MACEIÓ is the capital.

Alai or **Alay** (both alī'), mountain range, SW Kirghizstan, Central Asian USSR. A western branch of the Tien Shan system, it extends c. 200 mi (320 km) west from the Chinese border and rises to c. 19,280 ft (5,880 m) in its western portion. The Alai Valley, south of the range, is a fertile elevated (c. 9,800 ft/2,990 m) grassland used for grazing; there is irrigated grain cultivation in the west.

Alain see CHARTIER, ÉMILE-AUGUSTE

Alain de Lille (alān' dā lēl), c. 1128-c. 1202, French scholastic philosopher, a Cistercian, honored by his contemporaries as the Universal Doctor. He was born in Lille, he taught at Paris and Montpellier before retiring to Cîteaux. De Lille attempted to give rational support to the tenets of Christian faith in his writings. He held that the mind unaided by revelation can know the universe, but by faith alone can man know God. Although his thought was largely Neoplatonic, he made use of numerous Aristotelian and neo-Pythagorean elements. The mathematical and deductive method had an important

place in the working out of his theology. One of his chief works, *De fide catholica contra haereticos*, was written in order to refute heretics and unbelievers. Alain de Lille was also one of the foremost didactic poets of his day; his chief poem *Anticlaudian* (tr. 1935) is a complicated allegory. He is also called *Alanus de Insulis*.

Alain-Fournier (alān-'fōrnyā'), 1886-1914, French novelist, whose real name was Henri Alban Fournier. He was killed in action during World War I. His single full-length work is his poetic novel about a youthful search for the ideal, *Le Grand Meaulnes* (1913, tr. *The Wanderer*, 1928). Set in an imaginary locale called "the domain," it is based partly on Alain-Fournier's own childhood and partly on his mystical experiences and ideas. Its distinctiveness lies in its delicate blend of symbolism and realism.

Alais: see ALÈS

Alajuela (alahwā'la), city (1970 pop. 29,171), capital of Alajuela prov., central Costa Rica. On the central plateau, it is a commercial and agricultural center with sugar, coffee, and lumber industries. It was the national capital in the 1830s.

Alam, Assadollah (as-sadōl'lā' alām'), 1919-, Iranian political leader, prime minister of Iran (1962-64). He held a variety of governmental posts in the decade following World War II. When Shah Muhammad Reza Pahlavi announced his desire for a democratic party system in Iran, Alam became head of the newly formed People's party (1956). He became prime minister in 1962 and proceeded to support large-scale land reform and a pro-Western foreign policy until his resignation in 1964. One of Iran's largest landholders, he later returned (1966) to government to serve as minister of the imperial court.

Alaman, Lucas (lōō'kas alaman'), 1792-1853, Mexican historian and statesman. As deputy to the Spanish Cortes, he failed to win a hearing for the insurgents in Mexico. Returning to Mexico, he held several public offices and was twice minister of foreign affairs in the government after the fall of Agustín de Iturbide. Alaman founded the Archivo General and the National Museum, in Mexico City. He is chiefly remembered for his magnificent history of Mexico, *Historia de Mejico* (5 vol., 1849-52).

Alamanni or Alemanni, Luigi (lōō'e'ē alaman'nē, alā-), 1495-1556, Italian poet and patriot. He was a friend of Machiavelli, who may have encouraged his conspiracy (1522) against Cardinal Giulio de' Medici (later Pope Clement VII). Its failure forced him to flee to the French court. He returned (1527) to Florence to fight the Medici, but after their restoration (1532) he was declared a rebel. Alamanni was versatile and prolific. He wrote plays (*La Flora*, a comedy and *Antigone*, a tragedy) and lively letters to his friends and introduced the epigram into modern Italian poetry.

Alamayn, Al, Egypt see ALAMEIN EL

Alameda (ālāmē'dā, -mā'dā), city (1970 pop. 70,968), Alameda co., W. central Calif., on an island just off the eastern shore of San Francisco Bay, settled 1850, inc. as a city 1884. Shipbuilding, ship repairing, and the production of peanut butter are the leading industries. It is primarily residential, however, with excellent beaches, parks, and pleasure-boating facilities. The major employer in the city is the Alameda Naval Air Station, a large U.S. carrier base, which was built from 1938 to 1940. An important Coast Guard base and a junior college are also there. The city is connected with the mainland by four bridges and two tunnels.

Alamein, El (ēl ālamān', a-) or **Al Alamayn** (al ālamān'), town, N. Egypt, on the Mediterranean Sea. It was the site of a decisive British victory in World War II (see NORTH AFRICA CAMPAIGNS IN). In preparation for an attack by German Field Marshal Erwin Rommel from Libya (begun May 26, 1942) the British forces retreated into Egypt and by June 30 had set up a defense line extending 35 mi (56 km) from Alamein 5 to the Qattara Depression, a badland which could neither be crossed nor flanked. If this position had fallen, the British might have lost Alexandria and been forced to withdraw from North Africa. In August, Gen. Bernard L. MONTGOMERY took command of the 8th Army. The British offensive opened on Oct. 23 with tremendous air and artillery bombardments. Montgomery's forces cleared the German minefields and on Nov. 1 and 2 burst through the German lines near the sea and forced a swift Axis retreat out of Egypt, across Libya, and into E. Tunisia. Egypt was definitely saved, and with the landing on Nov. 7 and 8 of American troops in Algeria the Axis soon suffered (May, 1943) total defeat in North Africa. The Allies thereafter received more support from Middle Eastern countries, some of

which had drawn close to the Axis powers. For his victory Montgomery was made a viscount with the title Montgomery of Alamein. See Michael Carver, *El Alamein* (1962).

Alameth (āl'əmath), Benjamite 1 Chron 7 B

Alamgir: see AURANGZEB

Alammelech (ālām'ələk), village of Asher, NW Palestine Joshua 19 26. The modern Wadi el-Melek near Mt Carmel perhaps echoes the name.

Alamo, the [Span. = cottonwood], building in San Antonio, Texas, "the cradle of Texas liberty." Built as a chapel after 1744, it is all that remains of the mission of San Antonio de Valero, which was founded in 1718 by the Franciscans and later converted into a fortress. In the Texas Revolution, San Antonio was taken by Texas revolutionaries in Dec. 1835, and was lightly garrisoned. When Santa Anna approached with an army of several thousand in Feb. 1836, only some 150 men held the Alamo, and confusion, indifference, and bickering among the insurgents throughout Texas prevented any help from joining them, except for 32 volunteers from Gonzales who slipped through the Mexican lines after the siege had already begun. Defying Santa Anna's demands for surrender, the Texans in the fort determined to fight against the hopeless odds. The siege, which began Feb. 24, ended with hand-to-hand fighting within the walls on March 6. William B. Travis, James Bowie, Davy Crockett, and some 180 other defenders were dead, but the heroic resistance roused fighting anger among Texans, who six weeks later defeated the Mexicans at San Jacinto, crying, "Remember the Alamo!" The chapel-fort was bought by the state in 1883, the surrounding area was added in 1905, and the whole complex was restored and improved from 1936 to 1939. See A. G. Adair and M. H. Crockett, ed., *Heroes of the Alamo* (2d ed. 1957), Lon Tinkle, *13 Days to Glory* (1958), Walter Lord, *A Time to Stand* (1961).

Alamogordo (āl'amagōrdō, -də), city (1970 pop. 23,035), seat of Otero co., S N Mex., near the Sacramento mts., inc. 1912. It is a trade center for a large livestock, irrigated farm, timber, and recreational area. Pressure cookers, wearing apparel, and lumber are among its products. Holloman Air Force Base, headquarters of the 49th Tactical Air Command and site of the White Sands Missile Range, where the first atomic bomb was exploded on June 16, 1945, is located in Alamogordo. The city was founded in 1898 with the arrival of the Southern Pacific RR. New Mexico State Univ. has a branch at Alamogordo. Near the city are White Sands National Monument (see NATIONAL PARKS AND MONUMENTS, table), an Apache Indian Reservation, and Lincoln National Forest.

Alamoth (āl'amōth), Hebrew musical term, unknown in meaning, although some have guessed "soprano," connecting it with a word for "maidens." It occurs in 1 Chron. 15 20 and in the title of Ps. 46. The term *Sheminith*, in the titles of Pss. 6 and 12, has been explained as "bass," complementary to Alamoth.

Alanbrooke, Alan Francis Brooke, 1st Viscount, 1883-1963, British general. He entered the field artillery in 1902 and served with distinction during World War I. In the 1930s he made himself a master of mechanized warfare. At the beginning of World War II he commanded the 2d Army Corps in France and was (1940-41) commander in chief of the British Home Forces. From Dec. 1941, to 1946 he was chief of the imperial general staff and participated in the war conferences of Winston Churchill, Franklin Delano Roosevelt, and Joseph Stalin. He was made Baron Alanbrooke in 1945 and Viscount Alanbrooke in 1946.

Åland Islands, Finland: see ÅHVENANMAA ISLANDS

alanine, organic compound, one of the twenty-two alpha AMINO ACIDS commonly found in animal proteins. Only the L-stereoisomer participates in the biosynthesis of proteins (see STEREOCHEMISTRY). Its one-carbon aliphatic side chain confers no special reactivity upon this amino acid when it is included within a protein by two amide bonds, but it does allow the side chain to participate in hydrophobic

interactions. Alanine is not essential to the human diet, since it can be synthesized from other cellular metabolites. It was discovered in protein in 1875.

Alarcón, Hernando de (ārnan'dō dā alār'kōn'), fl. 1540, Spanish explorer in the Southwest. He was given command of a fleet that was supposed to support the land expedition of Francisco Vazquez de CORONADO. In the summer of 1540 he sailed up the Gulf of California, proved definitely that Lower California was a peninsula, not an island, and discovered the Colorado River. He failed, however, to make contact with Coronado's expedition. He explored the river a few months before Garcia Lopez de Cárdenas discovered the Grand Canyon.

Alarcón, Pedro Antonio de (pāth'rō āntō'n'yō), 1833-91, Spanish writer and diplomat. Alarcón was active in politics, became editor of a revolutionary journal in Madrid, and was later an ambassador. His first important literary work was a masterful and popular memoir of the Spanish Moroccan campaign (1859-60). He wrote several novels, including *El sombrero de tres picos* (1874, tr. *The Three-cornered Hat*, 1891), on which Manuel de Falla based his popular ballet, and *El capitán Veneno* (1881, tr. *Captain Venom*, 1914). In these works Alarcón shows keen powers of observation and subtle humor. A longer novel is *El escándalo* (1875, tr. *The Scandal*, 1945).

Alarcón y Mendoza, Juan Ruiz de (hwan rōōēth' dā alār'kōn' ē mändō'thā), 1581?-1639, Spanish dramatic poet, one of the great literary figures of the Spanish Golden Age, b. Mexico. After practicing law in Spain (1600-1608) and Mexico, he returned (1613) to Spain, where he obtained a minor government post. Like Molière, Alarcón was a comedic moralist, his comedies (2 vol., 1628-34) are notable for brilliant characterization and lively dialogue. Alarcón was a hunchback, and his carefully wrought plays reflect the stoic point of view that this circumstance compelled him to adopt. Best known is *La verdad sospechosa* [the suspicious truth], which was the model for Corneille's *Le Menteur*. Among the others are *Las paredes oyen* [the walls have ears] and *El anticristo*.

Alaric I (āl'arīk), c. 370-410, Visigothic king. He headed the Visigothic troops serving Emperor Theodosius I. After the emperor's death (395) the troops rebelled and chose Alaric as their leader (see VISIGOTHS). Alaric devastated Thrace, Macedonia, and Greece. Stopped, but not defeated, by STILICHO, he retired northward, and by an agreement with the Eastern emperor, ARCADICIUS, occupied Epirus. In 401 he invaded Italy, where after some indecisive warfare he agreed to withdraw. Stilicho persuaded (407) the Romans to buy Alaric's alliance, but shortly afterward Emperor HONORIUS had Stilicho executed for treason. Alaric again invaded (408) Italy and laid siege to Rome. Raising the siege after an agreement with the Roman senate, Alaric again turned on Rome (409) and forced the city to accept a puppet emperor, Attalus, whom he himself deposed the next year for disregarding his advice. After the failure of renewed negotiations with Honorius (who all the while held out at Ravenna), Alaric stormed and sacked Rome (410) and then marched south to attack Sicily and Africa. A storm destroyed his fleet, and Alaric, having turned back, died of an illness. His brother Athaulf was elected his successor. It is said that Alaric was buried with his treasures near Cosenza in the bed of the Busento River, which was temporarily diverted from its course. That the secret of his burial place might be kept, the slaves employed in the labor were killed. See study by Marcel Brion (tr. 1932).

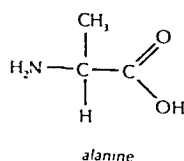
Alaric II, d. 507, Visigothic king of Spain and of 5 Gaul (c. 484-507), son and successor of Euric. He issued (506) at Toulouse the BREVARY OF ALARIC for his Roman subjects. Alaric's adherence to Arianism gave CLOVIS I, king of the Franks, an easy pretext for attacking him in the name of orthodoxy. Alaric was defeated and slain at Vouille (507), and the Visigoths lost all their possessions in Gaul except Septimania.

Alas, Leopoldo (lāōpōl'dō ā'lās), 1852-1901, Spanish novelist, short-story writer, and literary critic who wrote under the pseudonym Clarín, b. Zamora. Although he began his literary career as a journalist, he later was a professor of law at the Univ. of Oviedo. He is best known for his naturalistic novel *La Regenta* (1884-85), a detailed analysis of provincial life. His other works include another novel, *Su único hijo* [his only son] (1890), and several volumes of short stories, which are generally regarded as among the best of the genre. See study by Albert Brent (1951).

Alasco or à Lasco, Johannes: see LASKI, JOHN

Alaşehir (alā'shēhēr'), town (1970 pop. 20,313), W Turkey, at the foot of the Tmolus mts. (Boz Dağ). It is the trade center for a region where tobacco, fruit, and mineral water are produced. The town is picturesque, with narrow winding streets and a Byzantine wall. Nearby is the site of ancient PHILADELPHIA.

Alaska, state (1970 pop. 302,173), 586,400 sq mi (1,518,776 sq km), including 15,335 sq mi (39,718 sq km) of water surface, NW North America, admitted 1959 as the 49th state. Nearly one fifth the size of the rest of the United States, Alaska is the largest state in the Union but the least populous one. JUNEAU is the capital, ANCHORAGE the largest city. Alaska is a huge block of land at the northwestern extremity of the North American continent, between the Arctic Ocean on the north and the Gulf of Alaska and the Pacific Ocean on the south. It is bounded on the E by Canada (Yukon and British Columbia) and on the W by the Bering Sea, Bering Strait, and Chukchi Sea. The tip of the Seward Peninsula is only a few miles from Far Eastern USSR, the two are separated by the narrow Bering Strait. Seward Peninsula is chiefly tundra-covered and sparsely inhabited. Nome was founded there when gold was discovered (1898) in the sand on the beaches, but gold mining has greatly declined, and Nome's population is now well under 5,000. The Bering Strait widens in the north to the Chukchi Sea, which slices into Alaska with Kotzebue Sound, in the south the strait widens to the Bering Sea, which cuts into Alaska with Norton Sound and Bristol Bay. The state again extends toward the USSR in the Alaska Peninsula and the Aleutian Islands, reaching out a total of 1,200 mi (1,931 km) toward the Soviet Komandorski Islands, together they divide the Bering Sea from the Pacific. The Aleutian Range, which is the spine of the Alaska Peninsula, is continued in the grass-covered, treeless Aleutian Islands, the climate there is unrelentingly bad—foggy and, in the winter, disagreeably damp and cold and subject to violent winds (the williwaws). Once traversed by Russian fur traders hunting sea otters, the Aleutians are now chiefly of strategic importance. The southern shore of Alaska is deeply indented by two inlets of the wide Gulf of Alaska, Cook Inlet and Prince William Sound, the Kenai Peninsula between them extends southwest toward Kodiak Island. The narrow Panhandle dips southeast along the coast from the Gulf of Alaska, cutting into British Columbia. It consists of the offshore islands of the Alexander Archipelago and the narrow coast, which rises steeply to the mountains of the Coast Range and the St. Elias Mts. Winters in the Panhandle are relatively mild, with heavy rainfall and, except on the upper slopes of the mountains, comparatively little snow. The interior of Alaska, on the other hand, has very cold winters and short but very hot summers. In Arctic Alaska, N of the Brooks Range, the temperature in winter reaches -10°F to -40°F (-23°C to -40°C). The land there is mostly barren, cut by many short rivers and one long one, the Colville. Alaska's major river is the Yukon, which crosses the state from east to west for 1,200 mi (1,931 km), from the Canadian border to the Bering Sea. The northernmost reach of Alaska is Point Barrow. Alaska's climate and terrain (rough coast and high mountain ranges) divide it into isolated regions, the difficulty of communication is one of the state's most troublesome problems. Air transport is a partial solution, and all Alaskan cities have airports, but they nevertheless remain fundamentally isolated, self-contained units. This is true even in the Panhandle, the most populous region, where the capital and the state's third largest city, KETCHIKAN, are located. The Panhandle's connection with Seattle is by steamships, which ply the INSIDE PASSAGE between the coast and the offshore islands. In S central Alaska, Anchorage is the center for the Alaskan RR and for airways, it is also connected with the Alaska Highway. The port of Seward, having lost its commanding position as terminus of the Alaska RR to Whittier, was forced to construct a road link to the Alaska Highway at Fairbanks. Cordova and Kodiak both depend upon the ocean lanes. In the north, the entire Arctic coast is icebound most of the year, the ground there is permanently frozen. Alaska has very little agriculture, in number of farms and in the value of its farm products, it ranks last in the nation. The Panhandle, which has the best climate, is generally too steep for farming. The state's best farmland is in its S central region, in the Matanuska Valley, farmers from drought-stricken areas of the Midwest were resettled there by the Federal government in 1935. The Tenana Valley (the area around Fairbanks) is also good farmland. Most of Alaska's farms are dairies or poultry ranches, and the state's most valu-

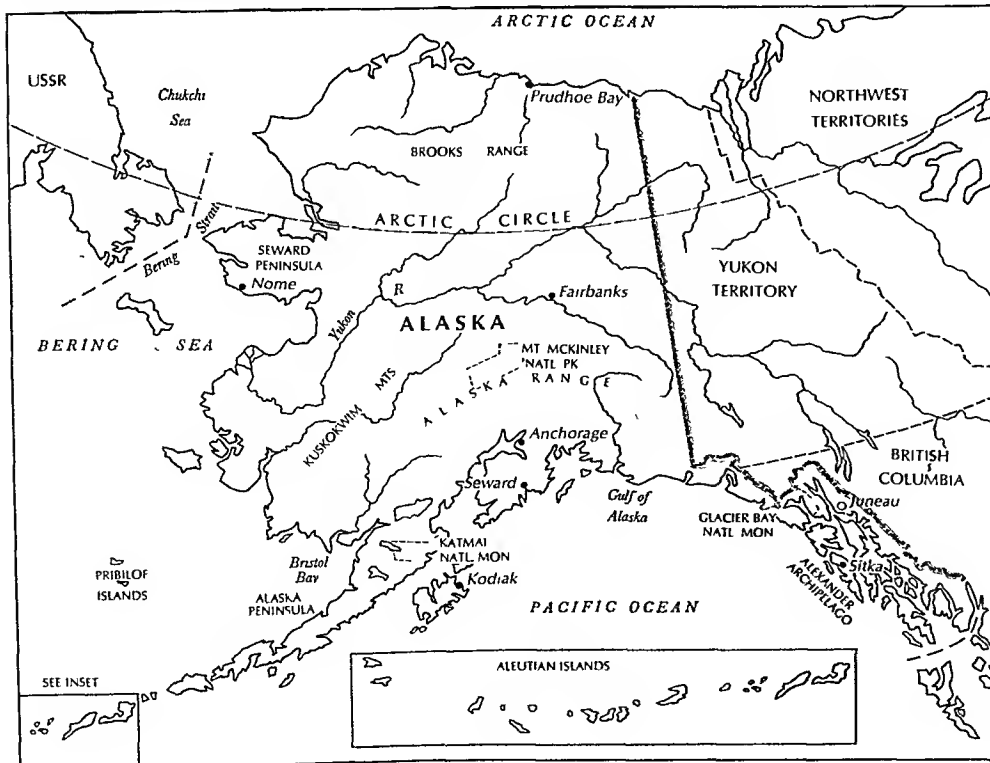


able farm commodities are dairy products, potatoes, cattle, and eggs. Fishing is a leading industry. Alaska heads the nation in the value of its commercial catch—chiefly salmon, crab, shrimp, halibut, herring, and cod. Its largest manufacturing enterprise is food processing, particularly the freezing and canning of fish. Lumbering and related industries are second. The state has two great national forests. Mining, principally of petroleum, sand and gravel, natural gas, and coal, is the state's most valuable industry. Alaska leads the nation in the production of platinum, is second in production of antimonies, and is a leading producer of tin, mercury, uranium, and beryllium are also found. Gold, which led to the opening of the area in the 19th cent., is no longer mined in quantity. Fur-trapping, Alaska's oldest industry, still endures, and pelts are obtained from a great variety of animals. The Pribilof Islands are especially noted as a source of sealskins. The seals there are now owned by the U.S. government, and their use is carefully regulated. Government—Federal, state, and local—is Alaska's major source of employment. The state's strategic location has generated considerable defense activity, including the establishment of permanent military bases. However, construction on the Distant Early Warning line and on the Ballistic Missiles Early Warning System is now completed, and Federal employment in the state declined in the early 1970s. Oil and natural gas offer the best hope for Alaska's future. The vast discoveries on the Arctic North Slope indicate that that area, along with the offshore deposits in S central Alaska, may make the state one of the world's greatest petroleum and natural gas producers. The proposed construction of an 800-mi (1,287-km) pipeline from the Arctic North Slope to the ice-free port of Valdez, however, encountered heated opposition from ecologists, but work on it began in 1974. Alaska's tourist industry also has great potential, especially with improvements in transportation. The state abounds in natural wonders. In the Panhandle, the scenic beauty of the mountains and the rugged fjord-indented coast are augmented by such attractions as the MALASPINA GLACIER and the acres of blue ice in GLACIER BAY NATIONAL MONUMENT. In the Alaska Range of S central Alaska stands the highest point in North America, Mt. McKinley (in MOUNT MCKINLEY NATIONAL PARK), while the Alaska Peninsula and the Aleutian Islands have numerous volcanoes. KATMAI NATIONAL MONUMENT contains the Valley of Ten Thousand Smokes, scene of a volcanic eruption in 1912. Alaska was discovered by white men, not from the United States or Canada but from Russia. The disastrous voyage of Vitus Bering and Aleksey Chirikov in 1741 climaxed the march of Russian traders across Siberia. The survivors who returned with sea otter skins started a rush of fur hunters to the Aleutian Islands. Rough, resourceful men, they survived

great hardships to bring away fortunes in fur. Grigori Shelekhov in 1784 founded the first permanent settlement in Alaska on Kodiak Island and sent (1790) to Alaska the man who was to dominate the period of Russian influence there, Aleksandr Baranov. A monopoly was granted to the Russian American Company in 1799, and it was Baranov who directed its Alaskan activities. Sitka was founded in 1799 as his capital, it was rebuilt after destruction by the Indians in 1802. Baranov extended the Russian trade far down the west coast of North America and even, after several unsuccessful attempts, founded (1812) a settlement in N California. Rivalry for the northwest coast was strong, and British and American trading vessels began to threaten the Russian monopoly. In 1821 the czar issued a ukase (imperial command) claiming the 51st parallel as the southern boundary of Alaska and warning foreign vessels not to transgress beyond it. British and American protests, the promulgation of the Monroe Doctrine, and Russian embroilment elsewhere resulted (1824) in a negotiated settlement of the boundary at lat 54°40' N (the present southern boundary of Alaska). Russian interests in Alaska gradually declined, and, after the Crimean War, Russia sought to dispose of the territory altogether. In 1867, Alaska was sold to the United States for \$7,200,000. The U.S. purchase was accomplished solely through the determined efforts of Secretary of State William H. Seward, and for many years afterward the land was derisively called Seward's Folly or Seward's Icebox because of its supposed uselessness. Since Alaska appeared to offer no immediate financial return, it was neglected. The U.S. army officially controlled the area until 1876, when scandals caused the withdrawal of the troops. After a small lapse, during which government was in the hands of customs men, the U.S. navy was given charge (1879). Most of the territory was not even known, although the British (notably Sir John Franklin and Capt. F. W. Beechey) had explored the coast of the Arctic Ocean, and Hudson's Bay Company men had explored the Yukon. It was not until after the discovery of gold in the Juneau region in 1880 that Alaska was given a governor and a feeble local administration (under the Organic Act of 1884). Missionaries, who had come to the region in the late 1870s, exercised considerable influence. Most influential was Sheldon Jackson, best known for his introduction of reindeer to help the Alaska Eskimo, impoverished by the wanton destruction of the fur seals. Sealing was the subject of a long international controversy (see Bering Sea Fur-Seal Controversy under BERING SEA), which was not ended until after gold had permanently transformed Alaska. Paradoxically, the first finds that tremendously influenced Alaska were in Canada. The great KLONDIKE strike of 1896 brought a stampede, mainly of Americans, and most of them came through Alaska. The

big discoveries in Alaska itself followed—Nome in 1898-99, Fairbanks in 1902. The miners and prospectors (the sourdoughs) took over Alaska, and the era of the rough mining camps reached its height; this was the Alaska of Jack London. It was lawless, and a criminal code was belatedly applied in 1899. Not until 1906 did Alaska get a territorial representative in Congress. The longstanding controversy concerning the boundary between the Alaska Panhandle and British Columbia was aggravated by the large number of miners traveling the Inside Passage to the gold fields. The matter was finally settled in 1903 by a six-man tribunal, composed of American, Canadian, and British representatives. The decision was generally favorable to the United States, and a period of rapid building and development began. Mining, requiring heavy financing, passed into the hands of Eastern capitalists, notably the monopolistic Alaska Syndicate. Opposition to the "interests" became the burning issue in Alaska and was catapulted into national politics; Gifford Pinchot and R. A. Ballinger were the chief antagonists, and this was a major issue on which Theodore Roosevelt split with President William Howard Taft. A new era began for Alaska when local government was established in 1912 and it became a U.S. territory (Juneau had officially replaced Sitka as capital in 1900 although it did not begin to function as such until 1906). The building of the Alaska RR from Seward to Fairbanks was commenced with government funds in 1915. Already, however, gold mining was dying out, and Alaska receded into one of its quiet periods. The fishing industry, which had gradually advanced during the gold era, became the major enterprise. Alaska enjoyed its greatest economic boom during World War II. The ALASKA HIGHWAY was built, supplying a still weak but much-needed link with the United States. After Japanese troops occupied the Aleutian islands of Attu and Kiska, U.S. forces prepared for a counterattack. Attu was retaken in May, 1943, after bloody fighting, and the Japanese evacuated Kiska in August after intensive U.S. bombardments. Dutch Harbor became a major key in the U.S. defense system. The growth of air travel after the war, the permanent military bases established in Alaska, and the success of arctic farming in Siberia all brightened the hopes for Alaska's growth, between 1950 and 1960 the population nearly doubled. In 1958, Alaskans approved statehood by a 5 to 1 vote, and on Jan. 3, 1959, Alaska was officially admitted into the Union as a state, the first since Arizona in 1912. On Mar. 27, 1964, the strongest earthquake ever recorded in North America occurred in Alaska, taking approximately 114 lives and causing extensive property damage. Some cities were almost totally destroyed, and the fishing industry was especially hard hit, with the loss of fleets, docks, and canneries from the resulting tidal waves. Reconstruction, with large-scale Federal aid, however, was speedily completed. Alaska operates under a constitution drawn up and ratified in 1956 (effective with statehood). Its executive branch is headed by a governor and a secretary of state, both elected (on the same ticket) for four-year terms. Alaska's bicameral legislature has a senate with 20 members elected for four-year terms and a house of representatives with 40 members elected for two years. The state sends 2 Senators and 1 Representative to the U.S. Congress and has 3 electoral votes. Democrats have generally dominated Alaskan politics, but there has been a Republican trend since 1966. William A. Egan, a Democrat, served as Alaska's first governor, from 1959 to 1967. He was succeeded by Walter J. Hickel, a Republican, after whom Egan was returned to office in 1971. In 1974, Alaska voted to move its capital from Juneau to a more central location, but a precise date and place was not set. Alaska has a four-year institution of higher learning, the Univ. of Alaska, at College, near Fairbanks. See W. W. Woolsten, *The Inside Passage to Alaska, 1792-1920* (1924); Herbert Hilscher and Miriam Hilscher, *Alaska, U.S.A.* (1959); George Rogers, *The Future of Alaska* (1962); H. Chevigny, *Russian Alaska* (1965); E. H. Gruening, *The Battle for Alaska Statehood* (1967) and *The State of Alaska* (rev. ed. 1969); C. C. Hulley, *Alaska, Past and Present* (3d ed. 1970); Bern Keating, *Alaska* (2d ed. 1971); H. W. Clark, *History of Alaska* (1930, repr. 1972); Bryan Cooper, *Alaska, the Last Frontier* (1973); Federal Writers' Project, *A Guide to Alaska, Last American Frontier* (1940, repr. 1973).

Alaska, University of, at College, near Fairbanks, land-grant and state supported, coeducational, chartered 1917, opened 1922 as Alaska Agricultural College and School of Mines. In 1935 it became a



university There are several two-year branches throughout the state

Alaska Highway, all-weather graveled road, 1,523 mi (2,451 km) long, extending NW from Dawson Creek, British Columbia, to Fairbanks, Alaska. An extension of an existing Canadian road between Dawson Creek and Edmonton, Alta., the Alaska Highway was constructed (March–Sept., 1942) by U.S. troops as a supply route to military forces in Alaska during World War II. It was a significant engineering feat because of the difficulties of terrain and weather. In the last stretch to Fairbanks the road used the previously built Richardson Highway. The Haines Cutoff connects the Alaska Highway with the Alaska panhandle. In 1946 control of the Canadian part of the road was transferred to Canada. In 1947 the entire highway was opened to unrestricted travel, it is one of the best routes to Alaska. The highway is open throughout the year, and there are roadside facilities along its length. It was formerly known as the Alaskan International Highway and the Alcan Highway.

Alaskan malamute (mäl'amyoot'), breed of strong, compact WORKING DOG believed to be one of the oldest arctic sled dogs. It stands about 23 in (58.2 cm) high at the shoulder and weighs from 70 to 85 lb (31.75–38.5 kg). Its coarse coat is composed of oily, woolly underhairs and a thick cover coat. It may be colored any shade of gray or black with white markings. Named after the Malamutes, an Inuit tribe of N. Alaska, it has been raised for centuries as a sled dog. The malamute is by nature a gentle and devoted companion, claims of wolf ancestry have never been proved. The malamute is often called a "husky," a term which properly applies to one purebred arctic dog, the Siberian husky. See DOG.

Alaska North Slope or Arctic North Slope, region, N. Alaska, between the Arctic Ocean and the Brooks Range. Large petroleum reserves were found there in the late 1960s.

Alaska Range, S. central Alaska, rising to the highest mountain in North America, Mt. McKinley (20,320 ft/6,194 m). The range divides S. central Alaska from the great plateau of the interior.

Alastor (aläs'tar), in Greek mythology, spirit of vengeance. It is an epithet applied to Zeus or any other god in his aspect as avenger and is also sometimes applied to an evildoer who is subject to vengeance.

Ala-Tau (ä'la-tou) [Turkic, =mottled mountains], several ranges of the Tien Shan system in central Asia. The Ala-Tau ranges are the Dzungarian, the Kungei, the Täläss, the Terskei, and the Trans-Ili, all except the Täläss Ala-Tau rise to more than 16,000 ft (4,880 m). Generally forested, these ranges are chiefly inhabited by Turkic-speaking pastoral tribes. A variety of grains are grown. The Dzungarian Ala-Tau, the northernmost and loftiest branch of the Tien Shan, forms part of the USSR-China border. Silver and lead mines and hot springs are found there (see DZUNGARIA). The Kungei Ala-Tau lies N. of Issyk-Kul, a huge lake in the Tien Shan. The Trans-Ili Ala-Tau, on the Kirghizia-Kazakhstan border, supports intensive, irrigated agriculture. Alma-Ata, the region's largest city, is on the northern slope.

Alatyr (alätir'), city (1967 est. pop. 43,000), Chuvash Autonomous Republic, E. European USSR, at the confluence of the Sura and Alatyr rivers. Founded in 1552, it is a river port and railroad junction with locomotive and food-processing plants.

Alaungpaya (älöng'pāyā), 1711–60, Burmese king, founder of the Konbaung dynasty, which ruled until 1885. His name, also given as Alompra, means "the coming Buddha." The son of a village headman, he rallied the Burmese and led them against their Mons rulers. He seized the important town of Ava in 1753 and moved south, uniting upper and lower Burma under his rule. Pursuing the Mons, he invaded Siam but was wounded in a siege of Ayuthia and died while returning to Burma.

Alava: see BASQUE PROVINCES

Alay: see ALAI, mountains, USSR

Al Aziziyah (äl äzēzē'yā) or **Azizīa** (äzizē'a), town, NW Libya, near Tripoli. It is a major trade center of the Gafara plain. The hottest recorded temperature on earth, 141°F (60.6°C), was recorded there.

Alba or **Alva**, **Fernando Álvarez de Toledo, duque de** (äl'bä, älvä, Span. both fämän'dō älväräth dā tölä'thō döökä dā älvä), b. 1507 or 1508, d. 1582, Spanish general and administrator. After a distinguished military career in Germany and Italy, Alba returned to Spain as adviser to King Philip II. Advocating a stern policy toward the rebels against Spain in the NETHERLANDS, he was appointed (1567)

captain general there, with full civil and military powers. The regent, MARGARET OF PARM, opposed him and resigned, and Alba became regent and governor general. A religious fanatic and ruthless absolutist, he set out to crush the Netherlands' attempts to gain religious toleration and political self-government. He set up a special court at Brussels, popularly known as the Court of Blood, which spread terror throughout the provinces. Some 18,000 persons were executed (among them the counts of EGMONT and HOORN) and their properties confiscated. Increased taxation also fanned popular resentment, and in 1572 the Netherlands rebelled again. Alba defeated the invading forces of WILLIAM THE SILENT, but he was unable to recover much of the NW Netherlands, which had been taken by the GUEUX. At the Spanish court he was accused of having compromised the royalist cause, and in 1573 he was recalled to Spain. In 1580, Philip was persuaded to use Alba for the conquest of Portugal. He took Lisbon within a few weeks.

Albacete (älbathä'tä), city (1970 pop. 93,233), capital of Albacete prov., SE Spain, in Murcia. Under the Moors, Albacete was a part of the Kingdom of MURCIA, with which it was incorporated (1269) into Castile. The city now has a modern aspect and is mainly an agricultural center. It is noted for the manufacture of fine knives and daggers.

albacore: see TUNA

Alba Iulia (äl'ba-yööl'ya), Hung. *Gyulafehérvár*, Ger. *Karlsburg*, town (1969 est. pop. 84,000), W. central Rumania, in Transylvania, on the Mureșul River. It is a rail junction and distribution center for a wine-making region, where grain, poultry, and fruit are raised. The town's light manufactures include soap, furniture, and footwear. Alba Iulia is the site of the ancient Apulum, founded by the Romans in the 2d cent. A.D., and destroyed by Tatars in 1241. It was the seat (16th–17th cent.) of the princes of Transylvania, of a Roman Catholic bishop, and of an Eastern Orthodox metropolitan. From 1599 to 1601, Alba Iulia was the capital of the united principalities of Walachia, Transylvania, and Moldavia. It was the site (1918) of the proclamation of Transylvania's union with Rumania and of the coronation (1922) of King Ferdinand. Points of interest include an 18th-century fortress, built by Emperor Charles VI, a 13th-century Roman Catholic cathedral, and a museum and library housing exhibits from the Roman period and rare manuscripts.

Alba Longa (äl'bä löng'ga), city of ancient Latium, in the Alban Hills near Lake Albano, c. 12 mi (19 km) SE of Rome. It was a city before 1100 B.C. and apparently the most powerful in Latium. Legend says that it was founded by Ascanius, son of Aeneas, and that Romulus and Remus were born there, thus making it the mother city of Rome. Tradition also says that Tullus Hostilius, king of Rome, razed it in 665 B.C. Possibly Rome was founded from Alba Longa, and certainly the Romans destroyed it (c. 600 B.C.). The modern Castel Gandolfo occupies the site.

Alban, Saint (öl'bän), 3d or 4th cent., traditionally the first British martyr. He lived and died at Verulamium, now St. Albans. In 793 an abbey was founded there in his honor. Feast: Roman Catholic Church, June 22; Church of England, June 17.

Albanel, Charles (sharl älbänē'), 1616–96, French missionary explorer in Canada, a Jesuit priest. After arriving in Canada (1649), he was stationed many years at Tadoussac where he explored the surrounding wilderness. At the time when the English Hudson's Bay Company was beginning operations, he was a leader of a French party that went (1671–72) by the Saguenay River, Mistassini Lake, and the Rupert River to Hudson Bay. The region was claimed for France. On another journey there he was captured (1674) by the English and taken to England. After returning (1676) to Canada, he served at missions in western Canada and died at Sault Ste. Marie.

Albanese, Licia (lē'chēä albanä'sä), 1913–, Italian-American lyric soprano, b. Bari. Albanese made her debut (1935) in *Madame Butterfly* in Parma. She first sang at the Metropolitan Opera House in 1940. After 1945 she appeared with the NBC Symphony Orchestra and continued to sing at the Metropolitan Opera.

Albania (älbä'nyä), Albanian *Shqipëri* or *Shqipëria*, independent republic (1970 est. pop. 2,100,000), 11,701 sq mi (28,752 sq km), SE Europe, on the Adriatic Sea coast of the Balkan Peninsula, between Yugoslavia to the north and east and Greece to the south. TIRANE is the capital, other important cities

are VLORE, DURRES, SHKODER, and KORÇE. Albania is rugged and mountainous, except for the fertile Adriatic coast. Mt. Korab (9,066 ft/2,763 m), on the



Yugoslav-Albanian border, is the highest point in the country. The coastal climate is typically Mediterranean, with hot, dry summers and mild, wet winters. The mountainous interior, especially in the north, has severe winters and mild summers. The chief rivers of Albania are the Drin, Mat, Shkumbi, Vjose, and Seman, but they are mostly unnavigable. The largest lakes are the Scutari and Ohrid, both shared with Yugoslavia, and the Prespa, on the border with Greece. More than one third of Albania's land is covered by forests and swamps, about one third is pasture, and only about one tenth is cultivated, nearly one half of the cultivated land being given over to vineyards and olive groves. Grains (especially wheat and maize), cotton, tobacco, potatoes, and sugar beets are also grown. Livestock raising (particularly the raising of sheep) is important. Agriculture is socialized in the form of collective and state farms, but small private plots are permitted. Albania is rich in mineral resources, notably oil, lignite, copper, chromium, limestone, salt, and bauxite. Although about two thirds of the population is still engaged in agriculture, mining provides the largest percentage of the national income and employs the highest proportion of the industrial labor force. Industry provides an increasing share of the national income, agricultural processing and the manufacture of textiles and cement and other building materials being among the leading industries, other important products include naphtha, copper, and machinery. Engineering, chemical, and iron and steel plants are being developed, and several hydroelectric stations have been built. All industrial enterprises and mines are nationalized, and the economy is run on the basis of Five-Year Plans. Foreign trade is carried by sea, Durrës and Vlorë (also the terminus of the oil pipeline) being the major ports. Exports include crude oil, coal, chromium, copper, textiles, iron, and agricultural produce. Among the imports are machinery, industrial equipment, and metal, chemical, and rubber products. Almost half of the total foreign trade is with China, Albania's chief trade partner in Eastern Europe is Czechoslovakia and in Western Europe, Italy. The Albanian unit of currency is the lek, which equals 100 qintars. The country's rugged and inaccessible terrain has traditionally isolated Albania from its neighbors, thus helping to preserve its ethnic homogeneity. About 97% of the population is ethnic Albanian, with scattered Greek, Vlach, Bulgar, Serb, and Gypsy minorities. About one million Albanians live in the Kosovo region of Yugoslavia, with which there has long been a border dispute. Albanian is one of the Indo-European languages. The Shkumbi River, which virtually bisects the country, separates speakers of the northern dialect (Gheg) from those of the southern dialect (Tosk). The great majority of the people are Muslim, with Roman Catholic and Greek Orthodox minorities, however, Albania is officially an atheist country.

Historic Albania The Albanians are reputedly descendants of Illyrian and Thracian tribes that settled the region in ancient times. The area then comprised parts of ILLYRIA and EPIRUS and was known to the ancient Greeks for its mines. The coastal towns,

Epidamnus (Durrës) and APOLLONIA, were colonies of Corcyra (Kérkira) and Corinth, but the interior formed an independent kingdom that reached its height in the 3d cent A D After the division (395) of the Roman Empire, Albania passed to Byzantium. While nominally (until 1347) under Byzantine rule, N Albania was invaded (7th cent) by the Serbs, and S Albania was annexed (9th cent) by Bulgaria. In 1014, Emperor Basil II retook S Albania, which remained in the Byzantine Empire until it passed to Epirus in 1204. Venice founded coastal colonies at present-day Shkoder and Lezhe in the 11th cent, and in 1081 the Normans began to contest Byzantine control of Albania. Norman efforts were continued by the Neapolitan Angevins, in 1272, Charles I of Naples was proclaimed king of Albania. In the 14th cent, however, the Serbs under Stephen DUSHAN conquered most of the country. After his death (1355), Albania was ruled by native chieftains until the Turks began their conquests in the 15th cent. In return for serving the Turks, a son of one of these chieftains received the title Skander Bey (Lord Alexander), which in Albanian became Skanderbeg. Later, however, he led the Albanian resistance to Turkish domination and, after his death in 1468, was immortalized as Albania's national hero. Supported by Venice and Naples, Albania continued to struggle against the Turks until 1478, when the country passed under Ottoman rule. Many Albanians distinguished themselves in the Turkish army and bureaucracy, others were made pashas and beys and had considerable local autonomy. In the early 19th cent, ALI PASHA ruled Albania like a sovereign and founded an Egyptian dynasty that lasted until the 1950s. Under Turkish rule Islam became the predominant religion of Albania, but the Albanian highlanders, never fully subjected, were able to retain their tribal organizations. Economically, the country stagnated under Ottoman rule, numerous local revolts flared. A cultural awakening began in the 19th cent, and Albanian nationalism grew in the aftermath of the Treaty of San Stefano (1877), which Russia imposed on the Turks and which gave large parts of Albania to the Balkan Slavic nations. The European Great Powers intensified their struggle for influence in the Balkans during the years that followed.

National Independence. The first of the BALKAN WARS, in 1912, gave the Albanians an opportunity to proclaim their independence. During the Second Balkan War (1913), Albania was occupied by the Serbs. A conference of Great Power ambassadors defined the country's borders in 1913 and destroyed the dream of a Greater Albania by ceding large tracts to Montenegro, Serbia, and Greece. The ambassadors placed Albania under their guarantee and named WILLIAM, PRINCE OF WIED, as its ruler. Within a year he had fled, as World War I erupted and Albania became a battleground for contending Serb, Montenegrin, Greek, Italian, Bulgarian, and Austrian forces. Secret treaties drafted during the war called for Albania's dismemberment, but Albanian resistance and the principle of self-determination as promoted by US President Woodrow Wilson helped to restore an independent Albania. In 1920 the Congress of Lushnje reasserted Albanian independence. The early postwar years witnessed a struggle between conservative landlords led by Ahmed ZOGU and Western-influenced liberals under Bishop Fan S. Noli. After Noli's forces seized power in 1924, Zogu fled to Yugoslavia, where he secured foreign support for an army to invade Albania. In 1925, Albania was proclaimed a republic under his presidency, in 1928 he became King ZOG. Italy, whose political and economic influence in Albania had steadily increased, invaded the country in 1939, forcing Zog into exile and bringing Albania under Italian hegemony. The Albanian puppet government declared war on the Allies in 1940, but resistance groups, notably the extreme leftist partisans under Enver HOXHA, waged guerrilla warfare against the occupying Axis armies. In 1943-44, a civil war also raged between the partisans and non-Communist forces within Albania. The only European Communist country that was liberated from the Axis invaders without the aid of the Red Army or of direct Soviet military assistance, Albania received most of its war materiel from the Anglo-American command in Italy. In late 1944, Hoxha's partisans seized most of Albania and formed a provisional government. The Communists held elections (Dec., 1945) with an unopposed slate of candidates and, in 1946, proclaimed Albania a republic with Hoxha as premier. From 1944 to 1948, Albania maintained close relations with Yugoslavia, which had helped to estab-

lish the Albanian Communist party. After Marshal TITO of Yugoslavia broke with STALIN, Albania became a virtual satellite of the USSR. Albania's disapproval of de-Stalinization and of Soviet-Yugoslav rapprochement led in 1961 to a break between Moscow and Tirane. Chinese influence and economic aid replaced Soviet, and Albania became China's only ally in Communist Eastern Europe. Albania ceased active participation in the COUNCIL FOR MUTUAL ECONOMIC ASSISTANCE and, after the Soviet invasion of Czechoslovakia in 1968, withdrew from the Warsaw Pact military alliance (in which it had long been inactive). In the early 1970s continuing Soviet hostility and Albanian isolation led the Hoxha regime to make overtures to neighboring Yugoslavia, Greece, and Italy, as well as to other Western nations. The Albanian constitution (adopted 1946) names the People's Assembly as "the highest organ of state power," but in practice the Communist party (officially the Albania Workers' party) wields complete control. Hoxha is the party's first secretary. Deputies to the unicameral people's assembly (which rubber-stamps party legislative proposals) are elected by universal suffrage for four-year terms. The assembly elects a presidium, whose chairman becomes titular head of state. The country's highest executive body, the council of ministers, is appointed by the assembly. The chairman of the council of ministers serves as premier. Albania is divided into 26 districts, the chief units of local government are the district-level people's councils. See FERDINAND SCHEVILL, *History of the Balkan Peninsula* (1922), E P. Stickney, *Southern Albania or Northern Epirus in European International Affairs, 1912-1923* (1926), Harry Hamm, *Albania—China's Beachhead in Europe* (tr 1963), Stavro Skendi, ed., *Albania* (1956) and *The Albanian National Awakening, 1878-1912* (1967), E K. Keefe et al., *Area Handbook for Albania* (1971).

Albano, Lake (alba'nō), crater lake, 2 sq mi (5.2 sq km), central Italy, in the Alban Hills SE of Rome. It is c 6 mi (9.7 km) in circumference and c 560 ft (170 m) deep. An underground tunnel built in the 4th cent B C is still its only outlet. ALBA LONGA was located near the lake. Castel Gandolfo, the Pope's summer residence, is located there. South of the lake is Albano Laziale, a small town on the Appian Way, noted for the beautiful villas and several tombs built there by the ancient Romans.

Albany, Alexander Stuart or Stewart, duke of: see STUART OR STEWART, ALEXANDER, DUKE OF ALBANY.

Albany, Louisa, countess of (ôl'bānē), 1752-1824, wife of Charles Edward STUART (the Young Pretender), self-styled count of Albany, daughter of a German noble, the prince of Stolberg-Gedern. Married in 1772, she was made unhappy by her dissolute husband, left him after eight years, and became the mistress of the poet Vittorio Alfieri. After his death in 1803, she was mistress of a French painter, François Fabre. Secret marriages with both men were rumored, but not well attested. See biography by Margaret Crosland (1962).

Albany, Robert Stuart or Stewart, 1st duke of: see STUART OR STEWART, ROBERT, 1ST DUKE OF ALBANY.

Albany, ancient and literary name of Scotland, N of the Firth of Forth and Firth of Clyde. Variants are Alban and Albin.

Albany, town (1971 pop. 12,434), Western Australia, SW Australia. It is a port on Princess Royal Harbour of King George Sound. The town has woolen mills and fish canneries. Founded in 1826 as a penal colony, Albany is the oldest settlement in the state of Western Australia.

Albany. 1 Residential city (1970 pop. 14,674), Alameda co., W Calif., on the eastern shore of San Francisco Bay, inc. 1908. A US Dept. of Agriculture research laboratory and a Univ. of California agricultural experiment station are there. 2 City (1970 pop. 72,623), seat of Dougherty co., SW Ga., on the Flint River, inc. 1841. It is the industrial center of a great pecan and peanut area. Among its many industries are peanut and pecan processing, meat-packing, and cotton milling. Manufactures include airplanes and airplane parts, farm tools, fertilizers, pharmaceuticals, and paper, wood, cotton, and concrete products. In the city are Albany State College, a junior college, the Albany Naval Air Station, and a US marine corps supply center. The Georgia Pecan Festival is held there annually. Nearby are Chehaw State Park and the popular resort, Radium Springs. 3 City (1970 pop. 114,873), state capital and seat of Albany co., E N.Y., on the west bank of the Hudson, inc. 1686. A deepwater port of entry, it handles

much shipping and is a major transshipment point. The trading center for a large agricultural and resort area, it has oil tanks, breweries, machine shops, foundries, meat-packing houses, and plants making paper items, felt, textiles, chemicals, brushes, and sports equipment. In 1609, Henry Hudson visited the site, and four years later the Dutch built a fur-trading post, called Fort Nassau, on Castle Island. In 1624 several Walloon families began permanent settlement at the Dutch post of Fort Orange, which was renamed Albany when the English took control (1664). Albany was long important as a fur-trading center and was involved in the French and Indian Wars. In 1754 the ALBANY CONGRESS met there, and after the Revolution the state capital was moved (1797) to Albany from New York City. Albany's trade grew with the development of the state, particularly after the opening of the Champlain and Erie canals in the 1820s. Today it is the seat of the State Univ. of New York at Albany, the schools of pharmacy, law, and medicine of Union Univ., the College of St. Rose, two junior colleges, and the Albany Institute of History and Art. Siena College is in suburban Loudonville. Among the many old buildings are the Schuyler mansion (1762), where Gen. Philip Schuyler's daughter, Elizabeth, was married to Alexander Hamilton, Ten Broeck Mansion (1798), and Cherry Hill (1768), the home of Philip Van Rensselaer and his descendants until 1963. Dominating the city, at the top of State Street hill, is the capitol, built (1867-98) in the French chateau style. The colonnaded State Education Building contains the state museum and state library. An annual tulip festival is held in the city. In the 1960s a major urban renewal project resulted in the razing of 90 acres (36.4 hectares) in the downtown section for a great complex of state administrative buildings, residences, and parks. Bret Harte was born in Albany. 4 City (1970 pop. 18,181), seat of Linn co., NW Oregon, on the Willamette River, inc. 1864. A metallurgical center in the Pacific Northwest, it is the seat of a US Bureau of Mines experimental station. Many refractory metals are produced there. The city also has important lumbering and paper and wood-product industries. Other manufactures are packaged meats, frozen foods, mobile homes, and seeds. An annual world championship timber carnival is held there. Albany has a junior college.

Albany, river, 610 mi (982 km) long, rising in Lake St. Joseph, W. Ont., Canada, and flowing generally E into James Bay, near Fort Albany. The Kenogami and Ogoki rivers are its chief tributaries. The river, named for the duke of York and Albany, later James II, was long an important fur-trading route. Fur-bearing animals are still caught along the river. Gold is found near Lake St. Joseph.

Albany, Fort: see FORT ALBANY, Canada.

Albany Congress, 1754, meeting at Albany, N.Y., of commissioners representing seven British colonies in North America to treat with the Iroquois, chiefly because war with France impended. A treaty was concluded, but the Indians of Pennsylvania were resentful of a land purchase made by that colony at Albany and allied themselves with the French in the ensuing French and Indian War. The meeting was notable as an example of cooperation among the colonies, but Benjamin Franklin's Plan of Union for the colonies, though voted upon favorably at Albany, was refused by the colonial legislatures (and by the crown) as demanding too great a surrender of their powers. See Robert Newbold, *Albany Congress and the Plan of Union of 1754* (1955).

Albany Regency, name given, after 1820, to the leaders of the political machine developed in New York state by Martin VAN BUREN. The name derived from the charge that Van Buren's principal supporters, residing in Albany, managed the machine for him while he served in the US Senate. During the Jacksonian period the Regency controlled the Democratic party in New York. It was one of the first effective political machines, using the SPOILS SYSTEM and rigid party discipline to maintain its control. Notable figures in the Regency were William L. MARCY, Silas WRIGHT, Azariah C. FLAGG, and the elder Benjamin F. BUTLER. After 1842 it split into factions (BARNBURNERS and HUNKERS) over issues of internal improvements and slavery, thereby losing its power. See J. D. Hammond, *The History of Political Parties in the State of New York* (3 vol., 1852), Robert Remini, *Martin Van Buren and the Making of the Democratic Party* (1959).

Al Basrah see BASRA. Iraq.

albatross (al'batrōs), common name for sea birds of the order of tube-nosed swimmers (Procellari-

(formes), which includes petrels, shearwaters, and fulmars. The wandering albatross, *Diomedea exulans*, made famous by Coleridge's *Rime of the Ancient Mariner*, has a wingspread of from 10 to 12 ft (305–366 cm), although the wings are only about 9 in (22.5 cm) wide. Because of their tapering wing design they excel at gliding and flying. Albatrosses eat mainly fish, floating carrion, and refuse. Most albatrosses are found in the South Pacific region, e.g., the wandering and the sooty species, a few, the black-footed (*D. nigripes*), the short-tailed, and the Laysan (*D. immutabilis*) albatrosses, regularly frequent the N Pacific. Albatrosses have unique courtship behavior. They groan, scrape their bills, and dance about awkwardly, before pairing and mating occurs. They are colonial breeders, the female laying her single white egg in crude nests on the ground. Both sexes incubate the egg; incubation takes from two to three months. Albatrosses have few natural enemies, with the exception of man. They were slaughtered for their feathers and wings in the 19th cent., and used in millinery and as "swansdown" pillow stuffings. Albatrosses are somewhat hazardous to aircraft, with many collisions reported between bird and plane, resulting in the bird's death and minor damage to the plane. Albatrosses are classified in the phylum CHORDATA, subphylum Vertebrata, class Aves, order Procellariiformes, family Diomedidae.

Al-Battani (al-bat-tā'nē) or **Albatenius** (āl'batē'nēas), b. before 858, d. 929, Arab astronomer and mathematician. He is best known in astronomy for his improvements and corrections of the Ptolemaic tradition. His *Kitab al-Zij*, which in Latin translation was very influential in the Middle Ages and the Renaissance, contains an elaborate set of astronomical tables and discusses a wide range of practical problems in spherical astronomy, some of which were devised for the purpose of solving related astrological problems. He recognized the possibility of an annular eclipse of the sun and obtained the very accurate value of 23°35' for the obliquity of the ecliptic.

Albay (albi'), province (1970 pop. 672,285), SE Luzon, on the Bicol peninsula, in the Philippines. Legaspi is the capital, chief port, and largest city. Albay's terrain is rugged, but its fertile volcanic soil and heavy rainfall favor farming, and the province is a major hemp-producing area. It has many small, sheltered harbors for interisland shipping. Major tourist attractions are the beautiful active volcano, Mt. Mayon (c. 8000 ft/2,440 m), the church of Cagsawa, half-buried since an eruption of Mayon early in the 19th cent., and Tiwi Hot Springs. In 1968, Mt. Mayon erupted and engulfed three villages as some 20,000 people fled their homes.

Al Bayda (al bā'da) or **Beida** (bā'dā), city (1964 pop. 12,799), NE Libya, situated at 2,000 ft (610 m) in the Jabal al Akhdar plateau. Construction of the city began in 1961 on the site of the tomb of Rawefi ibn Thabit, a revered Muslim holy person who was a companion of the prophet Muhammad. It is the seat of an Islamic university and government offices.

albedo (ālbē'dō), reflectivity of the surface of a planet, moon, asteroid, or other celestial body that does not shine by its own light. Albedo is measured as the fraction of incident light that the surface reflects back in all directions. A perfect diffuse reflector by definition has an albedo of unity, i.e., all the incident light is reflected, a body that reflects no light at all would have an albedo of zero. Real surfaces have albedos between these values. The albedos of planets, moons, and asteroids provide valuable information about the structure and composition of their surfaces. The dark regions on the earth's moon give it the very low average albedo of 0.07, while highly reflective clouds give Venus an albedo of 0.85, the highest of any body in the solar system.

Albee, Edward (āl'bē), 1928–, American playwright, b. Washington, D.C. Considered the major American exponent of the theater of the absurd, Albee is most famous for his clever, satiric, and often vindictive commentaries on American life. *Who's Afraid of Virginia Woolf* (1962), generally regarded as his finest play, presents an all-night drinking bout in which a middle-aged college professor and his wife verbally lacerate each other in scathingly brilliant colloquial language. Albee's other plays include five one-act plays, *The Zoo Story* (1959), *The Death of Bessie Smith* (1960), *The Sandbox* (1960), *Box* (1968), and *Quotations from Chairman Mao Tse-Tung* (1968), a dramatization of Carson McCullers's no-

vella *The Ballad of the Sad Cafe* (1963), *Tiny Alice* (1965), *Malcolm* (1966), a dramatization of James Purdy's novel, *Everything in the Garden* (1967), from a play by Giles Cooper, *A Delicate Balance* (1967, Pulitzer Prize), *All Over* (1971), and *Seascape* (1975).

Albemarle, Arnold Joost van Keppel, 1st earl of (āl'bamarl), 1669–1718, Dutch adherent and constant companion of William III of England. He accompanied the king to England (1688) and was made an earl in 1696. After William's death (1702), he returned to Dutch service and fought in the War of the Spanish Succession.

Albemarle, George Monck or Monk, 1st duke of: see MONCK, GEORGE

Albemarle, city (1970 pop. 11,126), seat of Stanly co., central N.C., in the Piedmont region, inc. 1857. A marketing center in an agricultural and aluminum-mining area, Albemarle has poultry-processing and textile and clothing industries. Pfeiffer College is in nearby Misenheimer. There is also a state park in the vicinity.

Albemarle, island, Ecuador. see GALAPAGOS ISLANDS

Albemarle Sound, large inland body of generally fresh water, c. 55 mi (90 km) long, from 3 to 14 mi (4.8–22 km) wide, NE N.C. Shallow and tideless, the sound is separated from the Atlantic Ocean by a long, narrow barrier island. The Chowan and Roanoke rivers are the largest of many streams flowing into the sound. Albemarle Sound forms a vital link in the Intracoastal Waterway; canals connect it with Chesapeake Bay. Fort Raleigh National Historic Site on Roanoke Island and Wright Brothers National Memorial at Kitty Hawk are at the western end of the sound (see NATIONAL PARKS AND MONUMENTS, table).

Albéniz, Isaac (ēsak' albā'nēth), 1860–1909, Spanish pianist and composer. He made his debut as a pianist at the age of four. When still young, he ran away from home and traveled in North and South America and Spain, supporting himself by playing the piano. As a composer, he was influenced by Liszt and later by Debussy, and studied with D'Indy and Dukas, among others. Filipe Pedrell interested him in Spanish music. Although he wrote operas, songs, and many short piano pieces, he is best remembered for his later piano works (especially *Iberia*, 1906–9), which combine a stylized use of Spanish folk material with a brilliant pianistic idiom.

Alberdi, Juan Bautista (hwan boutēs'ta albār'dē), 1810–84, Argentine political philosopher, patriot, and diplomat. With other young intellectuals he opposed Juan Manuel de Rosas, and after 1838 he spent years of exile in Uruguay, Chile, and in Europe writing against Rosas. After the overthrow of Rosas by Justo José de Urquiza (1852), Alberdi served on a number of diplomatic missions. His most important work, *Bases y puntos de partida para la organización política de la república argentina*, a masterpiece of political science, was published in 1852. Many of the suggestions contained in it were incorporated into the Argentine constitution of 1853. After Urquiza was defeated (1861), Alberdi settled in Paris and wrote political tracts against Bartolome Mitre and Domingo Faustino Sarmiento as well as sociological works and essays.

Alberoni, Giulio (jōō'lyō albārō'nē), 1664–1752, Italian statesman in Spanish service, cardinal of the Roman Catholic Church. Appointed (1713) representative of the duke of Parma at the court of Philip V of Spain, Alberoni gained influence and ultimately became de facto prime minister. With the princesses des Ursins he arranged the marriage of the king with Elizabeth Farnese. His aims were to strengthen Spain, nullify the Peace of Utrecht (see UTRECHT, PEACE OF), and crush Austrian hegemony in Italy. The expeditions by which he recovered Sardinia from Austria (1717) and Sicily from Savoy (1718) provoked Britain, the Netherlands, France, and Austria to form the Quadruple Alliance. Spain was forced to yield, and Philip dismissed and banished (1719). Alberoni, who retired to Rome, he later became papal legate in the Romagna and in Bologna.

Albers, Josef, 1888–, German-American painter, printmaker, designer, and teacher, b. Bottrop, Germany. After working at the Bauhaus (1920–23), Albers and his wife, the weaver Anni Albers, emigrated to the United States. He has taught throughout the Americas and Europe, and, as director of the Yale School of Art (1950–58), was responsible for major innovations in art education. An extremely versatile artist, he is best known for his *Homage to the Square*, a series of paintings begun in 1949. These serene works, quasi-concentric squares of

subtly related colors, form an extensive examination of color properties. See his *Interaction of Color* (1963), studies by Eugen Gomringer (1968) and Werner Spies (1971).

Albert I, 1875–1934, king of the Belgians (1909–34), nephew and successor of Leopold II. He married (1900) Elizabeth, a Bavarian princess. In World War I his heroic resistance (1914) to the German invasion of Belgium greatly helped the Allied cause. Albert spent the entire war at the head of his army, and in 1918 he led the Allied offensive that recovered the Belgian coast. The king and queen did much to improve social conditions in Belgium and in the Belgian Congo. Albert's democratic and affable ways won him great regard at home and abroad. He died in a rock-climbing accident and was succeeded by his son, Leopold III. His daughter, Marie José, married the crown prince (later King Humbert II) of Italy. See biography by Emile Cammaerts (1935).

Albert I, c. 1250–1308, German king (1298–1308), son of Rudolf I. Albert was invested with Austria and Styria in 1282 by his father, who also hoped to secure the succession as king of the Germans for Albert. However, on Rudolf's death (1291) the Electors rejected Albert's candidacy in order to check the growing power of the Hapsburgs and to prevent the crown from becoming hereditary within the Hapsburg dynasty. They chose Adolf of Nassau as king. Albert later engineered Adolf's deposition and replaced him. As king, Albert attempted to strengthen Hapsburg claims for a hereditary dynasty by allying (1299) with Philip IV of France, by supporting the Rhine towns against the Rhenish imperial electors, and by unsuccessfully attempting (1300) to add Holland and Zeeland to the Hapsburg domains. These actions provoked a revolt (1300–1302) by the Rhenish electors, backed by Pope Boniface VIII, which Albert suppressed. He later reached an agreement with Boniface, who recognized his title in 1303. Albert attempted to expand his dominion to the east by preventing Wenceslaus II of Bohemia from acquiring Hungary, but his campaign was unsuccessful until Wenceslaus's death (1305). Albert's son Rudolf succeeded Wenceslaus III (1306). Albert was assassinated by a band of conspirators that included his nephew Henry of Luxemburg (Henry VII) who was elected to succeed him.

Albert II, 1397–1439, German king, king of Hungary and Bohemia (1438–39), duke of Austria (1404–38). He was the son-in-law of Holy Roman Emperor Sigismund, whom he aided against the Hussites of Bohemia. Albert was unable to suppress the Bohemian revolts (see HUSITE WARS) and subsequently died on a disastrous campaign against the Turks. With Albert began the lasting Hapsburg rule over the Holy Roman Empire.

Albert, 1819–61, prince consort of Victoria of Great Britain, whom he married in 1840. He was of WETTIN lineage, the son of Ernest I, duke of Saxe-Coburg-Gotha, and first cousin to Victoria. As an alien prince he was initially unpopular in England, but, in time, the English came to admire him for his irreproachable character, his devotion to the queen and their children, and his responsible and studious concern with public affairs. His influence was particularly strong in diplomacy, and his insistence on a moderate approach to the Trent Affair (1861) may have averted war with the United States. See biographies by Hector Bolitho (1932), Roger Fulford (1949), Frank Eyck (1959), and Reginald Pound (1974).

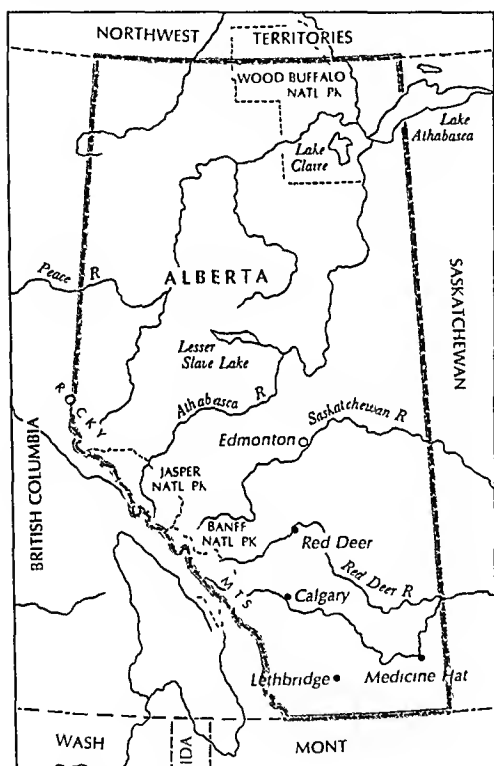
Albert, 1490–1545, German churchman, cardinal of the Roman Catholic Church. A member of the house of Brandenburg, he became (1514) archbishop-elect of Mainz. It was on his authorization that Johann Tetzel began in 1517 to preach an indulgence in Albert's diocese—occasioning Martin Luther's first attack on the church. A patron of Ulrich von Hutten, Albert was expected to join the Reformers, but after 1525 he actively opposed them. Later he invited the Jesuits to preach in his diocese. He was a friend of Erasmus.

Albert, Carl Bert, 1908–, U.S. Congressman (1947–), b. McAlester, Okla. Admitted to the bar in 1935, Albert enlisted (1941) in the army as a private, served (1942–46) in the Pacific during World War II, and rose to the rank of lieutenant colonel. Elected (1946) as a Democrat to the House of Representatives from a rural Oklahoma district, he rose to the position of majority whip (1955–62), majority leader (1962–71), and speaker of the House (1971). A loyal member of the farm bloc, Albert was also a reliable supporter of the liberal social and economic policies of the

Democratic party As presiding officer of the 1968 Democratic National Convention, he kept in check the antiwar supporters of Senators Eugene McCarthy and George McGovern

Albert, Lake, E Africa see ALBERT NYANZA

Alberta (älbûr'tä), province (1971 pop 1,627,874), 255,285 sq mi (661,188 sq km), including 6,485 sq mi (16,796 sq km) of water surface, W Canada EDMONTON is the capital and the largest city The second largest city is CALGARY, other important cities are Lethbridge, Red Deer, and Medicine Hat Alberta is bounded on the E by Saskatchewan, on the N by Mackenzie dist, Northwest Territories, on the W by British Columbia, and on the S by Montana Westernmost of the Prairie Provinces, it lies on a high plateau, rising on the W to the Continental Divide at the British Columbia border There are the foothills of the Rocky Mts and the spectacular mountains themselves, with three noted national parks—Jasper, Banff, and Waterton Lakes (the Canadian section of Waterton-Glacier International Peace Park) Although Alberta is known as a Prairie Province, only about one quarter of its area is actually treeless—chiefly the undulating prairie of S Alberta Central Alberta has parklike, partly wooded country, and the northern stretches bear thousands of acres of virgin timberland Endowed with many lakes,



streams, and rivers, the province is drained by the Peace, the Athabasca, the north and south branches of the Saskatchewan, the Red Deer, the St. Mary, the Milk, and many other rivers The population is concentrated in S and central Alberta, and except for farm centers in the fertile valley of the Peace, the northern portion is sparsely settled, it is still fur-trapping country Until recently agriculture was Alberta's basic industry Grain, especially wheat, is the dominant crop, but farming is becoming increasingly diversified In the south, large irrigation developments, such as the St. Mary-Milk development and those around Calgary, have placed thousands of additional acres under cultivation In this area is grown a variety of crops, such as vegetables and sugar beets The province is noted as well for the quality of its livestock Meat packing, flour milling, dairying, and food processing are important industries But Alberta's major industry, since the early 1960s, has been the exploitation of its vast petroleum and other mineral resources Alberta's coal beds contain about one half of Canada's reserves, while the province leads the country in the production of oil, it is believed to have the richest oil deposits in the world, most notably in the famous tar beds of the Athabasca River Its sources of natural gas are also among the world's greatest Pipelines radiate from Alberta, carrying crude oil and natural gas to points in E and W Canada and into the United States The refining of oil and the production

of petrochemicals within Alberta itself are growing industries Other industries include lumbering, textile milling, and the manufacture of iron, steel, and clay products Alberta's landscape—its rolling wheat fields, huge granaries, sprawling cattle ranches, and vast oil refineries—reminds many visitors of the U.S. Southwest Annual festivals include the Indian Days Celebration at Banff, which attracts thousands of Indians from a wide area, and the famous Calgary Exhibition and Stampede Other tourist attractions are Elk Island National Park and the extensive Wood Buffalo National Park, which shelters some 15,000 bison Alberta was originally part of the territory granted to the HUDSON'S BAY COMPANY by King Charles II in 1670, and its early history was dominated by the fur trade Traders arrived from the upper Great Lakes before Sir Alexander Mackenzie crossed (1793) the region on his way to the Pacific In 1794 a Hudson's Bay Company fort was built at the site of present-day Edmonton Destroyed by Indians in 1807, it was rebuilt 12 years later, and for 50 years it served traders and missionaries within a wide radius The area remained under the control of the Hudson's Bay Company until 1870 when it was sold, as part of the company's vast domain, to the newly created confederation of Canada In 1872 mounted police established Fort Macleod in S Alberta, and the following year they built a log fort on the site of present-day Calgary An act of 1882 created four administrative divisions from the Northwest Territories, and one was named Alberta in honor of Queen Victoria's daughter, Princess Louise Alberta, whose husband was then governor general of Canada The railroad came through in the mid-1880s, opening up the area to ranchers and homesteaders To settle the vast fertile land, the Canadian government advertised for immigrants, offering many free acres as inducements Europeans and Americans began streaming in, and farming began in earnest The city of Edmonton boomed during the 1898 Klondike gold rush, serving as a supply base, and its growth continued during the early 1900s as immigrants began settling the rich surrounding farmlands Alberta became a province in 1905 The discovery (1914) of oil in quantity at Turner Valley, near Calgary, presaged a new era for the mineral-rich province, but it was not until 1947, when oil was found in the Leduc fields near Edmonton, that the basic change in Alberta's economy began By then agriculture had suffered extensively the 1929 crash, followed by droughts, early frosts, grasshopper plagues, and dust storms, had triggered emigration from the area Politically, Albertans turned to the SOCIAL CREDIT party in 1935, when William Aberhart became premier of the first Social Credit government Social Credit administrations were elected for many years after Aberhart's death in 1943, but most attempts to reform banking and money control were declared unconstitutional by the courts In 1971 the Progressive Conservatives gained control of the provincial government, and Peter Lougheed became premier In 1974, Ralph Steinhauer, a Cree Indian, was appointed lieutenant governor of Alberta by Canadian Prime Minister Trudeau, Steinhauer was the first Indian to hold such a high executive post Alberta sends 6 senators (appointed) and 19 representatives (elected) to the national parliament The Univ. of Alberta is at Edmonton See W. A. McIntosh, *Prairie Settlement The Geographical Setting* (1934), P. F. Sharp, *The Agrarian Revolt in Western Canada* (1948), E. J. Hanson, *Dynamic Decade* (1958), C. B. Macpherson, *Democracy in Alberta* (2d ed. 1962), W. F. Schultz, *The People and Resources of Northeastern Alberta* (rev. ed. 1967), Robert Kroetsch, *Alberta* (1968)

Alberta, University of, at Edmonton, Alberta, Canada, provincially supported, coeducational, chartered 1906, opened 1908 It has faculties of arts, engineering, medicine, agriculture, law, dentistry, education, pharmacy and pharmaceutical science, science, graduate studies and research, business administration and commerce, and physical education, as well as schools of dental hygiene, library science, nursing, household economics, and rehabilitation medicine The Boreal Institute for Northern Studies promotes and supports research in the circumpolar regions

Albert Achilles, 1414–86, elector of Brandenburg (1470–86), third son of Elector FREDERICK I He succeeded his brother in 1470 Anxious to consolidate Hohenzollern power in Brandenburg, he issued (1473) the *Dispositio* of Achillea, which decreed that the title of elector should pass to the eldest son This established the law of primogeniture in Bran-

denburg The *Dispositio* remained in force until 1918

Albert Canal, waterway, c 80 mi (130 km) long N Belgium, from the Meuse River to the Scheldt River, constructed 1930–39 The canal connects the important industrial region around Liege with the port of Antwerp, Belgium

Alberti, Domenico (dōmā'nēkō albērtē), c 1710–c 1740, Venetian singer, harpsichordist, and composer The Alberti bass (which he used but probably did not invent) is a broken, left-hand chord accompaniment frequently employed in 18th-century keyboard music

Alberti, Leone Battista (lāō'nā bat-tēs'tā), 1404–72, Italian architect, musician, painter, and humanist, active at the papal court, Florence, Rimini, and Mantua His treatise *De re aedificatoria* was written c 1450 Though largely dependent upon Vitruvius, it was the first modern work on architecture and influenced the development of Renaissance architectural style Buildings erected from his designs from c 1450 until his death are among the most dignified and classical of the 15th cent They include the exteriors of the churches of San Francesco in Rimini, and San Andrea and San Sebastiano in Mantua, part of the facade of Santa Maria Novella, Florence, and the Palazzo Rucellai, Florence, where superimposed orders of architecture adorned the facade for the first time since antiquity His treatise on painting (1436), the first book in this field to treat theory as well as technique, exercised a great influence on the Renaissance painters and sculptors, in it Alberti discusses the imitation of nature, beauty, perspective, and ancient art His treatise on sculpture, written c 1464, another first work in its field, dealt, in addition, with human proportions Other writings include mathematical studies, a treatise on St. Potitus, one on the family, and works on ethics, jurisprudence, and other subjects See his *On Painting*, tr. by J. R. Spencer (rev. ed. 1966) and study by E. Arntzen (1959)

Alberti, Rafael (rafa'ēl'), 1902–, Spanish poet After abandoning an earlier career as a painter, Alberti published his first book, *Marinero en tierra* (1925), which was widely applauded His poems show the influence of Juan Ramon Jimenez and of the Spanish classics, especially of Gongora His poetic brilliance is revealed in *Concerning the Angels* (1929, tr. 1967), a collection of introspective lyrics with surrealist overtones A Loyalist in the Spanish civil war, Alberti sought exile in Buenos Aires after Franco's triumph His later poetry is enhanced by an intimate, spiritual lyricism He edited *A Year of Picasso Paintings* (1969) See his selected poems, ed. and tr. by Mark Strand (1973), studies by C. B. Morris (1966) and Joan Gadol (1969)

Albertinelli, Mariotto (maryōt'tō albārtēnēl'lē), 1474–1515, Italian painter A product of the Florentine school of the High Renaissance, Albertinelli was influenced by Leonardo and Raphael His best-known works are *The Visitation* (1503, Uffizi) and *The Annunciation* (1510, Accademia, Florence) Albertinelli's works were typical products of his time, revealing an infatuation with classical elegance

Albert Lea (lē), city (1970 pop 19,418), seat of Freeborn co., S Minn., near the Iowa line, inc. 1878 It is an important manufacturing and marketing center in a dairy, livestock, and poultry region Lea College is located there on Lake Chapeau A state park is nearby

Albert Nile, river, Uganda see NILE

Albert Nyanza (niān'zā, nyan'zā) or **Lake Albert**, 2,064 sq mi (5,346 sq km), on the Zaïre-Uganda border, E central Africa The lake is c 100 mi (160 km) long and c 19 mi (30 km) wide, with a maximum depth of 168 ft (51 m) Lying in the GREAT RIFT VALLEY, 2,030 ft (619 m) above sea level, Albert Nyanza receives the Semliki River and the Victoria Nile and is drained by the Albert Nile, which becomes the Bahr-el-Jebel when it enters the Republic of the Sudan Albert Nyanza, discovered in 1864 by Sir Samuel Baker, was named for Queen Victoria's consort

Albert of Brandenburg, 1490–1568, grand master of the TEUTONIC KNIGHTS (1511–25), first duke of Prussia (1525–68), grandson of Elector Albert Achilles of Brandenburg In 1525 he became a Protestant, and on the advice of Martin LUTHER he secularized the dominions of the Teutonic Knights and became duke of the hereditary duchy of PRUSSIA The knights' lands had been held as a fief from the king of Poland, and the new duchy remained under Polish suzerainty On the extinction of Albert's line (1618), Prussia passed to the senior line of Brandenburg, and in 1701 it was made a kingdom

Alberston, town (1970 pop 30,322), Transvaal, NE Republic of South Africa, on the WITWATERSRAND, founded 1904. It is an industrial center manufacturing cast iron, machine tools, paints, and abrasives.

Albert the Bear, c 1100–1170, first margrave of Brandenburg (1150–70). He was a loyal vassal of Holy Roman Emperor Lothair II, who, as duke of Saxony, helped him take (1123) Lower Lusatia and the eastern march of Saxony. Albert lost these lands in 1131. He was rewarded (1134) for his share in Lothair's first Italian campaign with the North March. Calling himself margrave of Brandenburg as early as 1136 or 1142, he used the North March as a base for campaigns against the Wends, a pagan Slavic people. Invested (1138) with Saxony by Conrad III, Lothair's successor, he was expelled from the dukedom by HENRY THE PROUD, whom Conrad had deprived of the duchy. Albert later made peace (1142) with HENRY THE LION, son of Henry the Proud. He took part in the Wendish Crusade of 1147, but preferred more conciliatory methods of dealing with his pagan neighbors. As a result he inherited (1150) Brandenburg from its last Wendish prince. Albert's achievements in Christianizing and Germanizing NE Germany were important.

Albertus Magnus, Saint (älbûr'tas mäg'nas), or **Saint Albert the Great**, b 1193 or 1206, d 1280, scholastic philosopher, Doctor of the Church, called the Universal Doctor. A nobleman of Bollstädt in Swabia, he joined (1223) the Dominicans and taught at Hildesheim, Freiburg, Regensburg, Strasbourg, and Cologne before the Univ. of Paris made him doctor of theology in 1245. Later he taught again at Cologne, and he was also briefly (1260–62) bishop of Regensburg. He was a thorough student of Aristotle, and he not only followed Robert Grosseteste in his approach to Aristotelian thought but also did much to introduce Aristotle's scientific treatises and scientific method to Europe. Like Roger Bacon, he had a scientific interest in nature. He made notable botanical observations (recorded in such works as *De vegetabilibus*), was the first to produce arsenic in a free form, and studied the combinations of metals. In philosophy he set out in his *Summa theologiae* to controvert AVERROES and others and to reconcile the apparent contradictions of Aristotelianism and Christian thought. He wrote many treatises, and many more have been ascribed to him, the problem of determining which are genuinely of his authorship is difficult. He was a strong influence on his favorite pupil, St Thomas Aquinas. Albertus was canonized in 1931. Feast Nov 15. See biography by T. M. Schwertner (1933), D. H. Madden, *A Chapter of Medieval History* (1969).

Albertville, Zaire see KALEMI

Albi (älbé'), town (1968 pop 46,613), capital of Tarn dept., S France, in Languedoc, on the Tarn River. A commercial center in an area yielding coal, salt, and sand, it has glassworks, foundries, and food and textile industries. An old Roman city (Albiga), it became an episcopal see in the 5th cent. It was the center of the heresy to which it gave its name (see ALBIGENSES). The old part of the city, known as the *ville rouge* because of its red-brick buildings, is a marvel of medieval architecture. The huge Gothic Cathedral of Sainte-Cécile, begun in 1282, resembles a fortress rather than a church. Other structures include the episcopal palace (13th–15th cent.) and an 11th-century bridge. The birthplace of Toulouse-Lautrec, Albi has an art museum containing much of his work.

Albigenses (älbijën'sēz) [Lat., =people of Albi, one of their centers], religious sect of S France in the Middle Ages. They were officially heretics, but actually they were CATHARI, i.e., not Christians at all, but Provençal adherents of the great Manichaean dualistic system that was endemically popular in the Mediterranean basin for centuries (see MANICHAISM, BOGOMILS). They held the coexistence of two principles, good and evil, represented by God and the Evil One, light and dark, the soul and the body, the next life and this life, peace and war, and the like. They believed that Jesus only seemed to have a human body (a typically Gnostic idea, see DOCTRINISM). They were extremely ascetic, bound to absolute chastity, and abstaining from flesh in all its forms, including milk and cheese. They comprised two classes, believers and Perfect, the former much more numerous, making up a catechumenate not bound by the stricter rules observed by the Perfect. The Perfect were those who had received the sacrament of *consolamentum*, a kind of laying on of hands. The Albigenses held their clergy in high re-

gard. One of the most curious practices of the sect was the custom of suicide, preferably by starvation, for, if this life is essentially evil, its end is to be hastened. They had proselyting enthusiasm and preached vigorously. This fact partly accounted for their success, for at that time preaching was unknown in ordinary parish life. In the practice of asceticism as well the contrast between local clergy and the Albigenses was helpful to the new sect. Albigensianism appeared in the 11th cent and soon had powerful protectors. Local bishops were ineffectual in dealing with the problem, and the pope sent St Bernard of Clairvaux and other Cistercians to preach in Languedoc, the center of the movement. In 1167 the Albigenses held a council of their own at Toulouse. Pope Innocent III attacked the problem anew, and his action in sending (1205) St Dominic to lead a band of poor preaching friars into the Albigensian cities was decisive. These missionaries were hampered by the war that soon broke out. In 1208 the papal legate, a Cistercian, Peter de Castelnau, was murdered, probably by an aid of RAYMOND VI of Toulouse, one of the chief Albigensian nobles. The pope proclaimed (1208) the Albigensian Crusade. From the first, political interests in the war overshadowed others, behind Simon de MONTFORT, the Catholic leader, was France, and behind Raymond was Peter II of Aragon, irreproachably Catholic. Innocent attempted to make peace, but the prize of S France was tempting, and the crusaders continued to harry the whole region. In 1213 at Muret, Montfort was victor and Peter was killed. The war went on, with the son of Philip II (later Louis VIII) as one of the leaders. Simon's death in 1218 robbed him of victory and left his less competent son to continue the fight. Raymond's son, Raymond VII, joined the war, which was finally terminated with an honorable capitulation by Raymond. By the Peace of Paris (1229), Louis IX acquired the county of Toulouse. The religious result of the crusade was negligible. In 1233, Pope Gregory IX established a system of legal investigation in Albigensian centers and put it into the hands of the Dominicans, this was the birth of the medieval INQUISITION. After 100 years of the Inquisition, of tireless preaching by the friars, and of careful reform of the clergy, Albigensianism was dead. See Steven Runciman, *The Medieval Manichee* (1947, repr 1961), studies by Edmond Holmes (1925), Jacques Madaule (tr 1967), J. R. Strayer (1971).

albino (älbī'nō) [Port., =white], animal or plant lacking normal pigmentation. The absence of pigment is observed in the body covering (skin, hair, and feathers) and in the iris of the eye. The blood vessels of the retina show through the iris, giving it a pink or reddish color, and the eyes are highly sensitive to light. Albinism is inherited as a Mendelian recessive character in humans and other animals. Through experimental breeding races of albinos have been established among some domestic animals, e.g., mice, rabbits, pigeons, and chickens. Albino animals are sometimes held sacred, for example, white elephants in Siam and white cattle in India. The presence of an excess of black pigment is called melanism.

Albinoni, Tomaso (älbënō'nē), 1671–1751, Italian violinist and composer. He wrote nearly 50 operas, as well as instrumental works. His orchestral music was admired by Bach, who used several of Albinoni's themes in his own compositions. Albinoni's surviving works include a violin concerto, two violin sonatas, three oboe concertos, and an adagio for strings and orchestra.

Albinus (älbī'nās) see ALCUIN

Albion (älbē'an), ancient and literary name of Britain. It is usually restricted to England and is perhaps derived from the Latin *albus* meaning "white," referring to the chalk cliffs of S England.

Albion, industrial city (1970 pop 12,112), Calhoun co., S Mich., at the forks of the Kalamazoo River, inc 1855. Among its manufactures are iron castings, electronic parts, air conditioners, heaters, bakery ovens, and wire products. Albion College is there, it was established in 1835 and the city developed around it. There are many lakes in the area.

Al-Biruni (älbērō'nē) or **Al Beruni**, **Abu Rayhan Muhammad ibn Ahmad** (äbōō' nīhān' mōhām'id īb'an ā'mād āl bē'rō'nē), b 973, d after 1050, Central Asian scientist. His earlier years were disturbed by political troubles, but after 1017 he was patronized by members of the Ghaznavid dynasty of Turkey. He traveled in Afghanistan and India, making astronomical and geographic observations. The larg-

est part of his writings are on astronomy, astrology, and applied mathematics, but he also wrote on pharmacology, geography, philosophy, history, and other subjects. A taste for precise observation is shown in his determinations of latitudes and the densities of gemstones. His encyclopedic *India* (tr 1888) and *Chronology* (tr 1879) provide invaluable information about his time.

albite (älbīt) see FELDSPAR

Albizu Campos, Pedro (pā'drō älbē'sōō kām'pōs), 1891–1965, Puerto Rican political leader. After service in a Negro unit during World War I he developed a lasting enmity for the United States and became the fiery champion of Puerto Rican independence. His Nationalist party, however, failed to receive popular support in the Puerto Rican elections of 1932, and Albizu Campos turned increasingly to violent action. Convicted of seeking to overthrow the U.S. government, he was imprisoned (1937–43) at Atlanta, then hospitalized in New York City before returning to Puerto Rico in 1947. His party made a poor showing in the 1948 election, and in 1950 Nationalists attacked the governor's mansion in Puerto Rico and Blair House in Washington. Charged with inciting to murder, Albizu Campos was again imprisoned. He was pardoned (1953) because of failing health, but the next year he was implicated in the Nationalist armed attack on the U.S. House of Representatives, and his pardon was revoked. He was sentenced to life imprisonment. He suffered a stroke in 1956 that left him speechless and bedridden. He was again pardoned in 1964 and died the next year.

Alboin (älbōin), d 572?, first Lombard king in Italy (569–572?). With the AVARS he defeated the Gepidae (see GERMANS). He then led (568) an army across the Alps into Italy, took (569) Milan, and after a three-year siege conquered Pavia, which became his capital. He won most of N and central Italy from the Byzantines (see LOMBARDS). According to a legend probably based on fact, he was murdered at the instigation of his wife, ROSAMOND.

Ålborg (öl'börg, öl'bör), city (1970 com pop 154,343), capital of Nordjylland co., N Denmark, on the Limfjord. It is a major industrial, transportation, and cultural center. Manufactures include cement, machinery, chemicals, liquor, ships, and textiles. Known in the 11th cent., Ålborg was chartered in 1342. Of note are the Cathedral of St Botolph (12th cent.), a castle (early 16th cent.), and a large cultural hall (1953). The city has two colleges. Until 1948 the name was spelled Aalborg.

Albornoz, Gil Álvarez Carrillo de (hēl al'varēth karē'lyō dā älbörnōth'), 1310?–1367, Spanish and papal statesman and general, cardinal of the Roman Catholic Church. Under Alfonso XI of Castile he became archbishop of Toledo and distinguished himself fighting the Moors at Tarifa and Algeciras. He also served as chancellor of Castile. Created cardinal in 1350, he left Spain and entered the service of the pope, then at Avignon. He was put in charge of the papal armies and sent (1353) to the Papal States with Cola di RIENZI to restore papal authority. By skillful diplomacy and force of arms, he reduced the communes and petty local tyrants to obedience, thus preparing the way for the return (1378) of the popes from Avignon to Rome. He compiled the law code of the Marches, known as the Constitutions of Aegidius (1357), which was in use until 1816. He died soon after becoming papal legate at Bologna, where he founded a college for Spanish students.

Albrecht. For rulers thus named, see ALBERT

Albrechtsberger, Johann Georg (yō'hān gā'ōrk al'brēkhtsbēr'gər), 1736–1809, Austrian musical theorist, teacher, and composer. He became (1772) court organist in Vienna and later was chief organist, conductor, and choirmaster of St Stephen's Cathedral, Vienna. He composed more than 240 works and wrote one of the most important books on counterpoint in the 18th cent. Considered the best teacher of composition in Vienna in his time, he taught Beethoven.

Albret, Jeanne d': see JEANNE D'ALBRET

Albret (älb'rā'), former duchy, SW France, in the LANDES of Gascony. The powerful lords of Albret became kings of NAVARRE by the marriage (1484) of Jean d'Albret with Catherine de Foix, queen of Navarre, who also brought him FOIX and BÉARN. Their son, Henri d'Albret, married (1527) Margaret of Angoulême (MARGARET OF NAVARRE). The marriage added ARMAGNAC to Henri's territories, which now included nearly all of Gascony. In 1550, Albret was raised to a duchy. Henri's daughter and heir, JEANNE

D'ALBRET, married Antoine de BOURBON, and their combined territories were inherited by Henry of Navarre, who in 1589 became king of France as Henry IV. Henry added Albret to the royal domain in 1607 as part of the province of Gascony.

Albright, Ivan Le Lorraine (ôl'brîl), 1897–, American painter, b. North Harvey, Ill. Allied with the Magic Realist group, Albright developed a style combining American scene painting with surrealist influences. He sought to portray the decadence of mankind and the horror of America during the depression. His compositions, such as *Poor Room* (1942, artist's coll.), contain much realistic detail organized into a fantastic conglomeration. The surfaces of his works are uniform in texture, predominantly gray in tone, and sordid in effect.

Albright, Jacob, 1759–1808, American religious leader, founder of the Evangelical Association (later the Evangelical Church), b. near Pottstown, Pa. A Pennsylvania German and a Lutheran, he was converted c. 1790 to Methodism. Preaching and forming classes among his converts in the German settlements, he was ordained a minister (1803) by representatives from these classes and was elected bishop at the first annual conference held by his followers in 1807. The movement, unrecognized by the Methodists, did not take the name Evangelical Association until after Albright's death. A college in Reading, Pa., bears his name. The Evangelical Church united in 1946 with the United Brethren in Christ to form the EVANGELICAL UNITED BRETHREN CHURCH.

Albumazar (âl'bôomaz'ar), 805?–885, Arabian astronomer, more fully Abu-Mashar Jafar ibn Muhammad. In his *De magnis conjunctionibus* he claimed that the world had been created when the seven planets were in conjunction in the first degree of the constellation Aries and that its end would come when they should be in conjunction again in the last degree of Pisces. In his astronomical tables he used the Persian calculations of the years and pointed out that they did not follow the Jews' reckoning of time.

albumin (âlbyôd'män) [Lat., =white of egg], member of a class of water-soluble, heat-coagulating PROTEINS. Albumins are widely distributed in plant and animal tissues, e.g., ovalbumin of egg, myogen of muscle, serum albumin of blood, lactalbumin of milk, legumelin of peas, and leucosin of wheat. Some albumins contain carbohydrates. Separation of serum albumins from other blood proteins can be carried out by electrophoresis or by fractional precipitation with various salts. (A 27% solution of sodium sulfate will precipitate the globulins from blood serum while leaving the albumins in solution.) Albumins normally constitute about 55% of the plasma proteins. They adhere chemically to various substances in the blood, e.g., amino acids, and thus play a role in their transport. Albumins and other proteins of the blood aid significantly in regulating the distribution of water in the body. In conditions of shock, heart action may be impaired by a decrease in the volume of circulating blood. Intravenous injection of an albumin solution restores the fluid volume by causing water to flow from the tissues into the circulatory system. In certain types of kidney disease albumin is lost through excretion, as the concentration of blood albumin falls water tends to flow into the tissues, causing edema. Albumins are also used in textile printing, in the fixation of dyes, in sugar refining, and in other important processes.

Albuquerque, Afonso de (afôn'zô dî âlbôokêr'ka, -dâ al'bâkêr'ka), 1453–1515, Portuguese admiral, the effective founder of the Portuguese Empire in the East. He first went to India in 1503, and in 1506 he set out for India again, carrying a royal commission empowering him to supersede Francisco de ALMEIDA in command. Albuquerque sailed with Tristão da CUNHA along the coasts of Madagascar and E. Africa and captured the island of Socotra (Suqutra). Then, leaving da Cunha, he ravaged the Oman coast and took (1507) the island of Hormuz, he attempted to build a fort at Hormuz but had to retire to Socotra when some of his men deserted. Almeida disavowed the conquest and, after Albuquerque had arrived in India, refused to yield command and imprisoned him. When a Portuguese fleet arrived with confirmation of Albuquerque's appointment, Almeida gave way (1509). Albuquerque captured Goa (1510), making it the mainstay of Portuguese power in India, Malacca (1511), extending Portuguese domination to SE Asia, and Hormuz again (1515), thus cutting off the Arab spice trade. While returning from Hormuz to India, Albuquerque learned

that he had been replaced. He died at the entrance to Goa harbor. Albuquerque had built forts at Goa, Calicut, Malacca, and Hormuz, reconstructed those of Cannanore and Cochin, begun shipbuilding and other industries in Portuguese India, and established relations with the rulers of SE Asia. The main goals of his policy—control over the spice sources and of the trade routes—were nearly attained during his brief tenure of power. See his *Commentaries* (tr., 4 vol., 1875–84, repr. 1970), biography by Elaine Sanceau (1936).

Albuquerque (âl'bâkûr'kê), city (1970 pop. 243,751), seat of Bernalillo co., W. central N. Mex., on the upper Rio Grande, inc. 1890. The largest city in the state, it is an important commercial, industrial, and transportation center serving a rich timber, livestock, and farm area. It has railroad shops, lumber mills, food-processing plants, and a large electronics industry. A major employer is the huge Atomic Energy Commission installation there, engaged in nuclear research, testing, and weapons development. Kirtland Air Force Base, home of the air force special weapons center, is in Albuquerque. Spanish settlers arrived in the mid-1600s but were driven out (1680) by the Indians. The old town was founded in 1706 and named for the viceroy of New Spain, the duke of Albuquerque. The new town was platted in 1880 in connection with the railroad and grew rapidly, soon enveloping the old town. Albuquerque is a noted health resort with many sanatoriums and hospitals (including a U.S. veterans' hospital and a U.S. Indian hospital). It is the seat of the Univ. of New Mexico, the Univ. of Albuquerque, a U.S. polytechnical institute for Indians, and the headquarters for Cibola National Forest. Tourist attractions in and about the city include the Church of San Felipe de Neri (1706), the Old Town plaza, numerous museums, the Sandia mts., with caves that contain remains of some of the oldest inhabitants in the western hemisphere, and many Indian pueblos. Coronado State Monument, to the north, is an excavated pueblo near which Coronado camped in 1541. More than one third of the city's residents speak Spanish.

Albury, city (1971 pop. 28,398), New South Wales, SE Australia, on the Murray River at the Victoria border. It is an agricultural market. Among the industries are food processing (including wine) and woollens milling. Albury is also a railroad center.

Alcaeus (âlsê'as), d. c. 580 B.C., Greek poet of Lesbos, a noted early writer of personal lyrics. An aristocrat, he was often embroiled in political battles with the ruling tyrants. The extant fragments of his verse are mostly convivial and light, but his political poetry is sterner. He was, according to tradition, a close associate of SAPPHO. The Alcaic strophe said to have been his invention was much used by Greek lyricists. It was greatly admired by Horace who employed it with slight modification. See C. M. Bowra, *Greek Lyric Poetry* (1936, repr. 1961), Denys Page, *Sappho and Alcaeus* (1955), Hubert Martin, *Alcaeus* (1972).

Alcalá de Henares (alkalá' dâ âna'räs), town (1970 pop. 59,783), Madrid prov., central Spain, on the Henares River, in New Castile. Leather, soap, and china are produced in the town, which is surrounded by an agricultural district that yields wheat. Called Complutum in Roman times, the town is triply famous as the former seat of a great university founded in 1508 and transferred in 1836 to Madrid, as the birthplace of Ferdinand I, Katherine of Aragon, and Cervantes, and as the scene of the Cortes in which ALFONSO XI promulgated the *Ordenamiento de Alcalá*. The town was severely damaged in the Spanish civil war. Among the landmarks are a Gothic collegiate church and the former archiepiscopal palace.

Alcalá la Real (la râal'), town (1970 pop. 21,349), Jaen prov., S. Spain, in Andalusia. It has well-known mineral springs. The town played an important part in the conquest of Granada from the Moors (15th cent.). In 1810 it was the site of a French victory in the Peninsular War.

Alcalá Zamora, Niceto (nêthä'tô alkalá' thamô'ra), 1877–1949, Spanish statesman and president of Spain (1931–36). After holding several cabinet posts under the monarchy, he became a republican and was jailed for his political activity in 1930. He helped lead the successful revolution of 1931 and became first provisional and then constitutional president of the Spanish republic. A middle-of-the-road liberal, he was deposed by the Cortes on a Socialist motion (April, 1936) and was succeeded as president by Manuel Azaña. He went into exile first to France and then (1942) to Argentina.

alcalde (âlkâl'dê, Span. alkal'dâ) [Span., from Arab., =the judge], Spanish official title, in existence at least from the 11th cent. Since the late 19th cent. it has been used for the mayor of a town or village who also acts as justice of the peace. Originally, however, it designated a judge whose scope of jurisdiction varied and who had administrative functions as well. There were, for example, *alcaldes de la hermandad* (judges attached to the tribunals of the town federations formed to assure public order and safety, see HERMANDAD) and *alcaldes de corte* (judges whose jurisdiction extended over the royal residence and the surrounding area). The *alcaldes* were distinguished from the *regidores*, whose functions were primarily administrative. In the 14th cent. the *corregidores*, royal appointees charged with assisting the *regidores* in their duties, encroached upon the judicial functions of the *alcaldes*, depriving them of all but minor civil and criminal jurisdiction. Moreover, *alcaldes* were increasingly chosen by the crown, with only a few towns keeping the right to choose their own *alcaldes* (these being known thereafter as *alcaldes ordinarios*). Since the *corregidores* were often inadequately versed in law, each usually received advice from two trained lawyers, termed *alcaldes mayores*, who specialized in criminal and civil law, respectively. The office was also instituted in the Spanish colonies, but changed its character. There the *alcalde mayor* was the administrator of a provincial division usually smaller than that of a *corregidor*, he also presided over the town ayuntamiento (later known as the CABILDO). The *alcalde ordinario* was an elected municipal officer who frequently exercised the powers of mayor and sheriff and was in some villages the sole representative of the law.

Alcámenes (âl'kamê'nêz), fl. 5th cent. 8 C., Athenian sculptor, said to have been a pupil and rival of Phidias. He worked in gold, ivory, and bronze. His *Aphrodite of the Gardens* at Athens is one of the great masterpieces of antiquity. Pausanias erroneously attributed to him the sculptures of the west pediment of the temple of Zeus at Olympia. He was also well known for his *Hermes Propylaios* [Hermes of the gateway] at the entrance of the Acropolis of Athens. A Roman copy found at Pergamum is in the Turkish Museum of Antiquities in Istanbul.

Alcamo (âl'kamô), city (1971 pop. 41,340), NW Sicily, Italy. It is an agricultural and industrial center and is noted for its white wine. The ruins of the ancient Greek settlement of Segesta are nearby.

Alcántara (alkan'tara), town (1970 pop. 4,636), Caceres prov., W. Spain, in Estremadura, near the Tagus River. A fine Roman bridge (Arabic al-kantara) built in honor of Emperor Trajan and the ruins of the convent and church of the Knights of Alcántara are located in the town. The Order of Alcántara, one of the great military religious orders of Spain, established its seat in the town in the 13th cent. after the expulsion of the Moors and enjoyed a period of great splendor (13th–14th cent.). The dignity of grand master passed to the Castilian crown in the 15th cent.

Alcatraz (âl'katraz') [Sp. *Álcatrazes*=pelicans], rocky island in San Francisco Bay, W. Calif. Discovered by the Spanish in 1769, it was named for its large pelican colony. The Spanish fortified Alcatraz, which, in 1851, came under U.S. control. The island was used as a U.S. military prison from 1859 until 1933, when it became a Federal prison for incorrigible criminals; the prison was closed in 1963. Nicknamed "The Rock," it was a symbol of the impregnable fortress prison with maximum security and very strict discipline. The island became part of Golden Gate National Recreation Area in 1972.

Alcazarquivir (alka'tharkêvêr'), city (1960 pop. 34,035), N. Morocco. The name also appears as Al Qasr al Kabir and Kasr el Kebir. Near the city on Aug. 4, 1578, the Moroccans soundly defeated the Portuguese. King Sebastian of Portugal had invaded Morocco in support of a pretender to the Moroccan throne. Abd al-Malik, ruler of Morocco, King Sebastian, and the Moroccan pretender, Muhammad, all died in the fighting. As a result of the battle, Portugal soon passed (1580) to Philip II of Spain, and the new Moroccan ruler, Ahmad al-Mansur, began his reign with tremendous prestige.

Alcestis (âlsês'tis), in Greek mythology, daughter of PELIAS. She was won in marriage by ADMETUS, who fulfilled her father's condition that her suitor come for her in a chariot pulled by a wild boar and a lion. So great was her wifely devotion that when Admetus was granted life by the gods if someone would die in his place, she willingly gave her life. In some myths Hercules rescued her from the dead, in others

Persephone was so touched by her devotion that she reunited husband and wife. The legend was dramatized by Euripides in his play *Alceste*.

alchemy (ăl'kāmē), ancient art of obscure origin that sought to transform base metals (e.g., lead) into silver and gold, forerunner of the science of chemistry. Some scholars hold that it was first practiced in early Egypt and others that it arose in China (in the 5th or 3d cent. B.C.) and was carried westward. It consisted chiefly of experiments with metals and other chemical materials. Alchemical apparatus included the alembic (or ambix) for distillation and the kerotakis for sublimation. In its beginnings alchemy was essentially a craft and embraced many kinds of metalwork, including the use of alloys resembling gold and silver. Alexandria is generally considered a center of early alchemy, and the art was influenced by the philosophy of the Hellenistic Greeks, the conversion of base metals into gold (considered the most perfect of metals) was part of a general striving of all things toward perfection. Since the early alchemists were mainly artisans, they tried to conceal the secrets of their work, thus, many of the materials they used were referred to by obscure or astrological names. It is believed that the concept of the philosopher's stone (called also by many other names, including the elixir and the grand magistry) may have originated in Alexandria, this was an imaginary substance thought to be capable of transmuting the less noble metals into gold and also of restoring youth to the aged. Alchemy, strongly tinged with magic, reached the Arabs (perhaps in the 8th cent.) and remained for several centuries under Muslim influence, in the 12th cent. it reached parts of Europe through translations of Arab writings (the early Greek treatises were not known in Europe in the Middle Ages). Arabian alchemy was preserved especially in the works of Geber, and the earlier Greek alchemy in those of Zosimus and others. The alchemical writings of the Middle Ages continued to be couched in symbolic and cryptic language. The alchemists became obsessed with their quest for the secret of transmutation, some adopted deceptive methods of experimentation, and many gained a livelihood from hopeful patrons. As a result, alchemy fell into disrepute. However, in the searching experimental quests of the alchemists chemistry had its beginnings, indeed, the histories of alchemy and chemistry are closely linked. TRANS-MUTATION OF ELEMENTS has been accomplished in modern chemistry. See Lynn Thorndike, *A History of Magic and Experimental Science* (8 vol., 1923-58), John Read, *Prelude to Chemistry* (2d ed. 1939, repr. 1966), A. J. Hopkins, *Alchemy: Child of Greek Philosophy* (1943), Mark Graubard, *Astrology and Alchemy* (1953), C. A. Burland, *The Arts of the Alchemists* (1967), Jack Lindsay, *The Origins of Alchemy in Graeco-Roman Egypt* (1970).

Alcibiades (ălsīb'ādēz), c. 450-404 B.C., Athenian statesman and general. Of the family of Alcmaeonidae, he was a ward of Pericles and was for many years a devoted attendant of Socrates. He turned to politics after the Peace of Nicias (421 B.C.), and during the PELOPONNESIAN WAR he was the leader in agitating against Sparta. He was so successful that Athens joined an alliance against Sparta. When Sparta attacked (418 B.C.) Argos, Alcibiades led an Athenian force to help the Argives, but Athens and the allies were beaten at Mantinea. He was (415 B.C.) the chief promoter of the Sicilian campaign and was one of the three leaders (with Nicias and Lamachus) of the Athenian forces. On the night before the expedition sailed, all the statues of Hermes (the hermae) in Athens were mutilated, a sacrilege that caused fear and commotion in the city. Alcibiades was accused—almost certainly falsely—of the crime and was not allowed to have an immediate trial before sailing. When the forces reached Sicily, he proposed an attempt to win allies rather than attacking the hostile cities of Selinus and Syracuse at once. Nicias carried out this policy to ultimate disaster. Alcibiades had meanwhile been summoned home to stand trial. Instead he fled to Sparta, where he gave advice to King AGIS I, who was successful against Athens. Alcibiades later fell into trouble with the Spartan king, and c. 413 he fled to the protection of the Persian satrap TISSAPHERNES and then sought to return to Athens. After the oligarchy of the Four Hundred fell (411), he was recalled at the request of Thrasybulus. Athens had a short era of greatness as Alcibiades directed brilliantly the Athenian fleet in the Aegean and in 410 won a victory over the Peloponnesian fleet off Cyzicus. In command of Athenian forces, he recovered (408) Byzantium and was acclaimed in Athens. A new Spartan commander, however, appeared in Lysander, who defeated the

Athenian fleet at Notium in c. 406 B.C. Though Alcibiades was absent on another expedition at the time, he was, nevertheless, blamed and exiled. He went to a castle he owned on the western shore of the Hellespont. There in 405 B.C. he attempted to warn the Athenian fleet at AEGOSPOTAMOS against a surprise attack by the Spartans, but his advice was ignored. In 404 at the behest of Lysander, the Persian satrap PHARNABAZUS had Alcibiades murdered. Historians have disagreed in their estimate of Alcibiades from his own day to the present, some have viewed him as a highly competent and unappreciated leader, but most have considered him to be largely responsible for the decline of Athens.

Alcimus (ăls'īmās), Hellenizing Jew, appointed to the high priesthood, but opposed by the Maccabees. 1 Mac 7, 9, 154-57, 2 Mac 14, 3, 13, 26.

Alcindor, Lew: see JABBAR, KAREEM ABDUL.

Alcinous (ălsin'ōēs), in Greek mythology, king of Phaeacia, father of Nausicaa. He aided Odysseus in his journey back to Ithaca. In the story of Jason, he protects Jason and Medea from the Colchians.

Alciphron (ăls'ifrōn, -frān), fl. A.D. c. 200?, Greek satirist. His only extant work, in fine Attic style, consists of 122 imaginary letters by common people living in Athens in the 4th cent. B.C. The letters tell much about domestic life of the times.

Alcmaeon (ălkmē'ēn), in Greek legend, son of Amphiaräus and Eriphyle, a leader of the expedition of the EPIGONI against Thebes. He murdered his mother in revenge for his father's death and consequently was haunted by the Erinyes until he found haven on Achelous' island. There he married Callirrhoe, daughter of Achelous, and lived in peace until his wife demanded the sacred robe and necklace of Harmonia, which were in the possession of his former wife Arsinoe. When he tried to regain them from Arsinoe, her brothers killed him.

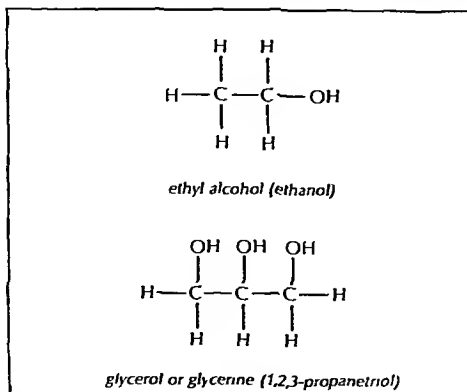
Alcmaeonidae (ălkmē'ōnīdē), Athenian family powerful in the 7th, 6th, and 5th cent. B.C. Blamed for the murder of the followers of Cylon, the would-be tyrant (c. 632 B.C.), they were considered attainted and were exiled. They were again in Athens in the 6th cent. The most prominent members of the family later were CLEISTHENES, PERICLES (whose mother was an Alcmaeonid), and ALICIBIADES.

Alcman (ălkm'an), fl. before 600 B.C., Greek poet of Sparta, founder of the Dorian school of choral lyric poetry. Short choral fragments and a longer one (part of a *parthenion* or choir song for girls) survive. His verse, simple, clear, and musical, was often sung at festivals. See his *Partheneion* (ed. by Denys L. Page, 1951).

Alcmene (ălkmē'nē) see AMPHITRYON.

Alcobaça (ălkōbă'să), town (1970 pop. 4,799), Leiria dist., W. central Portugal, in Estremadura. The town became a center of the Cistercians in the reign of Alfonso I, and its abbey (building begun 1152) was the greatest of medieval Portugal. The Alcobaça Cistercians exercised enormous influence on education, social conditions, finance, and politics. The early kings of Portugal are buried in the abbey.

alcohol, any of a class of organic compounds with the general formula R-OH, where R represents an alkyl group made up of carbon and hydrogen in various proportions and -OH represents one or more HYDROXYL GROUPS. In common usage the term *alcohol* usually refers to ETHANOL. The class of alcohols also includes METHANOL, the amyl, butyl, and propyl alcohols, the GLYCOLS, and GLYCEROL. An alcohol is generally classified by the number of hydroxyl groups in its molecule. An alcohol that has one hydroxyl group is called monohydric, monohydric alcohols include methanol, ethanol, and ISOPROPANOL.



Alcohols

Glycols have two hydroxyl groups in their molecules and so are dihydric. Glycerol, with three hydroxyl groups, is trihydric. The monohydric alcohols are further classified as primary, secondary, or tertiary according to the number of carbon atoms bonded to the carbon atom to which the hydroxyl group is bonded. Many of the properties and reactions characteristic of alcohols are due to the electron charge distribution in the C-O-H portion of the molecule (see CHEMICAL BOND). Chemical reactions involving the hydroxyl group in an alcohol molecule are of two kinds: those in which the hydroxyl group is replaced as a whole, e.g., reaction of ethanol with hydrogen iodide to form ethyl iodide and water, and those in which only the hydrogen in the hydroxyl group is replaced, e.g., the reaction of ethanol with sodium, an active metal, to form sodium ethoxide and hydrogen. Alcohols are generally less volatile, have higher melting points, and are more soluble in water than the corresponding hydrocarbons (in which the -OH group is replaced with hydrogen). For example, at room temperature methanol is a liquid, while methane is a gas.

Alcoholics Anonymous, worldwide organization dedicated to the curing of alcoholics, founded 1935 by two former alcoholics, one a New York broker, the other an Ohio physician. They developed a philosophy of life that has made recovery from alcoholism possible for countless men and women everywhere. It includes psychological principles that have long been recognized as being effective in the reorganization of personality. The organization functions through local groups that have no constitutions, officers, or dues. Anyone who has a drinking problem may become a member. There are presently about 17,000 local groups in the United States, with a total membership of approximately 575,000.

alcoholism, the consumption of alcoholic beverages to a degree that interferes with bodily or mental health or with normal social and occupational behavior. Chronic alcoholism is a condition in which the drinker is physiologically dependent on alcohol, i.e., he is addicted. Alcoholism, either in the form of heavy steady drinking or in the form of occasional periods of intense drinking alternating with sober periods, is the most widespread drug addiction problem; it is estimated that about 9 million of the 95 million social drinkers in the United States are problem drinkers or alcohol addicts (see DRUG ADDICTION AND DRUG ABUSE). Because alcohol can profoundly alter behavior (by blocking inhibitions, for example, and releasing aggressive behavior), it is one of the most dangerous addictive drugs. A large proportion of arrests in the United States are for drunkenness or for drunken driving, and a high proportion of crimes of violence (e.g., child beating, homicide, and suicide) are committed by people who have been drinking. Alcoholics cause one half of all highway fatalities and are responsible for much lost work time and inefficiency on the job. Intoxication is produced by alcohol as it circulates in the blood and acts to depress the central NERVOUS SYSTEM (see DEPRESSANT). Alcohol, which requires no digestion, can pass directly into the bloodstream. The absorption rate depends principally on the concentration of the drug in the stomach and small intestine; the presence of food in the stomach slows the absorption process. Alcohol is not stored in the body or excreted but is metabolized in the liver at a fixed rate of between 0.25 and 0.33 oz (7.1-9.4 grams) per hr, varying with the individual. Thus alcohol is found in the bloodstream and signs of intoxication appear when the rate of alcohol consumption is greater than the rate at which it is metabolized in the liver. At a blood level of about 0.05%, alcohol lowers alertness, increases appetite, and may relieve fatigue. In increasing doses, it causes exaggerated behavior, impairs muscular coordination and judgment, slows reflexes, and reduces negative feelings such as anxiety and guilt. Definite intoxication occurs at more than 0.15%, although 0.10% is frequently considered legal drunkenness. The lethal level, often given as 0.60%, may be as low as 0.40% in some people. Death results from respiratory failure as the medulla of the brain is depressed. The rapid ingestion of about a pint of absolute ethyl alcohol or its equivalent would be fatal for most individuals. In practice, most people become unconscious before they drink themselves to death. However, ingestion of adulterated alcoholic beverages containing methyl (wood) alcohol will cause damage to retinal cells and may lead to complete blindness within a few days. The effects of alcohol are similar to those of BARBITURATES, and the combination of the two is particularly dangerous. Like all addictive drugs, alcohol produces tolerance.

and physical dependence in the habitual user. A hangover, a combination of headache, nausea, fatigue, and depression, may be a mild type of withdrawal from alcohol. Sudden abstinence by the chronic alcoholic produces a severe withdrawal syndrome—including tremors, vomiting, and convulsions resembling those of epilepsy—that is more likely to cause death than withdrawal from narcotic drugs. The final and most dangerous phase in this withdrawal pattern is DELIRIUM TREMENS, a toxic psychosis characterized by insomnia, hallucinations, seizures, and maniacal behavior. Chronic use of alcohol results in loss of brain cells, producing memory lapses, impaired learning ability, motor disturbances, and general disorientation. It is not known whether the deterioration is caused by the alcohol itself or by malnutrition and vitamin deficiencies resulting from the body's decreased ability to use vitamins. Other ailments that can result from prolonged alcoholism include CIRRHOSIS, a liver ailment, diseases of the digestive system, damage to the heart, and lowered resistance to infection. Although anyone who drinks alcohol experiences intoxicating effects, only a small percentage of all drinkers become alcoholics. The steps in the development of chronic alcoholism vary with the individual, it is usually not possible to determine which of a group of drinkers will become addicted. Although there is no such thing as an alcoholic personality, there are certain personality traits common in alcoholics, e.g., feelings of inadequacy and inability to tolerate frustration or deal with the demands of life. Many alcoholics may border on serious mental illness. Nearly half come from broken homes or have an alcoholic parent. Certain cultural groups, e.g., some N European peoples, and some groups where the social structure has been disrupted, e.g., Eskimos and North American Indians, seem to be more susceptible than others. In the United States, although the number of women drinkers has markedly increased in recent years, four out of five alcoholics are male. It is possible that a hereditary component exists, i.e., some people may experience a unique sense of gratification when intoxicated. A typical case of beginning alcoholism resembles ordinary social drinking, although drinking may be more intense and prolonged. Later the drinker may begin to drink in the morning to obliterate his guilt feelings and to relieve the physical discomfort of the hangover from the drinking of the night before. As the alcoholic becomes increasingly unable to control his drinking he becomes antisocial and disorganized. Severe chronic alcoholism may result in loss of job, home, and family. The treatment of alcoholism begins with medical efforts to achieve sobriety. Anti-anxiety drugs such as certain SEDATIVES and barbiturates are used to ease withdrawal and delirium tremens. Medical treatment is usually followed by membership in a supportive group such as ALCOHOLICS ANONYMOUS, in which alcoholics commit themselves to change and work together to solve their drinking problems. Although most therapeutic methods emphasize complete abstinence, some experimental groups try to teach alcoholics to keep drinking under control. Psychoanalysis is not usually helpful. Some alcoholics are helped by hypnotic suggestion, methods of conditioning to avoid alcohol, or self-administration of drugs such as ANTABUSE, which produces severe discomfort if present in the system when alcohol is consumed. An experimental treatment for severe drinking bouts is the use of lithium salts, presently used to treat manic-depressive illness. Increased sensitivity to the problem of alcoholism led to the establishment of the US National Institute on Alcohol Abuse and Alcoholism as part of the National Institutes of Mental Health. The Federal government now sponsors rehabilitation centers, outpatient halfway houses, and much research. See H M Trice, *Alcoholism in America* (1966), Henrik Wallgren, *Actions of Alcohol* (2 vol., 1970), Yedy Israel and Jorge Mardones, ed., *Biological Basis of Alcoholism* (1971), P G Bourne and Ruth Fox, ed., *Alcoholism: Progress in Research and Treatment* (1973).

Alcor (ä'lkör'), in astronomy see MIZAR

Alcott, Bronson (Amos Bronson Alcott) (öl'kät'), 1799–1888, American advocate of educational and social reform, b near Wolcott, Conn. His meager formal education was supplemented by omnivorous reading, while he gained a living from farming, working in a clock factory, and as a peddler in the South. He taught in several places before he opened (1834) his Temple School in Boston. His own records, as well as those made by Elizabeth Palmer Peabody, his assistant, show his concern with the integrated mental, physical, and spiritual development

of the child. Yet unfavorable reactions to his advanced and liberal theories forced him to close his school. His disappointment was lessened when he learned of the success of Alcott House, a school founded by his disciples in England. One of the leading exponents of TRANSCENDENTALISM, he wrote for the transcendental periodical *Dial* (the "Orphic Sayings" being his most famous contribution) and was a nonresident member of Brook Farm. He was one of the founders (1843) of a cooperative vegetarian community, "Fruitlands," near Harvard, Mass., but it was abandoned in 1844. Poverty continually plagued the life of the Alcotts until the writings of his daughter, Louisa May Alcott, relieved the family of financial worry. He became superintendent of the Concord public schools, whose reformation he described in his *Reports*. From 1879 he was dean of the Concord School of Philosophy, which annually gathered disciples to hear him and many other speakers. Among his writings are *Observations on the Principles and Methods of Infant Instruction* (1830), *Record of a School* (1835), and *Ralph Waldo Emerson* (1882). See his journals (ed. by Odell Shepard, 1938, repr. 1966) and his letters (ed. by R L Herrin, 1969), biographies by F B Sanborn (1893, repr. 1965) and D McCuskey (1969), study by G E Haefner (1970), Odell Shepard, *Pedlar's Progress* (1937, repr. 1967).

Alcott, Louisa May, 1832–88, American novelist and writer of children's books, b Germantown, Pa., daughter of Bronson Alcott. She is chiefly remembered for *Little Women*, one of the most popular girls' books ever written. Mostly educated by her father, she was also guided by her friends Emerson and Thoreau, and her first book, *Flower Fables* (1854), was a collection of tales originally created to amuse Emerson's daughter. Alcott was determined to contribute to the small family income and worked as a servant and a seamstress before she made her fortune as a writer. By 1860 her poems and short stories were appearing in the *Atlantic Monthly*. Her letters written to her family when she was a Civil War nurse were published as *Hospital Sketches* (1863) and were received with enthusiasm, her first novel, *Moods*, followed in 1864. In 1867 she became editor of a children's magazine, *Merry's Museum*. She first achieved wide fame and wealth with *Little Women*, published in two volumes in 1868–69. The novel, which recounts the adolescent adventures of the four March sisters, is largely autobiographical, the author herself being represented by the spirited Jo March. Her other books for juveniles include *Little Men* (1871) and *Jo's Boys* (1886), both sequels to *Little Women*, *An Old-Fashioned Girl* (1870), *Eight Cousins* (1875), with its sequel *Rose in Bloom* (1876), and *Under the Lilacs* (1879). They all picture family life in Victorian America with warmth and perception. Another novel, *Work* (1873), draws on Alcott's early experiences as a breadwinner for her family. In her mature years she was active in the abolition and temperance movements, woman suffrage, and other causes. Her letters and journal were edited by E D Cheney (1889, repr. 1966). See biographies by M M Worthington (1958) and C L Meigs (1970).

Alcoy (alkor'), city (1971 pop. 61,371), Alicante prov., SE Spain, in Valencia, on the Serpis River. An important industrial center with manufactures of paper (especially cigarette paper), matches, and textiles, it also has trade in grain, wine, and oil from the surrounding region.

Alcuin (ä'lkwin) or **Albinus** (älbī'nəs), 735?–804, English churchman and educator. He was educated at the cathedral school of York by a disciple of Bede, he became principal in 766. CHARLEMAGNE invited him (781?) to court at Aachen to set up a school. For 15 years Alcuin was the moving spirit of the Carolingian renaissance. He combated illiteracy with a system of elementary education. On a higher level he established the study of the seven liberal arts, the trivium and quadrivium, which became the curriculum for medieval Western Europe. He encouraged the study and preservation of ancient texts. His dialogue textbook of rhetoric, called *Compensia*, was widely used. He wrote verse, and his letters were preserved. Alcuin's treatise against Felix of Urgel did much to defeat the heresy of ADOPTIONISM. He died as head of the abbey of St Martin of Tours, where he had one of his most famous schools. See studies by E J B Gaskoin (1904), Eleanor Duckett (1951, repr. 1965), and Gerald Ellard (1956).

Alcyone: see HALCYONE

Aldan (äldän'), city (1967 est. pop. 67,000), Yakut Autonomous Republic, E Siberian USSR, on the Aldan Plateau. Located on a major north-south highway of

the region, it is also in the heart of an important gold-mining area. Nearby, at Emeldzhak, are valuable mica deposits.

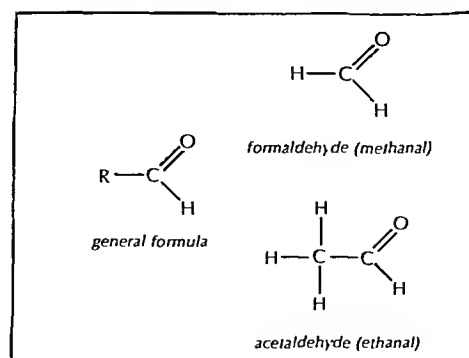
Aldan, river, c 1,400 mi (2,250 km) long, rising in the Stanovoy Range, Yakut Autonomous Republic, SE Siberian USSR. It flows north and east, past Tommot and around the Aldan Plateau, before flowing generally northwest to enter the Lena River c 100 mi (160 km) N of Yakutsk. The Amga, Uchur, and Maya rivers are its main tributaries. The Aldan River is navigable c 1,000 mi (1,610 km) upstream. Gold is found in its basin.

Aldana, Francisco de (fränthēs'kō thā äldā'nā), 1537–78, Spanish general, diplomat, and poet, b Alcantara or Naples. He symbolizes the ideal of the Spanish Renaissance. As a soldier he served Philip II of Spain and Sebastian of Portugal in Europe and Africa. He cultivated many verse forms, and his poetry treats themes such as love and religion. His works were published posthumously by his brother Cosme.

Aldanov, Mark (mark äldā'naf), pseud. of Mark Aleksandrovich Landau, 1886–1957, Russian writer. Aldanov earned degrees in chemistry and law. He took part in the Revolution of 1917, after which he emigrated to France, where he wrote novels about social conflict. These include *The Thinker*, a tetralogy on the events of the era 1793–1821, comprising *The Ninth Thermidor* (1923, tr. 1926), *The Devil's Bridge* (1925, tr. 1928), *The Conspiracy* (1927), and *St. Helena Little Island* (1921, tr. 1924). *The Tenth Symphony* (1931, tr. 1948) concerns Vienna in Beethoven's time. *The Fifth Seal* (1939, tr. 1943) portrays the decay of revolutionary idealism during the Spanish civil war. Aldanov describes the clash between Soviet and American ideologies in *Nightmare and Dawn* (tr. 1957). Among his last works are *A Night at the Airport* (tr. 1949) and *The Escape* (tr. 1950). He visited the United States in 1941, returning to France shortly before his death.

Aldebaran (ä'l'dēb'ārən), brightest star in the constellation TAURUS, Bayer designation α Tauri, 1970 position R.A. 4^h34^m2^s, Dec. +16°27'. An orange giant star (SPECTRAL CLASS K5 III) with apparent magnitude averaging 0.85, it is one of the 20 brightest stars in the sky. Aldebaran is a visual BINARY STAR and an irregular VARIABLE STAR, with MAGNITUDE ranging from 0.78 to 0.93. Its distance is 68 light-years. The name is from the Arabic meaning "follower (of the Pleiades)".

aldehyde (ä'l'dēhīd) [alcohol + New Lat. *dehydrogenatus*=dehydrogenated], any of a class of organic compounds that contain the CARBONYL GROUP, >C=O , and in which the carbonyl group is bonded to at least one hydrogen, the general formula for an aldehyde is RCHO , where R is hydrogen or an alkyl or aryl group. Aldehydes are formed by partial oxidation of primary alcohols and form carboxylic acids



Aldehydes

when they are oxidized. The common name for an aldehyde is often derived from the name of the acid it forms, the IUPAC name is usually derived from the name of the alcohol from which it is formed. Low molecular weight aldehydes, e.g., FORMALDEHYDE and ACETALDEHYDE, have sharp, unpleasant odors, higher molecular weight aldehydes, e.g., BENZALDEHYDE and FURFURAL, have pleasant, often flowery, odors and are found in the ESSENTIAL OILS of certain plants. Aldehydes are important in industry for the manufacture of synthetic resins, e.g., bakelite, and for making dyestuffs, flavorings, perfumes, and other chemicals. Some are used as preservatives and disinfectants.

Alden, Henry Mills (öl'dən), 1836–1919, American editor, b Mt. Tabor, Vt. He was editor of *Harper's*

Magazine from 1869 until his death. A highly religious and fastidious man, he directed his efforts toward making *Harper's* a family magazine. His works include *A Study of Death* (1895) and *Magazine Writing and the New Literature* (1908).

Alden, John, c.1599–1687, Puritan settler in Plymouth Colony. He came to America on the *Mayflower* and was prominent as assistant to the governor of the colony. He moved (c.1627) to Duxbury and there was neighbor and friend of Miles STANDISH. Alden's marriage to Priscilla Mullens gave rise to the romantic legend made familiar by Longfellow's poem, *The Courtship of Miles Standish*.

Alder, Kurt (al'dar), 1902–58, German chemist, educated at Berlin and at Kiel. He was on the research staff of the Bayer Dye Works (1936–40) before becoming (1940) professor of chemistry and director of the chemical institute of the Univ. of Cologne. He shared with Otto Diels the 1950 Nobel Prize in Chemistry for discovering a process for the synthesis of complex organic compounds. The commercial application of the process led to the preparation of various products, including dyes, drugs, insecticides, and plastics.

alder (ôl'dar), name for deciduous trees and shrubs of the genus *Alnus* of the family Betulaceae (BIRCH family), widely distributed, especially in mountainous and moist areas of the north temperate zone and in the Andes. The black alder (*A. glutinosa*) is an Old World species now naturalized in E. North America. Its bark, still used for dyes and tanning, was formerly considered medicinal, its wood is useful chiefly as charcoal. *A. rugosa*, the speckled alder, forms extensive swamp thickets in Eurasia and North America. The red alder (*A. rubra*), the largest tree of the genus, is the most important hardwood timber tree in its native region, the Pacific coast of North America. Alder trees are classified in the division MAGNOLIOPHYTES, class Magnoliopsida, order Fagales, family Betulaceae.

alderfly: see DOBSONFLY

Alderney (ôl'darnê), Fr. Aurigny (ôrên'yê'), anc. Riduna, island (1971 pop. 1,686), c. 3 sq mi (7.7 sq km), in the English Channel, northernmost of the larger Channel Islands. It is separated from the French coast and from other islands by swift tidal races. The soil is fertile and well cultivated about St. Anne, the principal town, the island's main crops are potatoes and grains. Tourism is important.

Aldershot (ôl'darshôt), municipal borough (1971 pop. 33,311), Hampshire, S. central England. It is the site of the largest military training center (est. 1854) in Great Britain. The minister of defense appoints most of the borough council.

Aldhelm, Saint (ôld'hêlm), 639?–709, English churchman and scholar. He was abbot of Malmesbury (from 675) and became the first bishop of Sherborne (705). A distinguished student of the classics whose own Latin prose style was widely imitated, he was also a skilled musician and wrote hymns, popular songs, and ballads for the people. He founded several monasteries and built several churches, the one still standing at Bradford-on-Avon is considered a fine example of Saxon architecture. His name also occurs as Ealdhelm. Feast: May 25.

Aldington, Richard (ôl'dîngtôn), 1892–1962, English poet and novelist. While studying at the Univ. of London, he became acquainted with Ezra Pound and H. D. (Hilda DOOLITTLE), whom he married in 1913. He was one of the leading Imagists and helped edit the *Egoist*, the principal imagist organ. His early poems, extraordinary in their verbal precision, were published under the title *Images* (1915). *Images of War* and *Images of Desire* followed in 1919, the latter marking a departure from pure imagism. Aldington's first novel, *Death of a Hero* (1929), was a bitter indictment of war. It was followed by *The Colonel's Daughter* (1931), equally biting in its satiric intent. Aldington was at his best when in an angry state of artistic and intellectual rebellion, experiments with milder satire proved less effective. After World War II he published little poetry. His most important work was in biography—*Wellington* (1946), *Portrait of a Genius, But* (1950), a study of D. H. Lawrence, *Lawrence of Arabia* (1955), a harshly critical portrait of T. E. Lawrence, and *Portrait of a Rebel: The Life and Work of Robert Louis Stevenson* (1957). See his autobiographical *Life for Life's Sake* (1941), study by N. T. Gates (1974).

aldosterone (ôl'dôstêrôn'), steroid secreted by the cortex of the adrenal gland. It is the most potent HORMONE regulating the body's electrolyte balance. Aldosterone acts directly on the kidney to decrease the rate of sodium-ion excretion (with accompanying retention of water), and to increase the rate of

potassium-ion excretion. The secretion of aldosterone appears to be regulated by two mechanisms. First, the concentration of sodium ions may be a factor since increased rates of aldosterone secretion are found when dietary sodium is severely limited. Second, reduced blood flow to the kidney stimulates certain kidney cells to secrete the proteolytic enzyme renin, which converts the inactive angiotensinogen globulin in the blood into its active form, angiotensin. This peptide in turn stimulates the secretion of aldosterone by the adrenal cortex. Pathologically elevated aldosterone secretion with concomitant excessive retention of salt and water often results in edema.

Aldrich, Nelson Wilmarth, 1841–1915, U.S. Senator from Rhode Island, b. Foster, R.I. He rose in local politics as state assemblyman (1875–76) and U.S. Representative (1879–81) before he served as Senator (1881–1911). Aldrich, after the death of Henry B. Anthony, dominated Republican politics in Rhode Island, and because of his wide interests in banking, manufacturing, and public utilities he was popularly considered the spokesman of big business in the Republican party and the nation. After the controversy of 1888 he was the great proponent of protective tariffs and was successful in saving the Payne-Aldrich Tariff Act of 1909 even against the combined opposition of the Democrats and the Progressives. He took charge of Republican administrative legislation after 1897 and helped force the Silver Republicans out of the party, the Gold Standard Act of 1900 completing the work. As Theodore Roosevelt's sympathies grew increasingly progressive, Aldrich led the Senate opposition to him. Aldrich was deeply concerned with monetary problems, helped shape the Aldrich-Vreeland Currency Act of 1908, and headed the National Monetary Commission to study bank reform. He visited Europe in the course of this study, which he continued after leaving the Senate. The "Aldrich plan," published in 1911, was not made into law, but it did offer information that was used by the Democrats in setting up the Federal Reserve System. See biography by N. W. Stephenson (1930, repr. 1971).

Aldrich, Thomas Bailey, 1836–1907, American author and editor, b. Portsmouth, N.H. His most widely read work was *The Story of a Bad Boy* (1870), a vigorous narrative based on his own boyhood. His short stories, especially those in *Marjorie Daw* and *Other People* (1873), are noted for their naturalness and craftsmanship. Aldrich also excelled at writing light verse. In 1881 he succeeded W. D. Howells as editor of the *Atlantic Monthly*, a position he held until 1890. See biography by Ferris Greenslet (1908, repr. 1965), Mrs. T. B. Aldrich, *Crowding Memories* (1920), study by C. E. Samuels (1966).

Aldridge-Brownhills, urban district (1971 pop. 88,475), Staffordshire, central England. It was created in 1966 through the merger of two former districts. Aldridge-Brownhills is residential and has extensive areas of open countryside. Chasewater Pleasure Park, in the northern part of the district, has the largest area of open water in the Midlands. The village of Rushall in the district was the site of a battle in 1643 during the English civil war. In 1974, Aldridge-Brownhills became part of the new metropolitan county of West Midlands.

aldrin (ôl'drîn) see INSECTICIDE

Aldrovandi, Ulisse (ôlê'ssâ aldrovân'dê), 1522–1605, Italian naturalist, professor at the Univ. of Bologna. He instigated the establishment (1567) of the Bologna Botanical Garden and wrote an early pharmacopoeia. His chief work was the *Natural History* (14 vol.), of which four volumes (some sources say five) were published before his death, the rest were prepared for publication from his manuscripts.

Aldus Manutius (âl'das manyôô'shas) or **Aldo Manuzio** (âl'dô mânôô'tsyô), 1450–1515, Venetian printer. He was educated as a humanistic scholar and became tutor to several of the great ducal families. One of them, the Pio family, provided him with money to establish a printery in Venice. Aldus was at this time almost 45 years old. He devoted himself to publishing the Greek and Roman classics, in editions noted for their scrupulous accuracy, a five-volume set of the works of Aristotle, completed in 1498, is the most famous of his editions. He was especially interested in producing books of small format for scholars at low cost. To this end he designed and cut the first complete font of the Greek alphabet, adding a series of ligatures or tied letters, similar to the conventional signs used by scribes, which represented two to five letters in the width of one character. To save space in Latin texts he had a type designed after the Italian cursive script, it is

said to be the script of Petrarch. This was the first italic type used in books (1501). Books produced by him are called Aldine and bear his mark, which was a dolphin and an anchor. Aldus employed competent scholars as editors, compositors, and proofreaders to insure accuracy in his books. Much of his type was designed by Francesco Griffi, called Francesco da Bologna. The Aldine Press was later managed by other members of his family, including a son, Paulus Manutius (1512–74), and a grandson, Aldus Manutius (1547–97), who was best known for his classical scholarship.

ale: see BEER

Aleandro, Girolamo (jêrô'lamô âläân'drô), 1480–1542, Italian scholar, cardinal of the Roman Catholic Church. He is also called Hieronymus Alexander. A principal in the Lutheran crisis, he obtained the condemnation of Martin Luther at the Diet of Worms (1521), and he made an outline of policy for the Catholic Reformation. His grandnephew Girolamo Aleandro, the younger, 1574–1649, was a humanist, known for his antiquarian studies.

aleatory music (â'lêâtôr'ê), music in which elements traditionally determined by the composer are determined either by a process of random selection chosen by the composer or by the exercise of choice by the performer(s). At the compositional stage, pitches, durations, dynamics, and so forth are made functions of playing card drawings, dice throwings, or mathematical laws of chance, the latter with the possible aid of a computer. Those elements usually left to the performers' discretion include the order of execution of sections of a work, the possible exclusion of such sections, and subjective interpretation of temporal and spatial pitch relations. Also called "chance music," aleatory music has been produced in abundance since 1945 by several composers, the most notable being John CAGE and Iannis XENAKIS.

Alecsandri, Vasile (vasê'lê âlêksân'drê), 1821–90, Rumanian poet, dramatist, and statesman. He was (1858) provisional foreign minister and subsequently served in various diplomatic posts. Besides writing lyric poetry celebrated for the description of his native landscape, he published a notable collection of Rumanian folk songs. His plays include *Ovidiu* (1890). See study by Alexandre Cioranescu (tr. 1973).

Alecto (âlêk'tô) see FURIES

Alegría, Ciro (sê'rô âlâgrê'a), 1909–67, Peruvian novelist. Imprisoned several times for his political activities, Alegría was exiled to Chile in 1934. He gained fame with his novel *La serpiente de oro* (1935, tr. *The Golden Serpent*, 1943). In 1941 he won the Latin American Nobel Prize for *El mundo es ancho y ajeno* (tr. *Broad and Alien Is the World*, 1941), which depicts the exploitation of the Indian by the white man.

Aleichem, Sholom (shô'lâm alâ'khâm) [Heb. = Peace be upon you!—a very common form of greeting in Yiddish], 1859–1916, Yiddish author, b. Russia. His real name was Solomon, or Shalom, Rabinowitz. The first part of his pseudonym is also written Sholem or Shalom. He was influential in establishing Yiddish as a literary language. His stories are celebrated for their portrayal of character, and he is perhaps best known for his humorous tales of life among the poverty-ridden and oppressed Russian Jews of the late 19th and early 20th cent. His five novels, many plays, and some 300 short stories, all written in Yiddish, have been translated into Russian, German, and other European languages. English translations of some of his tales include *The Old Country* (1946) and *Tevye's Daughters* (1949). In the last years of his life Sholom Aleichem lived in the United States; he died in New York City where, through his work, he helped to found the Yiddish Art Theater. His autobiographical writings include *Adventures of Mottel* (tr. 1953) and *The Great Fair* (tr. 1955). See biography by his daughter, Marie Waife-Goldberg (1968), Maurice Samuel, *The World of Sholom Aleichem* (1943, repr. 1973), Melech Grafstein, ed., *Sholom Aleichem Panorama* (1949).

Aleijadinho (âlâzhâdê'nyô) [Port. = little cripple], 1730–1814, Brazilian sculptor. His real name was Antônio Francisco Lisboa. Although he was maimed in hands and feet, he is known for the brilliance of his church sculpture. His most famous works are the carvings in the Church of São Francisco at OURO PRÊTO and the statues of the Twelve Prophets at Congonhas do Campo. The distinctive baroque style of Aleijadinho's works, carved in wood and indigenous soapstone, has caused much church sculpture in his native Minas Gerais to be attributed to him.

Alexandre, Vicente (vēthēn'tā alāhan'drā), 1898–, Spanish lyric poet. He won the national prize for literature for *La destrucción o el amor* (1935). His verse, often free in form, is pessimistic and surrealist, it expresses the anguish and hope of man. Alexandre's works are collected in *Poesías completas* (1960) and *Obras completas* (1968). See study by Kessel Schwartz (1970).

Alekhine, Alexander (alyēkh'ēn), 1892–1946, Russian-French chess player, b. Moscow. He became a naturalized French citizen after the Russian Revolution. At the age of 16 he gained the rank of master and in 1927, by a surprising defeat of Capablanca at Buenos Aires, became world champion. In 1930 at San Remo, Italy, he did not lose a single game in a tournament that included all of the major European players. In 1935 he lost the championship to Max Euwe but regained it in 1937 and kept it until his death. His clear and realistic style and the brilliance of his middle-game and end-game combinations are found in his book, *My Best Games of Chess, 1924–1937* (1939). See study by R. G. Eales and A. H. Williams (1973).

Aleks-. For some Russian names beginning thus, see ALEX-, e.g., for Aleksandr, see ALEXANDER.

Aleksandropol, see LENINAKAN, USSR.

Aleksandrov (alyiksan'drəf), city (1967 est. pop. 46,000), Russian Republic, E. European USSR. It has radio, textile, and food industries. The city came under the control of the Muscovite princes in 1302. Ivan IV resided (1564–81) in Aleksandrov, where he organized his political police, the Oprichnina. The city is also the site of the first printing establishment in Russia, founded during the reign of Ivan IV, and of the famous Uspenski convent (late 17th cent.).

Aleksandrov-Grushevski, see SHAKHTY, USSR.

Aleksandrovsk, see ZAPOROZHYE, USSR.

Aleksandrovsk-Sakhalinski (alyiksan'drəfsk-sakhalyēn'skē), city on N. Sakhalin island, Far Eastern USSR. A port on the Tatar Strait, it is also a coal-mining center and has lumber and fishing industries. The city was founded in 1881 as a place of exile.

Alekseyev, Mikhail Vasilyevich (mēkhāēl'vasē'-lyāvich alyiksyā'ēf), 1857–1918, Russian general, chief of staff (1915–17) of Czar Nicholas II. With other officers he urged the czar to abdicate in favor of the czarévich in order to save the dynasty prior to the Russian Revolution. Alekseyev was briefly chief of staff in the provisional government headed by Aleksandr Feodorovich Kerensky after the czar was overthrown. After the Bolsheviks took over in Nov., 1917 (Oct., 1917, O.S.), Alekseyev and General KORNILOV organized an anti-Bolshevik movement in the south.

Alema (āl'ama), unidentified town, E. of the Jordan 1 Mac 5:26.

Alemán, Mateo (matā'ō alāman'), 1547–1614?, Spanish novelist, b. Seville. Aleman studied medicine and practiced accounting. He led a turbulent life, was sent to jail twice for his debts, and at the age of 60 found refuge in Mexico. The first part of his picaresque novel, *Guzmán de Alfarache*, was published in 1599 and the second part in 1604. Written with moralizing overtones, the novel presents a valuable picture of contemporary life and a view of mankind as corrupt but salvageable through divine grace. James Mabbe translated it into English as *The Rogue, or, The Life of Guzman de Alfarache* (1922).

Alemán, Miguel (mēgēl' alāman'), 1902–, president of Mexico (1946–52). Son of a revolutionary general, Aleman became a highly successful lawyer and a champion of Mexican labor. He was governor of Veracruz from 1936 to 1940 but resigned to manage the presidential campaign of Manuel Ávila Camacho, under whom Aleman held (1940–45) the ministry of the interior. Elected president in 1946, Aleman became the first civilian president of Mexico since Francisco I. MADERO. He changed the name of the official government party from National Revolutionary party to Institutional Revolutionary party (PRI), to indicate the permanent status of the revolution. Aleman's administration was characterized by a vigorous program of modernization. He encouraged foreign investment, developed reclamation and power projects, improved communications and education, and generally raised the standard of living. In his post-presidential years he headed the national tourism council, encouraging the development of Acapulco as a resort and helping to bring the Olympic games to Mexico City in 1968.

Alemanni (ālīmān'i), Germanic tribe, a splinter group of the Suebi (see GERMANS). The Alemanni may have been a confederation of smaller tribes. First mentioned (A.D. 213) as unsuccessfully assault-

ing the Romans between the Elbe and the Danube, they later settled (3d cent.) in upper Italy. By the 5th cent. they occupied territories on both sides of the Rhine south of its junction with the Main (present Alsace, Baden, and NE Switzerland). Their westward expansion brought them into conflict with the Franks, whose king CLOVIS I defeated them in 496. In 505 he forced them to retire into Rhaetia, and in 536 they passed under Frankish rule. By the 7th cent. they had accepted Christianity. SWABIA is also known as Alamannia, and the High German dialects of SW Germany and Switzerland are called Alemannic. In French speech the name *Allemands* came to signify all Germans.

Alemanni, Luigi: see ALAMANNI, LUIGI.

Alembert, Jean le Rond d' (zhaN lārōN' dalaN-bēr'), 1717–83, French mathematician and philosopher. The illegitimate son of the chevalier Des-touches, he was named for the St. Jean le Rond church, on whose steps he was found. His father had him educated. Diderot made him coeditor of the *ENCYCLOPÉDIE*, for which he wrote the "preliminary discourse" (1751) and mathematical, philosophical, and literary articles. Discouraged, however, by attacks on his unorthodox views, he withdrew (1758) from the *Encyclopédie*. A member of the Academy of Sciences (1741) and of the French Academy (1754, appointed secretary, 1772), he was a leading representative of the ENLIGHTENMENT. His writings include a treatise on dynamics (1743), in which he enunciated a principle of mechanics known as D'ALEMBERT'S PRINCIPLE, a work on the theoretical and practical elements of music (1759), and a valuable history of the members of the French Academy (1787).

Alembert's principle: see D'ALEMBERT'S PRINCIPLE.

Alemeth (āl'amēth), 1. Descendant of Saul. 1 Chron 8:36, 9:42. 2. Town, NE of Jerusalem. 1 Chron 6:60. Almon. Joshua 21:18.

Alemtejo: see ALENTEJO, Portugal.

Alençon, François, duc d': see FRANCIS, duke of Alençon and Anjou.

Alençon (alaNsōN'), town (1968 pop. 33,388), capital of Orne dept., N. France, in Normandy, on the Sarthe. A commercial center in a fertile farm area, it is particularly noted for its fine lace work, an industry which dates from the 17th cent. The town also has spinning mills, printing plants, sawmills, and quarries. Alençon was heavily damaged in World War II. Among its surviving structures are Notre Dame Church, with windows and a porch from the 16th cent., the Gothic St. Leonard's Church (completed in 1505), and the Oze House (15th cent.).

Alentejo (ālāntā'zhōō), historic province, SE Portugal, now divided into Alto (Upper) Alentejo (4,888 sq mi/12,660 sq km) and Baixo (Lower) Alentejo (5,318 sq mi/13,774 sq km). The capital of Alto Alentejo is Évora, and the capital of Baixo Alentejo is Beja. The historic province has been further subdivided into the districts of Beja, Évora, and Portalegre. Alentejo, "the granary of Portugal," is drained by the Guadiana River and tributaries of the Sado River. Sheep, horses, cattle, and hogs are raised, and grains, olives, cork trees, and fruits are grown. Alentejo was involved in Portugal's many wars with Castile. The name was formerly spelled Alemtejo.

Aleppo (alēp'ō) or **Alep** (alēp'), Arabic *Haleb*, city (1970 est. pop. 639,000), capital of Aleppo governorate, NW Syria. It is a commercial center located in a semidesert region where grains, cotton, and fruit are grown. The city is also a market for wool, hides, and fruit. Manufactures include silk, printed cotton textiles, dried fruits and nuts (especially pistachios), and cement. Aleppo is a transportation hub, it has an international airport and is connected by rail with Damascus and the Mediterranean port of Latakia, as well as with Turkey and Iraq. The city was inhabited perhaps as early as the 6th millennium B.C. In the 14th–13th cent. B.C. it was controlled by the Hittites. Later, Aleppo was a key point on the major caravan route across Syria to Baghdad. From the 9th to the 7th cent. B.C. it was mostly ruled by ASSYRIA and was known as Halman. It was later (6th cent. B.C.) held by the Persians and Seleucids. Seleucus I (d. 280 B.C.) rebuilt much of the city, renaming it Berea. The city's commercial importance was enhanced by the fall of Palmyra in A.D. 272, and by the 4th cent. Aleppo was a major center of Christianity. A flourishing city of the Byzantine Empire, it was taken without a struggle by the Arabs in 638, subsequently, in the late 11th cent., it was captured by the Seljuk Turks. Crusaders besieged Aleppo without success in 1118 and 1124, and Saladin captured it in 1183, making it his stronghold. The city was held

briefly by the Mongols under Hulagu Khan (1260) and by Tamerlane (1401), in 1517 the Ottoman Empire annexed Aleppo, which then became a great commercial city. From 1832 to 1840 it was held by Muhammad Ali of Egypt. Aleppo's importance declined in the late 19th cent. with the advent of the Suez Canal and other trade routes, but the city revived under French control after World War I and continued to prosper after Syrian independence (1941). The Univ. of Aleppo (1960), Aleppo Institute of Music (1955), and Muslim theological schools are in the city. Points of interest include the Byzantine citadel (12th cent.) and the Great Mosque (715).

Alert, settlement, on Ellesmere Island, extreme N. Northwest Territories, Canada, on the Arctic Ocean. It is the most northerly permanent settlement in the world. The settlement has a radio and meteorological station and a landing strip operated jointly by Canada and the United States.

Ales, Alexander: see ALESIUS, ALEXANDER.

Alès (alēs'), formerly **Alais** (alā', alēs'), city (1968 pop. 44,607), Gard dept., S. France, in Languedoc, at the foot of the Cévennes mts., on the Gardon River. Situated in one of the most important coal basins in SE France, it has iron and steel industries, vehicle-repair facilities, and factories making machinery and hosiery. In the 16th cent. Alais was one of the principal centers of French Protestantism (see HUGUENOTS). The Peace of Alais, signed there (1629), stripped the Huguenots of their political power. Several buildings date from the 17th cent.

Alesia (alē'zhā), hilltop town of Celtic and Roman Gaul, on the site of Alise-Sainte-Reine, near Dijon. It was held by VERDUNTORIX and his men (52 B.C.) when Caesar besieged it. Caesar prevented Verdugetorix' allies from raising the siege and starved out the town, thereby ending Gallic resistance to Rome.

Alesius (alēs'shās), **Ales**, or **Aless**, **Alexander** (both alēs'), 1500–1565, Scottish Protestant theologian. As canon of the collegiate church at St. Andrews he tried to reclaim Patrick HAMILTON from his Lutheran views but was himself persuaded to accept the reformed teachings. In 1532 he escaped to the Continent, where he gained the confidence of Martin Luther and Philip Melancthon and joined in signing the Augsburg Confession. He was commended to Henry VIII by them, and arriving in England in 1535, he enjoyed friendly association with Archbishop Cranmer, Thomas Cromwell, and others. He lectured on divinity at Cambridge and afterward practiced medicine in London. After Cromwell's fall in 1540, Alesius returned to Germany, where he was professor of theology, first at Frankfurt-an-der-Oder and later at Leipzig.

Alessandri, Arturo (artōō'rō alēssan'drē), 1868–1950, president of Chile (1920–25, 1932–38). The 1920 presidential candidate of the Liberal Alliance, a coalition of all the enemies of the conservatives, Alessandri was elected on a reform platform. During his first administration, the conservatives were able to block most of his program, and when his cabinet refused to support him, Alessandri went (1924) into voluntary exile. Returning in 1925, he supervised the writing of a new constitution that guaranteed universal male suffrage, granted greater provincial powers, and effectively ended the power of the conservative-clerical oligarchy. During these years, Chile underwent a political reformation that was supported essentially by the middle class and the labor unions. His second term was also stormy, but marked by continued political and social reforms.

Alessandria (alās-san'drēā), city (1971 pop. 102,349), capital of Alessandria prov., in Piedmont, NW Italy, at the confluence of the Tanaro and Bormida rivers. It is an industrial center and agricultural market. Manufactures include furniture, machinery, and hats. Alessandria was built (1164–67) as a stronghold of the LOMBARD LEAGUE and was named for Pope Alexander III. At first a free commune, the city passed in 1348 to the duchy of Milan and, in 1707, to the duke of Savoy. Alessandria was the scene of a pro-Mazzini conspiracy in 1833. There are two 13th-century churches and remains of the city's medieval fortifications.

Ålesund (ō'lēsōōn), city (1970 pop. 39,496), Møre og Romsdal county, W. Norway, on 3 islands in the Atlantic Ocean at the mouth of the Storfjord. It is a major commercial and fishing port. Products include clothing, processed fish, and dairy goods. Of note is a nearby stone church (early 13th cent.). The name was formerly spelled Aalesund.

Aletsch (alēch), glacier, 66 sq mi (171 sq km), 16 mi (26 km) long and 1.2 mi (1.9 km) wide, 5 central Switzerland, largest in the Alps. It lies between the

Jungfrau and the Aletschhorn, one of the highest (13,721 ft/4,182 m) peaks in the Bernese Alps

Aleut (alōōt', āl'ēōōt'), native inhabitant of the Aleutian Islands and W Alaska. Like the ESKIMO, the Aleuts are racially similar to Siberian peoples. Their language is a member of the ESKIMO-ALEUT family (see AMERICAN INDIAN LANGUAGES). When they were first noted by Vitus Jonassen Bering in 1741, their estimated population was between 20,000 and 25,000. Because of their skill in hunting sea mammals, the Aleuts were exploited by Russian fur traders throughout the coastal waters of the Gulf of Alaska, sometimes as far south as California. The ruthless policies of their masters and conflict with the fierce mainland natives reduced their population by the end of the 18th cent. to one tenth its former size. They now number about 1,000 and continue to live in relative isolation. Most are members of the Russian Orthodox Church. See V. I. Jochelson, *The History, Ethnology and Anthropology of the Aleut* (1933, repr 1966), Robert Ackerman, *Ethnohistory in Southwestern Alaska and the Southern Yukon* (1970).

Aleutian Islands (alōō'shan), chain of rugged, volcanic islands curving c 1,200 mi (1,900 km) west from the tip of the Alaska Peninsula and approaching the Komandorski Islands, USSR. A partially submerged continuation of the Aleutian Range, they separate the Bering Sea from the Pacific Ocean. The Aleutians are composed of four main groups: Fox Islands, nearest to the mainland, including Unimak, Unalaska, Umnak, and Akutan; Andreanof Islands, including Adak, Atka, Kanaga, and Tanaga; Rat Islands, including Amchitka and Kiska; and Near Islands, smallest and westernmost group, including Agattu and Attu. The Semich Islands, of which Shemya Island is the largest, are nearby. The Aleutians have few good harbors, and the numerous reefs make navigation treacherous. Temperatures are relatively moderate, but heavy rains and constant fog make the climate dreary. Almost completely treeless, the islands have a luxuriant growth of grasses, bushes, and sedges. Sheep and reindeer are raised. Hunting and fishing are the main occupations of the Eskimo population. The Aleutian Islands were discovered in 1741 by Vitus Bering, a Danish explorer employed by Russia. The indigenous Aleuts were exploited by the Russian trappers and traders who, in search of sea otter, seal, and fox fur, established settlements on the islands in the late 18th and early 19th cent. The Aleutian Islands were included in the Alaska purchase in 1867 and at that time became part of the United States. After the purchase, the U.S. government forbade seal trapping off the Aleutians except by the Aleuts. Fishing and fur hunting are now controlled by the Federal government. Dutch Harbor, one of the few good Aleutian harbors, became a transshipping point for Nome in 1900, after the discovery of gold turned Nome into a boom town. The Aleutian Islands were important during World War II; in 1940, a U.S. naval base was established at Dutch Harbor. In 1942 the Japanese bombed the base and later occupied Attu, Kiska, and Agattu islands. From bases on Adak and Amchitka, the United States launched a counterattack and regained the islands in 1943. The Aleutian Islands play an important role in U.S. defense because of their proximity to the USSR. Radar stations (part of the Distant Early Warning Line) and military bases are located on the islands. Most of the islands are incorporated in the Aleutian National Wildlife Reserve. The islands have a population of 8,057. The main settlements are on Unalaska Island.

Aleutian Range, volcanic mountain chain, c 1,600 mi (2,600 km) long, SW Alaska, extending W from Anchorage along the Alaska Peninsula, and continuing, partly submerged as the Aleutian Islands, to Attu Island. Mt. Redoubt (10,200 ft/3,109 m) is the highest peak. Part of the volcanic belt that rings the Pacific Ocean, the Aleutian Range has been active in recent years, notably at Katmai (see KATMAI NATIONAL MONUMENT).

alewife, see HERRING

Alex-, For some Russian names beginning thus, see ALEKS-, e.g., for Alexandrov, see ALEKSAANDROV

Alexander III, d. 1181, pope (1159-81), a Sienese named Orlando Bandinelli, successor of Adrian IV. He was a learned canonist who had studied law under Gratian and had taught at Bologna. He came to Rome under Eugene III, was made a cardinal, and became a trusted adviser of Adrian IV. Alexander's election to the papacy was opposed by a few cardinals, who elected an antipope, Victor IV. Although the antipope was supported only by Germany and some Lombards, the schism thus begun continued until 1178 with antipopes Paschal III and Calixtus III.

Alexander was forced (1162) by Holy Roman Emperor FREDERICK I into exile in France. In the long struggle with the emperor, the pope was aided by the LOMBARD LEAGUE which named the town of Alessandria for him. After the battle of Legnano (1176), the emperor was forced to submit. Alexander had already (1174) received the penance of Henry II of England for the murder of St. Thomas a Becket, whom Alexander had canonized in 1173. He convened and presided at the Third LATERAN COUNCIL. One of the great medieval popes, he issued many decretals, established the procedure for canonizing saints, inaugurated the two-thirds rule for papal elections, protected the universities, and was one of the most distinguished champions of ecclesiastical independence in the Middle Ages. He was succeeded by Lucius III. See biography by Cardinal Bosio (tr. 1973).

Alexander VI, 1431?-1503, pope (1492-1503), a Spaniard (b. Jativa) named Rodrigo de Borja or, in Italian, Rodrigo Borgia, successor of Innocent VIII. He took Borja as his surname from his mother's brother Alfonso, who was Pope Calixtus III. Rodrigo became cardinal (1456), vice chancellor of the Roman Church (1457), and dean of the sacred college (1476). Cardinal Borgia had four illegitimate children by a Roman woman, Vannozza, among them were Cesare and Lucrezia Borgia. Alexander was elected by a corrupt conclave. The foreign relations during his papacy were dominated by the increasing influence of France in Italy, which culminated in the invasion of Charles VIII in 1494. Alexander prevented Charles from taking the church property in Rome, but he turned over to the French the valuable Ottoman hostage Djem, brother of Sultan BEYAZID II. Alexander's son, Cesare Borgia, was the principal leader in papal affairs, and papal resources were spent lavishly in building up Cesare's power. For his daughter Lucrezia, Alexander arranged suitable marriages. The favoritism shown his children and the lax moral tone of Renaissance Rome as well as the unscrupulous methods employed by Cesare and other papal officials have made Alexander's name the symbol of the worldly irreligion of Renaissance popes. Girolamo SAVONAROLA was an outspoken opponent and critic of Alexander. Recent studies tend to minimize the pope's immorality and stress his solid achievements as a political strategist and church administrator. It was Alexander who proclaimed the line of demarcation that awarded part of the new discoveries in the world to Spain, part to Portugal (see TORDESILLAS TREATY OF). Alexander was a munificent patron of the arts. He was succeeded by Pius III. See Orestes Ferrara, *The Borgia Pope*. Alexander VI (1940), Michael de La Bedoyere, *The Meddlesome Friar and the Wayward Pope* (1958).

Alexander I, 1777-1825, czar of Russia (1801-25), son of PAUL I (in whose murder he may have taken an indirect part). In the first years of his reign the liberalism of his Swiss tutor, Frederic César de LA HARPE, seemed to influence Alexander. He suppressed the secret police, lifted the ban on foreign travel and books, made attempts to improve the position of the serfs, and began to reform the backward educational system. In 1805, Alexander joined the coalition against NAPOLEON I, but after the Russian defeats at Austerlitz and Friedland he formed an alliance with Napoleon by the Treaty of Tilsit (1807) and joined Napoleon's CONTINENTAL SYSTEM. Alexander requested M. M. SPERANSKI to draw up proposals for a constitution, but adopted only one aspect of Speranski's scheme, an advisory state council, and dismissed him in 1812 to placate the nobility. During this period Russia gained control of Georgia and parts of Transcaucasia as a result of prolonged war with Persia (1804-13) and annexed (1812) Bessarabia after a war with Turkey (1806-12). Relations with France deteriorated, and Napoleon invaded Russia in 1812. Alexander's defeat of the French made him one of the most powerful rulers in Europe. At first his foreign policy was liberal. He insisted on a constitutional charter and mild treaty terms for France at the Congress of Vienna, and he gave autonomy to Finland (annexed in 1809) and a constitution to Poland, of which he became king in 1815. From 1812 on, Alexander was preoccupied by a vague, mystical Christianity, which contributed to his increasing conservatism. Under the influence of the pietistic Juliana KRÜDENER and others, he created the HOLY ALLIANCE to uphold Christian morality in Europe. Viewing revolutionary movements as challenging to the authority of legitimate Christian monarchs, the czar now supported METTERNICH in suppressing all national and liberal movements. Alexander's religious fervor was partly responsible for the establishment of military colonies, which

were agricultural communities run by peasant soldiers. Intended to better the lot of the common soldier, the colonies became notorious for the regimentation and near-serfdom imposed on the soldiers. Alexander abrogated many of his earlier liberal efforts. His policies caused the formation of secret political societies, and when Alexander's brother NICHOLAS I succeeded him the societies led an abortive revolt (see DECEMBRISTS). After Alexander's death, rumors persisted that he escaped to Siberia and became a hermit. His tomb was opened (1926) by the Soviet government and was found empty, the mystery remains unsolved. In Alexander's reign St. Petersburg became a social and artistic center of Europe. Ivan KRYLOV and Aleksandr PUSHKIN dominated the literary scene. An excellent picture of Alexander's period is found in Leo Tolstoy's *War and Peace*. See biographies by Maurice Paleologue (1938, repr 1969), Allen McConnell (1970), and Alan Palmer (1974).

Alexander II, 1818-81, czar of Russia (1855-81), son and successor of Nicholas I. He ascended the throne during the Crimean War (1853-56) and immediately set about negotiating a peace (see PARIS CONGRESS OF). Influenced by Russia's defeat in the war and by peasant unrest, Alexander embarked upon a modernization and reform program. The most important reform was the emancipation of the serfs (1861, see EMANCIPATION, EDICT OF). This failed, however, to meet the land needs of the newly freed group and created many new problems. In 1864, a system of limited local self-government was introduced (see ZEMSTVO) and the judicial system was partially westernized. Municipal government was overhauled (1870), universal military training was introduced (1874), and censorship and control over education were temporarily relaxed. In Poland, Alexander initially adopted a moderate policy, granting the subject nation partial autonomy. When revolt broke out in 1863, however, Alexander reacted with brutal suppression, imposing severe russification. The Western powers were sharply warned against interference. Prussia's support of Russia during this diplomatic crisis led to a Russo-Prussian rapprochement, and in 1872 the THREE EMPERORS LEAGUE was formed by Russia, Prussia, and Austria-Hungary. Throughout his reign Alexander promoted vigorous expansion in the East. The conquest of the Ussuri region in the Far East was confirmed by the Treaty of Peking (1860) with China. Central Asia was added to Russia by the conquest of Kokand, Khiva, and Bokhara (1865-76). Alaska, however, was sold (1867) to the United States. In 1877-78 Russia waged war on Turkey, ostensibly to aid the oppressed Slavs in the Balkans (see RUSSO-TURKISH WARS). Meanwhile, in domestic affairs, Alexander's reforms, while outraging many reactionaries, were regarded as far too moderate by the liberals and radicals. Radical activities increased sharply among the intelligentsia, resulting in a reassertion of repressive policies. When the populist, or "to the people," movement arose in the late 1860s (see NARODNIKI), the government arrested and prosecuted hundreds of students. Many radicals responded with terrorist tactics. In 1881, after several unsuccessful attempts, a member of the People's Will, a terrorist offshoot of the populist movement, assassinated Alexander with a hand-thrown bomb, this on the very day (March 13) that Alexander had signed a decree granting the zemstvos an advisory role in legislation. He was succeeded by his son Alexander III. See biography by Stephen Graham (1935, repr 1968), studies by W. E. Mosse (rev. ed. 1962), E. M. Almedingen (1964), and David Footman (1974).

Alexander III, 1845-94, czar of Russia (1881-94), son and successor of Alexander II. His father's assassination, his limited intelligence and education, his military background, and the influence of such advisers as Konstantin P. POBYEDONOSTZEV and Mikhail N. Katkov all contributed to his reactionary policies. On his accession he discarded the modest proposals for reform made by Count LORIS-MELIKOV. Alexander increased the repressive powers of the police and tightened censorship and control of education. He limited the power of the zemstvos [local assemblies] and the judiciary, increased controls over the peasantry, subjected the national minorities to forcible Russification, and persecuted all religious minorities, especially the Jews. Perhaps the only enlightened policy of Alexander's reign was pursued by his energetic minister of finance, Count WITTE, who used governmental pressure and investments to stimulate industrial development and to begin construction of the TRANS-SIBERIAN RR. The czar and his foreign minister, Nikolai K. GIEPS, worked for peace in Europe, although Russian expansion in Central

Asia almost led to conflict with Great Britain. In the Balkans, Russia's attempts to make Bulgaria a satellite proved unsuccessful and led to a final break with Austria-Hungary, which also had interests there. The Three Emperors' League of Russia, Austria-Hungary, and Germany was replaced (1887) with a Russo-German alliance. This was not renewed in 1890, and a Franco-Russian entente grew after 1891 (see TRIPLE ALLIANCE AND TRIPLE ENTENTE). Alexander was succeeded by his son Nicholas II.

Alexander, 1893-1920, king of the Hellenes (1917-20), second son of CONSTANTINE I. After his father's forced abdication, he succeeded to the Greek throne with the support of the Allies, who distrusted the sympathies of his elder brother George (later King George II). Alexander died of a monkey bite. His father, Constantine I, was restored to the throne shortly afterward.

Alexander III, king of Macedon. See ALEXANDER THE GREAT.

Alexander I, 1078?-1124, king of Scotland (1107-24), son of Malcolm III and St. Margaret of Scotland. He succeeded his brother Edgar, who had divided the kingdom so that Alexander ruled only N of the Forth and Clyde rivers, while his brother David ruled in the south. Early in his reign he decisively quelled an uprising in N Scotland. Like his mother, Alexander encouraged ecclesiastical conformity with English ways and established several monasteries, including the abbeys at Inchcolm and Scone. David succeeded him as David I.

Alexander II, 1198-1249, king of Scotland (1214-49), son and successor of William the Lion. He joined the English barons in their revolt against King John of England in 1215. Though he made his peace with John's successor, Henry III, in 1221, there was later friction that almost led to war. In 1237, Alexander agreed to give up his claims to overlordship in old Northumbria and to exchange lands he held in central England for lands in the north. At home Alexander was firm in quelling disorder.

Alexander III, 1241-86, king of Scotland (1249-86), son and successor of Alexander II. He married a daughter of Henry III of England and quarreled with Henry, and later Henry's son Edward I, over the old English claims to overlordship in Scotland. The great achievement of Alexander was his final acquisition for Scotland of the Hebrides and of the Isle of Man, which his father had already claimed from Norway. King Haakon IV of Norway attempted to drive the Scots from the islands in 1263, but a storm battered his ships, and he was defeated in the battle of Largs in the Clyde River. In 1266, Alexander signed a treaty with Haakon's successor, Magnus VI, assigning the islands to Scotland. This was followed by an arrangement with Norway providing for the marriage of Magnus's son Eric with Alexander's daughter Margaret. Alexander survived his children, and when he died his only near relative was his little granddaughter MARGARET MAID OF NORWAY. See biography by James Fergusson (1937).

Alexander (Alexander Obrenović) (ōbrě'nāvīch), 1876-1903, king of Serbia (1889-1903), son of King MILAN. He succeeded on his father's abdication. Proclaiming himself of age in 1893, he took over the government, abolished (1894) the relatively liberal constitution of 1889, and restored the conservative one of 1869. He recalled his father in 1897, gave him command of the army, and permitted him to undertake a campaign against the pro-Russian Radical party. In 1900 he married Draga Mašin, the widow of a foreign engineer and a former lady-in-waiting (see DRAGA). The scandal of the marriage exasperated his opposition. In 1903, after Alexander had arbitrarily suspended and then restored the new liberal constitution that he had granted in 1901, he and his queen were assassinated by a clique of officers. Peter Karadjordjević was recalled as King Peter I, and the Obrenović dynasty came to an end.

Alexander, 1888-1934, king of Yugoslavia (1921-34), son and successor of Peter I. Of the Karadjordjević family, he was educated in Russia and became crown prince of Serbia upon the renunciation (1909) of the succession by his brother George. He led Serbian forces in the Balkan War of 1912, became regent in June, 1914, led the Serbian army in World War I, and became (Dec., 1918) regent of the kingdom of the Serbs, Croats, and Slovenes (later Yugoslavia). In 1922 he married Princess Marie of Rumania. After his accession increasing disorder arose from the Croatian autonomy movement. After the assassination (1928) of Stepan RADČIĆ, the Croat Peasant party leader, Alexander in 1929 dismissed the parliament, abolished the constitution and the parties, and became absolute ruler. To emphasize

the unity he hoped to give the country he changed (Oct., 1929) its official name to Yugoslavia. Although he announced the end of the dictatorship in 1931 and proclaimed a new constitution, he kept power in his own hands. His authoritarian and centralizing policy brought him the hatred of the separatist minorities, particularly the Croats and Macedonians, as well as the opposition of Serbian liberals. In foreign policy he was loyal to the French alliance and to the LITTLE ENTENTE. In 1934 he debarked at Marseilles on a state visit to France. A member of a Croatian terrorist organization fired on his car, killing the king and fatally wounding the French foreign minister, Louis Barthou. Alexander was succeeded by his young son, Peter II. See Stephen Graham, *Alexander of Yugoslavia* (1939, repr. 1972).

Alexander (Alexander of Battenberg), 1857-93, prince of Bulgaria (1879-86), second son of Prince Alexander of Hesse-Darmstadt and nephew of Alexander II of Russia. He served in the Russian army against the Turks (1877-78) and, backed by the Russian czar, was elected hereditary prince of Bulgaria under Turkish suzerainty. In 1885 the revolutionaries in Eastern RUMELIA, also known as Southern Bulgaria, proclaimed the union of that province with Bulgaria. Alexander accepted the union, thus incurring the wrath of the Russian czar and Serbia. The latter declared war. Alexander was victorious and by an agreement with Turkey became governor of Eastern Rumelia, but he was forced to abdicate by a group of officers. He became an Austrian officer, and Ferdinand was elected to succeed him as prince. See biography by E. C. Corti (1920, tr. 1955).

Alexander (Alexander Karadjordjević) (kāřājōr'jāvīch), 1806-85, prince of Serbia (1842-58), son of KARAGEORGE (Karadjordje). He was elected to succeed the deposed MICHAEL of Serbia. Weak and vacillating, he did not send troops to aid the Slavic minorities in Hungary during the revolution of 1848-49. He later submitted to Turkish and Austrian pressure in withholding his support from Russia in the Crimean War of 1854-56. Discontent with his ineffective government finally led his subjects to depose him and to recall MILOŠ as king. In 1868, Alexander was condemned to death in absentia by a Serbian court for his alleged part in the assassination of Michael, who had succeeded Miloš. Alexander was the father of Peter I of Yugoslavia.

Alexander, in the Bible. 1 Kinsman of Annas. Acts 4:6. 2 Son of Simon of Cyrene, probably a Christian. Mark 15:21. 3 Heretic condemned by Paul. 1 Tim. 1:20. 4 Copper-smith who did Paul harm. 2 Tim. 4:14. 5 Jew who tried to speak during a riot at Ephesus. Acts 19:33. The last three may be the same man. The Alexanders in the books of the Maccabees are Alexander the Great and ALEXANDER BALAS.

Alexander, Grover Cleveland, 1887-1950, American baseball player, b. St. Paul, Nebr. One of the great right-hand pitchers of the National League, Alexander pitched 696 games, won 373 of them, and compiled a 642 winner percentage. He played for the Philadelphia Phillies (1911-17) and again in 1930, the Chicago Cubs (1918-26), and the St. Louis Cardinals (1926-29). Alexander was elected to the National Baseball Hall of Fame in 1938.

Alexander, Harold Rupert Leofric George, 1st Earl Alexander of Tunis, 1891-1969, British field marshal. His long military career began with service in World War I, followed by a period (1934-38) in the North-West Frontier Province, India. In World War II he directed the retreats at Dunkirk (1940) and in Burma (1942). Then, appointed (Aug., 1942) head of the Middle Eastern Command (see NORTH AFRICA, CAMPAIGNS IN), he directed the conquest of Sicily (1943) and the bitter fighting in Italy. In 1944, Alexander was made field marshal and Allied commander in chief in the Mediterranean. In 1946 he was appointed governor general of Canada (holding the post until 1952) and was created viscount. He became minister of defense under Sir Winston Churchill and was raised (1952) to the rank of earl. See his *Alexander Memoirs 1940-1945* (1962), biography by Nigel Nicholson (1973), study by W. G. F. Jackson (1972).

Alexander, Samuel, 1859-1938, British philosopher, b. Australia. From 1893 to 1924 he was professor of philosophy at Victoria Univ., Manchester. Strongly influenced by the theory of evolution, Alexander conceived of the world as a single cosmic process in which higher forms of being emerge periodically. The basic principle of this process is space-time, and the result is God. His works include *Space, Time, and Duty* (1920), *Spinoza and Time* (1921), *Art and the Material* (1925), and *Beauty and Other Forms of Value* (1933). See studies by J. W. McCarthy

(1948), A. P. Stiernotte (1954), and S. R. Dasgupta (1965).

Alexander, Sir William, d. 1640. See STIRLING. WILLIAM ALEXANDER, EARL OF.

Alexander, William, known as *Lord Stirling*, 1726-83, American Revolutionary general, b. New York City. Although the House of Lords rejected his claim to succeed as the 6th earl of Stirling, in America he was generally considered a nobleman. He served in the French and Indian Wars and joined the Continental Army early in the Revolution. Although he fought well at the battle of Long Island (1776), he was captured by the British. After being freed in a prisoner exchange, he saw action at Trenton, Brandywine, Germantown, and Monmouth. In 1778 he helped to expose the CONWAY CABAL. See A. C. Valentine, *Lord Stirling* (1969).

Alexander, in Greek mythology. See PARIS.

Alexander Archipelago (arkipēl'agō), island group off SE Alaska. The islands are the exposed tops of the submerged coastal mountains that rise steeply from the Pacific Ocean. Deep, fjordlike channels separate the islands and cut them off from the mainland; the northern part of the Inside Passage threads its way among the islands. The largest islands are Chichagof, Admiralty, Baranof, Wrangell, Revillagigedo, Kupreanof, Mitkof, and PRINCE OF WALES. All the islands are rugged, densely forested, and have an abundance of wildlife. The Tlingit Indians are native to the area. Ketchikan (1970 pop. 6,994) on Revillagigedo island, Sitka (1970 pop. 3,310) on Baranof island, and Wrangell (1970 pop. 2,029) on Wrangell island are the largest towns. Lumbering, trapping, fishing, and canning are the main industries. The archipelago was discovered by the Russians in 1741 and was later explored by Britain, Spain, and the United States.

Alexander Balas (bālās), d. 145 B.C., ruler of Syria, putative son of Antiochus IV. He seized power from his uncle Demetrius I (c. 152 B.C.), Jonathan the Maccabee supported him. He died in battle against Ptolemy Philometor 1 Mac. 10-11.

Alexander Bay, town, Cape Prov., NW South Africa, where the Orange River enters the Atlantic Ocean, site of some of the world's richest alluvial diamond deposits.

Alexander City, city (1970 pop. 12,358), Tallapoosa co., E central Ala., in a piedmont farm area, inc. 1874. Nearby Martin Dam supplies power for the city's textile mills, foundries, and mobile home manufactures; the dam also has created Lake Martin, a superb recreational area. A junior college is in Alexander City, and nearby is Horseshoe Bend National Military Park (see NATIONAL PARKS AND MONUMENTS, table), site of a fierce battle (1814) between Andrew Jackson and the Creek Indians.

Alexander John I, prince of Rumania. See CUZA, ALEXANDER JOHN.

Alexander Karadjordjević: see ALEXANDER, prince of Serbia, ALEXANDER, king of Yugoslavia.

Alexander Karageorgevich: see ALEXANDER, prince of Serbia, ALEXANDER, king of Yugoslavia.

Alexander Nevsky (nēv'skē) [Rus., = of the Neva], 1220-1263, Russian hero, grand duke of Vladimir-Suzdal. As prince of Novgorod (1236-52) he earned his surname by his victory (1240) over the Swedes on the Neva River. He successfully defended N. Russia against its western neighbors by defeating the Livonian Knights (1242) and the Lithuanians (1245). After the Tatar invasion of Russia Alexander submitted to Tatar rule and was appointed (1252) grand duke by the khan. His submissive attitude toward the Tatars and his suppression of the anti-Tatar movements in Novgorod and other cities provoked much resentment among the local princes and the common people. However, he saved the principality from ruin by his cooperation with the invaders. Russian popular tradition made him a national hero, and he was canonized by the Russian Orthodox Church. The order of Alexander Nevsky was instituted (1725) by Catherine I of Russia. Although abolished in 1917, it was revived by the Soviet government in 1942.

Alexander of Aphrodisias (āfrōdīsh'ēās), fl. A.D. 200, Greek Peripatetic philosopher. A celebrated ancient commentator on Aristotle, he was often called the Exegete. During the Renaissance, his interpretations of Aristotle were used to counter those of the church. Two original treatises are extant.

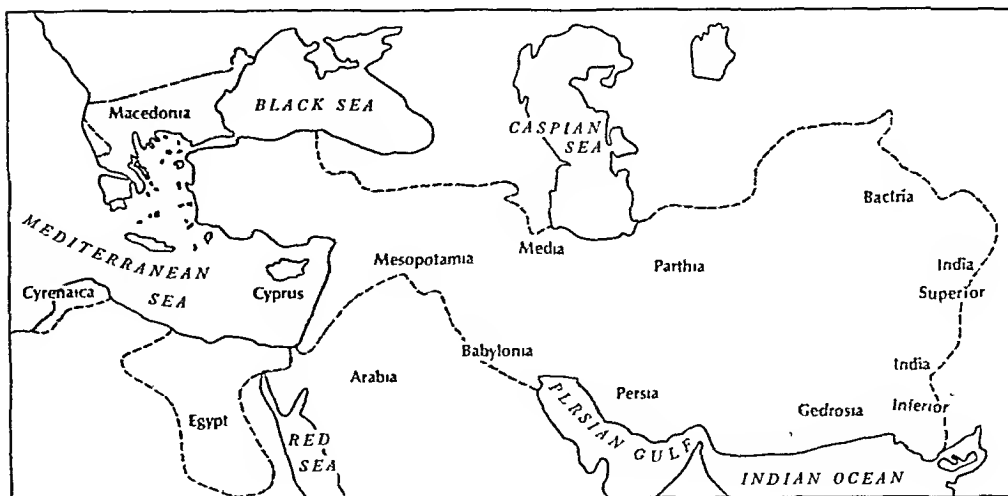
Alexander of Hales, d. 1245, English scholastic philosopher, called the Unanswerable Doctor by his fellow scholastics. He was a Franciscan and a lecturer at the Univ. of Paris. His *Summa universae theologiae* was the first systematic exposition of

Christian doctrine to introduce Aristotle as a prime authority. His eclectic work also contains elements of Neoplatonism and Augustinian and Arabic ideas. Alexander held that all created things, spiritual as well as corporeal, are made up of matter and form. This teaching became the central feature of Franciscan scholasticism and an important influence on St. Thomas Aquinas.

Alexander of Pherae (fēr'ē), d. 358 B.C., tyrant of the city of Pherae in Thessaly after 369 B.C. He was opposed by other Thessalian cities and by the Thebans. PELOPIDAS failed (368 B.C.) in one expedition against him and was briefly imprisoned. Returning in 364 B.C., Pelopidas destroyed Alexander's power in the battle of Cynoscephalae, though he himself was killed. Alexander was murdered by members of his own family.

Alexander Severus (Marcus Aurelius Alexander Severus) (sivēr'as), d. 235, Roman emperor (222–35), b. Syria. His name was changed (221) from Alexius Bassianus when he was adopted as the successor to HELIOGABALUS. He possessed a virtuous and studious character, and during his reign Christians enjoyed a brief immunity from the persecutions of his century. Although he won a triumph in a campaign (232) against Ardashir I of Persia, he could not maintain discipline among his own troops and had to retire from battle. In a mutiny on the Rhine, he and his mother, Julia Mamaea, were murdered by the supporters of MAXIMIN (d. 238).

Alexander the Great or Alexander III, 356–323 B.C., king of Macedon, conqueror of much of Asia, one of the greatest leaders of all time. The son of PHILIP II of Macedon and OLYMPIAS, he had Aristotle as his tutor and was given the education of a model prince. Alexander had no part in the murder of his father, although he may have resented him because he neglected Olympias for another wife. He succeeded to the throne in 336 B.C. and immediately showed his brilliance by quieting the restive cities of Greece, then putting down uprisings in Thrace and Illyria. Thebes revolted on a false rumor that Alexander was dead. The young king rushed south and sacked the city, sparing only the temples and Pindar's house. Greece and the Balkan Peninsula secured, he then crossed (334) the Hellespont (now the Dardanelles) and, as head of an allied Greek army, undertook the war on Persia that his father had been planning. The march he had begun was to be one of the greatest in history. At the Granicus River (near the Hellespont) he met and defeated a Persian force and moved on to take Miletus and Halicarnassus. None could stand up against his military skill. For the first time in history Persia faced a united Greece, and Alexander saw himself as the spreader of Pan-Hellenic ideals. Having taken most of Asia Minor, he entered (333) N. Syria and there in the battle of Issus met and routed the hosts of DARIUS III of Persia, who fled before him. Alexander, triumphant, now envisioned conquest of the whole of the Persian Empire. It took him nearly a year to reduce Tyre and Gaza, and in 332, in full command of Syria, he entered Egypt. There he met no resistance. When he went to the oasis of Ammon he was acknowledged as the son of Ammon-Ra, and this may have contributed to a conviction of his own divinity. In the winter he founded Alexandria, perhaps the greatest monument to his name, and in the spring of 331 he returned to Syria, then went to Mesopotamia where he met Darius again in the battle of Gaugamela. The battle was hard, but Alexander was victorious. He marched S. to Babylon, then went to Susa and on to Persepolis, where he burned the palaces of the Persians and looted the city. He was now the visible ruler of the Persian Empire, pursuing the fugitive Darius to Ecbatana, which he submitted in 330, and on to Bactria. There the satrap Bessus, a cousin of Darius, had the Persian king murdered and declared himself king. Alexander went on through Bactria and captured and executed Bessus. He was now in the regions beyond the Oxus River (the present-day Amu Darya), and his men were beginning to show dissatisfaction. In 330 a conspiracy against Alexander was said to implicate the son of one of his generals, PARMENION, Alexander not only executed the son but also put the innocent Parmenion to death. This act and other instances of his harshness further alienated the soldiers, who disliked Alexander's assuming Persian dress and the manners of an Oriental despot. Nevertheless Alexander conquered all of Bactria and Sogdiana after hard fighting and then went on from what is today Afghanistan into N. India. Some of the princes there received him favorably, but at the Hydaspes (the present-day Jhelum River) he met and defeated an army under Porus. He overran the Pun-



*Empire of Alexander the Great
(including dependencies)*

jab, but there his men would go no farther. He had built a fleet, and after going down the Indus to its delta, he sent Nearchus with the fleet to take it across the unknown route to the head of the Persian Gulf, a daring undertaking. He himself led his men through the desert regions of modern Baluchistan, S. Afghanistan, and S. Iran. The march, accomplished with great suffering, finally ended at Susa in 324. There he found that many of the officials he had chosen to govern the conquered lands had indulged in corruption and misrule. Meanwhile certain antagonisms had developed against Alexander, in Greece, for instance, many decried his execution of Aristotle's nephew, the historian CALLISTHENES, and the Greek cities resented his request that they treat him as a god. Alexander's Macedonian officers balked at his attempt to force them to intermarry with the Persians (he had himself married ROXANA, a Bactrian princess, as one of his several wives), and he resisted his Orientalizing ways and his vision of the equality of peoples. There was a mutiny, but it was put down. In 323, Alexander was planning a voyage by sea around Arabia when he caught a fever and died at 33. Whether or not he had plans for a world empire cannot be determined. He had accomplished greater conquests than any before him, but he did not have time to mold the government of the lands he had taken, and after his death his generals fell to quarreling about dividing the rule (see DIADOCHI). His only son was Alexander Aegus, born to Roxana after Alexander's death and destined for a short and pitiful life. Incontestably, Alexander was one of the greatest generals of all time and one of the most powerful personalities of antiquity. He influenced the spread of Hellenism and instigated profound changes in the history of the world. There are many legends about him, e.g., his feats on his horse Bucephalus and his cutting of the Gordian knot. The famous Greek sculptor Lysippus did several studies of Alexander. Arrian and Plutarch wrote biographies of him in ancient times, and the literature of the Middle Ages romanticized his life. See modern biographies by J. W. Snyder (1966), Peter Bamm (1968), R. D. Milns (1969), Peter Green (1970), C. B. Welles (1970), and R. L. Fox (1974).

Alexandra, 1844–1925, queen consort of Edward VII of Great Britain, whom she married in 1863. She was the daughter of Christian IX of Denmark.

Alexandra, Mount, E. Africa. See RUWENZORI, mts.

Alexandra Feodorovna (fēō'dorōv'nā, Rus. fyō'dorōv'nā), 1872–1918, last Russian czarina, consort of NICHOLAS II, she was a Hessian princess and a granddaughter of Queen Victoria. Neurotic and superstitious, she was easily dominated by RASPUTIN, who seemingly was able to check the hemophilia of her son. During World War I, when Nicholas took command (Sept. 1915) of the forces at the front, Alexandra Feodorovna assumed control in St. Petersburg and prevailed upon her weak husband to replace independent and liberal ministers with those favored by Rasputin. Her great unpopularity was increased by widespread suspicions that she was pro-German. With her husband and children, she was shot by the Bolsheviks.

Alexandrescu, Grigore (grēgō'rē əlēksandrē'skōō), 1812–85, Rumanian poet. Of a noble family, he was active in secret revolutionary societies. In his fables he commented ironically on the complications of living in a Russian protectorate and tried to encourage pride in the national heritage. In *The Tombs at*

Drăgășani he recalls the greatness of the Rumanian past.

Alexandretta, Turkey. See ISKENDERUN.

Alexandretta, sanjak of (san'jāk', āl'igzāndrēt'a), former name of Hatay prov. (1970 pop. 596,201), 2,141 sq. mi. (5,545 sq. km), S. Turkey, including the cities of Antioch (now Antakya) and Alexandretta (now Iskenderun). The population includes many Christians. The sanjak of Alexandretta was awarded to Syria in 1920 and in 1936 became the subject of a complaint to the League of Nations by Turkey, which claimed that the privileges of the Turkish minority in the sanjak were being infringed. The sanjak was given autonomous status in 1937 by an agreement, arranged by the League, between France (then mandatory power in Syria) and Turkey. Rioting by Turks and Arabs resulted (1938) in the establishment of joint French and Turkish military control. In 1939, France transferred the sanjak to Turkey.

Alexandria, Arabic *Al Iskandariyah*, city (1970 est. pop. 2,000,000), N. Egypt, on the Mediterranean Sea. It is at the western extremity of the Nile River delta, situated on a narrow isthmus between the sea and Lake Maryut. The city is Egypt's leading port, a commercial and transportation center, and the heart of a major industrial area where refined petroleum, asphalt, cotton textiles, processed food, paper, and plastics are produced. In addition, motor vehicles are assembled and fish are caught. Alexandria, founded in 332 B.C. by Alexander the Great, was (304–30 B.C.) the capital of the Ptolemies. The city took over the trade of TYRE (sacked by Alexander the Great), outgrew CARTHAGE by c. 250 B.C., and became the largest city in the Mediterranean basin. It was the greatest center of Hellenistic and Jewish culture. The SEPTUAGINT, a translation by Jews of the Old Testament into Greek, was prepared there. Alexandria had two celebrated royal libraries, one kept in a temple of Zeus and the other in a museum. The collections at their maximum were said to contain, counting duplicates, c. 700,000 rolls. A great university grew around the museum and attracted many scholars, including ARISTARCHUS OF SAMOTHRACE, the collator of the Homeric texts, EUCLID, the mathematician, and HEROPHILUS, the anatomist, who founded a medical school there. Julius CAESAR temporarily occupied (47 B.C.) the city while in pursuit of Pompey, and Octavian (later Augustus) entered it (30 B.C.) after the suicide of Antony and Cleopatra. Alexandria formally became part of the Roman Empire in 30 B.C. It was the greatest of the Roman provincial capitals, with a population of about 300,000 free persons and numerous slaves. In the later centuries of Roman rule and under the Byzantine Empire, Alexandria was a center of Christian learning that rivaled Rome and Constantinople. It was (and remains today) the seat of a patriarch of the Eastern Orthodox Church. The libraries, however, were gradually destroyed from the time of Caesar's invasion, and suffered especially in A.D. 391, when THEODOSIUS I had pagan temples and other structures razed. When the Muslim Arabs took Alexandria in 642, its prosperity had fallen severely, largely because of a decline in shipping, but the city still had about 300,000 inhabitants. The Arabs moved the capital of Egypt to Cairo in 969 and Alexandria's decline continued, becoming especially rapid in the 14th cent., when the canal to the Nile silted up. During his Egyptian campaign, NAPOLEON I took the city in 1798, but it fell to the British in 1801. At that time

Alexandria's population was only about 4,000. The city gradually regained importance after 1819, when the Mahmudiya Canal to the Nile was completed by MUHAMMAD ALI, who developed Alexandria as a deepwater port and a naval station. During the 19th cent. many foreigners settled in Alexandria, and in 1907 they made up about 25% of the population. In 1882, during an anticolonial uprising in Egypt spearheaded by Arabi Pasha, a liberal nationalist, there were anticolonial riots in Alexandria, which was subsequently bombed by the British. During World War II Alexandria, the chief Allied naval base in the E Mediterranean, was bombed by the Germans. In 1944 at a meeting in Alexandria, plans for the ARAB LEAGUE (founded 1945) were drawn up. The city's foreign population declined during the 20th cent., particularly after the 1952 revolution. The Univ. of Alexandria, the Institute of Alexandria, an affiliate of Al Azhar Univ. in Cairo, a college of nursing, and medical and textile research centers are in the city, which is also the Middle East headquarters of the World Health Organization (WHO). Much of ancient Alexandria is covered by modern buildings or is under water, only a few landmarks are readily accessible, including ruins of the emporium and the Serapeum and a granite shaft (88 ft/27 m high) called Pompey's Pillar. Nothing remains of the lighthouse on the PHAROS (3d cent. B.C.), which was one of the SEVEN WONDERS OF THE WORLD. The Greco-Roman Museum in Alexandria houses a vast collection of Coptic, Roman, and Greek art.

Alexandria. 1 City (1970 pop. 41,557), seat of Rapides parish, central La., on the Red River, inc. 1818. It is a trade, rail, and medical center for a rich agricultural and timber area. Among its many manufactures are valves, lumber, paper, and soaps and cleansers. During the Civil War the city was burned (May, 1864) to the ground by Federal troops. Alexandria is the headquarters for Kisatchie National Forest and the seat of a branch of Louisiana State Univ. Louisiana College is in its neighboring twin city of Pineville. Also in the immediate area are a veterans' hospital, a state mental hospital, and a national cemetery. Several nearby lakes, recreation areas, state parks, and a hot mineral springs resort attract tourists. 2 City (1970 pop. 6,973), seat of Douglas co., W. Minn., in a rich farm and timber region surrounded by over 200 lakes, inc. 1877. Its economy is based upon tourism, agriculture, and light manufacturing. The KENSINGTON RUNE STONE is on exhibition at a museum there. Also of interest is a walk-in prehistoric Indian mound. A state park is to the north. 3 City (1970 pop. 110,938), independent and in no county, N. Va., a port of entry on the Potomac, patented 1657, permanently settled 1730s, inc. 1779. Primarily a residential suburb of Washington, D.C., it also has extensive railroad yards and repair shops, a sizeable deepwater port, and a great variety of manufactures, including fertilizers, chemicals, and farm equipment. A number of U.S. government buildings and scientific and engineering research firms are there. George Washington helped lay out the streets in 1749. The city was part of the District of Columbia from 1789 to 1847. In May, 1861, it was occupied by Federal troops and was cut off from the rest of the South throughout the Civil War. Its many historic buildings include Gadsby's Tavern (1752), frequented by Washington, Carlyle House (1752), General Braddock's headquarters in the French and Indian War, where Washington received his commission as major, Christ Church (1767-73), where Washington, and later Robert E. Lee, worshiped, and Ramsey House (1749-51). A famous landmark, the George Washington Masonic National Memorial Temple (1923-32), modeled after the ancient lighthouse at Alexandria, Egypt, houses Washington mementos. The Alexandria Gazette, believed to be the nation's oldest daily newspaper, was first printed in 1784. Nearby are MOUNT VERNON, Woodlawn, one of the Washington family estates (made a national shrine in 1949), an Episcopal seminary (1823), and U.S. Fort Belvoir, the U.S. Army Engineer Center, with an engineer school and research and development laboratories.

Alexandria Troas (trō'ās), ancient Greek seaport city, Mysia, NW Asia Minor, called Troas in the Bible. It was important under the Greeks and Romans (Acts 16 B, 11, 20 5, 6, 2 Cor. 2:12, 2 Tim. 4:13).

alexandrine, in prosody, a line of 12 syllables (or 13 if the last syllable is unstressed). Its name probably derives from the fact that some poems of the 12th and 13th cent. about Alexander the Great were written in this meter. In French, rhyming couplets of two alexandrines of equal length, usually containing four accents, have been the classic poetic form since the time of Ronsard, e.g., in the dramas of

Racine and Corneille. In English an iambic HEXAMETER line is often called an alexandrine. The most notable example is found in the Spenserian stanza, which contains eight iambic PENTAMETERS and an alexandrine rhyming with the last pentameter. Pope's "Essay on Criticism" contains what is probably the most quoted alexandrine in literature.

A needless alexandrine ends the song
that like a wounded snake, drags its slow length
along.

Alexandroupolis (alēksandroō'pōlē), city (1971 pop. 22,995), capital of Evros prefecture, NE Greece, W Thrace, a seaport on the Gulf of Ainos, an inlet of the Aegean Sea. It is near the Turkish frontier. Alexandroupolis is a commercial center with rail connections to Thessaloniki and Edirne, wheat, cotton, rice, tobacco, salt, and dairy products are traded. Originally called Dedeagach, it developed from a small fishing village after 1871. It supplanted the older port of Enos upon the completion (1896) of the Thessaloniki-Istanbul RR. The city suffered greatly at the hands of the Bulgarians in both World Wars. It was ceded to Greece in 1919, and it was renamed for King Alexander of Greece.

Alexis (alēk'sīs) (Aleksey Mikhailovich) (aly'kyä' mēkhī'lavich), 1629-76, czar of Russia (1645-76), son and successor of Michael. His reign, marked by numerous popular outbreaks, was crucial for the later development of Russia. A new code of laws was promulgated in 1648 and remained in effect until the early 19th cent.; it favored the middle classes and the landowners, but tied the peasants to the soil. The reforms of Patriarch NIKON resulted in a dangerous schism in the Russian Church, and Nikon's deposition (1666) was a prelude to the abolition of the Moscow patriarchate in 1721. In 1654 the Cossacks of Ukraine, led in revolt against Poland by Bohdan CHMIELNICKI, voted for the union of Ukraine with Russia. War with Poland ensued and ended in 1667 with Russia retaining most of Ukraine. A serious revolt against the czar (1670) among the Don Cossacks under Stenka RAZIN was quelled by 1671. Alexis was succeeded by his son Feodor III. A younger son, by a second marriage, became Peter I (Peter the Great).

Alexis (Aleksey Petrovich) (aly'kyä' pētrō'vich), 1690-1718, Russian czar, son of PETER I (Peter the Great) by his first wife, and father of PETER II. Opposing his father's anticlerical policy, Alexis renounced his right of succession and fled (1716) to Vienna. Peter, who feared that Alexis might win foreign backing, enticed him to return, he then had him arrested and tried for treason. Sentenced to death, Alexis died from the effects of torture shortly before his scheduled execution.

Alexius I (Alexius Comnenus) (alēk'sēas, kām'nē-nas), 1048-1118, Byzantine emperor (1081-1118). Under the successors of his uncle, ISAAC I, the empire had fallen prey to anarchy and foreign invasions. In 1081, Alexius, who had become popular as a general, overthrew Nicephorus III and was proclaimed emperor. The most immediate danger besetting the empire was the Norman invasions (1081-85) under ROBERT GUISCARD and his son, BOHEMOND I. Alexius obtained Venetian help at the price of valuable commercial privileges. This and a truce with the Seljuk Turks enabled him to defend the Balkan Peninsula until the death of Robert Guiscard, when the Normans temporarily withdrew (1085). Next, Alexius secured the alliance of the CUMANS and with their help defeated (1091) the PECHENEGS, who had besieged Constantinople. He then repulsed the Cumans, who had turned against him, regained territory from the Turks, and suppressed insurrections in Crete and Cyprus. At the same time as Alexius was seeking aid from the West against the Turks, the First Crusade (see CRUSADES) was declared. Faced with the presence of an army of unruly and pillaging Crusaders near his capital, Alexius sought both to rid himself of the Crusaders and to employ them for his own purposes. He furnished them with money, supplies, and transportation to Asia Minor after he had persuaded the leaders to swear him fealty and to agree to surrender to him all conquests of former Byzantine territories. In return, he promised to join the Crusaders, who at first complied. Bohemond, however, seized Antioch for himself, and in 1099 Alexius began operations against him. In 1108, Bohemond was forced to acknowledge Alexius as his suzerain. The last years of Alexius' reign were consumed by fresh struggles with the Turks and by the intrigues of his daughter ANNA COMNENA against his son and heir, John II. Alexius' reign restored Byzantine military and naval power and political prestige, but brought onerous taxation, the depreciation

of currency, and the extension of feudalism by grants of estates, draining imperial strength.

Alexius II (Alexius Comnenus), 1168-83, Byzantine emperor (1180-83), son and successor of Manuel I. His mother, Mary of Antioch, who was regent for him, alienated the population by favoring the Latin element in Constantinople. In 1182 Alexius' cousin Andronicus, after instigating a massacre of the Latins, stormed the city, had Alexius sign the death sentence of his mother, and, as Andronicus I, became coemperor. One month later he strangled Alexius and married his widow.

Alexius III (Alexius Angelus) (ān'jēlās), d. after 1210, Byzantine emperor (1195-1203). He acceded to power by deposing and blinding his brother Isaac II. This act served as pretext for the leaders of the Fourth Crusade (see CRUSADES) to attack Constantinople (1203). The Crusaders made Isaac II and his son Alexius IV coemperors, Alexius III having fled. In 1204, Alexius III's son-in-law was briefly emperor as Alexius V. Another son-in-law, Theodore I, became emperor of Nicaea. Alexius died in obscurity.

Alexius IV (Alexius Angelus), d. 1204, Byzantine emperor (1203-4), son of ISAAC II. When his father was deposed, Alexius fled to Italy and then went to Germany. Encouraged by his brother-in-law, Philip of Swabia, he obtained (1202) from the leaders of the Fourth Crusade (see CRUSADES) the promise of help in deposing his uncle, Alexius III. Made joint emperor with Isaac II after the Crusaders entered Constantinople, he was overthrown for his subservience to his allies and was strangled by order of Alexius V.

Alexius V (Alexius Ducas Mourtzouphlos) (dōō'-kās mōōrt'sōōflōs), d. 1204, Byzantine emperor (1204), son-in-law of Alexius III. The head of the Byzantine national party, he overthrew emperors Isaac II and Alexius IV (who had been installed by the Crusaders), thus precipitating the conquest and sack of Constantinople (1204) by the army of the Fourth Crusade (see CRUSADES). He was deposed and executed, and Baldwin I was elected by the Crusaders as Latin emperor of Constantinople.

alfalfa (ālfāl'fā) or **lucern**, perennial leguminous plant (*Medicago sativa*) of the family Leguminosae (PULSE family), the most important pasture and hay plant in North America, also grown extensively in Argentina, S. Europe, and Asia. Probably native to Persia, it was introduced to the United States by Spanish colonists. Of high yield, high protein content, and such prolific growth that it acts as an effective weed control, alfalfa is also valued in crop rotation and for soil improvement because of the nitrogen-fixing bacteria in its nodules. The several varieties of the species grow well in most temperate regions except those with acid soil or poor drainage. The alfalfa belt of the United States centers chiefly in the northern and western parts of the country. Young alfalfa shoots have been used as food for humans and have antiscorbutic properties. Carotene and chlorophyll for commercial use are extracted from the leaves. Alfalfa is also called medic, the name for any plant of the genus *Medicago*—Old World herbs with blue or yellow flowers similar to those of the related clovers. Black medic (*M. lupulina*) and the bur clovers (*M. arabica* and *M. hispida*) are among the annual species naturalized as weeds in North America and sometimes also grown for hay and pasture. Alfalfa is classified in the division MAGNOLIOPHYTES, class Magnoliopsida, order Rosales, family Leguminosae.

alfalfa caterpillar, larva of the alfalfa butterfly, *Colias eurytheme*, a member of the family Pieridae. Found throughout most of Mexico, the United States, and S. Canada, it is sometimes a serious pest of alfalfa, clover, and other legumes in the SE United States. It usually overwinters as a pupa, the orange adult emerging in early spring, when large numbers of these butterflies may be seen fluttering low over alfalfa fields. The female lays several hundred eggs on the undersides of leaves. The larvae are fully grown in 12 to 15 days, there are two generations each season in the northern part of the range and up to seven in the south. Low cutting of infested alfalfa, which exposes the larvae to sun and predators, aids control. The alfalfa caterpillar is classified in the phylum ARTHROPODA, class Insecta, order Lepidoptera, family Pieridae.

Alfarabius—see FARABI, AL-

Al-Farghani (al-fargā'nē) or **Alfraganus** (ālfargā'nēs), d. after 861, Arab astronomer. Al-Farghani was born in Farghana, Transoxania (present-day Pakistan), and died in Egypt. His most important work, written between 833 and 857, is *Elements*, a thorough, readable, nonmathematical summary of Ptolemaic astronomy. The book, which circulated in

several Latin editions, was widely studied in Europe from the 12th to the 17th cent. Two treatises on astrolabes by Al-Farghani also survive.

Alfaro, Flavio Eloy (flā'vyō āloi' ālfā'rō), 1867-1912, president of Ecuador (1897-1901, 1907-11). Regarded as a champion of liberalism, Alfaro introduced legal and economic reforms that largely undid the clerical privileges granted by Gabriel García Moreno. Exiled by the opposition, he returned to lead a revolt but was defeated, imprisoned, and murdered by an angry mob.

Al-Fasi, Isaac ben Jacob ha-Kohen (al-fā'sē), 1013-1103, first prominent Jewish Talmudic scholar, following the Gaonic period, b. near Fez, N. Africa. His *Halachoth*, a codification of the Talmud, is his greatest work; it contains a simplified exposition of complicated Talmudic passages. It has been reprinted many times, and the edition of 1881 is appended to the regular editions of the Talmud. He is also known for his collection of *Responsa*, a great deal of which was written in Arabic and later translated into Hebrew.

Al Fatah see ARAFAT, YASIR, PALESTINE LIBERATION ORGANIZATION

Alfieri, Vittorio, Conte (vēt-tō'rēō kōn'tā ālfyē'rē), 1749-1803, Italian tragic poet. A Piedmontese, born to wealth and social position, he spent his youth in dissipation and adventure. From 1767 to 1772 he traveled over much of Europe but returned to Italy fired by a sense of the greatness of his own country. He saw himself as a prophet called to revive the national spirit of Italy and chose tragic drama as his means. The first of his plays, *Cleopatra*, written in a vigorous, harsh, and individual style, was staged in Turin in 1775. From 1776 to 1786 he wrote 19 tragedies, among them *Philip the Second*, *Saul*, *Antigone*, *Agamemnon*, *Orestes*, *Sophonisba*, and *Maria Stuart*—all in the tradition of French classical tragedy. He also wrote comedies, a bitter satire against France, the *Misogallo*, and a revealing autobiography (1804, tr. by W. D. Howells, 1877). Alfieri's most productive period coincided with the beginning of his love for the countess of Albany, wife of Charles Edward Stuart, the Young Pretender. The rest of his life was spent with her; they may have married secretly after her husband's death. Alfieri's complete works, which figured in the rise of Italian nationalism, were posthumously edited and published (1805-15) by the countess. His tragedies were translated into English in 1815 and 1876. *Della tirannia* appeared as *Of Tyranny* (1961). See biography by G. Megaro (1930, repr. 1971).

Alfiós see ALPHEUS, river, Greece

Alfold (āl'fōld), Hun. Nagy-Alfold [Great Alfold], great central plain of Hungary extending into N. Yugoslavia and W. Rumania. The level region is drained by the Tisza and Danube rivers. Formerly wooded, the Alfold gradually became a steppe region as the Mongol invaders (13th cent.) cut down many trees, exposing the soil to dry winds. Grasslands covered most of the Alfold until the late 19th cent., when extensive irrigation and drainage projects transformed it into fertile farmland, grains, hemp, flax, and livestock are now raised. The Alfold, on a primary invasion route to Europe, has been the scene of many major battles. The Little Alfold (Hun. Kis-Alfold) is located in NW Hungary and extends into S. Czechoslovakia.

Alfonsine tables or Alphonsine tables (ālfōn'sīn), compilation of astronomical data tabulating the positions and movements of the planets, completed c. 1252 and printed in Venice in 1483. They were a revision and improvement of the Ptolemaic tables and were compiled at Toledo, Spain, by about 50 astronomers assembled for the purpose by Alfonso X of Castile.

Alfonso I (Alfonso the Battler) (ālfōn'sō, āl-), d. 1134, king of Aragon and Navarre (1104-34), brother and successor of Peter I. The husband of URRACA, queen of Castile, he fought unsuccessfully to extend his authority over her kingdom. He also fought energetically against the Moors, from whom he captured Zaragosa (1118), Calatayud (1120), and many other towns. His raid (1125) into Andalusia bolstered Christian morale, and he encouraged Christians in Muslim lands to settle in his domain. Alfonso was killed in battle against his stepson, Alfonso VII of Castile, and was succeeded by his brother Ramiro II in Aragon and by Garcia IV in Navarre.

Alfonso II, 1152-96, king of Aragon (1162-96) and, as Raymond Berengar V, count of Barcelona (1162-96), son and successor of Raymond Berengar IV of Barcelona and Petronilla of Aragon. He inherited Provence (1166), which he successfully defended

against the counts of Toulouse, and Roussillon (1172). He conquered (1171) Teruel from the Moors and, after releasing himself from homage to Alfonso VIII of Castile, concluded with him the Treaty of Cazorla (1179), which reserved the reconquest of Valencia for Aragon. He was succeeded in Aragon by his eldest son, Peter II, and in Provence by a younger son.

Alfonso III, 1265-91, king of Aragon and count of Barcelona (1285-91), son and successor of Peter III. He was forced to grant wide privileges to the cortes of the Aragonese nobles. At first he supported the claim to Sicily of his brother James (later JAMES II of Aragon) against CHARLES II of Naples. Later, however, he recognized papal suzerainty over Sicily and pressed James to abandon his claim. He also made war on Castile and on his uncle, JAMES I of Majorca. James II succeeded him.

Alfonso IV, 1299-1336, king of Aragón and count of Barcelona (1327-36), son and successor of James II. Before his accession he conquered (1323-24) SARDINIA, where later a revolt involved him in war with Genoa and Pisa. He was succeeded by his son, Peter IV.

Alfonso V (Alfonso the Magnanimous), 1396-1458, king of Aragón and Sicily (1416-58) and of Naples (1443-58), count of Barcelona. He was the son of Ferdinand I, whom he succeeded in Aragon and Sicily. Queen JOANNA II of Naples sought his aid against LOUIS III, rival king of Naples, and, after Alfonso had defeated (1421) Louis, Joanna adopted Alfonso as her heir. They quarreled in 1423, and when Joanna died (1435), she left her throne to RENÉ of Anjou. Attempting to conquer Naples, Alfonso was captured (1435) by the Genoese, but he was released through the agency of the duke of Milan. In 1442 he defeated René, took Naples, and was recognized (1443) as king by the pope. Leaving his Spanish possessions under the rule of his wife and his brother, Alfonso spent the rest of his life in Naples, where he accorded great privileges to Spanish nobles and tried to introduce Spanish institutions. A patron of arts and letters, he held a splendid court and beautified the city. Alfonso also played a vigorous part in Italian politics. He left Naples to his son Ferdinand I and the rest of his kingdom to his brother John II.

Alfonso I, 1109?-1185, first king of Portugal, son of Henry of Burgundy. After his father's death (1112), his mother, Countess Teresa, ruled the county of Portugal with the help of her Spanish lover, Fernando Perez. In 1128 young Alfonso, who had allied himself with discontented nobles, defeated her in battle and drove her into Leon with Pérez. (Alfonso did not, despite the popular legend, put her in chains at Guimarães.) Beginning as little more than a quasi-independent guerrilla chief, Alfonso spent his life in almost ceaseless fighting against the kings of Leon and Castile and against the Moors to increase his prestige and his territories. In 1139 he defeated the Moors in the battle of Ourique (fought not at Ourique, but at some undetermined place). In 1147 he took Santarém by surprise attack and, with the help of the English, Flemish, and German crusaders, captured Lisbon. He began to style himself king in 1139, and in 1143, by the Treaty of Zamora, he placed his lands under papal protection and secured Castilian recognition of his title, which was confirmed (1179) by Pope Alexander III. Alfonso's son SANCHE I ascended an established throne.

Alfonso II (Alfonso the Fat), 1185-1223, king of Portugal (1211-23), son and successor of Sancho I. His reign was spent in struggles with the church and his brothers and sisters, to whom his father had left many of his estates. Alfonso's measures against the church holdings and the bishops led to his excommunication (1219). Though he was himself unwarlike, Alfonso's army took part in the major victory over the Moors at Las Navas de Tolosa (1212) and captured (1217) Alcacer do Sal. He was succeeded by his son Sancho II (reigned 1223-48).

Alfonso III, 1210-79, king of Portugal (1248-79), son of Alfonso II, brother and successor of Sancho II. By his marriage with Matilda, countess of Boulogne, he became count of Boulogne and thus was known as *Alfonso o Bolonhez* [Alfonso of Boulogne]. He seized power after the deposition (1245) of his brother by the pope, becoming king on Sancho's death. Alfonso completed the reconquest of Portugal from the Moors by taking (1249) the rest of the Algarve. This involved him in a long quarrel with Alfonso X of Castile, who had been receiving revenues from Algarve, but the two kings reached an agreement by which Alfonso III married the illegitimate daughter of Alfonso X, and Alfonso X was to relinquish all rights to the Algarve when the heir

born of this union (the later King Diniz) should reach the age of seven. Alfonso's second marriage brought the Portuguese king into disfavor with the church because Matilda was still living, but her death ended the conflict. Despite promises he had made at the time of Sancho's deposition, Alfonso seized lands and revenues from the church. This caused another break with the church, which healed shortly before his death. Alfonso called the Cortes of Leiria (1254), the first Portuguese Cortes to include commoners. He also instituted administrative and financial reforms, encouraged commerce and the development of the towns, and commuted many feudal dues into money payments. French and Provençal culture was imported to the court, and the period was one of great intellectual activity. Alfonso was succeeded by Diniz.

Alfonso IV, 1291-1357, king of Portugal (1325-57), son and successor of DINIZ. Disgruntled by the favoritism his father showed toward Alfonso's illegitimate half brothers, Alfonso rose in revolt in 1320. Although peace was arranged twice by his mother, St. Elizabeth (or St. Isabel) of Portugal, he was estranged from Diniz most of the five years before his father's death. He was involved (1337-40) in a fruitless war with Alfonso XI of Castile before joining him in a campaign against the Moors that culminated in the notable victory of Tarifa (Oct., 1340). Alfonso is, however, best remembered for countenancing the murder (1355) of his son's mistress (or wife), Ines de CASTRO, one of the most romantic figures in Portuguese history. His son (later PETER I) promptly led a rebellion, but peace between father and son was restored before Alfonso's death.

Alfonso V, 1432-81, king of Portugal (1438-81), son of Duarte and Queen Leonor. During his minority there was a struggle for the regency between the queen mother and Alfonso's uncle, Dom Pedro, duke of Coimbra. The duke was triumphant (1440) and retained power after Alfonso was declared of age (1446) until the young king fell under the influence of Dom Pedro's illegitimate half brother, Alfonso, duke of BRAGANZA. The dismissal (1448) of Dom Pedro led to a civil war, in which the king's troops killed (1449) his uncle at Alfarrobeira. Alfonso undertook ventures in Morocco and by capturing Alcacer-Seguer (1458) and Tangier (1471) won the name Alfonso the African. Less rewarding was his long attempt to win the throne of Castile after his marriage—never sanctioned by the church—in 1475 to JUANA LA BELTRANEJA, officially the daughter and heiress of Henry IV of Castile, although generally thought to be the child of Beltrán de la Cueva. This claim brought Alfonso into war with ISABELLA I of Castile and her husband, FERDINAND II of Aragon. Alfonso, badly beaten in the battle of Toro (1476), capitulated in 1479. During his reign Prince HENRY THE NAVIGATOR was active. Alfonso was succeeded by his son, John II, who was the effective ruler of Portugal after 1476.

Alfonso VI, 1643-83, king of Portugal (1656-83), son and successor of John IV. Slightly paralyzed and mentally defective, he distinguished himself under the regency of his mother, Queen Luisa, by associating with a group of rowdy youths. After their ring-leader was dismissed from court, Alfonso, directed by the count of Castelo Melhor, ousted his mother in 1662. The count of Castelo Melhor then took over the government and ruled ably. Under his direction the army won the series of victories over Spain (1663-65) that finally secured Spanish recognition of Portuguese independence (1668). After Alfonso's marriage (1666) to Marie Françoise of Savoy, daughter of the duc de Nemours, the young queen took a hand in government. She and the king's younger brother (later PETER II) fell in love, and in 1667 they forced Castelo Melhor from power and made Alfonso sign over the government to Peter, who became prince regent. A quick annulment of her marriage to Alfonso enabled Marie Françoise to wed the new regent. Alfonso was confined in the Azores until 1674 and at Sintra thereafter.

Alfonso I (Alfonso the Catholic), 693?-757, Spanish king of Asturias (739-57). He was the son-in-law of the first Asturian king, PELAYO. A Berber rebellion (740-41) against the Moors enabled him to conquer parts of Galicia, Leon, and Santander.

Alfonso II (Alfonso the Chaste), 759-842, Spanish king of Asturias (791-842), grandson of Alfonso I. He established his capital at Oviedo, which his father, Fruela I, had founded. Continuing the struggle against the Moors, he sought the support of the Frankish emperors Charlemagne and Louis I. Alfonso II built the first church on the site of SANTIAGO DE COMPOSTELA.

Alfonso III (Alfonso the Great), 838?-911?, Spanish king of Asturias (866-911?). He recovered the territory of León from the Moors. The kingdom was consolidated in his reign, but after his forced abdication, it was divided among his sons.

Alfonso V (Alfonso the Noble), 994?-1027, Spanish king of León (999-1027). While he was still a minor, the Moorish ruler al-Mansur died, and the Spanish court recovered the city of León. Alfonso gave (1020) León its *fuero* [charter]. He was killed in the siege of Viseu.

Alfonso VI, 1030-1109, Spanish king of León (1065-1109) and Castile (1072-1109). He inherited León from his father, Ferdinand I. Defeated by his brother SANCHE II of Castile, he fled to the Moorish court of Toledo. After Sancho's assassination (1072) Alfonso succeeded to the throne of Castile and took Galicia from his brother Garcia (1073). He thus became the most powerful Christian ruler in Spain. He encouraged Christians in Muslim lands to migrate north, and he raided Muslim territory, penetrating as far south as Tanja. After the conquest of strategic Toledo (1085), he took many other cities and reached the line of the Tagus River. Alarmed by his advance, Abbad III (see ABBADIDS) and his Muslim allies called to their aid the Almoravid YUSUF IBN TASHFIN, who defeated Alfonso in 1086. Alfonso was defeated again in 1108, and his only son died in the battle. Alfonso's reign gave a great crusading impulse to the reconquest of Spain and was also notable for the exploits of the Cid. Alfonso's court at Toledo became the center of cultural relations between Muslim and Christian Spain. French influence was strong because of the king's many French followers, French monks introduced the Cluniac reform into León during his reign. Alfonso was succeeded by his daughter URRACA.

Alfonso VII (Alfonso the Emperor), 1104-57, Spanish king of Castile and León (1126-57), son and successor of URRACA. He recovered the places in Castile that his stepfather, Alfonso I of Aragon, had occupied and soon gained supremacy over the other Christian states in Spain. In 1135 he had himself crowned emperor in León. His many victories over the Moors had no permanent results, his most famous conquests, Córdoba (1146) and Almería (1147), were soon lost again. Alfonso left Castile to his son Sancho III (reigned 1157-58) and León to his son Ferdinand II.

Alfonso VIII (Alfonso the Noble), 1155-1214, Spanish king of Castile (1158-1214), son and successor of Sancho III. Chaos prevailed during his minority, but he quickly restored order after assuming (1166) the government. Alfonso took (1177) Cuenca from the Moors, but later (1195) he was seriously defeated by them at Alarcos. León and Navarre then invaded Castile, but Alfonso forced them to make peace, annexing Álava and Guipuzcoa from Navarre. Allied with his former Christian enemies, he led them to the great victory over the Almohads at Las Navas de Tolosa (1212). Alfonso was married to Eleanor, daughter of Henry II of England. Their children included Henry, who succeeded his father as Henry I, Blanche, who married Louis VIII of France, and Berenguela, who married Alfonso IX of León and whose son Ferdinand III united Castile and León.

Alfonso IX, 1171-1230, Spanish king of León (1188-1230), son and successor of Ferdinand II. He conquered from the Moors several cities in Estremadura and was frequently at war with Alfonso VIII of Castile. His marriages with Teresa of Portugal and Berenguela of Castile were both annulled by the pope. He defeated (1230) the Moors at Mérida. His son by Berenguela, Ferdinand III, reunited (1230) León and Castile.

Alfonso X (Alfonso the Wise), 1221-84, Spanish king of Castile and León (1252-84), son and successor of Ferdinand III, whose conquests of the Moors he continued, notably by taking Cadiz (1262). His mother, Beatriz, was a daughter of the German king Philip of Swabia, and Alfonso's principal ambition was to become Holy Roman Emperor. In 1257 he was elected by a faction of German princes as anti-king to Richard, earl of Cornwall, but because of papal opposition and Spanish antagonism, he did not go to Germany, and in 1275 he finally renounced his claim to the imperial throne. In his domestic policy, Alfonso's assertion of royal authority led to a rebellion of the nobles. His Moorish subjects also rose (1264) against him and were subdued only with the help of James I of Aragon. After the death (1275) of his eldest son, Ferdinand, while fighting the Moors, civil war for the succession broke out between Ferdinand's children and Alfonso's second son, who eventually succeeded him as

Sancho IV. Sancho's partisans in the Cortes at Valladolid even declared Alfonso deposed (1282). The king died while the dynastic dispute was still unsettled. Alfonso stimulated the cultural life of his time. Under his patronage the schools of Seville, Murcia, and Salamanca were furthered, and Muslim and Jewish culture flowed into Western Europe. He was largely responsible for the *Siete Partidas*, a compilation of the legal knowledge of his time, for the ALFONSINE TABLES in astronomy, and for other scientific and historical works. See studies by E. E. S. Procter (1951), J. E. Keller (1967), and J. Ribera y Tarrago (1970).

Alfonso XI, 1311-50, Spanish king of Castile and León (1312-50), son and successor of Ferdinand IV. His vigorous campaign against Granada provoked an invasion by the Moors from Morocco, they took Gibraltar in 1333. In 1340, having formed alliances with Portugal, Navarre, and Aragon, Alfonso won the great victory of Tarifa (also called the battle of Salado), and in 1344 he took Algeciras. By the *Ordenamiento de Alcalá*, issued at Alcalá de Henares in 1348, Alfonso enforced the *Siete Partidas* of Alfonso X. He died while besieging Gibraltar and was succeeded by his son, Peter the Cruel.

Alfonso XII, 1857-85, king of Spain (1874-85), son of ISABELLA II. He went into exile with his parents at the time of the revolt of the CARLISTS in 1868 and was educated in Austria and England. In 1870 his mother abdicated her rights in his favor, and in 1874 he was proclaimed king. He entered Madrid in triumph early in 1875 and soon won great popularity. Supported by MARTINEZ DE CAMPOS and CANOVAS DEL CASTILLO, he consolidated the monarchy, suppressed republican agitation, and restored order. His widow, MARIA CRISTINA (1858-1929), was regent during the minority of his posthumous son, Alfonso XIII.

Alfonso XIII, 1886-1941, king of Spain (1886-1931), posthumous son and successor of Alfonso XII. His mother, MARIA CRISTINA (1858-1929), was regent until 1902. In 1906, Alfonso married Princess Victoria Eugenie of Battenberg, granddaughter of Queen Victoria of Great Britain. An attempt was made to kill the couple on their wedding day, the first of several assassination attempts. Although Alfonso enjoyed some personal popularity, the monarchy was threatened by social unrest in the newly industrialized areas, by Catalan agitation for autonomy, by dissatisfaction with the constant fighting in Morocco, and by the rise of socialism and anarchism. In 1909 the government was widely attacked for the execution of the radical publicist FRANCISCO FERRER GUARDIA, following an uprising in Barcelona. After keeping Spain out of World War I, Alfonso, dissatisfied with the functioning of parliamentary government, supported Gen. Miguel PRIMO DE RIVERA in establishing (1923) a military dictatorship. At the fall (1930) of Primo de Rivera, discontent was running high. After the municipal elections of 1931 showed an overwhelming republican majority, Alfonso "suspended the exercise of royal power" and went into exile (April 14, 1931). A few weeks before his death in Rome he renounced his claim to the throne in favor of his third son, Juan (see BOURBON, family).

Alfraganus: see AL-FARGHANI.

Alfred, 849-99, king of Wessex (871-99), sometimes called Alfred the Great, b. Wantage, Berkshire. The youngest son of King Æthelwulf, he was sent in 853 to Rome, where the pope gave him the title of Roman consul. He returned to Rome with his father in 855. His adolescence was marked by ill health and deep religious devotion, both of which persisted for the rest of his life. Little is known of him during the reigns of his older brothers Æthelbald and Æthelbert, but when Æthelred took the throne (865), Alfred became his *secundarius* (vicar?) and aided his brother in subsequent battles against the Danes, who then threatened to overrun all England. When the Danes began their assault on Wessex in 870, Æthelred and Alfred resisted with varying results; they won a victory at Ashdown, Berkshire, they were defeated at Basing, and they had several indecisive engagements. Upon his brother's death after Easter in 871, Alfred became king of the West Saxons and overlord of Kent, Surrey, Sussex, and Essex. Faced by an enemy too powerful to defeat decisively, Alfred cleared the Danes from Wessex by a heavy payment of tribute (see DANEGELD) in 871. Alfred used the five-year respite that followed to begin building up a fleet. In 876 and 877 the Danes returned to ravage for several months and finally, halted by Alfred's army, swore to leave Wessex forever. However, in a surprise invasion early in 878 they crushed Alfred's forces, and he fled to Athelney in the fens of Somerset, where he organized a series of harassing raids

on the enemy. The famous legend in which, unrecognized, he is scolded by a peasant woman for letting her cakes burn probably derives from this period of his life. In May, 878, Alfred rallied his army and won a complete victory over the Danes at Edington. He then dictated the Peace of Chippenham (or Wedmore) by which Guthrum, the Danish leader, accepted Christian baptism and probably agreed to separate England into English and Danish spheres of influence. The Danes moved into East Anglia and E. Mercia, and Alfred established his overlordship in W. Mercia. Later, Alfred captured (886) London and concluded another treaty with Guthrum that marked off the DANELAW E. and N. of Thames, Lea, and Ouse rivers, and Watling Street, leaving the south and west of England to Alfred. Security gave Alfred the chance to institute numerous reforms within his kingdom. Against further probable attacks by the Danes, he reorganized the militia, or *fyrð*, about numerous garrisoned forts throughout Wessex. Drawing from the old codes of Æthelbert of Kent, Ine of Wessex, and Offa of Mercia, he issued his own code of laws, which contained measures for a stronger centralized monarchy. He reformed the administration of justice and energetically participated in it, and he reorganized the finances of his court. He came eventually to be considered the overlord of all England, although this title was not realized in concrete political administration. Alfred's greatest achievements, however, were the revival of learning and the establishment of Old English literary prose. He gathered together a group of eminent scholars, including the Welshman Asser. They strengthened the church by reviving learning among the clergy and organized a court school like that of Charlemagne, in which not only youths and clerics but also mature nobles were taught. Alfred himself between 887 and 892 learned Latin and translated several Latin works into English—Gregory the Great's *Pastoral Care*, Orosius's universal history, Boethius's *Consolation of Philosophy*, and St. Augustine's *Soliloquies*. A translation of Bede's *Ecclesiastical History* is also commonly ascribed to him, but there is some doubt since it differs markedly in style from the others. Alfred liberally interpolated his own thoughts into his writings, and the Orosius is particularly interesting for the addition of accounts of voyages made by the Norse explorers OTHHERE and Wulfstan. Although he probably was not directly responsible for the compilation of the ANGLO-SAXON CHRONICLE, his patronage of learning undoubtedly encouraged it. All these pursuits were interrupted, but not ended, by new Danish invasions between 892 and 896. The struggle was severe because Alfred's military reforms had not been completed and because the invading forces were joined by settlers from the Danelaw. He received strong support from his son EDWARD THE ELDER, his daughter Æthelflæd, and her husband, Æthelred of Mercia, and in the critical year of 893 the great Danish fort at Benfleet was successfully stormed. The one Danish attempt to penetrate deeply into Wessex was halted by Edward the Elder. In 896 the Danes slowly dispersed to the Danelaw or overseas, and Alfred's new long ships fought with varying success against pirate raids on the south coast. Alfred's career was later embroidered by many heroic legends, but history alone justifies calling him Alfred the Great. See J. A. Giles, ed., *The Whole Works of King Alfred the Great* (1858, repr. 1969), biographies by E. S. Duckett (1956), P. J. Helm (1963), and H. R. Loyn (1967), F. M. Stenton, *Anglo-Saxon England* (3d ed. 1971).

Alfred University, at Alfred, N.Y., state and private support, coeducational, opened as a school 1836, chartered 1857 as Alfred University. It is especially known for the College of Ceramics, which is among the few institutions in the United States offering a doctoral program in ceramics. The college is administered by Alfred Univ., although it is a division of the State University of New York.

algae (ăl'jē) [plural of Lat. *alga*=seaweed], group of plants belonging to the most primitive subkingdom of the plant kingdom, the THALLOPHYTES, plants that lack true roots, stems, leaves, and flowers. Unlike the fungi, the other large group of thallophytes, the algae have chlorophyll. They are of world-wide distribution and form the chief aquatic plant life both in the sea and in fresh water. Practically all seaweeds are marine algae. The simplest algae are single cells (e.g., the diatoms), the more complex forms consist of many cells grouped in a spherical colony (e.g., Volvox), in a ribbonlike filament (e.g., *Spirogyra*), or in a branching thallus form (e.g., *Fucus*). The cells of the colonies are generally similar, but some are differentiated for reproduction and for other func-

tions Many algae are microscopic, though the marine thalloid forms, known as kelps, may attain a length of more than 100 ft (30 m). *Euglena* and similar genera are free-swimming one-celled forms that contain chlorophyll but that are also able, under certain conditions, to ingest food in an animal-like manner. They are therefore classified either as protozoan animals or as a unique group separate from both plant and animal phyla. The blue-green algae and green algae include most of the freshwater forms. The POND SCUM, a green slime found in stagnant water, is an alga, as is the green film found on the bark of trees. The more complex brown algae and red algae are chiefly saltwater forms, the green color of the chlorophyll is masked by the presence of other pigments. Algae, the major food of fish (and thus indirectly of many other animals), are a keystone in the food chain of life, they are the primary producers of the food that provides the energy to power the whole system. They are also important to aquatic life in their capacity to supply oxygen through photosynthesis, hence algae are a necessary component of a healthy aquarium. Research has investigated the possibility of sea gardening with algae (especially the diatoms, the most numerous of marine plants) as a solution to the problem of insufficient output of land agriculture to meet the needs of the growing world population. In experimental cultivation, algae utilize about 2% of available solar energy for photosynthesis and carbohydrate production, as compared to 0.1% for land plants in general. Algae have also been suggested as a source of oxygen and food for prolonged space travel. Seaweeds (e.g., AGAR) have long been used as a limited source of food, especially in the Orient. Algae are also much used as fertilizer. See the separate algal divisions CHLOROPHYTA, EUGLENOPHYTA, CRYPTOPHYTA, PYRROPHYTA, CHRYSOPHYTA, PHAEOPHYTA, RHODOPHYTA.

Algardi, Alessandro (alās-sān-drō algār'dē), 1595-1654, Italian sculptor and designer, b. Bologna. He studied under Ludovico Carracci. In Rome his friend Domenichino obtained his first commissions for him, the *Magdalene* and *St. John* statues for San Silvestro al Quirinale. When Bernini temporarily fell from favor, Algardi replaced him c. 1644 as the most important sculptor in Rome under Pope Innocent X and received numerous commissions, including some from Spain. Although greatly influenced by Bernini, he retained the classical inclination of the Bolognese in his work, lacking Bernini's emotional vitality. An example of Algardi's work in relief is *The Meeting of Leo and Attila* (St. Peter's). A few prints in the style of Agostino Carracci are attributed to Algardi.

Algarve (algār'vā), province (1970 est. pop. 316,200), 1,958 sq mi (5,070 sq km), extreme S Portugal, coextensive with Faro dist. The capital is FARO, and other important cities are Silves, Portimão, and LAGOS. Much fruit (almonds, citrus, grapes, olives, figs, pomegranates) is grown in Algarve, and there are offshore tuna and sardine fisheries. The region was settled by the Phoenicians and later prospered under the Moors, who made it their last stronghold in Portugal. Alfonso III completed its reconquest in 1250.

algebra, branch of MATHEMATICS concerned with operations on sets of NUMBERS or other elements that are often represented by symbols. In elementary algebra letters are used to stand for numbers, e.g., in the EQUATION $ax^2 + bx + c = 0$, the letters a , b , and c stand for various known constant numbers called coefficients and the letter x is an unknown variable number whose value depends on the values of a , b , and c and may be determined by solving the equation. Much of classical algebra is concerned with finding solutions to equations or systems of equations, i.e., finding the ROOTS, or values of the unknowns, that upon substitution into the original equation will make it a numerical identity. For example, $x = -2$ is a root of $x^2 - 2x - 8 = 0$ because $(-2)^2 - 2(-2) - 8 = 4 + 4 - 8 = 0$, substitution will verify that $x = 4$ is also a root of this equation. The equations of elementary algebra usually involve POLYNOMIAL functions of one or more variables (see FUNCTION). The equation in the preceding example involves a polynomial of second degree in the single variable x (see QUADRATIC). One method of finding the zeros of the polynomial function $f(x)$, i.e., the roots of the equation $f(x) = 0$, is to factor the polynomial, if possible. The polynomial $x^2 - 2x - 8$ has factors $(x+2)$ and $(x-4)$, since $(x+2)(x-4) = x^2 - 2x - 8$, so that setting either of these factors equal to zero will make the polynomial zero. In general, if $(x-r)$ is a factor of a polynomial $f(x)$, then r is a zero of the polynomial and a root of the equation $f(x) = 0$. To determine if $(x-r)$ is a factor, divide it

into $f(x)$, according to the Factor Theorem, if the remainder $f(r)$ (found by substituting r for x in the original polynomial) is zero, then $(x-r)$ is a factor of $f(x)$. In many cases a polynomial cannot be separated into simple factors because the roots of the equation are not real, e.g., $x^2 - 9$ separates into $(x+3)(x-3)$, which yields two zeros, $x = -3$ and $x = +3$, but $x^2 + 9$ does not have simple factors because its zeros are imaginary numbers. The Fundamental Theorem of Algebra states that every polynomial $f(x) = a_n x^n + a_{n-1} x^{n-1} + \dots + a_1 x + a_0$, with $a_n \neq 0$ and $n \geq 1$, has at least one zero, from which it follows that the equation $f(x) = 0$ has exactly n roots, which may be real or complex and may not all be distinct. For example, the equation $x^4 + 4x^3 + 5x^2 + 4x + 4 = 0$ has four roots, but two are identical and the other two are imaginary, the factors of the polynomial are $(x+2)(x+2)(x+i)(x-i)$, as can be verified by multiplication. Algebra is a generalization of arithmetic and gains much of its power from dealing symbolically with elements and operations (chiefly addition and multiplication) and relationships (such as equality) connecting the elements. Thus, $a+a=2a$ and $a+b=b+a$ no matter what numbers a and b represent. Modern algebra is yet a further generalization. It deals with operations that are not necessarily those of arithmetic and that apply to elements that are not necessarily numbers. The elements are members of a SET and are classed as a GROUP, a RING, or a FIELD according to the axioms that are satisfied under the particular operations defined for the elements. Among the important concepts of modern algebra are those of a MATRIX and of a VECTOR space. See Garrett Birkhoff and Saunders MacLane, *A Brief Survey of Modern Algebra* (1965), R. H. Bardell and Abraham Spitzbart, *College Algebra* (2d ed. 1966).

algebraic geometry, branch of GEOMETRY, based on ANALYTIC GEOMETRY, that is concerned with geometric objects (loci) defined by algebraic relations among their coordinates (see CARTESIAN COORDINATES). In plane geometry an algebraic curve is the locus of all points satisfying the POLYNOMIAL equation $f(x,y) = 0$, in three dimensions the polynomial equation $f(x,y,z) = 0$ defines an algebraic surface. In general, points in n -space are defined by ordered sequences of numbers $(x_1, x_2, x_3, \dots, x_n)$, where each n -tuple specifies a unique point and $x_1, x_2, x_3, \dots, x_n$ are members of a given FIELD (e.g., the complex numbers). An algebraic hypersurface is the locus of all such points satisfying the polynomial equation $f(x_1, x_2, x_3, \dots, x_n) = 0$, whose coefficients are also chosen from the given field. The intersection of two or more algebraic hypersurfaces defines an algebraic set, or variety, a concept of particular importance in algebraic geometry.

algebraic number: see NUMBER

Algeciras (alhāthē'rās), city (1970 pop. 81,622), Cadiz prov., S Spain, in Andalusia, on the Bay of Algeciras opposite Gibraltar. A Mediterranean seaport, it has fishing and tourist industries. It was the first Spanish town taken (711) by the Moors. In the naval engagements of July, 1801, near Algeciras, the British defeated the French and Spanish fleets.

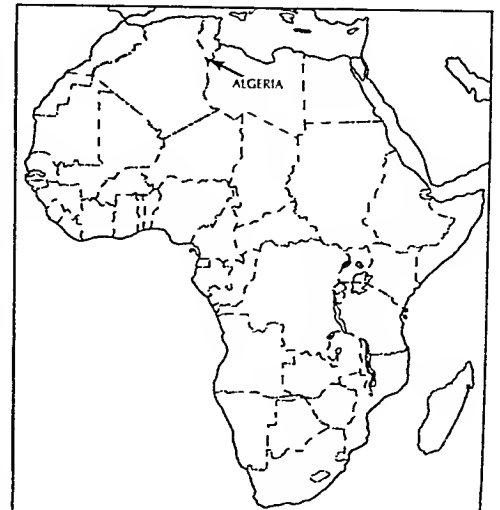
Algeciras Conference: see MOROCCO

Alger, Horatio (āl'jār), 1834-99, American writer of boys' stories, b. Revere, Mass. He wrote over 100 books for boys, the first, *Ragged Dick*, being published in 1867. By leading exemplary lives, struggling valiantly against poverty and adversity, Alger's heroes gain wealth and honor. His works were all extremely popular. *Silas Snobden's Office Boy*, which ran serially in the *Argosy* magazine in 1889-90, was not published as a book until 1973. See H. R. Mayes, *Alger: A Biography without a Hero* (1928), biography by Frank Gruber (1961), studies by J. W. Tebbel (1963) and R. D. Gardner (1964).

Alger, Russell Alexander, 1836-1907, U.S. Secretary of War (1897-99), b. near Medina, Ohio. After moving to Michigan he engaged in the lumber business, in which he made a fortune. During the Civil War he rose from the ranks to be a brevet major general. Alger was (1885-86) a popular governor of Michigan and was prominent in Republican national affairs. He was made Secretary of War by President McKinley, but the inefficiency of his department, which was highly disorganized when he took charge, and his appointment of William R. SHAFER as leader of the Cuban expedition were bitterly criticized, and he resigned. He was later (1902-7) Senator from Michigan.

Algeria (āl'jēr'ēā), Arab *Al Djazair*, Fr *Algerie*, republic (1973 est. pop. 15,200,000), 919,590 sq mi (2,381,741 sq km), NW Africa, bordering on Mauritania, Spanish Sahara, and Morocco in the west, on the

Mediterranean Sea in the north, on Tunisia and Libya in the east, and on Niger and Mali in the south. ALGIERS is the capital and largest city of the country, which is divided into 15 departments. Other major cities include ANNABA, BLIDA, CONSTANTINE, MOSTAGANEM, ORAN, SÉTIF, SIBI-BEL-ABBES, SKIKDA, and TLEMCEN. Algeria falls into two main geographical areas, the northern region and the much larger Saharan or southern region. The northern region, which is part of the MAGHREB, is made up of four parallel east-west zones: a narrow lowland strip (interspersed with mountains) along the country's 600-mi (970-km) Mediterranean coastline, the Tell Atlas Mts. (highest point c. 7,570 ft/2,310 m), which have a Mediterranean climate and abundant fertile soil, the sparsely populated, semiarid Plateau of the Chotts (average elevation c. 3,500 ft/1,070 m), containing a number of shallow salt lakes (chotts) and supporting mainly sheep and goat herders, and the Saharan Atlas Mts., a broken series of mountain ranges and massifs (highest point 7,638 ft/2,330 m), also a semiarid area and used chiefly for pasturing livestock. The arid and very sparsely populated Saharan region has an average elevation of c. 1,500 ft (460 m), but reaches greater heights in the Ahaggar Mts. in the south, where Algeria's loftiest point, Mt. Tahat (9,850 ft/3,002 m), is located. Most of the region is covered with gravel or rocks, with little vegetation, there are also large areas of sand dunes in the north (the Great Western Erg) and east (the Great Eastern Erg). In addition, the region contains several oases (including TOUGGOURT, BISKRA, Chenachane, In Zize, and Tin Rerhoh), where date palms are cultivated. The Cheliff River, which flows into the Mediterranean, is the largest of the country's few permanent streams. The great majority of Algeria's inhabitants are Berbers, who, beginning in the late 7th cent. A.D., adopted the Arabic language and Islam from the small number of Arabs who settled in the country. Many Berbers today are partly of Arab descent. About 15% of the population still speaks a Berber language, these inhabitants live mostly in the mountainous regions of the north, but also include the nomadic TUAREG of the Sahara. About 80,000 persons of European descent live in Algeria. Almost all Algerians are Sunni Muslims, Arabic is the official language of the country. About half of Algeria's workers are engaged in farming, but agriculture's contribution to the country's annual domestic product is much less than that of either mining or manufacturing, both of which began their main growth in the mid-1960s. The state plays a leading role in planning the economy and owns many important industrial concerns. Farming is concentrated in the fertile valleys and basins of the north and in the oases of the Sahara. The principal crops are wheat, barley, oats, potatoes, citrus fruit, wine grapes, olives, tomatoes, tobacco, figs, and dates. Large numbers of sheep, poultry, goats, and cattle are raised. Petroleum, found principally in the E Sahara and produced almost exclusively under the auspices of the state-owned SONATRACH corporation, is Algeria's most important mineral resource and its leading export. There are pipelines to the seaports of Arzew and BEJAIA in Algeria and As Sukhayrah in Tunisia. Much natural gas is also produced. Other minerals extracted in significant quantities include iron, lead, and copper ores, phosphates, zinc, mercury, antimony, kaolin, salt, and coal. The country's leading manufactures are processed food (notably olive oil),



beverages (especially wine), tobacco products, construction materials, chemicals, metals (including steel), refined petroleum, liquefied natural gas, textiles, and clothing. There are small forest-products and fishing industries. Algeria's limited rail and road networks serve mainly the northern region. The annual cost of Algeria's imports is usually slightly higher than the earnings from exports. The chief imports are food, machinery, iron and steel, and transport equipment. The principal exports besides petroleum (which accounts for about 70% of annual foreign exchange earnings) are wine, agricultural goods (especially fruit), and liquefied natural gas. Algeria's main trade partners are France, West Germany, the USSR, and Italy.

History to the early 19th cent. The earliest known inhabitants of Algeria were Berber-speaking nomads, who lived there in small political units by the 2d millennium B.C. In the 9th cent. B.C., CARTHAGE was founded in modern-day Tunisia, and Carthaginians eventually established trading posts at Annaba, Skikda, and Algiers. Coastal Algeria was known as Numidia and was usually divided into two kingdoms, both of which were strongly influenced by Carthage. The kingdoms of Numidia were united by King MASINISSA (c. 238–149 B.C.). In 146 B.C., Rome destroyed Carthage, and by 106 B.C., after defeating King JUGURTHA of Numidia, it held coastal Algeria. The Romans also gained control of the Tell Atlas region and part of the Plateau of the Chotts; the rest of present-day Algeria remained under Berber rulers and was outside Roman influence. Under Rome, the cities were built up and impressive public works (including roads and aqueducts) were constructed. Much grain was shipped from Algeria to Rome. By the Christian era, Algeria (divided into Numidia and Mauritania Caesariensis) was an integral, albeit relatively unimportant, part of the Roman Empire. One of its most famous citizens was St. AUGUSTINE (354–430), who was bishop of Hippo (now Annaba) and a leading opponent of DONATISM (which was in part a Berber protest against Roman rule). However, by the 5th cent. Roman civilization in Algeria had been eroded by the incursions of Berbers and Saharan tribes, and the destruction wreaked by the VANDALS (who passed through Algeria on their way to Tunisia) in 430–431 marked the end of effective Roman influence. Algeria again came under the control of numerous small indigenous political units. In the early 6th cent. a temporary veneer of unity and order was forged by the Byzantine Empire, which conquered parts of the North African coast including the region E of Algiers. In the late 7th and early 8th cent. Muslim Arabs conquered Algeria and ousted the Byzantines. Although few Arabs settled in the region, they had a profound influence as most of the Berbers quickly became Muslims and gradually absorbed the Arabic language and culture. In addition, the Arabs interbred with the Berbers. A number of small Muslim states rose and fell in Algeria, but generally the eastern part of the country came under the influence of dynasties centered in Tunisia (notably the Aghlabids of Kairouan) and the western part was controlled by states centered in Morocco (notably the ALMORAVIDS and ALMOHADS). Also, in the 8th and 9th cent. Tlemcen was the center of the Muslim Kharajite sect, and in the early 10th cent. the FATIMID dynasty began its major rise from a base in NE Algeria. In the late 15th cent. Spain expelled the Muslims from its soil and soon thereafter captured the coastal cities of Algeria. Algerians appealed to Turkish pirates (especially the BARBAROSSA brothers) for help, and, with the aid of the Ottoman Empire, they ended Spanish control by the mid-16th cent. Algeria then came under Ottoman rule. The country was at first governed by officials sent from Constantinople, but in 1671 the dey (ruler) of Algiers, chosen by local civilian, military, and pirate leaders to govern for life and virtually independent of the Ottoman Empire, became head of Algeria. The country was divided into three provinces (Constantine, Titteri, and Mascara), each governed by a bey. The power of the Ottomans, and later of the deys, did not extend much beyond the Tell Atlas. The coast was a stronghold of pirates (see BARBARY STATES) who preyed on the Mediterranean shipping of Christian countries. Privateering reached a high point in the 16th and 17th cent. and declined thereafter; there was a temporary increase during the Napoleonic Wars (early 19th cent.). A large percentage of the dey's revenues came from pirates. Considerable trade with Europe also was conducted from Algerian ports, the chief exports were wheat, fruit, and woven goods. The country was in addition a center of the slave trade, most of the slaves being persons captured by pirates.

Algeria in the 19th and 20th cent. In an effort to discourage privateering from Algerian ports, a British fleet bombarded Algiers in 1816. By this time the dey's power was greatly circumscribed by the three beys and by independent-minded Berber groups, and he effectively controlled only a small part of the coastal region. In the 1820s a minor dispute with the French reached a climax that had far-reaching effects: two Algerian merchants had delivered wheat to France in the 1790s but had never been paid for it. The dey unsuccessfully pressed their claim for payment, and, in exasperation, he flicked the French consul in Algeria with a fly whisk during an audience in 1827. To avenge this insult and also to gain glory for his lackluster regime, Charles X of France responded first by instituting a naval blockade of Algeria and then, in June, 1830, by invading the country. The dey capitulated in July, 1830, but most of the country resisted the French, who lapsed into a period of indecision regarding Algeria with the accession of Louis Philippe later in July, 1830. In 1834 the French renewed their drive to occupy Algeria and in 1837 they took Constantine, which had been the last major city to retain its independence. However, the Berber leader, ABD AL-KADIR, whose power was centered in the hinterland of Oran, held out against the French, and it was only in 1847, after a major military campaign against him led by Gen. T. R. BUGEAUD DE LA PICONNERIE, that he capitulated. Until 1910, France faced isolated (but occasionally fierce) resistance, mainly in Kabylia (see KABYLES) and the Sahara region. Colonization by Europeans (half of whom were French and the rest mainly Spanish, Italian, and Maltese) began c. 1840 and accelerated after 1848, when Algeria was declared to be French territory. By 1880 persons of European descent numbered about 375,000, and they controlled most of the better farmland. During the 19th cent. Algeria was usually administered under civil departments in Paris, but there were also short periods of military rule. In 1900 the country was given administrative and financial autonomy and placed under a governor general, who was advised by bodies whose membership was two-thirds European and one-third Muslim. By this time the colonists had started large-scale agricultural and industrial enterprises (introducing, among other things, wine and tobacco production) and had built roads, railroads, schools, and hospitals and modernized the cities. These improvements were intended for the Europeans' own use, and the Muslims benefited little from them, being left with scant political or economic power and with few legal rights. Although the official French policy in Algeria was to encourage the Muslims to adapt to European ways and thus to prepare them for full citizenship, very little was done to implement this policy. There was virtually no mixing between the European and Muslim populations. After World War I two types of protest groups were started by the Muslims. One movement called for a fully independent, Muslim-controlled Algeria, an early exponent was Messali Hadj, who in 1924 founded the Star of North Africa movement (later called, successively, the Party of the Algerian People and the Movement for the Triumph of Democratic Liberties, or MTLD). The other faction sought assimilation with France and the equality of Muslims and Europeans in Algeria; its chief exponent was Ferhat Abbas, who, however, after several rebuffs by the French in the 1930s and early 40s, by the mid-40s was calling for Algerian autonomy and by the early 50s advocated complete independence. In World War II, Algeria at first came under the Vichy regime, but later became (1942) Allied headquarters in North Africa; it also served for a time as the seat of Charles de Gaulle's Free French government. The hopes of the nationalists were buoyed by Allied statements during the war concerning self-determination, but the Muslims' actual status improved little. In May, 1945, a spontaneous nationalist uprising in Sétif resulted in the massacre of about 90 Europeans; the French responded by a sweeping crackdown during which at least 1,500 Muslims (and perhaps as many as 10,000) were killed. In 1947 the French national assembly passed the Statute of Algeria, under which the Muslims were to be given some additional political power. However, most of the statute's provisions were not implemented, and the colonists (in partnership with the French government) continued to control Algerian affairs. Despairing of ever gaining meaningful concessions from the colonists or the French government, a radical group of Muslims in 1954 seceded from Messali's MTLD, formed the National Liberation Front (FLN), its military arm was called the National Liberation Army or ALN), and on Nov. 1 attacked police posts

and other government offices in the Batna-Constantine region. In the following months the revolt gradually spread to other parts of the country. The FLN called for the establishment of an independent Algerian state controlled by the Muslim majority. The MTLD was reorganized into the Algerian Nationalist Movement, which, led by Messali, unsuccessfully competed with—and at times fought against—the FLN. On Aug. 20, 1955, the FLN carried out more extensive attacks on the colonists (especially in the Skikda area), and the French responded with severe reprisals. By 1956 the FLN had the support of virtually all Algerian nationalists except Messali, controlled much of the countryside, and was organizing frequent terrorist actions in the cities (especially Algiers). In 1957 the French successfully used massive measures to rid the cities of most of the terrorists, and the FLN was forced to concentrate on guerrilla activities in the rural areas; the French also constructed electrified barriers along Algeria's borders with Morocco and Tunisia in order to reduce the infiltration of men and materiel. By this time, about 500,000 French troops, including crack paratroopers, were stationed in Algeria. In May, 1958, there were demonstrations in Algeria by colonists and elements of the French army who feared that the government in France might negotiate a settlement with the Muslims that would undermine the Europeans' position, an ensuing political crisis in France resulted in the return to power of De Gaulle and the establishment of the Fifth French Republic. De Gaulle indicated a willingness to talk with the Muslims, but was imprecise as to the future of Algeria beyond a ceasefire. Fighting continued, and in 1959 the FLN established at Tunis the Provisional Government of the Algerian Republic (GPRA), with Ferhat Abbas as prime minister. By 1960, De Gaulle had come to recognize the inevitability of some form of Algerian independence, the main problem concerned the future status of the almost one million European colonists, many of whom had been born in Algeria. Sensing the direction of French policy, the colonists and army (both of whom aimed for the full integration of Algeria with France) staged major protests in Jan., 1960, and April, 1961, but both were put down by De Gaulle. In mid-1961, Ferhat Abbas resigned as prime minister of the GPRA and was replaced by Ben Yusef Ben Khedda. Shortly thereafter, negotiations with the French government began at Evian-les-Bains (in France), and in March, 1962, an agreement was signed. The accord provided for an end to the fighting and for the establishment of an independent Algerian state after a transition period; France and Algeria were to cooperate in economic and social affairs and France was to retain for a limited period military bases and the right to test nuclear devices in the Sahara. The people of France overwhelmingly approved the Evian agreement in a referendum held in early April, 1962. Members of the French army in Algeria, banded together in the Secret Army Organization (OAS), launched a terrorist campaign against Muslims in an attempt to prevent the implementation of the accord. However, in late April their leader, Gen. Raoul Salan, was captured and by late June the army revolt had been ended. Already in April the colonists had begun to leave Algeria in large numbers; by October only about 250,000 remained and most of them as well soon left. As a result of the more than seven years' fighting at least 100,000 Muslim and 10,000 French soldiers had been killed; in addition, many thousands of Muslim civilians and a much smaller number of colonists lost their lives. On July 1, 1962, the people of Algeria voted almost unanimously for independence in a referendum, and on July 3 France recognized Algeria's sovereignty. As a result of the fighting and of the exodus of colonists, the Algerian economy lay in ruins by mid-1962. Ben Khedda, the moderate leader of the GPRA, formed the initial Algerian government, but in Sept., 1962, he was replaced as prime minister by Ahmed BEN BELLA, a leftist radical who had the support of the ALN (led by Houari BOUMEDIENNE). A constituent assembly chosen in late 1962 established a strong presidential government, and in Sept., 1963, Ben Bella was elected president. Ben Bella, who increasingly concentrated power in his hands, followed a left-wing domestic policy that included the confiscation of European-held farms and the nationalization of various parts of the economy. There were border disputes with Morocco in 1963–64 that resulted in sporadic fighting; the disputes erupted again in 1967, but were settled by negotiation in 1972. On June 19, 1965, Ben Bella was deposed in a bloodless coup d'état by Boumedienne, his defense minister, who was angered by the army's

greatly reduced influence and by the deterioration of the economy. Boumedienne suspended the constitution and established a revolutionary council, of which he was president, to run the country. During his first years in power Boumedienne faced resistance from students and regional groups, but by the end of 1968 he had a secure hold on Algeria. Algeria gave strong vocal support to the Arabs in the Arab-Israeli wars of 1967 and 1973 and also contributed some soldiers and matériel (especially aircraft). After an initial slowdown Boumedienne increased the pace of state involvement in the economy. In 1971 he nationalized (with compensation) the French oil and natural gas companies active in Algeria, he planned thereby to increase production and thus to augment Algeria's revenues. By 1972 output had reached record levels, and there was a growing emphasis on the export of liquefied natural gas. Price rises for petroleum and natural gas in 1973-74 resulted in considerably higher export earnings. In the early 1970s, Algeria was on good terms with its North African neighbors, and gave moral support (if not much material aid) to the various movements against white minority rule in Africa. See Stephane Gsell et al., *Histoire d'Algérie* (1929), Edgar O'Ballance, *The Algerian Insurrection 1954-62* (1967), Frantz Fanon, *The Wretched of the Earth* (tr 1968), W. B. Quandt, *Revolution and Political Leadership Algeria, 1954-1968* (1969), David Ottaway and Marina Ottaway, *Algeria: the Politics of a Socialist Revolution* (1970), Charles-Andre Julien, *Histoire de l'Algérie contemporaine, conquête et colonisation, 1827-1871* (1964) and *History of North Africa* (tr 1970), A. A. Heggoy, *Insurgency and Counterinsurgency in Algeria* (1972).

Algerine War, early 19th-century conflict between Algiers and the United States. The TRIPOLITAN WAR (1801-5) had brought a temporary halt to the pirate activities of the Barbary States. However, during the subsequent Napoleonic Wars and the War of 1812 the Barbary pirates renewed their predatory raids on American Mediterranean commerce, and Algiers actually declared war on the United States. In 1815, Stephen DECATUR was sent to Algiers at the head of a squadron of 10 ships. After two minor engagements he sailed into the harbor of Algiers and forced (June 30) the dey of Algiers to sign a treaty renouncing U.S. tribute and agreeing to release all U.S. prisoners without ransom. Decatur then exacted similar guarantees from Tunisia (July 26) and Tripoli (Aug. 5), and the so-called Algerine War was ended.

Algiers (ālġēr'), Fr. *Alger* (ālzhā'), city (1966 pop. 943,142), capital of Algeria, N. Algeria, on the Bay of Algiers of the Mediterranean Sea. It is one of the leading ports of North Africa (wine, citrus fruit, iron ore, cork, and cereals are the major exports), as well as a popular winter resort and a commercial center. Industries include metallurgy, oil refining, automotive construction, machine-building, and the production of chemicals, tobacco, paper, and cement. Founded by the Phoenicians and called Icosium by the Romans, the city disappeared after the fall of the Roman Empire. It was reestablished in the late 10th cent. by the Muslims. Many of the Moors expelled from Spain in 1492 settled in Algiers. In 1511 the Spanish occupied an island in the city's harbor, but they were driven out when BARBAROSSA captured Algiers for the Turks. Algiers then became a base for the Muslim fleet that preyed upon Christian commerce in the Mediterranean (see BARBARY STATES). Under the Ottoman Empire, the city's population reached 100,000. The ruling Turkish official in Algeria, the dey of Algiers, made himself virtually independent of Constantinople in the 18th and 19th cent. As European navies repeatedly attacked Algiers, the city's prosperity, which was based on piracy, declined. When French forces captured the port in 1830, Algiers had less than 40,000 inhabitants. Algiers became headquarters for the Allied forces in North Africa in World War II, as well as for Charles de Gaulle's provisional French government. An anti-French uprising in the city in 1954 provided a major spark in the Algerian armed struggle for independence. In May, 1958, Algiers was the principal scene of a revolt that ended the Fourth French Republic and returned De Gaulle to power. During the final months before Algeria won independence (1962), bombings by the French terrorist Organization of the Secret Army (OAS) damaged industrial and communications facilities in Algiers. In 1973 a major conference of nonaligned nations was held there. The city is divided into the newer, French-built sector, with wide boulevards and modern administrative and commercial buildings, and the original Muslim quarter, with narrow streets, numerous

mosques, and the 16th century casbah (fortress), which was once the residence of the Turkish deys. Other points of interest in Algiers include the observatory, botanical gardens, the national library and museum, the Basilica of Notre Dame, and the Cathedral of Sacre Coeur, which was designed by Le Corbusier. The Univ. of Algiers dates back to 1909. Only a few thousand permanent European residents remain in the city.

Algoa Bay (ālġō'a), arm of the Indian Ocean, indenting SE Cape Province, Republic of South Africa. Discovered by the Portuguese in the late 15th cent., it was used as an anchorage. Port Elizabeth is on the shore of the bay.

Algol (āl'gōl), famous VARIABLE STAR in the constellation PERSEUS, Bayer designation β Persei, 1970 position R.A. 3^h06^m0^s, Dec. +40°50'. Algol's variation in apparent MAGNITUDE, from 2.06 to 3.28, is due to the fact that it is an eclipsing BINARY STAR, with one component revolving about the other with a period of 2 days, 20 hr, 49 min. Because the plane of revolution is almost parallel to the line of sight, the star dims noticeably when the dimmer component passes in front of, or eclipses, the brighter component, and dims again very slightly when the brighter component eclipses the dimmer one (see ECLIPSE), the primary minimum, when the brighter component is eclipsed, lasts about 10 hr. Algol is of SPECTRAL CLASS B8 V. It is about 105 light-years from the earth. The star is actually a quadruple system, with two other components orbiting but not eclipsing the nearby eclipsing pair. The name *Algol* comes from the Arabic *Ras al Ghul*, which means "demon's head," and the star is sometimes called the Demon Star.

Algonquian (ālġōng'kēan, -kwēan), branch of the Algonquian-Wakashan linguistic family of North America. See AMERICAN INDIAN LANGUAGES.

Algonquin Indians (ālġōng'kwīn, -kīn), small group of now extinct North American Indians. The name of the Algonquian branch of the Algonquian-Wakashan linguistic stock (to which they belonged) is derived from their name (see AMERICAN INDIAN LANGUAGES). They were among the first Indians with whom the French formed alliances, and their name was used to designate other tribes in the area. Despite French aid, they were dispersed in the 17th cent. by the Iroquois, and the remnants of the tribe found refuge chiefly near white settlements in Quebec and Ontario. The name is also spelled Algonkin.

algorithm (āl'garīth'm) or **algorism** (-rīz'm) [for al-Khwarizmi, 9th-century Persian mathematician], procedure used in calculations to simplify the operation; it involves direct manipulation of the figures without regard for the underlying principles of the operation. Much of ordinary arithmetic as traditionally taught consists of algorithms involving the fundamental operations of addition, subtraction, multiplication, and division. An example of an algorithm is the common procedure for division, e.g., the division of 1,347 by 8, in which the remainders of partial divisions are carried to the next digit or digits, in this case the remainder of 5 in the division of 13 by 8 is placed in front of the 4, and 8 is then divided into 54.

Algren, Nelson, 1909-, American novelist, b. Detroit. He grew up in Chicago, and much of his fiction is laid in the slums. His novels, such as *Never Come Morning* (1942), *The Man with the Golden Arm* (1949), and *A Walk on the Wild Side* (1956), are brutally realistic. In a lighter vein are the personal sketches collected in *Who Lost an American* (1963), *Notes from a Sea Diary* (1965), and *The Last Carousel* (1973).

algun: see ALMUG.

Al-Hakam II: see HAKAM II AL-

Alhambra (ālġhām'brā), city (1970 pop. 62,125), Los Angeles co., S. Calif., a suburb NE of Los Angeles, inc. 1903. Its many manufactures include aircraft parts, electronic equipment, oil refinery machinery, airconditioners, and felt products.

Alhambra [Arabic, =the red], extensive group of buildings on a hill overlooking Granada, Spain. They were built chiefly between 1230 and 1354 and they formed a great citadel of the Moorish kings of Spain. After the expulsion of the Moors in 1492, the structures suffered mutilation, but were extensively restored after 1828. The Alhambra is a true expression of the once flourishing Moorish civilization and is the finest example of its architecture in Spain. It comprises remains of the citadel, the so-called palace of the kings, and the quarters once used by officials. The halls and chambers surround a series of open courts, which include the Court of Lions containing arcades resting on 124 white marble col-

umns. The interior of the building is adorned sumptuously with magnificent examples of the so-called honeycomb and stalactite vaulting, its walls and ceilings are decorated with geometric ornamentation of minute detail and intricacy, executed with surpassing skill in marble, alabaster, glazed tile, and carved plaster. See Washington Irving, *Legends of the Alhambra* (1832), A. F. Calvert, *The Alhambra* (1907), Stewart Desmond, ed., *The Alhambra* (1974).

Alhazen: see IBN AL-HAYTHAM.

Al Hillah (al hīl'la), city (1965 pop. 84,717), provincial capital, central Iraq, on a branch of the Euphrates River. It was built (c. 1100) largely of material taken from the nearby ruins of ancient Babylon. It is a port and the main cereal market of the middle Euphrates area.

Al Hudaidah: see HODEIDA, Yemen.

Al Hufuf: see HOFUF.

Alī (alē'), 600?-661, 4th caliph (656-61). He was the son of Abu Talib, Muhammad's uncle, but was more closely related to the Prophet as the husband of FATIMA. One of the Prophet's most faithful followers, he was expected to become caliph on Muhammad's death, but Abu Bakr was chosen. Alī succeeded only on Uthman's death. He was strongly opposed by AL-SHA, who incited a revolt in Iraq. Alī put down the disturbance, but he was never able to suppress MUAWIYA. Alī was murdered at Kufa by fanatics (the Kharijites), and his son HASAN abdicated in favor of Muawiya. The division in Islam between the SUNNI and SHIITES began in the time of Alī. He and his son HUSEIN are the great saints of the Shiites.

Ali, Muhammad (mahām'ad alē'), 1940-, American boxer. Originally named Cassius Marcellus Clay, Jr., he changed his name in 1964 on becoming a Black Muslim. After winning an Olympic gold medal in 1960, he turned professional. In 1964 he defeated Sonny Liston, winning the world heavyweight championship. Although this title was accepted by the public, it was not officially recognized by the World Boxing Association. Nevertheless, Alī twice defended his boxing title in 1965, defeating both Liston and Floyd Patterson. In 1967, however, various state and foreign boxing commissions stripped him of the title when he refused induction into the U.S. armed services on religious grounds. (The U.S. Supreme Court, in June, 1971, upheld Alī's draft appeal on religious grounds.) Prevented from fighting by the professional boxing establishment, he was finally granted a license to fight again in 1970. In 1971 he lost his first fight, it was to Joe Frazier, who was then champion. In 1974, Alī regained the championship by defeating George Foreman in a fight held in Zaïre. See biographies by Jose Torres (1971) and Budd Schulberg (1972).

Aliah (ālī'a) see ALVAH.

Aliakmon (alēak'mōn), longest river of Greece, c. 200 mi (320 km) long, rising in the mountains near Lake Prespa, N. Greece, and flowing SE then NE into the Thermaic Gulf. The river waters an agricultural region, Katoria and Verioia are along its course. The Aliakmon forms the western portion of the extensive Vardar River delta. It is also known as the Vistritsa River.

Alian (ālī'an) see ALVAN.

Alibamu Indians: see ALABAMA INDIANS.

Alibates Flint Quarries and Texas Panhandle Pueblo Culture National Monument: see NATIONAL PARKS AND MONUMENTS (table).

Alī Bey: see BADIA Y LEBLICH DOMINGO.

Alicante (alēkan'tā), city (1971 pop. 184,716), capital of Alicante prov., SE Spain, in Valencia. A Mediterranean port and resort, it has exports of wine, oil, cereals, fruit, and esparto from the fertile surrounding region. Textiles and tobacco and clay products are made. The Romans had a naval base on the site. The town was permanently recaptured from the Moors c. 1250. The Falangist leader Jose Antonio Primo de Rivera was executed by the Republicans in 1936 in Alicante.

Alice, city (1970 pop. 20,121), seat of Jim Wells co., S. Texas, inc. 1910. Long a cow town at a railroad junction, Alice is still a cattle-shipping center. Oil and natural gas are also important to its economy. Manufactures include oil well equipment and cottonseed oil. Nearby are a wildlife refuge, the great King Ranch, and several Gulf Coast resorts.

Alice Springs, town (1971 pop. 11,118), Northern Territory, Australia. It lies in a pastoral area near the center of the continent and at the terminus of the Central Australian RR. The town became important as a telegraph station on the overland route from Adelaide to Darwin. Gold, copper, wolfram, and mica are mined in the area. An aborigine reservation

is nearby Formerly called Stuart, Alice Springs was (1926-31) the capital of Central Australia, a former subdivision of the Northern Territory

alien, in law, person residing in one political community while owing ALLEGIANCE to another A legal procedure known as naturalization permits aliens to become CITIZENS The attitude toward aliens is a matter of custom, usage, and law All modern governments have laws covering the rights and privileges of aliens, and there is a large body of international law on the subject A country has the right to exclude undesirable aliens, and most countries, including the United States, forbid the admission of criminals, paupers, and the diseased A country has the right to exclude completely certain groups and nationalities, but such discrimination is likely to cause friction From the right to exclude aliens proceeds the right to establish the conditions upon which they will be admitted and to make special laws concerning them An alien, while he resides in a country, is subject to the laws of that country and not to those of his own country, except in the case of EXTRATERRITORIALITY jurisdiction A state distinguishes between aliens who are merely traveling or living there temporarily and those who have come to stay or to earn their livelihood, and wider powers are assumed over the second class Such aliens are subject to taxation and may even be drafted to serve in the national defense As a citizen of his own country, an alien may call upon it to intercede if he feels that the country in which he lives has failed properly to protect his person or property The home state usually points out or protests injustice, but it may threaten reprisals Such situations have frequently caused international disputes, and there is controversy as to how far a nation is justified in interfering in behalf of its nationals abroad On the other hand, an alien may find ASYLUM in the country to which he has fled unless treaties of EXTRADITION provide for the DEPORTATION of such refugees A state also has the right to expel an alien who was once admitted As population in a state increases and the competition for livelihood becomes more intense, a country may become less hospitable to aliens This process was seen in the United States in the 20th cent in more restrictive IMMIGRATION laws and more stringent deportation laws In time of war the laws governing aliens are stricter, and special restrictions usually govern enemy aliens Treaties between most governments provide that in case of war a reasonable period should be given enemy citizens in either country to withdraw under supervision After that time the remaining enemy aliens may be expelled or may be permitted to remain under whatever conditions the government chooses to impose Thus, in World War II, enemy aliens in the United States were required to register, were excluded from certain areas, and in some cases were interned Aliens in the United States are required to register each year under the Immigration and Nationality Act of 1952 See NATIONALITY

Alien and Sedition Acts, 1798, four laws enacted by the Federalist-controlled U.S. Congress, allegedly in response to the hostile actions of the French Revolutionary government on the seas and in the councils of diplomacy (see XYZ AFFAIR), but actually designed to destroy Thomas Jefferson's Republican party, which had openly expressed its sympathies for the French Revolutionaries Depending on recent arrivals from Europe for much of their voting strength, the Republicans were adversely affected by the Naturalization Act, which postponed citizenship, and thus voting privileges, until the completion of 14 (rather than 5) years of residence, and by the Alien Act and the Alien Enemies Act, which gave the President the power to imprison or deport aliens suspected of activities posing a threat to the national government President John Adams made no use of the alien acts Most controversial, however, was the Sedition Act, devised to silence Republican criticism of the Federalists Its broad proscription of spoken or written criticism of the government, the Congress, or the President virtually nullified the First Amendment freedoms of speech and the press Prominent Jeffersonians, most of them journalists, such as John Daly Burk, James T. Callender, Thomas COOPER, William DUANE (1760-1835), and Matthew LYON were tried, and some were convicted, in sedition proceedings The Alien and Sedition Acts provoked the KENTUCKY AND VIRGINIA RESOLUTIONS and did much to unify the Republican party and to foster Republican victory in the election of 1800 The Republican-controlled Congress repealed the Naturalization Act in 1802, the others were allowed to expire (1800-1801) See John C. Miller, *Crisis in Free-*

dom (1951, repr 1964), James Morton Smith, *Freedom's Fetters* (1956)

alienation, in property laws see TENURE

Aligarh (alēg'ūr'), city (1971 pop 254,008), Uttar Pradesh state, N central India A district administrative headquarters and an important agricultural trade center, it also has cotton mills Aligarh is famous chiefly for its university, opened in 1875 as Anglo-Oriental College, which is the leading school for Indian Muslims The city, whose native name is Koil, has ancient Buddhist remains and many Muslim buildings

alimentary canal: see DIGESTIVE SYSTEM

alimony, in law, allowance for support that, by court order, a husband pays to his wife if she is not living with him It is based on the COMMON LAW right of a wife to be supported by her husband Alimony is distinct from the husband's duty to contribute to the support of his minor children Temporary alimony is allowed pending the outcome of a suit for DIVORCE, for SEPARATION, or for a decree of NULLITY OF MARRIAGE, whether wife or husband initiated the suit Permanent alimony is the allowance to the wife after the action has been tried and the decree rendered In the United States, laws regulating alimony awards vary greatly among the states Generally it may be granted after separations or divorces, but not after annulments Alimony ceases on the death of the husband, because it is not payable out of his estate unless there are arrears Although remarriage does not necessarily terminate alimony, the amount may be reduced or cut off at the court's discretion if the second husband is able to support the wife In all cases the amount of, and the continuing need for, alimony are questions that can always be reopened in a court having jurisdiction over the parties The rule that the husband cannot obtain alimony from the wife has been changed in a few states but for the most part holds, since the wife generally has no duty to support the husband A decree awarding alimony is a court order issued to the husband personally, and failure to pay constitutes CONTEMPT OF COURT

Alingsås (a'līngsōs'), city (1970 pop 18,761), Alvsborg co, SW Sweden, on Lake Mjörn, chartered 1619 It is an industrial center Manufactures include textiles, leather goods, processed food, candy, beer, and metal goods

Aliotta, Antonio (antō'nyō ālyō'ta), 1881-1964, Italian philosopher, b. Salerno He taught at the universities of Padua and Naples He wrote a critical analysis of contemporary philosophy, *The Idealistic Reaction Against Science* (1912, tr 1914), and then became identified with pragmatism, primarily in opposition to the idealism of Benedetto Croce and Giovanni Gentile His complete works, in Italian, were published in 7 volumes (1949-54)

Ali Pasha (alē' pasha'), 1744?-1822, Turkish pasha [military governor] of Yannina (now Ioannina, Greece), a province of the Ottoman Empire (Turkey) He was called the Arslan [lion] of Yannina His father, governor at Tepelene in S Albania, was murdered, and Ali went to live with the mountain brigands who infested the country He soon rose to leadership among them, came to the attention of the Turkish government, and as its agent put down the rebellion of a governor at Scutari in Albania About 1787 he became governor of Yannina, where his power grew until he ruled as a quasi-independent despot over most of Albania and Epirus He made war on the French along the Adriatic coast and entered an alliance (1814) with Great Britain Valuing Ali's services, the sultan let him do as he wished until, in 1820, Ali ordered the assassination of an opponent in Constantinople Sultan Mahmud II ordered Ali deposed Ali refused to comply, thus keeping Turkish troops engaged against himself while they were needed against the Greeks, who had begun their fight for independence Ali was assassinated by an agent of the Turks, his head was exhibited at Constantinople The wild yet cultured court of Ali was described by French and English visitors, notably by Byron in *Childe Harold*

aliphatic compound (āl'əfāt'ik), any of a large class of organic compounds whose carbon atoms are joined together in straight or branched open chains rather than in rings The hydrocarbons of the ALKANE, ALKENE, and ALKYNE series are aliphatic compounds, as are FATTY ACIDS and many other compounds Most compounds containing rings are AROMATIC COMPOUNDS, compounds that contain a ring but are not aromatic compounds are called alicyclic

Aliquippa (ālīkwīp'a), borough (1970 pop 22,277), Beaver co, W Pa., in a highly industrialized region along the Ohio River N of Pittsburgh, inc 1894 Ali-

quippa grew after the expansion of steel mills in 1909

Alisal, Calif see SALINAS

alizarin (ālīz'arīn), or 1,2-dihydroxyanthraquinone, mordant vegetable dye obtained originally from the root of the madder plant (*Rubia tinctorum*), in which it occurs as a glucoside The term also includes a group of synthetic dyestuffs prepared from coal-tar derivatives A method for the synthesis of alizarin was first discovered (1868) by Karl Graebe and Karl Liebermann, German chemists With salts of metals the compound forms brilliant LAKES, although by itself it is a poor dye Turkey red is produced with an aluminum mordant, other shades of red with calcium and tin salts, dark violet with iron mordants, and brownish red with chromium Purpurin, also used in dyeing, occurs with alizarin in madder and is produced synthetically

Al-Jadida (al-jadē'da), city (1960 pop 40,302), W Morocco, on the Atlantic Ocean Agricultural products are exported from the port It was seized by the Portuguese in 1502 and after 1541 was the only place Portugal held in Morocco Repeatedly besieged by the Moroccans, it was finally captured by them in 1769 The city was formerly called Mazagan

Al Jazirah (al jazē'ra) or **Gazira** (gazē'ra), region, central Sudan, occupying the tract between the White and Blue Niles south of their convergence at Khartoum The Arabic word *Jazira* means "island" or "peninsula" WAD MADANI is the region's chief town The plan to develop the region for irrigated cotton cultivation has made it by far Sudan's leading cotton-producing area Originally operated by a private company in conjunction with the government, the entire project was nationalized in 1950 The Sannar Dam and the irrigation canals built there since 1925 have put more than 1 million acres (400,000 hectares) into cultivation Profits from the cotton crop are divided among the government, the board that supervises the project, and the tenant farmers, who provide the labor The region was under the hegemony of the Funj rulers of Sannar from 1504 to 1821 and later passed to Turco-Egyptian and British control

Aljubarrota (əlzhōbər-rō'ta), village, Leiria dist, W central Portugal, in Beira Litoral On Aug 14, 1385, it was the site of the momentous battle in which the Portuguese, aided by English archers, defeated the forces of the Spanish King John I of Castile, thus assuring Portuguese independence Nun'Álvares Pereira was the Portuguese hero of the battle

alkali (āl'kalī) [Arabic, *al-gili*=ashes of saltwort], HYDROXIDE of an ALKALI METAL Alkalies are readily soluble in water and form strongly basic solutions with a characteristic acrid taste They neutralize acids, forming salts and water Strong alkalies (e.g., those of sodium or potassium) are sometimes called caustic alkalies The term *alkali* originally applied to salts obtained from plant ashes and is sometimes applied to a carbonate of sodium or potassium or to the hydroxide of an ALKALINE-EARTH METAL

alkali metals, metals found in group Ia of the PERIODIC TABLE Compared to other metals they are soft and have low melting points and densities Alkali metals are powerful reducing agents and form univalent compounds All react violently with water, releasing hydrogen and forming hydroxides They tarnish rapidly even in dry air They are never found uncombined in nature In order of increasing atomic number the alkali metals are LITHIUM, SODIUM, POTASSIUM, RUBIDIUM, CESIUM, and FRANCIUM

alkaline dry cell: see CELL, in electricity

alkaline-earth metals, metals constituting group IIa of the PERIODIC TABLE Generally, they are softer than most other metals, react readily with water (especially when heated), and are powerful reducing agents, but they are exceeded in each of these properties by the corresponding alkali metal They form divalent compounds In order of increasing atomic number the alkaline-earth metals are BERYLLIUM, MAGNESIUM, CALCIUM, STRONTIUM, BARIUM, and RADIUM

alkaline earths (āl'kalīn, -līn), oxides of the ALKALINE EARTH METALS, especially of calcium, strontium, and barium They are not readily soluble in water and form solutions less basic than those of alkalies

alkaloid, any of a class of organic compounds composed of carbon, hydrogen, nitrogen, and usually oxygen that are often derived from plants Although the name means alkalilike, some alkaloids do not exhibit alkaline properties Many alkaloids, though poisons, have physiological effects that render them valuable as medicines For example, curarine, found in the deadly extract CURARE, is a powerful muscle relaxant, ATROPINE is used to dilate the pupils of the

eyes, and physostigmine is a specific for certain muscular diseases. Narcotic alkaloids used in medicine include MORPHINE and CODEINE for the relief of pain and COCAINE as a local anesthetic. Other common alkaloids include QUININE, CAFFEINE, NICOTINE, STRYCHNINE, SEROTONIN, and LYSERGIC ACID DIETHYLAMIDE. Aconitine is the alkaloid of ACONITE. Cinchonine and quinine are derived from CINCHONA, coniine is found in poison HEMLOCK, and reserpine is an extract of rauwolfia roots. Emetine is an alkaloid of IPECAC.

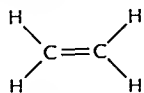
alkalosis (āl'kalō'sās) see ACIDOSIS

Alkan, Charles Henri Valentin (shārl aNré'vālaNtān' ālkān'), 1813-88, French pianist and composer, his original surname was Morhange. He began studying piano at the Paris Conservatory at the age of 6. Throughout his career he was admired for his skill as a performer. Alkan wrote mainly for the piano. His most influential works were the technically formidable *Études* (Op. 35 and 39), which greatly enlarged the piano techniques of the day. Much of his music was program music.

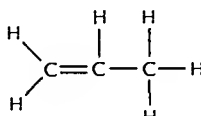
alkane (āl'kān), any of a group of aliphatic hydrocarbons whose molecules contain only single bonds (see CHEMICAL BOND). Alkanes have the general chemical formula C_nH_{2n+2} . An alkane is said to have

been cred or expelled in 1910. A 12th-century castle built by the Crusaders at Al Karak is well preserved.

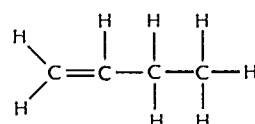
alkene (āl'kēn), any of a group of aliphatic hydrocarbons whose molecules contain one or more carbon-carbon double bonds (see CHEMICAL BOND). Alkenes with only one double bond have the general formula C_nH_{2n} . In the International Union of Pure and Applied Chemistry (IUPAC) system of chemical nomenclature, the name of an alkene is derived from the name of the corresponding ALKANE by replacing the -ane alkane suffix with -ene and, if necessary, adding a prefix to indicate the location of the dou-



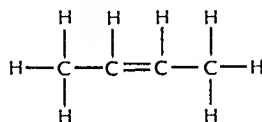
ethylene (ethene)



propylene (propene)



butylene (1 butene)



butylene (2 butene)

Alkenes

ble bond in the molecule. The IUPAC name of the simplest alkene, $H_2C=CH_2$, is ethene, which is derived from ethane. Propene is related to propane. Two alkenes, 1-butene and 2-butene, are related to butane, these two compounds, which differ in the location of the double bond in their molecules, are structural ISOMERS. In addition to these IUPAC names, many of the alkenes have common names, e.g., ethene is called ethylene and propene propylene. The alkenes as a group are sometimes called the ethylene series. Since the carbon-carbon double bond is sometimes called an olefinic linkage, the alkenes are sometimes called the olefins. Many of the reactions in which alkenes take part involve the cleavage of half the carbon-carbon double bond and subsequent formation of two single bonds, one to each of the adjacent carbon atoms. Such reactions include hydrogenation, with the formation of an alkane, and hydrolysis, with the formation of an alcohol.

Al-Khowarizmi (al-khōwarēz'mē), fl. 820, Arabian mathematician of the court of Mamun in Baghdad. His treatises on Hindu arithmetic and on algebra made him famous. He is said to have given algebra its name, and the word *algorithm* is said to have been derived from his name. Much of the mathematical knowledge of medieval Europe was derived from Latin translations of his works.

Alkmaar (āl'kām), town (1971 pop. 51,643), North Holland prov., NW Netherlands. It is an important market town and has varied industries. The Edam-cheese market, held weekly in front of the 16th-century weighhouse, is world famous. Alkmaar was chartered in 1254. Its successful defense (1573) against Spanish troops was a turning point in the revolt of the Netherlands.

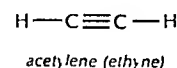
Al Kufah (āl kōō'fā), town (1965 pop. 30,862), S central Iraq. Founded (638) by Caliph Umar I, it was one of the two Muslim centers (the other was BASRA) of the early Ummayyad caliphs.

Al Kut (āl kōōt), town (1965 pop. 42,116), SE Iraq, on the Tigris River. It is a port and a market center for grains, dates, fruit, and vegetables. Much of the town was destroyed during World War I. Al Kut was taken from the Turks in Sept., 1915, by the British under Gen. Charles Townshend, who then advanced north to attack Baghdad. Defeated by the

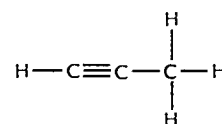
Turks, he retreated to Al Kut, his small army withstood siege by the Turks for 143 days before surrendering in April, 1916. The town was recaptured by Gen. S. F. Maude in 1917 in his successful advance on Baghdad. It is also called Kut-al-Amara or Kut-el-Amara.

alkyl group (āl'kīl), in chemistry, group of carbon and hydrogen atoms derived from an ALKANE molecule by removing one hydrogen atom (see RADICAL). The name of the alkyl group is derived from the name of its alkane by replacing the -ane suffix with -yl, e.g., methyl, CH_3 , from methane, CH_4 , and ethyl, C_2H_5 , from ethane, C_2H_6 . In some cases different alkyl groups can be formed from the same alkane by removing different hydrogen atoms, the alkyl groups are then distinguished by adding a prefix, e.g., 1-propyl or n-propyl, $CH_3CH_2CH_2$, and 2-propyl or isopropyl, $CH(CH_3)_2$, both formed from propane, $CH_3CH_2CH_3$. When a FUNCTIONAL GROUP is joined with an alkyl group, replacing the hydrogen that was removed, a compound is formed whose characteristics depend largely on the functional group.

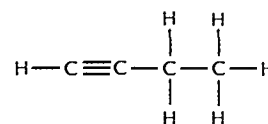
alkyne (āl'kīn), any of a group of aliphatic hydrocarbons whose molecules contain one or more carbon-carbon triple bonds (see CHEMICAL BOND). Alkynes with one triple bond have the general formula C_nH_{2n-2} . In the International Union of Pure and Applied Chemistry (IUPAC) system of chemical nomenclature, the name of an alkyne is derived from the name of the corresponding ALKANE by replacing the -ane alkane suffix with -yne and, if necessary,



acetylene (ethyne)



propyne



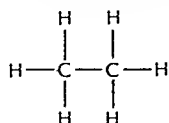
1 butyne

Alkynes

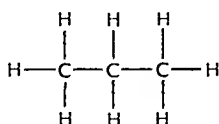
adding a prefix to indicate the location of the triple bond in the molecule. The IUPAC name of the simplest alkyne, $HC\equiv CH$, is thus ethyne, which is derived from ethane. Ethyne is more commonly known as ACETYLENE, it is an extremely important starting material in commercial chemical synthesis. The next simplest alkyne is propyne, $CH_3C\equiv CH$. There are two butynes, 1-butyne and 2-butyne, which are structural ISOMERS that differ in the location of the triple bond in their molecule. The alkynes are sometimes referred to as the acetylene series, the higher members of the series being named as derivatives of acetylene, e.g., propyne as methylacetylene, 1-butyne as ethylacetylene, and 2-butyne as dimethylacetylene. The usefulness of the alkynes in chemical synthesis is due both to the reactions of the triple bond itself and to the relative acidity of a hydrogen atom bonded to a triply bonded carbon.

Allah (āl'a, a'la), Arabic name of GOD. It is used not only in ISLAM but also among Arabic-speaking Christians. The name Allah was well known in pre-Islamic Arabia, when religion there was polytheistic. It was the Prophet Muhammad who emphasized the uniqueness of the god Allah and introduced the idea of monotheism to Arabia. See S. M. Zwemer, *The Moslem Doctrine of God* (1905), F. M. Fitch, *Allah, the God of Islam* (1950, repr. 1967), Daud Rahbar, *God of Justice* (1960).

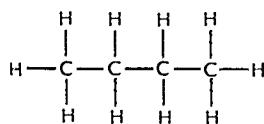
Allahabad (āl'ahābād', -bād'), city (1971 pop. 493,524), Uttar Pradesh state, N central India. On the site of Prayag, an ancient Indo-Aryan holy city, Allahabad is at the junction of two sacred rivers, the Jumna and the Ganges, and is visited by many Hindu pilgrims. The oldest monument is a pillar (c. 242 B.C.) with inscriptions from the reign of ASOKA. The city was the scene of much fighting in the INDIAN



ethane



propane



butane

Alkanes

a continuous chain if each carbon atom in its molecule is joined to at most two other carbon atoms, it is said to have a branched chain if any of its carbon atoms is joined to more than two other carbon atoms. The first four continuous-chain alkanes are METHANE, CH_4 , ETHANE, C_2H_6 , PROPANE, C_3H_8 , and BUTANE, C_4H_{10} . Names of continuous-chain alkanes whose molecules contain more than five carbon atoms are formed from a root that indicates the number of carbon atoms and the suffix -ane to indicate that the compound is an alkane, e.g., alkanes with 5, 6, 7, 8, 9, and 10 carbon atoms in their molecules are pentane, hexane, heptane, octane, nonane, and decane, respectively. The name of a branched-chain alkane is formed by adding prefixes to the name of the continuous-chain alkane from which it is considered to be derived, e.g., 2-methylpropane (called also isobutane) is thought of as being derived by replacing one of the hydrogen atoms bonded to the second (2-) carbon atom of a propane molecule with a methyl (CH_3) group, forming $CH_3CH(CH_3)_2$. Chemically, the alkanes are relatively unreactive. They are obtained by fractional distillation from petroleum and are used extensively as fuels. The alkanes are sometimes referred to as the methane series (after the simplest alkane) or as paraffins.

Al Karak (āl kārāk'), town, W central Jordan. It is also known as Krak. It is a road junction and an agricultural trade center. The ancient Kir Moab (also mentioned in the Bible as Kir Hareseth, Kir Hareh, and Kir Heres), it was the walled citadel of the Moabites. Al Karak played an important role in the Crusades. The lordship of Al Karak and Montreal was one of the chief baronies of the Latin Kingdom of Jerusalem. The brigand Reginald of Châtillon was lord of Al Karak and Montreal when, in 1187, he attacked a caravan led by Sultan SALADIN and thus provoked the events leading to the fall of Jerusalem. Al Karak was taken by Saladin in 1188 after a long siege. The town was an archiepiscopal see from the early Christian era until the Christians were massa-

MUTINY (1857) Allahabad was the capital of the United Provinces from 1901 to 1949. It is a district administrative headquarters and trading center and has a university.

All-American Canal, 80 mi (129 km) long, SE Calif., part of the Federal irrigation system of the Hoover Dam. Built between 1934 and 1940 across the Colorado Desert, the canal is entirely within the United States and replaces the Inter-California Canal, which passes through Mexico. The Imperial Dam, NE of Yuma, Ariz., diverts water from the Colorado River into the All-American Canal, which runs W to Calexico, Calif. Smaller canals move water into the Imperial Valley, the Coachella Canal branches NW to the Coachella Valley. This canal system irrigates more than 630,000 acres (254,961 hectares) and has greatly increased crop yield in the area, problems of drainage and salinity exist, however. The All-American Canal also supplies water to San Diego, Calif.

Allan, Sir Hugh, 1810-82, Canadian financier and shipowner, b. Scotland. He emigrated to Canada in 1826, was employed by a large shipbuilding company in Montreal, and later founded the Allan Line of steamships. He was given the contract to build the Canadian Pacific Railway, but the PACIFIC SCANDAL (1873) led to its cancellation.

Allegheny (ăl'agā'nē, äl'agā'nē), river, 325 mi (523 km) long, rising in N central Pa., and flowing NW into N.Y., then SW through Pa. to the Monongahela River, with which it forms the Ohio River at Pittsburgh, drains 11,580 sq mi (29,992 sq km). Before the railroad era, the river was an important commercial route and is still used to transport coal and other bulky freight. Kinzua Dam (completed in 1965), a federal flood-control project on the river, forms a large lake, there are also dams on the river's tributaries. The Allegheny's basin has coal, oil, and natural gas.

Allegheny College, at Meadville, Pa., United Methodist, coeducational, founded 1815, opened 1816.

Allegheny Mountains, dissected plateau, western part of the Appalachian Mts., extending c 500 mi (800 km) SW from N Pa. to SW Va., rising to c 4,860 ft (1,480 m) at Spruce Knob, the highest peak in West Virginia. The E Alleghenies, with a steep escarpment often called the Allegheny Front (c 1,500-1,600 ft/460-490 m high) are more rugged than the western portion, which is a plateau extending into Ohio and Kentucky. The Alleghenies, formed by the folding of sedimentary rocks, have been subsequently reduced by erosion. The mountains are rich in coal and timber and contain iron ore, petroleum, and natural gas.

Allegheny Portage Railroad National Historic Site: see NATIONAL PARKS AND MONUMENTS (table).

allegiance, formal tie that binds an individual to another individual or institution. The term usually refers to a person's obligation of obedience to a government in return for the protection of that government, although it may have reference to any institution that one is bound to support. Allegiance in strict usage is a legal tie only, but as used in ordinary speech, the term may include supplemental emotional ties that make it loosely synonymous with loyalty. In the United States allegiance is required of both CITIZENS and resident aliens. There are four types of allegiance: natural allegiance, which arises from membership by birth within a political society; express allegiance, which arises from an oath or promise to support a political society and usually results from NATURALIZATION; local allegiance, in which an alien owes temporary allegiance to a government for the protection it offers; and legal allegiance, which arises in certain cases from an oath taken to support a government temporarily, as when a foreign soldier joins its armed forces. Under the customary law of Europe a subject did not have the right to change his allegiance without the consent of his government. In 1868 the United States challenged this notion and declared that it was the right of any citizen to voluntarily expatriate himself, that is, to transfer voluntarily his allegiance to another government. Great Britain provided the same opportunity for its citizens in 1870, and thereafter various other European states followed similar policies. The process of EXPATRIATION, however, is by no means universal.

allegory, in literature, symbolic story that serves as a disguised representation for meanings other than those indicated on the surface. The characters in an allegory often have no individual personality, but are embodiments of moral qualities and other abstractions. The allegory is closely related to the parable, fable, and metaphor, differing from them largely in intricacy and length. A great variety of lit-

erary forms have been used for allegories. The medieval morality play *Everyman*, personifying such abstractions as Fellowship and Good Deeds, recounts the death journey of Everyman. John Bunyan's *Pilgrim's Progress*, a prose narrative, is an allegory of man's spiritual salvation. Spenser's poem *The Faerie Queene*, besides being a chivalric romance, is a commentary on morals and manners in 16th-century England as well as a national epic. Although allegory is still used by some authors, its popularity as a literary form has declined in favor of a more personal form of symbolic expression (see SYMBOLISTS).

allelu (äl'ēl') see GENETICS

Alleluia, Latin form of the expression HALLELUJAH.

Allen, Ethan, 1738-89, hero of the American Revolution, leader of the GREEN MOUNTAIN BOYS, and promoter of the independence and statehood of Vermont, b. Litchfield (?), Conn. He had some schooling and was proud of his deist opinions, which he later incorporated in *Reason the Only Oracle of Man* (1784). After fighting briefly in the French and Indian Wars, he interested himself in land speculation, and in 1770 he appeared as one of the proprietors in the NEW HAMPSHIRE GRANTS. He and his brothers, notably Ira Allen, became the leaders of the New England settlers and speculators in the disputed lands—invertebrate enemies of the Yorkers (settlers under New York patents) and violent opponents of all attempts of New York to exert control in the area. He was active in forming the Green Mountain Boys and became their leader in defying the New York government and harrying the Yorkers. Governor Tryon of New York put a price on the heads of Allen and two of his followers, but Ethan was not captured. After the outbreak of the American Revolution, he made the Green Mountain Boys into an independent patriot organization. Joined by Benedict ARNOLD (with a commission from Massachusetts) and some Connecticut militia, Ethan Allen and his men captured Fort Ticonderoga from the British on May 10, 1775. Legend says that when the British officer asked him under what authority he acted, Ethan Allen roared, "In the name of the Great Jehovah and the Continental Congress!" The story is, however, apocryphal. Allen then urged an expedition against Canada, and the Green Mountain Boys were attached to Gen. P. J. Schuyler's invasion force, but the men chose not Allen, but his cousin Seth WARNER, as leader. Allen went on the expedition and in a rash effort to capture Montreal before the main Continental army arrived was captured (Sept., 1775) by the British. He told his own story of this in the popular *Narrative of Colonel Ethan Allen's Captivity*, which appeared in 1779, a year after he had been exchanged. He returned to Vermont, which had declared its independence but was unrecognized by the Continental Congress. Ethan and his brother Ira then devoted themselves to insuring the new political unit in one way or another. The region remained in danger of British attack, and the British late in 1779 opened negotiations with Ethan Allen in an attempt to attach Vermont to Canada. No conclusion was reached, and the victory at Yorktown ending the American Revolution also ended the talks. Ethan Allen withdrew from politics in 1784. When he died, Vermont was still independent and still dickering with Congress and dealing with internal struggles between the Allen party and their opponents. See biography by C. A. Jellison (1969).

Allen, Frederick Lewis, 1890-1954, American social historian and editor, b. Boston, grad. Harvard (B.A., 1912, M.A., 1913). He is best remembered for his journalistic but nonetheless penetrating works of social history, including *Only Yesterday* (1932), *The Lords of Creation* (1935), *Since Yesterday* (1940), *The Great Pierpont Morgan* (1949), and *The Big Change* (1952). After teaching English at Harvard, he was an assistant editor of the *Atlantic Monthly* (1914-16), then managing editor of *The Century* (1916-17). In 1923 he began working for *Harper's Magazine*, where he remained until 1953, becoming chief editor in 1941.

Allen, Hervey, 1889-1949, American novelist and poet, b. Pittsburgh, grad. Univ. of Pittsburgh, 1915. After service in World War I, he taught English in Charleston, S.C., where, in collaboration with DuBose Heyward, he wrote *Carolina Chansons* (1922), a volume of verse. He wrote other books of poetry but is best known for his excellent biography of Poe, *Israfel* (1926), and the picaresque novel *Anthony Adverse* (1933), which achieved enormous popular success.

Allen, Ira, 1751-1814, political leader in early Vermont, b. Cornwall, Conn. He was the younger brother and the assistant of Ethan ALLEN. Although

he was a member of the GREEN MOUNTAIN BOYS, he took little part in their activities. His cool shrewdness, his adeptness in business matters, and his brilliant planning complemented the colorful vigor and rash violence of his brother. He organized the Onion River Land Company and secured the lands around the Winooski River and Lake Champlain that the Allens worked hard to protect. Ira Allen took part in the conventions at Dorset and Westminster that brought about the independence of VERMONT, and he was a leading figure in its political life in the years following, holding many offices. He was involved in the long negotiations with the British and was accused of treason. After Vermont became a state he was forced out of politics. He helped to establish the Univ. of Vermont. In 1798, Allen published his *Natural and Political History of the State of Vermont*. See biography by J. B. Wilbur (1928).

Allen, James Lane, 1849-1925, American novelist, b. Lexington, Kentucky. Among his stylized, "genteel" novels set in his native region are *A Kentucky Cardinal* (1894), *Aftermath* (1895), and *The Choir Invisible* (1897). See studies by W. K. Bortoff (1964) and G. C. Knight (1935, repr. 1967).

Allen, Richard, 1760-1831, American clergyman, founder of the African Methodist Episcopal Church. He was born a slave in Philadelphia. He became pastor of a Negro group that had seceded from the Methodist Episcopal Church in Philadelphia. When the African Methodist Episcopal Church was organized nationally (1816), Allen was consecrated its first bishop. See biographies by M. M. Mathews (1963) and C. V. R. George (1973).

Allen, William, 1704-80, American jurist, b. Philadelphia. He and his father-in-law, Andrew Hamilton, decided the choice of Philadelphia instead of Chester as provincial capital, and he helped finance the building of Independence Hall. Allen was (1750-74) chief justice of Pennsylvania, secured (1763) postponement of the sugar duties, and helped (1765) Benjamin Franklin in his efforts to have the Stamp Act repealed. He wrote *The American Crisis* (1774), containing a plan for colonial reconciliation with England. When it was not accepted, he made his home in England. Allentown, Pa., was named for him.

Allen, Bog of, area of several peat bogs c 375 sq mi (971 sq km), with patches of cultivable land, in the central lowlands, E Republic of Ireland. The bog is crossed by the Grand and Royal canals. It is a source of fuel and contains peat-fired electrical generating stations.

Allen, Lough (lōkh, lōk), lake, 8 mi (12.9 km) long and 3 mi (4.8 km) wide, Co. Leitrim and Co. Roscommon, N Republic of Ireland. The upper Shannon River flows through the lake.

Allenby, Edmund Henry Hynman Allenby, 1st Viscount (äl'ənbē), 1861-1936, British field marshal. Educated at Sandhurst, he saw active service in Bechuanaland (1884-85) and Zululand (1888) and in the South African War (1899-1902). When World War I broke out (1914), he commanded first the cavalry and then (1915-17) the 3d Army in France. Appointed commander of the Egyptian Expeditionary Force in June, 1917, he waged the last of the great cavalry campaigns by invading Palestine, capturing Jerusalem, and ending Turkish resistance after the battle of Megiddo (Sept. 18-21, 1918). He served as British high commissioner for Egypt and the Sudan (1919-25). He was made viscount in 1919. See A. P. Wavell, *Allenby* (1941) and *Allenby in Egypt* (1945), Brian Gardner, *Allenby of Arabia* (1965).

Allende, Ignacio (ēgna'syō ayān'dā), 1779-1811, Mexican revolutionist. He was a captain in the army when he joined the movement against Spanish domination. He played a prominent part in the revolution and after the great defeat at Calderon Bridge (Jan. 17, 1811) took chief command of the forces. His seizure of power left Miguel HIDALGO Y COSTILLA, with whom he had quarreled, only nominal control. The revolutionists went northward, hoping to reach the United States, but the treachery of one of their leaders led to capture by the royalists. Allende was shot at Chihuahua.

Allende Gossens, Salvador (salvathōr' ayān'dā gō'sāns), 1908-73, president of Chile (1970-73). A physician, he helped found the Chilean Socialist party in 1933 and later served as minister of health (1939-42) and as president of the senate (1965-69). He ran for president several times, and on his fourth try (1970) he won by a narrow plurality, thus becoming the first freely elected Marxist in the Western Hemisphere. Attempting to turn Chile into a socialist state, he nationalized numerous industries (including the giant copper operations) and pushed exten-

sive land reform. However, as a minority president he lacked the popular support necessary for such drastic measures, and much of the nation opposed him. Soaring inflation and widespread shortages sparked a period of crippling strikes and violence, caused at least in part by the undercover activities of the US Central Intelligence Agency. In Sept., 1973, Allende was overthrown in a bloody military coup, during which he apparently committed suicide (his wife asserted that he was murdered). He was succeeded as president by Gen. Augusto Pinochet Ugarte.

Allen Park, city (1970 pop. 40,747), Wayne co., SE Mich., a suburb of Detroit, inc. as a city 1957. Its manufactures include automobiles, tires, liquor, bread, and potato chips. The area was settled in the early 1800s and was named after Lewis Allen, a settler from Detroit.

Allenstein: see OLSZTYN, Poland

Allentown, city (1970 pop. 109,527), seat of Lehigh co., E Pa., on the Lehigh River, inc. as a borough 1811, as a city 1867. Allentown, situated in the agricultural Lehigh valley and in the Pennsylvania Dutch region, is an industrial and commercial city. Cement, truck and bus bodies, clothing, machinery, small appliances, transistors, tubes, air-reduction equipment, gas-generating equipment, pneumatic loading machinery, and beer are the major products. In the city are Muhlenberg College, Cedar Crest College, Allentown College of St. Francis de Sales, Lehigh County Community College, and a campus of Pennsylvania State Univ. Allentown was founded in 1762 by William Allen, Chief Justice of the Commonwealth of Pennsylvania, and was settled by representatives of various German religious groups. First known as Northampton, it was renamed Allentown c.1836. The Liberty Bell was brought there (1777) for safekeeping during the Revolutionary War, and the city became a munitions center for the Continental Army. Points of interest include the Zion Reformed Church (where the Liberty Bell was kept) and an art museum.

Alleppey (äl'pē), town (1971 pop. 160,064), Kerala state, SW India. It is a district administrative center and port on the Arabian Sea. Copra, coir, rubber, and spices are its chief exports. Fishing is a major industry.

allergy, hypersensitive reaction of the body tissues of certain individuals to certain substances that, in similar amounts and circumstances, are innocuous to other persons. Allergens, or allergy-causing substances, can be airborne substances (e.g., pollens, dust, smoke), infectious agents (bacteria, fungi, parasites), foods (strawberries, chocolate, eggs), contactants (poison ivy, chemicals, dyes), or physical agents (light, heat, cold). It is believed that a person who is hereditarily predisposed toward allergy produces, when sensitized, special weak types of antibodies, called reagins, that give little immune protection but cause local tissue damage during the antibody-antigen reaction (see IMMUNITY). Allergens can affect the respiratory system, the reaction manifesting itself as asthma or hay fever, or they can affect the skin, causing wheals and rashes. Allergens may also act on the gastrointestinal tract, causing nausea and vomiting. Allergic reactions to substances injected into the bloodstream can cause violent and sometimes fatal reactions (see ANAPHYLAXIS, SERUM SICKNESS). The best treatment of allergic reactions is prevention, i.e., elimination of the offending substances from the sensitive person's environment. If this is not possible, desensitization (i.e., deliberate production of the allergic reaction by injecting the allergen, after which the sufferer is no longer susceptible) is sometimes helpful. Antihistamine drugs may give temporary relief. See HISTAMINE.

Allerton, Isaac (äl'ärtən), c.1586-1659, Pilgrim settler in Plymouth Colony. Possibly a London tailor, he was a merchant in Leiden before going to America on the *Mayflower*. From 1626 to 1631, acting as the agent of PLYMOUTH COLONY, he was often in England. While there he bought up the rights of merchants in the enterprise and in 1630 secured a new patent for the colony. The terms of the new patent, however, were opposed by William Bradford and other colonists. Allerton was at best incompetent and ran up the debt, even if he was not—as his neighbors accused him of being—dishonest. He probably left Plymouth Colony in 1631 and was later at Marblehead, at New Amsterdam, and in the New Haven colony.

Alleyn, Edward (äl'in), 1566-1626, English actor. He was the foremost member of the ADMIRAL'S MEN, joining the group c.1587, and was the only rival of Richard Burbage. He gained fame for his portrayals

in Marlowe's *Tamburlaine, Jew of Malta*, and *Faustus*. He married the stepdaughter of Philip Henslowe and with Henslowe owned the Rose and Fortune theaters. His popularity brought him wealth, which he employed in the founding of Dulwich College in 1613 and in aiding contemporary writers. After his wife's death, he married a daughter of John Donne.

Alliance, city (1970 pop. 26,547), Mahoning and Stark cos., NE Ohio, on the Mahoning River, in a farm area, inc. 1854. It is an industrial, distributing, and rail center, with manufactures of steel, heavy machinery, electric tubing, chinaware, and farm, railroad, and industrial equipment. It is the seat of Mount Union College, where Clarke Observatory is located.

Alliance for Progress (*Alianza para Progreso*), inter-American program of economic assistance begun in 1961. Conceived as an evolutionary plan to relieve Latin American economic and social problems, it was created, in part, to counter the appeal of revolutionary approaches such as the one adopted by Cuba. It is administered by the Inter-American Committee for the Alliance for Progress (CIAP), a permanent committee within the ORGANIZATION OF AMERICAN STATES. The charter of the Alliance, formulated at the Inter-American Economic and Social Council conference at Punta del Este, Uruguay, in Aug., 1961, envisioned a minimum annual increase of 2.5% in per capita income. To achieve this a capital investment of \$80 billion over a period of 10 years was pledged by the Latin American countries (excluding Cuba), who in turn agreed to carry out tax and land reforms. The United States agreed to supply or guarantee 60% of an additional \$20 billion in outside financing. Private capital was asked to supply a yearly average of \$300 million of this amount. Although the increase of 2.5% in per capita income was not achieved by the early 1970s, the United States had already assured (1967) Latin American leaders that the program would be extended beyond the 1971 terminal date. By the early 1970s, criticism of the program was heard across Latin America and in the United States. In 1971 the United States began a reduction in loans to the program, limiting its prospects for future success. See H. K. May, *The Problems and Prospects of the Alliance for Progress* (1968), Harvey S. Perloff, *Alliance for Progress* (1969), Jerome Levinson and Juan de Onis, *The Alliance That Lost Its Way* (1970).

Allier (äl'yä'), department (1968 pop. 386,533), central France, in BOURBONNAIS MOULINS is the capital.

alligator, large aquatic reptile of the genus *Alligator*, in the same order as the CROCODILE. There are two species—a large type found in the S United States and a small type found in China. Alligators differ from crocodiles in several ways. They have broader, blunter snouts, which give their heads a triangular appearance, also, the lower fourth tooth does not protrude when the mouth is closed, as it does in the crocodile. The American alligator, *Alligator mississippiensis*, is found in swamps and sluggish streams from North Carolina to Florida and along the Gulf Coast. When young, it is dark brown or black with yellow transverse bands. The bands fade as the animal grows, and the adult is black. Males commonly reach a length of 9 ft (2.7 m) and a weight of 250 lbs (110 kg), females are smaller. Males 18 ft (5.4 m) long were once fairly common, but intensive hunting for alligator leather has eliminated the larger individuals (a specimen over 10 ft/3 m long is now unusual) and threatened the species as a whole. The American alligator is now completely protected by law. Alligators spend the day floating just below the surface of the water or resting on the bank, lying in holes in hot weather. They hunt by night, in the water and on the bank. Young alligators feed on water insects, crustaceans, frogs, and fish, as they grow they catch proportionally larger animals. Large alligators may occasionally capture deer and cows as they come to drink, they are not known to attack humans except in self-defense. Alligators hibernate from October to March. In summer the female builds a nest of rotting vegetation on the bank and deposits in it 20 to 70 eggs, which she guards for 9 to 10 weeks until they hatch. The Chinese alligator, *A. sinensis*, which grows to about 6 ft (1.8 m) long, is found in the Yangtze River valley near Shanghai. This species is nearly extinct. Caimans are members of the alligator family found in Central and South America. There are several species, classified in three genera. The largest grow up to 15 ft (4.8 m) long. Unlike alligators, caimans have bony overlapping scales on their bellies. Baby caimans are often sold in the United States as baby alligators. Alligators and caimans are classified in the phylum CHOR-

DATA, subphylum Vertebrata, class Reptilia, order Crocodilia, family Alligatoridae.

alligator pear: see AVOCADO

Alliluyeva, Svetlana (svyēt'läna al-lēlōō'yäva), 1926-, only daughter of the Soviet Communist leader Joseph Stalin and his second wife, Nadezhda Alliluyeva. After her father's death (1953) she was a teacher and translator in the Soviet Union. In late 1966, while in India, she defected to the West. She left a grown son and daughter from two earlier marriages in the Soviet Union. She settled in the United States in April, 1967, and published (1967) her memoirs, *Twenty Letters to a Friend*. She also wrote *Only One Year* (1969), an account of her experiences under diverse Soviet regimes. Becoming a U.S. citizen, she married (1970) an American architect, William Peters, but separated from him after having given birth to a daughter.

Allingham, Margery (äl'ing-əm), 1904-66, English detective-story writer, b. London. Most of her novels feature Mr. Albert Campion, a scholarly detective of noble birth, bespectacled, mild, and believable. Her thrillers are intelligently written and noted for their adroit characterization and literate style. Among her more than 25 books are *The Crime at Black Dudley* (1928), *Flowers for the Judge* (1936), *Black Plumes* (1940), *The Tiger in the Smoke* (1952), and *The Mind Reader* (1965), her last.

Allingham, William, 1824-89, English poet, b. Donegal, Ireland. He is best known for his short lyrics, most notably "The Fairies," beginning "Up the airy mountain, Down the rushy glen." See study by Alan Warner (1972).

Allison, William Boyd, 1829-1908, U.S. Senator from Iowa (1873-1908), b. Ashland co., Ohio. He served (1863-71) in the House of Representatives and entered the Senate in 1873. One of the most influential Republican members of Congress, he spoke for the farmers of the Midwest and was considered a political moderate. Allison opposed high tariffs on goods needed in quantity by the farmers and helped to build compromise tariff bills. He changed the bill for "free and unlimited coinage" of silver to allow specified limited coinage and thus gave his name to the BLAND-ALLISON ACT. See biography by Leland Sage (1956).

alliteration (älit'ərā'shan), the repetition of the same starting sound in several words of a sentence. Probably the most powerful rhythmic and thematic uses of alliteration are contained in *Beowulf*, written in Anglo-Saxon and one of the earliest English poems extant. For example:

Pa com of more under mist-hleopum
Grendel gongan, Godes yre baer
(Then came from the moor, under the misty hills,
Grendel stalking, he God's anger bare)

Beowulf, Book XI

The poet was drawing here on an even older Germanic tradition, just as he was setting a high standard for other poets in Anglo-Saxon, who produced such alliterative works as *Widsith*, *Deor's Lament*, *The Wanderer*, *The Seafarer*, and *The Ruin*. Although the tradition lay dormant for centuries, an alliterative revival occurred in England in the mid-1400s, as evidenced by such masterworks as *Piers Plowman* and *Sir Gawain and the Green Knight* (see LANGLAND, WILLIAM, PEARL, THE). Shakespeare parodies alliteration in Peter Quince's Prologue in *A Midsummer Night's Dream*.

Whereat, with blade, with bloody blameful blade,

He bravely breach'd his boiling bloody breast
Modern poets have continually renewed the possibilities of alliteration, e.g., Gerard Manley Hopkins's "Pied Beauty"

Glory be to God for dappled things
Landscapes plotted and pieced—fold, fallow
and plough,

And all trades, their gear and tackle
and trim

Alliterative Morte Arthure. see ALLITERATION

Alliterative Revival: see ALLITERATION

Alloa (äl'lōä), burgh (1971 pop. 14,110), administrative center of Clackmannanshire, central Scotland, on the Forth River. Coal mining, brewing, and bottle making are the principal industries. A 15th-century tower on Mar's Hill marks the seat of the Erskines, earls of Mar. In 1975, Alloa became part of the new Central region.

Allobroges (äl'ōbrājēz), Celtic tribe in Gaul, inhabiting later Dauphine and Savoy. They were conquered (121 B.C.) by Quintus Fabius Maximus, who was called Allobrogicus in commemoration of the victory. In the time of Julius Caesar they sided with Rome.

allograft: see TRANSPLANTATION MEDICAL

Allon 1 Simeonite 1 Chron 4 37 2 Naphtalite city Joshua 19 33

Allon-bachuth (āl'an-bāk'əth), place close to Bethel, where they buried Rebecca's nurse Gen 35 8

allotropy (əłō'trəpē) [Gr. = other form] A chemical element is said to exhibit allotropy when it occurs in two or more forms, the forms are called allotropes. Allotropes generally differ in physical properties such as color and hardness, they may also differ in molecular structure or chemical activity, but are usually alike in most chemical properties. Diamond and graphite are two allotropes of the element CARBON. OZONE is a chemically active triatomic allotrope of the element OXYGEN. PHOSPHORUS, SULFUR, and TIN also exhibit allotropy. Many metals have allotropic crystalline forms that are stable at different temperatures. POLYMORPHISM is an analogous phenomenon observed in chemical compounds.

Allouez, Claude Jean (klōd zhaN alwā'), 1622-89, French Jesuit missionary in Canada and the American Midwest. After arriving (1658) in Canada he served at posts in the St. Lawrence region until 1665, when he went to Lake Superior and founded the Chequamegon Bay mission (near present-day Ashland, Wis.). A canoe trip around Lake Superior in 1667 supplied material for the well-known Jesuit map of the lake. Later he founded several missions, including that at De Pere, made his headquarters at Green Bay, and spent his last years as missionary to the Illinois and Miami Indians. His accurate and informed reports made the Great Lakes country known.

Alloway, Scotland see AYR

alloy (āl'oi, əl'oi) [from O Fr. = combine], substance with metallic properties that consists of a metal fused with one or more metals or nonmetals. Most alloys are solid at room temperature. An alloy may be a homogeneous solid solution, a heterogeneous mixture of tiny crystals, a true chemical compound, or a mixture of these. Alloys generally have properties different from those of their constituent elements: they may be poorer conductors of heat and electricity, harder, or more resistant to corrosion. Because of these and other properties, alloys are used more extensively than pure metals. Alloys of iron and carbon are among the most widely used; they include cast iron and steels. Brass and bronze are important alloys of copper. Nickel is often added to alloys to improve their properties. Because pure gold and pure silver are too soft for many uses, e.g., jewelry and tableware, they are often alloyed either with one another or with other metals, e.g., copper or platinum. Amalgams are alloys that contain mercury.

All Saints Bay, Brazil see TODOS OS SANTOS BAY

All Saints' Day, Nov. 1, feast of the Roman Catholic and Anglican churches, the day on which the church glorifies God for all his saints, known and unknown. It is one of the principal feasts of the year in the Roman Catholic Church, all are obliged to hear Mass on it. Its origin probably lies in the common commemoration of martyrs who died in groups or whose names were unknown. In 609, Pope Boniface IV dedicated the Pantheon at Rome to Our Lady and all martyrs, and by 900 All Saints was generally celebrated on Nov. 1. In medieval England the festival was known as All Hallows, hence the name Halloween ('Hallows' eve) for the preceding day (Oct. 31). Halloween is associated, in countries where Celtic influence is strong, with age-old customs peculiar to that night. In certain parts of the British Isles bonfires and fortune-telling like those of midsummer night continue. Elsewhere, especially in America, mumming and masquerading are popular, and jack-o'-lanterns are displayed. Tales of witches and ghosts are told, and in remote communities old superstitions are kept. One of the special games, bobbing for apples, is known to date from the Middle Ages. These pagan survivals of Halloween probably represent old Celtic practices associated with Nov. 1, the beginning of winter. Probably All Saints' Day arose apart from Celtic influence, and the customs of Halloween have survived independently of the Christian feast.

All Souls' Day, Nov. 2 (exceptionally, Nov. 3), feast of the Roman Catholic Church on which the church on earth prays for the souls of the faithful departed still suffering in PURGATORY. The proper office is of the dead, and the Mass is a REQUIEM. General intercessions for the dead (e.g., for those of a parish, a city, or a regiment) are very ancient (2 Mac. 12:43-45), but the modern feast was probably first established by an 11th-century abbot of Cluny for his community and later extended throughout the

church. In Catholic countries there are many customs peculiar to All Souls' Day (e.g., leaving lights in the cemeteries on the night before). These vary from region to region. They should be distinguished from the customs of Halloween, which were apparently an independent development (see ALL SAINTS' DAY).

allspice: see PIMENTO

Allston, Washington, 1779-1843, American painter and author, b. Georgetown co., S.C. After graduating from Harvard (1800), where he composed music and wrote poetry (published in 1813 as *The Sylphs of the Seasons*), Allston went to London and there studied painting with Benjamin West. He then spent four years in Rome studying the old masters and began his ambitious religious and allegorical paintings, which at first he rendered with classical reserve. His greatest years were spent in England (1810-18), where his work revealed a sophisticated and controlled, yet romantic mind. An important work of this period was the portrait of his lifelong friend Coleridge. In England and Europe, Allston was the intimate of intellectuals and in frequent contact with the best of Western art. He returned to the United States, where artistic stimulation was lacking, and, as a result, his own work eventually lost its vitality. His allegorical works and his tragic failure, *Belshazzar's Feast*, over which he labored for more than 20 years, were totally overshadowed by his lyric fantasies—his landscapes and seascapes, of which *Moonlit Landscape* (1819, Mus. of Fine Arts, Boston) and *Ship in a Squall* (before 1837, Fogg Art Mus.) are two of the finest. Although he was his own most perceptive critic, Allston persisted in his nostalgic re-creation of monumental neoclassic figure paintings until his death. Samuel F. B. Morse was one of his numerous pupils. See biographies by J. B. Flagg (1892, repr. 1969) and E. P. Richardson (1948).

Alma (alma', āl'ma), city (1971 pop. 22,622), S. central Que., Canada, on the Saguenay River. In 1954 its name was shortened from St. Joseph d'Alma. There are granite quarries in the region, and the town has pulp and paper and aluminum plants.

Alma-Ata (āl'mā-ā'ta, Rus. āl'mā-ā'ta'), city (1970 pop. 730,000), capital of the Kazakh Soviet Socialist Republic, Central Asian USSR, in the foothills of the Trans-Ili Ala-Tau. A terminus of the Turkistan-Siberia RR, Alma-Ata is the industrial and cultural center of Kazakhstan. Leading industries include motion picture production, fruit canning, meat-packing, tobacco processing, and the repair of railroad equipment. The city was founded in 1854 as a Russian fort and trade center known as Verny. Alma-Ata has a university and is the site of the Kazakh Academy of Sciences.

Almagest: see PTOLEMY

Almagro, Diego de (dyā'gō dā alma'grō), c. 1475-1538, Spanish conquistador, a leader in the conquest of Peru. A partner of Francisco PIZARRO, he took part in the first (1524) and second (1526-28) expeditions and in the bloody subjugation of the Incas after 1532. He aided (1534) BENALCÁZAR in thwarting Pedro de ALVARADO in the conquest of Ecuador. No match for the Pizarro brothers, he lost out in the division of spoils but was granted the lands S. of CUZCO. In 1535, Almagro set out on a march that was incredible in its hardships—south through the freezing cordillera of the Andes, probably as far as Coquimbo in present Chile, and then, after finding no gold, back north through the desert wastes of ATACAMA. He believed CUZCO was within his jurisdiction and so seized (1537) the city from Hernando PIZARRO, whom he injudiciously set free. Civil war ensued, and Almagro's forces were defeated. Almagro begged for his life and was promised it, but he was garroted by orders of Hernando Pizarro. Almagro's half-Indian son, Diego de Almagro (d. 1542), inherited his rights. Later the youth nominally headed the revolt that began with the assassination of Francisco Pizarro, but in 1542 he was captured and executed by the new governor, VACA DE CASTRO.

Al Mahdīyah (al madē'ya) or **Mahdia**, town (1966 pop. 15,900), E. Tunisia, on the Mediterranean Sea. It is a fishing port where olive oil and handicrafts are marketed. The town was founded in 912 by the Fatimids on the site of Phoenician and Roman colonies, and it was the Fatimid capital from 921 to 948.

almanac, calendar with notations of astronomical and other data. Almanacs have been known in simple form almost since the invention of writing, for they served to record religious feasts, seasonal changes, and the like. The Roman *fasti*, originally a list of *dies fasti* (days when legal business might be transacted) and *dies nefasti* (days when legal business should not be transacted), were later elaborated into various lists, some of them resembling

modern almanacs. The almanac did not become a really prominent type of reading matter until the introduction of printing in Western Europe in the 15th cent. Regiomontanus produced one of the famous early almanacs (his *Ephemerides*), incorporating his astronomical knowledge. Most early almanacs were devoted primarily to astrology and predictions of the future. Prediction of the weather has persisted in many modern almanacs, but the crude and sensational magic began to disappear early, to be replaced by more or less scientific information. There appeared late in the 18th cent. truly scientific almanacs—notably the British Nautical Almanac (founded 1767) (see EPHEMERIS), which was the inspiration for the *American Ephemeris and Nautical Almanac* (founded 1855). The popular almanac, however, developed in the 17th and 18th cent. into a full-blown form of folk literature, with notations of anniversaries and interesting facts, home medical advice, statistics of all sorts, jokes, and even fiction and poetry. The first production (except for a broadside) of printing in British North America was an almanac for the year 1639. One of the best colonial almanacs was the *Astronomical Diary and Almanack* begun by Nathaniel Ames in 1725, and this was the *forerunner of the most famous of them all*, Benjamin Franklin's *Poor Richard's Almanack* (pub. by him 1732-57), which in its title recalled one of the most popular and long-lasting of English almanacs, that of "Poor Robin" (founded c. 1662). The most enduring of all American almanacs was first published in 1793 by Robert Baily Thomas; it came later to be called *The Old Farmer's Almanack*. The best types of present-day almanacs are handy and dependable compendiums of large amounts of statistical information. Noteworthy are *The World Almanac and Book of Facts* (first pub. as a booklet in 1868, discontinued 1884, revived 1885), *Information Please Almanac* (first pub. 1947), and the *Reader's Digest Almanac* (first pub. 1965).

Al Manamah (al manam'a), town (1971 pop. 89,728), capital of Bahrain, on the Persian Gulf. It has oil refineries and light industries and is a free port. A causeway links it with the island of Al Muharraq.

Alma-Tadema, Sir Lawrence (āl'mā-tād'īma), 1836-1912, English painter, b. Friesland. He studied in Belgium, where he lived until 1869. In that year he went to England, there he became a citizen and enjoyed a long popularity and many honors. He is best known for his scholarly and meticulous paintings of scenes from Greek and Roman life.

Almeida, Antonio José de (āntō'nyōō zhōōzē' dī almā'dā), 1866-1929, Portuguese statesman. A republican, he was minister of the interior in the provisional government after the overthrow of the monarchy in 1910. As leader of the moderate Evolutionist party, he was premier of a coalition cabinet in World War I and later (1919-23) president of the republic.

Almeida, Francisco de (frānsēsh'kōō), c. 1450-1510, Portuguese admiral, first viceroy of Portuguese India. He was first sent to India in 1503 as captain major of a fleet and helped Portuguese forces defeat the ruler of Calicut. In 1505 he was appointed viceroy and set out from Lisbon with instructions to develop Portuguese commerce by building fortifications on the east coast of Africa, concluding alliances with the Indian rulers, and taking control of the spice trade from the Arabs. In Africa he built forts at Kilwa and Sofala and burned Mombasa. After his arrival in India he built further forts but relied mainly on his fleets to secure control of all sea trade. The Egyptians, seeing their commerce threatened, built a fleet (with the help of Venice) and defeated and killed (1508) Almeida's son at Chaul. However, in 1509, Almeida won a great naval battle against them and their Indian allies off Diu. Almeida at first refused to yield his power to Afonso de ALBUQUERQUE and had Albuquerque imprisoned (1509), but he later gave him command. On his way home to Portugal, Almeida was killed by Hottentots near the Cape of Good Hope. See K. C. Jayne, *Vasco da Gama and His Successors* (1910).

Almeida Garrett, João Batista de (zhwōn bātēsh'tā dī almā'dā garēt'), 1799-1854, Portuguese dramatist, poet, journalist, and orator, leader of the romantic movement in Portugal. After a period in the Azores he returned to graduate from the Univ. of Coimbra. An ardent liberal democrat, he supported the revolution of 1820 and was twice forced into exile (1823-26, 1828-32). Upon his return he abandoned classicism for a romanticism that he expressed most effectively in the plays *Alfama de Santarem* and *Frei Luis de Sousa* (tr. *Brother Luiz de Sousa*, 1909), and the long poems *Camões* and *Dona*

Branca Generally considered the greatest of Portuguese dramatists, he was a significant poet and folklorist as well. Almeida Garrett held numerous political offices, working effectively for the democratic cause. His major works include collections of poetry, *Flores sem fruto* [flowers without fruit] (1844), *Fóllas caídas* [fallen leaves] (1853), a book of folklore, *Romanceiro* (1843), and the prose *Viagens na minha terra* [journeys in my native land] (1846).

Almelo (ál'mälō), city (1971 pop 59,426), Overijssel prov., E Netherlands. It is a manufacturing center and has a large textile industry.

Almería (almärē'a), city (1970 pop 114,510), capital of Almería prov., SE Spain, in Andalusia, on the Gulf of Almería. A busy Mediterranean port, it exports the celebrated grapes of the region, other fruits, esparto, as well as iron and other minerals mined nearby. The city has refineries and processing plants and light industries. Probably founded by Phoenicians, Almería flourished from the 13th to the 15th cent. as the outlet of the Moorish kingdom of Granada. Under the Moors it was an important naval base. It fell to the Christians in 1489. There is a Moorish fort, now in ruins, and a Gothic cathedral. In 1937, during the civil war, the city was shelled by German warships.

Almirante Brown (almērān'tā) or **Adrogué** (adrō-gā'), city (1960 pop 136,924), Buenos Aires prov., E Argentina. It was settled in 1873 by families fleeing a yellow fever epidemic in the city of Buenos Aires.

Almodad (ālmō'dād), descendant of Shem. Gen 10:26, 1 Chron 1:20.

Almohads (āl'mähādz), Berber Muslim dynasty that ruled Morocco and Spain in the 12th and 13th cent. It had its origins in the puritanical sect founded by Ibn Tumart, who stirred up (c 1120) the tribes of the Atlas Mts. area to purify Islam and oust the Almoravids. His successors, ABD AL-MUMIN, Yusuf II, and YAKUB I, succeeded in conquering Morocco and Muslim Spain, and by 1174 the Almohads had completely displaced the Almoravids. With time the Almohads lost some of their fierce purifying zeal, Yakub had a rich court and was the patron of Averroës. Yakub defeated (1195) ALFONSO VIII of Castile in the battle of Alarcos, but in 1212 the Almohad army was defeated, and Almohad power in Spain was destroyed by the victory of the Spanish and Portuguese at Navas de Tolosa. In Morocco they lost power to the Merenid dynasty, which took Marrakesh in 1269. See studies by Abd al-Wahid al-Marrakushi (1881, repr 1968) and Roger Le Tourneau (1969).

Almon: see ALEMETH 2.

almond, name for a small tree (*Prunus amygdalus*) of the family Rosaceae (ROSE family) and for the nutlike, edible seed of its fruit. The "nuts" of sweet-almond varieties are eaten raw or roasted and are pressed to obtain almond oil. Bitter-almond varieties also yield oil, from which the poisonous prussic acid is removed in the extraction process. Almond oil is used for flavoring, in soaps and cosmetics, and medicinally as a demulcent. The tree, native to central Asia and perhaps the Mediterranean, is now cultivated principally in the Orient, Italy, Spain, and (chiefly the sweet varieties) in California. It closely resembles the peach, of which it may be an ancestor, except that the fruit is fleshless. The flowering almonds (e.g., *P. triloba*) are pink- to white-blossomed shrubs also native to central Asia, like the similar and closely related pink-blossomed almond, they are widely cultivated as ornamentals. Several Asian types are known as myrobalan, a name applied also to the cherry plum, with which flowering almonds are sometimes hybridized. The beauty of the almond in bud, blossom, and fruit gave motif to sacred and ornamental carving. In the Middle East the tree breaks into sudden bloom in January, and in Syria and Palestine it came to symbolize beauty and revival. The rod of Aaron in the Bible (see AARON'S-ROD) bore almonds. Almonds are classified in the division MAGNOLIOPHYTA, class Magnoliopsida, order Rosales, family Rosaceae.

Almon-diblathaim (āl'man-dīb'lāthā'am), camping place of the Israelites. Num 33:46,47. Called Beth-diblathaim in a denunciation of Moab. Jer 48:22.

Almoravids (ālmō'rāvīdz), Berber Muslim dynasty that ruled Morocco and Muslim Spain in the 11th and 12th cent. The Almoravids may have originated in what is now the Islamic Republic of Mauritania. The real founder was Abd Allah ibn Yasin, who by military force converted a number of Saharan tribes to his own reformed religion and then advanced on Morocco. After his death (c 1059), YUSUF IBN TASHFIN and his brother ABU BAKR came to power. MARRAKESH was founded in 1062 and was the center of a power-

ful empire. Called by the Moors in Spain to help stem Christian reconquest, Yusuf entered Andalusia and defeated (1086) Alfonso VI of Castile. He later subdued the local Muslim rulers and governed Muslim Spain and N Morocco (Abu Bakr ruling over S Morocco). The dynasty also pushed south, destroying the ancient state of GHANA. The Almoravids were rough and puritanical, contemptuous of the luxurious Muslim courts in Spain. Their rule was never entirely stable and in the 12th cent. was attacked by the ALMOHADS, who finally (by 1174) won both Morocco and Muslim Spain.

Almqvist, Carl Jonas Love (karl yōō'nās lōō'və alm'kvist), 1793-1866, Swedish writer. He has been called the only Swedish novelist of note in the period 1830-50. At first a somewhat bizarre romanticist, inclined toward anarchy, he later became more concerned with realism and democracy. This transition is seen in *The Book of the Thorn Rose* (14 vol., 1832-51), which contains most of his novels, stories, plays, and poems. His novel *Sara Videbecke* (1839) appeared in English in 1919. In his varied career he was civil servant, teacher, clergyman, and socialist. Accused of forgery and suspected of murder, he fled to the United States and after 1865 lived in Bremen as Professor Westermann. See Axel Hemming-Sjoberg, *A Poet's Tragedy* (tr 1932).

almug or **algum**, precious wood mentioned in the Bible (2 Chron 2:8, 9:10,11), used in the Temple of Solomon and in his palace, brought from Ophir and Lebanon. It is perhaps a red SANDALWOOD.

Aloadae (ālō'adē) or **Aloidae** (ālōt'dē), in Greek mythology, two giants who warred against the Olympian gods. Their names were Otus and Ephialtes, and they were the sons of Aloeus' wife by Poseidon. They tried to reach heaven to overthrow the gods by piling Mt. Ossa on Mt. Olympus and Mt. Pelion on Mt. Ossa. Some said they were killed by Apollo, others that they killed each other while shooting at a hind sent by Apollo. For their wickedness they were condemned to eternal torture in Tartarus. Thus the phrase "to pile Pelion on Ossa" means to attempt an enormous but fruitless task.

alod (āl'ōd). In feudal tenure, lands held without obligation to any suzerain (overlord) were termed held in alod. Alodial lands existed in England and on the Continent. They became less common as landowners sought protection by turning their lands over to more powerful lords and receiving the holdings back as fiefs. In modern times the distinction between fee simple (see TENURE) and alod has vanished.

aloe (āl'ō) [Gr.], any species of the genus *Aloe*, succulent perennials of the family Liliaceae (LILY family), native chiefly to the warm dry areas of S Africa and also to tropical Africa, but cultivated elsewhere. The juice of aloe leaves contains the purgative aloin. Today the various drug-yielding species, e.g., *A. barbadensis* and *A. chinensis*, are still used for their traditional medicinal properties as well as for X-ray-burn treatment, insect repellent, and a transparent pigment used in miniature painting, cords and nets are made from the leaf fiber. In ancient times the juice was used in embalming. A Muhammadan, on his return from his pilgrimage to Mecca, hangs an aloe above his door. The American and false aloes are agaves, a family Amaryllidaceae (AMARYLLIS family) group that is the American counterpart in habit and general appearance to the true aloes. There is evolutionary evidence that the aloes and the agaves should be considered a single separate family, the Agavaceae. The Scriptural aloe is unrelated. Aloe is classified in the division MAGNOLIOPHYTA, class Liliatae, order Liliales, family Liliaceae.

aloes (āl'ōz), drug obtained from the ALOE, also a biblical name for an aromatic substance of various uses, mentioned in connection with myrrh and spices (Ps 45:8, Prov 7:17, Cant 4:14, John 19:39) and thought to be the fragrant wood of the modern aloeswood (also called eaglewood, agalloch, or agilawood), an *Aquilaria* native to Asia. In the East the aloeswood has been valued for medicinal purposes, as an incense, and for the beautiful grain of its wood, which takes a high polish and was used for setting precious stones. The tree lignaleos of Num 24:6, sometimes thought to be the aloeswood, may have been a different plant. The aloe and the American aloe, or agave (see AMARYLLIS), are not to be confused with the aloes of the Scriptures.

Aloidae: see ALOADAE.

Alompra: see ALAUNGPAWA.

Alonso, Alicia (Alicia Martinez) (ālēs'yā alōn'sō, mār'tē'nās), 1921-, Cuban ballerina and choreographer, b. Havana. Alonso danced in Broadway musi-

cals before becoming a soloist with several leading companies, including the American Ballet Theatre, in 1939. She soon gained acclaim in an enormous variety of starring roles, ranging from classical to modern. She was best known for her work in *Giselle* and in Agnes de Mille's *Fall River Legend*. Her own works include *La Tinaja* (1943), *Ensayos Sinfónicos*, and *Lidia*, all created for her own company in Cuba.

Alonso, Dámaso (da'māsō alōn'sō), 1898-, Spanish philologist, lyric poet, and literary critic, b. Madrid. He is known for his literary sensitivity and the precision and rigor of his critical approach. His critical works include *La lengua poetica de Gongora* [the poetic language of Gongora] (1935) and *Ensayos sobre poesia española* [essays on Spanish poetry] (1944). Among his volumes of poetry are *El viento y el verso* [wind and verse] (1925) and *Hijos de la ira* (1944, tr *Children of Wrath*, 1970).

alopecia (āl'apē'shēā) see BALDNESS.

Alor Setar (a'lōr sē'tar') or **Alor Star** (star), city (1971 pop 66,179), capital of Kedah, Malaysia, central Malay Peninsula, on the Kedah River. It is a major center for trade in rice and rubber. The residence of the Sultan of Kedah is in the city.

Alot: see AALST, Belgium.

Aloth (āl'ōth) see BEALOTH.

Aloysius, Saint (ālōi'shās), 1568-91, Italian Jesuit, b. Luigi Gonzaga, heir to the marchese de Castiglione. Highly devout from childhood, he renounced his title and entered (1585) the Society of Jesus under the tutelage of St. Robert Bellarmine. He died of a fever he caught while ministering to victims of the plague. He is the patron of youth. St. Aloysius has been especially extolled for his purity. Feast: June 21.

alpaca (ālpāk'ə), partially domesticated South American hoofed mammal of the CAMEL family. Like the LLAMA, it is probably a descendant of the guanaco. Although the flesh is sometimes used for food, the animal is bred chiefly for its long, lustrous wool, which varies from black, through shades of brown, to white. Flocks of alpaca are kept by Indians in the highlands of Bolivia, Chile, and Peru. They feed on grasses growing close to the snow line, and they require a pure water supply. The Incas had domesticated the alpaca and utilized its wool before the Spanish Conquest. Exporting of alpaca wool to Europe began after Sir Titus Salt discovered (1836) a way of manufacturing alpaca cloth. The name alpaca is sometimes used for materials such as mohair, which do not contain alpaca wool. Alpacas are classified in the phylum CHORDATA, subphylum Vertebrata, class Mammalia, order Artiodactyla, family Camelidae.

Alp Arslan (alp arslan'), 1029-72, Seljuk sultan of Persia (1063-72). In 1065 he led the Seljuks in an invasion of Armenia and Georgia and in 1066 attacked the Byzantine Empire. The success of his campaign was crowned (1071) by his brilliant victory over Romanus IV at MANZIKERT. After defeating the Byzantines, he wrested Syria from the Fatimids. In Dec. 1072, while campaigning beyond the Oxus River, he was murdered by one of his captives. He was succeeded by his son Malik Shah, who consolidated the victories his father had won.

Alpena (ālpē'nā), city (1970 pop 13,805), seat of Alpena co., N Mich., on Thunder Bay, an arm of Lake Huron, inc. 1871. Limestone quarried nearby is used to make cement, Alpena's chief manufacture. Other products include hardboard, paper, machinery, and automobile parts. Cement, limestone, and coal are transported on the Great Lakes by way of Alpena's harbor. Alpena lies in a year-round resort area and has an annual winter carnival. Alpena Community College is there.

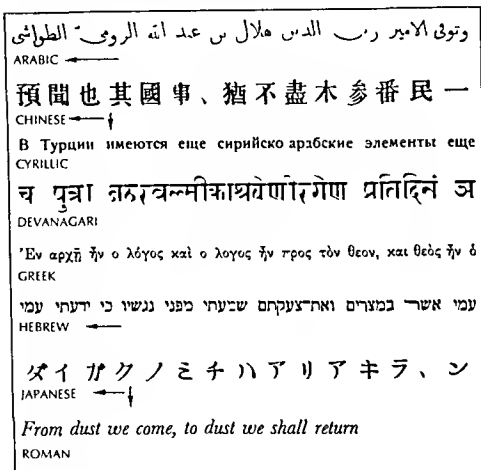
alpenhorn: see ALPHORN.

Alpes-de-Hautes-Provence (alp'-dā-ōt'-prāvāNs'), department (1968 pop 104,813), SE France, formerly Basses-Alpes dept. Digne is the capital.

Alpes-Maritimes (alp-marētēm'), department (1968 pop 722,070), SE France, bounded by Italy on the east and the Mediterranean Sea on the south and surrounding the independent principality of MONACO. Nice is the capital.

alphabet [Gr. *alpha-beta*, like Eng. ABC], system of writing, theoretically having a one-for-one relation between character (or letter) and phoneme (see PHONETICS). Few alphabets have achieved the ideal exactness. A system of writing is called a syllabary when one character represents a syllable rather than a phoneme, such as the kana, used in Japanese to supplement the originally Chinese characters normally used. The precursors of the alphabet were the

iconographic and ideographic writing of ancient man, such as wall paintings, CUNEIFORM, and the HIEROGLYPHIC writing of the Egyptians. The alphabet of



Examples of letters in various alphabets
(arrows indicate the direction of reading)

modern Western Europe is the Roman alphabet, the base of most alphabets used for the newly written languages of Africa and America, as well as for scientific alphabets. Russian, Serbian, Bulgarian, and many languages of the USSR are written in the Cyrillic alphabet, an augmented Greek alphabet. Greek, Hebrew, and Arabic all have their own alphabets. The most important writing of India is the Devanagari, an alphabet with syllabic features, this, invented probably for Sanskrit, is the source of a number of Asian scripts. The Roman is derived from the Greek, perhaps by way of Etruria, and the Greeks had imitated the Phoenician alphabet. The exact steps are unknown, but the Phoenician, Hebrew, Arabic, and Devanagari systems are based ultimately on signs of the Egyptian hieroglyphic writing. This writing was not alphabetic, but in the phonogram it bore the germ of phonemic writing, thus the sign "bear" might (to use an English analogy) mean also the sound *b*, and "dog" *d*. A similar development created the Persian cuneiform syllabary. Two European alphabets of the late Roman era were the RUNES and the OGHAM. An exotic modern system is the Cherokee syllabary created by SEQUOYAH, suggested by, but not based on, the Roman alphabet. Another was the short-lived Mormon Deseret alphabet. See Samuel Mercer, *The Origin of Writing and Our Alphabet* (1959), David Diringer, *The Alphabet* (2 vol., 3d ed. 1968), Oscar Ogg, *The 26 Letters* (rev. ed. 1971).

Alpha Centauri (ā'fə sēntōr'ē), brightest star in the constellation CENTAURUS and 3d-brightest star in the sky, also known as Rigil Kent or Rigil Kentaurus, 1970 position R.A. 14^h37^m6^s, Dec. -60°43'. It is a yellow main-sequence star of the same SPECTRAL CLASS (G2 V) as the sun and of about the same size and mass, its apparent MAGNITUDE is -0.26. Actually, Alpha Centauri is a triple-star system, the components being designated A, B, and C. Alpha Centauri C is also called Proxima Centauri because it is the closest star to the earth (other than the sun), its distance being 4.28 light-years while that of components A and B is 4.34 light-years. Proxima Centauri orbits about the common center of mass of the system with a period of more than 250,000 years, so that in about 125,000 years it will be more distant than A and B.

Alpha Crucis (krō'sis) see ACRUX

Alphæus (ālfē'as) 1 See CLEOPHAS 2 Father of the evangelist Matthew. Mark 2:14

alpha particle, one of the three forms of natural RADIOACTIVITY. Alpha radiation (or alpha rays) was distinguished and named by E. R. Rutherford, who found by measuring the charge and mass of alpha particles that they are the nuclei of ordinary helium atoms, consisting of two protons and two neutrons (see NUCLEUS).

Alpheus (ālfē'as), river god see ARETHUSA

Alpheus (ālfē'as) or **Alfios** (ālfē'as), river, c. 70 mi (110 km) long, rising in the Taygetus mts., 5 Greece. The longest river in the Peloponnesus, it flows northwest through gorges, past Olympia, and onto the Olympia plains before entering the Ionian Sea. In Greek mythology, its waters were said to pass under the sea and to emerge at Syracuse (Italy) in the fountain of Arethusa. Hercules, to clean the stables

of Augeas, turned the Alpheus through them. It is the river Alph of Coleridge's poem *Kubla Khan*. The lower Alpheus was formerly known as Roupia.

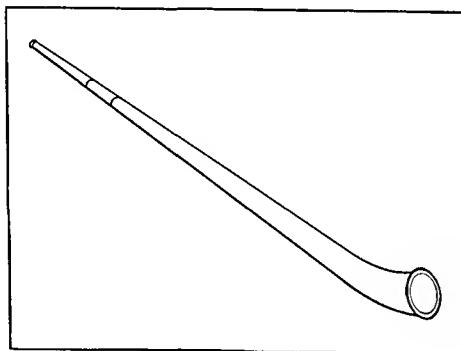
Alphonse (ālfōns'), 1220-71, count of Poitiers and of Toulouse, brother of King Louis IX of France. By his marriage to the daughter of RAYMOND VII, count of Toulouse, he inherited Raymond's lands in 1249. An able administrator, he did much to heal the wounds of the crusade against the Albigenses. During the absence of Louis in the Holy Land, Alphonse was coregent (1250-52) with his mother, Blanche of Castile, and later (1252-54) with his younger brother, Charles of Anjou (later Charles I, king of Naples and Sicily). Alphonse left no heir, and at his death his lands were incorporated into the holdings of Philip III, king of France.

Alphonsine tables see ALFONSINE TABLES

Alfonso. For rulers thus named, see ALFONSO

Alphonsus Liguori, Saint (ālfōn'səs ligwō'rē), 1696-1787, Italian churchman, Doctor of the Church. He was named Alfonso Maria de' Liguori. In 1732 he founded the Congregation of the Most Holy Redeemer (the Redemptorists) for religious work among the poor, especially in the country. He refused the archiepiscopal see of Palermo but accepted (1762) a poor country diocese near Capua. He labored incessantly until 1775, when sickness forced him to resign. He worked for his order under great difficulties, caused by an anticlerical government and overzealous monks. Goatherds of the mountains were his especial care. St. Alphonsus was an accomplished musician and wrote many hymns and instrumental pieces. His point of view in CASUISTRY, which has become standard, is called equiprobabilism. St. Alphonsus was unusual, even among Roman Catholics, for his great devotion to the Virgin. Feast Aug. 2. See biography by D. F. Miller and L. X. Aubin (1940).

alporn or alpenhorn [Ger., = Alps horn], wooden horn from 3 ft to 12 ft (91 cm-3.7 m) long, sometimes curved slightly, with conical bore and a cup-shaped mouthpiece. It produces only the natural



Alporn

harmonics of the tube, slightly modified, however, by the material of the horn and its somewhat irregular shape. In Switzerland it is used to call cattle and to entertain tourists. The RANZ DES VACHES is played upon it.

alpine plants, high-altitude representatives of various flowering plants (chiefly perennials) that because of their dwarfed form, profuse blooming, and the preference of many for shady places are cultivated in alpine and ROCK GARDENS. Some species require specially constructed gardens duplicating mountain terrain, including systems for supplying cool water underground, comparable to the melting snows of their natural habitat. Others thrive without special care in favorable conditions (e.g., cool climate, short growing season, and sweet, rocky soil). Alpine species of gentians, saxifrages, and stonecrops are among those most commonly planted. Many garden plants (e.g., roses, irises, and primroses) have alpine representatives. The EDELWEISS is a popular alpine.

Alps, great mountain system of 5 central Europe, c. 500 mi (800 km) long and c. 100 mi (160 km) wide, curving in a great arc from the Riviera coast on the Mediterranean Sea, along the borders of N Italy and adjacent regions of SE France, Switzerland, 5 West Germany, and Austria, and into NW Yugoslavia. MONT BLANC (15,771 ft/4,807 m) is the highest peak. Cut by numerous gaps and passes, the Alps do not form a complete climatic or strategic barrier, as is evidenced by the similarities of air, people, and animals on either side of the system. The Alps form the watershed of many of Europe's rivers, including the

Rhine, the Rhône, the Po, and the Danube. Geologically, the Alps were formed during the Oligocene and Miocene epochs as a result of the pressure exerted on the Tethyan geosyncline as its Mesozoic and Cenozoic strata were squeezed against the stable Eurasian landmass by the northward moving African landmass. The squeezing action formed great recumbent folds (nappes) that rose out of the sea and pushed northward, often breaking and sliding one over the other to form gigantic thrust faults. Crystalline rocks, which are exposed in the higher central regions, are the rocks forming Mont Blanc, the MATTERHORN, and high peaks in the Pennine Alps and Hohe Tauern, limestone and other sedimentary rocks are predominant (but not continuously present) in the generally lower ranges to the north and south. Permanently snowcapped peaks rise above the snowline—located between 8,000 ft and 10,000 ft (2,440-3,050 m)—and glaciers (the longest being Aletsch glacier) form the headwaters of many Alpine rivers. Glaciation (see GLACIER) was more extensive during the Pleistocene epoch and carved a distinctive mountain landscape—characterized as alpine—of arêtes, cirques, matterhorns, U-shaped and hanging valleys, and long moraine-blocked lakes (such as Garda, Como, and Maggiore in the south and Zurich, Geneva, Thun, and Brienz in the north). Below the snowline is a treeless zone of alpine pastures that have for generations been used for the summer grazing of goats and cattle. Agriculture is confined to the valleys and foothills, with fruit growing and viticulture on some sunny slopes. Hydroelectric power, used for industries in the mountains and in nearby regions, is generated from the many waterfalls and swift-flowing rivers. Tourism, based on the scenic attractions of the Alps and the mountaineering and winter sports they provide, is a major source of income, among the more famous resorts are Chamonix (France), Zermatt, Interlaken, St. Moritz, Davos, and Arosa (Switzerland), Sankt Anton, Innsbruck, Kitzbühel, Salzburg, and Bad Gastein (Austria), Berchtesgaden (West Germany), Cortina d'Ampezzo and Bolzano (Italy), and Bled (Yugoslavia). The Alps are divided by rivers and other topographic features into more than 40 subunits for which local names are commonly used. Well-known groups in the W Alps (from the Riviera to the Great St. Bernard Pass) include the Maritime, Ligurian, Cottian, and Graian alps, the Mont Blanc group, and Valle d'Aosta. The highest western peaks are Mont Blanc, Mont Pelvoux, Monte Viso, and the Gran Paradiso, the chief routes across this section are via the Mont Cenis Tunnel and the Great and Little St. Bernard passes. The Central Alps (between the Great St. Bernard and Brenner passes) include, in the south, the Pennine, Lepontine, Phœtian, and Ötztal alps, and, in the north, the Bernina, Glarus, Allgäu, and Bavarian alps. The principal peaks of the Central Alps are Monte Rosa, the Matterhorn, the Finsteraarhorn, the Jungfrau, and the Wildspitze, the chief routes are the Simplon Tunnel and the St. Gotthard, Grimsel, Furka, Splügen, Bernina, and Brenner passes. The E Alps comprise, in the south, the Dolomites, the Carnic Alps, and the Julian Alps, and, in the north, the Hohe Tauern and Niedere Tauern, the principal eastern peak is Grossglockner. The major routes across the E Alps follow the Brenner and Semmering passes. The Alps were the first mountain system to be extensively studied by geologists, and many of the geologic terms associated with mountains and glaciers originated there. The term *alps* has been applied to mountain systems around the world that exhibit similar traits to the Alps of Europe. See C. E. Engel, *Mountaineering in the Alps: An Historical Survey* (new ed. 1971), *The Alps*, prepared by the National Geographic Society, Washington, D.C. (1973), Ronald Clark, *The Alps* (1973).

Alps, Australian: see AUSTRALIAN ALPS

Al Qayrawan (al kīrawān') or **Kairouan** (kīrawān', Fr. kīrwan'), city (1966 pop. 46,199), NE Tunisia. It is a sacred city of Islam. Founded in 670 by Okba, an Arab leader, it was the seat of Arab governors in W Africa until 800. Under the Aghlabid dynasty (800-909) it remained the chief center of commerce and learning. It was the first capital (909-21) of the Fatimids. When the city was ruined (1057) by invaders, it was supplanted by Tunis. Of Al Qayrawan's 150 mosques, the most celebrated is the Grand Mosque, started by Okba and completed in (1057) by invaders. The city is noted for its carpet industry.

Als (als), Ger. *Alsen*, island, 121 sq mi (313 sq km), Sønderjylland co., 5 Denmark, in the Lille Bælt, separated from the mainland by the narrow Als Sund. Sønderborg (partly situated on the mainland) is the main city, other towns include Augustenborg.

and Nordborg Farming (particularly of apples and grain), fishing, and manufacturing (especially of motor vehicle parts) are the main occupations. The island was held by Germany from 1864 to 1920.

Alsace (alzas'), Ger *Elsass*, region and former province, E France. It is separated from West Germany by a part of the Rhine River. It comprises the departments of Bas-Rhin, Haut-Rhin, and the Territory of Belfort (a department created after the Franco-Prussian War when the rest of Alsace was annexed by Germany). Alsace is rich agriculturally (especially in the plain between the Rhine River and the Vosges mts.), geologically (potassium exploitation in the Mulhouse area ranks France third among worldwide producers), and industrially. STRASBOURG is the ancient capital and the leading industrial center. Textile industries are located in the Mulhouse-Colmar area, and wines (notably Riesling) are produced there. Hydroelectric plants are at Kembs and Ottmarsheim. Virtually the whole population speaks French, but a very large majority have also retained their Alemannic dialect. About 75% of the population is Roman Catholic. Of Celtic origin, Alsace became part of the Roman province of Upper Germany (see GAUL). It fell to the Alemanni (5th cent.) and to the Franks (496). The Treaty of Verdun (843, see VERDUN, TREATY OF) included it in Lotharingia, the Treaty of MESEN (870) put it in the kingdom of the East Franks (later Germany). The 10 chief cities of Alsace gained (13th cent.) virtual independence as free imperial cities. The remainder of the region was divided into fiefs with the exception of Upper Alsace, where the HAPSBURG family consolidated its original holdings. Alsace became a center of the Reformation (although the rural areas remained generally Catholic). The Treaty of Westphalia (1648) transferred all Hapsburg lands in Alsace to France. Lower Alsace was conquered (1680-97) by Louis XIV of France, the Treaty of Ryswick (1697) confirmed French possession. The Edict of Nantes (1685), promulgated before the annexation of Alsace, could not be revoked, therefore religious worship remained free. In 1798 the city of Mulhouse voted to join France. In 1871, as a result of the FRANCO-PRUSSIAN WAR, all Alsace (except Belfort) was annexed by Germany. With part of Lorraine, it formed the "imperial land" of Alsace-Lorraine, held in common by all the German states. Many Alsatians emigrated to France rather than submit to a policy of Germanization. Clamor for the return of Alsace-Lorraine became the chief rallying force for French nationalism and was a major cause of the armaments race that led to World War I. France's recovery (1918) of this territory was confirmed by the Treaty of Versailles (1919). After the decline of early enthusiasm over the reunion with France, a strong particularist movement gained ground, demanding cultural and even political autonomy. The movement received impetus from recurrent efforts by the French government to end the CONCORDAT OF 1801, which had remained valid in Alsace-Lorraine although it had been ended in the rest of France in 1905. In 1940, German troops occupied Alsace, a large part of the population had already been evacuated to central France. Alsace was treated as a part of Germany. French and American troops recovered (Jan. 1945) Alsace for France and were generally hailed as liberators. Alsace retains many old customs such as the wine and harvest festivals.

Alsen: see ALS, Denmark

alsike (äl'sik) see CLOVER

Alsip, village (1970 pop. 11,141), Cook co., NE Ill., a suburb of Chicago, inc. 1927

Alsop, Richard (ól'səp), 1761-1815, American author, b. Middletown, Conn. Best remembered as one of the CONNECTICUT WITS, he collaborated with Theodore Dwight and others in writing light satiric verse for the *Political Greenhouse* and the *Echo*. See biography by K. P. Harrington (1939, repr. 1969).

Alta California, term used by the Spanish to refer to their possessions along the entire Pacific coast north of what is now the Mexican state of Baja California. California was often represented on maps as an island some 3,000 mi (4,800 km) long until the 18th-century explorations of the Jesuit father Eusebio Kino proved conclusively that the southern part of the area was a peninsula and the rest of it mainland. Thereafter the peninsula came to be called Baja (Lower) and the mainland Alta (Upper) California.

Altadena (ältädē'nə), uninc. residential city (1970 pop. 42,380), Los Angeles co., 5 Calif., just N of Pasadena, on the slopes of the San Gabriel Mts. and in an orange and avocado area, founded 1887.

Altai or **Altay** (both äl'tī', äl-, äl'tī', Rus äl'tī'), geologically complex mountain system of central Asia,

largely in the Gorno-Altai Autonomous Oblast, and in Kazakh SSR, but extending into W Mongolia (where it is called the Mongolian, or Gobi, Altai), and into N China. In the northeast the Kuznetsk Ala-Tau and the Salair Ridge adjoin the Altai and enclose the KUZNETSK BASIN. The Soviet Altai are bounded by the Sayan range in the west, the Mongolian Altai in the south, and the Tannu-Ola range in the east. The highest sections of the Soviet Altai are the Katun, the Chuya, and the Sailyugem ranges. The highest peak in the Soviet Altai, Belukha (14,783 ft/4,506 m), is in the Katun range. Meltwater from more than 230 sq mi (596 sq km) of glaciers feeds many rivers, the Ob and the Irtysh rise in the Altai Lake Teletskoye, with an area of 90 sq mi (233 sq km) and a depth of 1,066 ft (325 m), is the largest of the Altai's more than 3,000 lakes. Rich deposits of gold, silver, mercury, iron, lead, zinc, and copper are found in the mountains, especially in E Kazakhstan. Located in the center of the great Asian landmass, the Altai have a continental climate with a wide annual temperature range and receive c 40 in (101.6 cm) of precipitation annually. Dense forests on the lower slopes are used for timber. Bears, martens, musk deer, and mountain goats inhabit the mountains. The first Russians entered the area in the 17th cent., settled in the foothills, and mined silver. In the late 19th cent., piedmont agriculture replaced mining as the main occupation. After the Soviet takeover in the early 20th cent., the area became both an important farming and mining region. UST-KAMENOGORSK and LENINGOROSK are principal mining and industrial centers. The Mongolian Altai support little agriculture and are economically undeveloped.

Altaic (ältä'ik), subfamily of the Ural-Altaic family of languages (see URALIC AND ALTAIC LANGUAGES). Some scholars still consider Altaic an independent linguistic family. Spoken by about 70 million people, who occupy parts of a territory that stretches from E Europe across Russia and Asia to the Pacific Ocean, the Altaic languages fall into three subdivisions: TURKIC, Mongolian (see MONGOLIAN LANGUAGES), and Tungusic. It has also been suggested that Korean and Japanese belong to the Altaic subfamily, but this is still disputed. The Tungusic subdivision has an estimated 300,000 speakers. It includes Manchu, the tongue of 200,000 persons in various parts of Manchuria, and Tungus, native to 15,000 people in eastern Siberia. Like the Uralic languages, the Altaic tongues are characterized by agglutination and vowel harmony. The former involves using suffix upon suffix to express grammatical relationships and meanings. Suffixes are also employed to form derived words. With vowel harmony, the vowel in a suffix corresponds to the vowel of the root to which the suffix is added. The Altaic languages lack grammatical gender. See Nicholas Poppe, *Introduction to Altaic Linguistics* (1965).

Altai Kray, administrative division (1970 pop. 2,766,000), c 102,400 sq mi (265,220 sq km), S central Siberian USSR. BARNUL is the capital. It is drained by the Upper Ob River and traversed by the Turksib and South Siberian railroads. In the southeast is a subdivision of the region, the GORNO-ALTAI AUTONOMOUS OBLAST, which contains a large portion of the Altai mountain range. The fertile Kulunda steppe, where spring wheat and sugar beets are grown, is in the western part of the territory. Major cities, besides Barnaul, include BISK and Cheshnokovka.

Altair (äl'tä'ir), brightest star in the constellation AQUILA (Eagle), Bayer designation α Aquilae, 1970 position R.A. 19^h49.3^m, Dec. +8°47'. Its apparent MAGNITUDE is 0.74, making it one of the 20 brightest stars in the sky, and it is of SPECTRAL CLASS A7 IV/V. Altair is one of the nearest bright stars, its distance being 16.8 light-years.

Altamira: see PALEOLITHIC ART

Altamirano, Ignacio Manuel (égna'syō manwēl' altamēra'nō), 1834-93, Mexican novelist and poet. Altamirano came from a poor, wholly Indian background, and after gaining his formal education he joined Benito JUÁREZ in the struggle against Maximilian. Afterward he was a key figure in the reconstruction of the republic. He edited the newspaper *Correo de Mexico*. As a poet Altamirano interpreted the Mexican landscape. He is best known for two novels—*Clemencia* and *La Navidad en las Montañas* [Christmas in the mountains], a story sketching Mexican customs.

Altamira y Crevea, Rafaél (rafaél' altamē'ra ē krāv'a), 1866-1951, Spanish jurist and historian. He was appointed professor of the history of the law in the universities at Oviedo (1897), Madrid (1914), and Mexico City (1945), and he served (1921-45) as a

judge of the Permanent Court of International Justice (the World Court). Among his numerous works on education, social science, literature, law, and history, his *Historia de España y de la civilización española* (5 vol., 1913-29, tr. *A History of Spanish Civilization*, 1930) is the best known, an English adaptation is C. E. Chapman, *A History of Spain* (1931).

Altamont, uninc. town (1970 pop. 15,746), Klamath co., S Oregon, a suburb of Klamath Falls.

Altamura (äl'tamōō'ra), city (1971 pop. 45,865), Apulia, S Italy. It is a commercial and agricultural center. The imposing Romanesque cathedral, with twin campaniles, was begun by Emperor Frederick II in 1232.

altar, table or platform for the performance of religious sacrifice. In its simplest form the altar is a small pile, with a square or circular surface, made of stone or wood. Its features vary according to its purpose. The altar of libation usually has a drain for the liquid, and so does the altar of bloody sacrifice, the altar of burnt offering (including incense) often has a depressed hollow for a fire. Altars in Egypt, in Mesopotamia, in Greece, in Rome, and among the Aztec and the Maya were highly adorned with friezes, cornices, elaborate platforms, and canopies. At Pergamum there was a huge monumental altar 40 ft (12.2 m) high. Altars as a rule were out of doors in the ancient world and in Central America. The Christian altar is the place to celebrate the EUCHARIST, a sacrifice in the traditional view. In the Western Church the altar is a long, narrow table of stone or wood, often reminiscent of a tomb, at its back is a REREDOS, which often bears a canopy. In the Roman rite there are in the middle of the altar a crucifix and a tabernacle to contain the reserved Host, although recent legislation of Roman liturgical reform suggests that the tabernacle be placed elsewhere in the church. There is a recess in each altar containing bones of martyrs, this is even true of tiny portable altars carried by chaplains. In Eastern rites the altar is square and has no backing or reredos, it is away from the wall. Most Protestant denominations have no altar, a typical practice is to have a permanent communion table below and in front of the pulpit.

Alt-taschith: see AIJELETH SHAHAR

Altay: see ALTAI, mountain system, Asia

altazimuth mounting (ältāz'əmath) see TELESCOPE

Altdorf (ält'dōrf), town (1971 pop. 8,647), capital of Uri canton, central Switzerland. Cables and rubber goods are manufactured. Altdorf was the scene of the legendary exploits of William TELL, commemorated by a monument (1895) and by the William Tell theater (1925).

Altdorfer, Albrecht (äl'brēkht ält'dōr'fər), 1480-1538, German painter and engraver. He served as city architect of Regensburg, where much of his life was spent. Although influenced by Dürer, Altdorfer's works are less severe in mood. The forms and lines in his works seem to vibrate with intense movement. These qualities are especially clear in his white-ink drawings of figures and landscapes. Altdorfer may have been the first German to paint pure landscape, of which the *Danube Landscape at Regensburg* (1522-25) is typical. His varied subject matter included allegorical and biblical themes such as *Susannah at the Bath* (1526) and *Birth of the Virgin* (c 1521). The *Battle of Alexander* (1529) displays his penchant for detailed, panoramic vistas. All four works are in the Alte Pinakothek, Munich. Equally skilled at woodcutting and engraving, Altdorfer often executed one subject in a variety of media.

Altenburg (äl'tənboörk), city (1970 pop. 46,737), Leipzig district, E East Germany, on the Pleisse River. Manufactures include sewing machines, machine tools, textiles, and playing cards. "Skat," the popular German card game, originated there in the 19th cent. Lignite is mined nearby. Built on the site of early 9th-century Slavic fortifications, Altenburg became an important trade center and was made an imperial city in the 12th cent. It formally passed in 1329 to the house of Wettin and later was (1603-72, 1826-1918) the capital of the duchy of SAXE-ALTENBURG. Noteworthy structures include an 11th-century church and the tower of the monastery founded (1172) by Emperor Frederick I.

alternating current, abbr. AC, a flow of electric charge that undergoes periodic reverses in direction. There are certain currents, such as pulsating direct currents, that contain both alternating and direct components. See ELECTRICITY, GENERATOR.

alternation of generations see GAMETOPHYTE, REPRODUCTION.

alternator: see GENERATOR.

Altgeld, John Peter (alt'gēlt), 1847-1902, American politician, governor of Illinois (1892-96), b. Germany. He was taken by his immigrant parents to Ohio, where he grew up with little formal schooling. After service in the Union army he spent some years as an itinerant worker on farms, read law, and became county attorney of Savannah, Mo. In 1875 he moved to Chicago, where he wrote *Our Penal Machinery and Its Victims* (1884), arguing that American judicial methods were weighted against the poor. In 1886 he was elected to the Cook co. superior court, and in 1892 he was elected governor. In office he established himself as a champion of labor, reform, and liberal thought. Charging a miscarriage of justice, he pardoned three anarchists imprisoned as parties to the Haymarket riot of 1886. During the PULLMAN STRIKE of 1894, when President Cleveland sent federal troops into Chicago, Governor Altgeld publicly termed the act unconstitutional. His extreme liberalism, coupled with his espousal of free silver, lost him reelection in 1896. Denounced as a radical in his own day, he was later regarded as a defender of the freedom of the individual against entrenched power. See his writings and speeches, ed. by H. M. Christman (1960, repr. 1970), biography by H. Barnard (1938), study by R. Ginger (1958, repr. 1965).

althaea or althea: see MALLOW

Althing (al'thīng) [Icel. = general diet], parliament of Iceland. This assembly, the oldest in Europe, was convened at Thingvellir, SW Iceland, in 930. It was dissolved in 1800, was revived as an advisory body in 1843, and in 1874, when Iceland was granted a constitution, became again a legislative body. Each of the 60 members serves for four years. Its upper house (one third of the members) and lower house (two thirds) sometimes work together in a United Althing. The Althing in 1944 voted the independence of Iceland from Denmark, a decision ratified by popular vote. Since 1959 the Althing has used a complicated system of proportional representation.

Althorp, John Charles Spencer, Viscount: see UNDER SPENCER, GEORGE JOHN SPENCER, 2D EARL

Altichiero da Zevio (altēkyā'rō da tsāv'yō), c. 1330-c. 1395, early Italian painter, follower of Giotto. He worked in Verona and then Padua. His frescoes in the churches of Sant' Antonio and San Giorgio in Padua are notable as early examples of the use of rational proportions in the treatment of figures and space.

altimeter (ältīm'tar, äl'tīmē'tar), device for measuring altitude. The most common type is an aneroid BAROMETER calibrated to show the drop in atmospheric pressure in terms of linear elevation as an airplane, balloon, or mountain climber rises. It shows height above sea level, but not above such land features as hills, mountains, and valleys. The radio altimeter, or terrain-clearance indicator, is an absolute altimeter; it indicates the actual altitude over water or over terrain, however uneven. It operates by first sending either continuous or pulse radio signals from a transmitter in an aircraft to the earth's surface. A receiver in the aircraft then picks up the reflection of the signals from the surface. The time it takes for the signals to travel to the earth and back is converted automatically into absolute altitude that can then be read from a calibrated indicator. The radio altimeter is used in the automatic landing systems of aerospace vehicles, systems developed from radio altimeters can automatically control military aircraft flying at high speeds and low altitudes.

altiplano, high plateau (alt. c. 12,000 ft/3,660 m) in the Andes Mts., c. 65,000 sq mi (168,350 sq km), W Bolivia, extending into S Peru. The altiplano is a sediment-filled depression between the Cordillera Oriental and the Cordillera Occidental. Its lowest point is occupied by Lake Titicaca, the largest high-altitude lake in the world. The lake is drained by the Desaguadero River south across the altiplano into Lake Poopó. The sparsely vegetated region receives little precipitation and has several large salt flats. The bleak plateau has a cool climate throughout the year. Potatoes and hardy grains are the principal crops there. Mining is the chief industry in the mineral-rich plateau. One of the world's most densely populated areas, the altiplano contains most of Bolivia's inhabitants, La Paz, the capital, and Oruro are the largest cities.

altitude, vertical distance of an object above some datum plane, such as mean SEA LEVEL or a reference point on the earth's surface. It is usually measured by the reduction in atmospheric pressure with height, as shown on a barometer or altimeter. In surveying and astronomy, it is the vertical angle of an observed point, such as a star or planet, above

the horizon plane. The altitude of a feature of the earth's surface is usually called its ELEVATION.

altitude, in astronomy, angular distance of a heavenly body above the astronomical horizon. The angle used in measuring is that which a line drawn from the eye of the observer to the heavenly body makes with the plane of the horizon. The reading of the apparent altitude, as determined by a telescope attached to a graduated circle, must be corrected for refraction by the atmosphere and for certain other errors to ascertain the true altitude. The altitude of the north celestial pole, which is approximately that of the star POLARIS, is equal to the observer's latitude. In navigation, observations of altitude are made with a sextant.

altitude sickness: see DECOMPRESSION SICKNESS

alto, singing voice the range of which is lower than the soprano by the interval of a fifth. More generally, the term refers to the register in which this voice sings, i.e., the second highest part in a four-part musical texture, and to instruments utilizing this register. See COUNTERTENOR.

Alto Adige. see TRENTINO-ALTO ADIGE, Italy

Altoaguirre, Manuel (manwēl'ältōägē'rā), 1904-59, Spanish poet, b. Malaga. With his contemporary Emilio PRADOS he founded the literary journal *Litoral*. His poetry is distinguished by its grace, sensitivity, and refinement, treating such themes as love, nature, and solitude. His interest in typography is evident in some of the beautiful editions of his poetry. His works include *Las islas invitadas y otros poemas* [Invited islands and other poems] (1920) and *Fin de un amor* [end of a love] (1949).

altocumulus: see CLOUD

Alton (ōl'tan), city (1970 pop. 39,700), Madison co., SW Ill., on bluffs of the Mississippi River 5 mi (8.1 km) above its confluence with the Missouri, inc. 1837. Alton is a shipping and industrial center, with machine shops, foundries, oil refineries, and a large bottle-making plant. Among its many other manufactures are food products, building materials, and ammunition and explosives. Lewis and Clark built their first camp and spent the winter of 1803-04 just south of what is now Alton. The town was laid out in 1815. During the Civil War it grew as a main supply point for the Union armies. A state penitentiary (built in 1827) served as a prison and hospital for captured Confederate soldiers, many of whom are buried in the Confederate cemetery there. Of interest are a monument to Elijah Lovejoy, who was killed in Alton, a tablet marking the site of the last Lincoln-Douglas debate (1858), and a replica of a huge man-eating bird originally painted by Indians on the face of a bluff above the Mississippi. The Principia (at Elsah) and a state park are nearby.

Altona (al'tōna), part of Hamburg, N West Germany, a port on the Elbe River. Its manufactures include chemicals, textiles, and tobacco products. There are fisheries, and the district is a rail center. Founded as a fishing village in the 16th cent. and later one of the first free ports in N Europe, Altona was incorporated into Hamburg in 1937.

Altoona (ältōō'nā), industrial city (1970 pop. 62,900), Blair co., central Pa., on the eastern slopes of the Allegheny Mts., near the source of the Juniata River, settled c. 1769, laid out (1849) by the Pennsylvania RR as a switching point for locomotives preparing to cross the Alleghenies, inc. as a city 1868. It is still a major railroad center with huge construction and repair shops. The city's great variety of manufactures include foundry products, machinery, electrical equipment, paper items, shoes, clothing, and textiles. Bituminous coal is mined nearby. In 1862, Governor Curtin called a conference of governors at Altoona to pledge support of Lincoln's administration. Nearby tourist attractions are the scenic Horseshoe Curve of the Pennsylvania RR, a world-famous engineering feat, Wopsononock Mt. (2,580 ft/786 m high), which offers a magnificent view of six counties, and Fountain Inn, the historic hotel mentioned by Dickens in his *American Notes*. Pennsylvania State Univ. has a junior college campus in Altoona.

altostratus: see CLOUD

Altrincham (ōl'trīng-əm), municipal borough (1971 pop. 40,752), Cheshire, W central England. A suburb of Manchester, it has a textile-printing industry and engineering works and is also noted for its market gardens. The town's growth was stimulated by the construction of the Bridgewater Canal in 1760. In 1974, Altrincham became part of the new metropolitan county of Greater Manchester.

altruism (äl'trōōiz'm), concept in philosophy and psychology that holds that the interests of others, rather than of the self, can motivate an individual. The term was invented in the 19th cent. by the

French philosopher Auguste Comte, who devised it as the opposite of EGOISM. Herbert Spencer and John Stuart Mill, English contemporaries of Comte, accepted the worth of altruism but argued that the true moral aim should be the welfare of society, rather than that of individuals.

Altus (äl'tās), city (1970 pop. 23,302), seat of Jackson co., SW Okla., inc. 1907. The city's agricultural products include cotton, wheat, and cattle. Altus Air Force Base, a large training facility, also contributes to the economy. The city was founded in 1892 as the town of Fraiser, but after floods forced the moving of the city to its present site it was renamed Altus [Lat. = high place]. Wichita Mountain Wildlife Refuge, which is state-operated, is nearby.

Al Ubayyid (al ōbayīd') or **El Obeid** (ēl ōbād'), city (1969 est. pop. 66,000), central Sudan. It is a rail terminus, a road and camel caravan junction, and the end of a pilgrim road from Nigeria. Al Ubayyid is also a trade and transshipment point. Founded by the Turco-Egyptian pashas in 1821, it fell to the Mahdists in 1883 and was destroyed. Its reconstruction followed the fall of the Mahdist empire in 1898.

alum (äl'əm), any one of a series of isomorphous double salts that are hydrated SULFATES of a univalent cation (e.g., potassium, sodium, ammonium, cesium, or thallium) and a trivalent cation (e.g., aluminum, chromium, iron, manganese, cobalt, or titanium). The name *alum* commonly refers to potassium aluminum sulfate dodecahydrate, or potash alum, $KAl(SO_4)_2 \cdot 12H_2O$, a colorless-to-white, crystalline compound having a sweetish-sour taste. It is used in water purification, leather tanning, mordant dyeing, as an astringent, and in baking powder; it occurs in nature as the mineral kalunite. Sodium aluminum sulfate, or soda alum, $NaAl(SO_4)_2 \cdot 12H_2O$, is also used in baking powder. Ammonium aluminum sulfate, or ammonium alum, $NH_4Al(SO_4)_2 \cdot 12H_2O$, is used in tanning, in dyeing and fireproofing textiles, in vegetable glues and porcelain cements, and in water purification. Chromium potassium sulfate, or chrome alum, $KCr(SO_4)_2 \cdot 12H_2O$, is used as a mordant in dyeing, in tanning, and in photographic fixing baths to harden gelatin films and plates. Aluminum sulfate, $Al_2(SO_4)_3 \cdot 18H_2O$, is also called alum. A pseudalum is a double sulfate salt of a divalent cation (e.g., magnesium or calcium) and a trivalent cation (e.g., aluminum).

alumina (älōō'mīnā) or **aluminum oxide**, Al_2O_3 , chemical compound with m.p. about 2000°C and sp. gr. about 4.0. It is insoluble in water and organic liquids and very slightly soluble in strong acids and alkalis. Alumina occurs in two crystalline forms. Alpha alumina is composed of colorless hexagonal crystals with the properties given above; gamma alumina is composed of minute colorless cubic crystals with sp. gr. about 3.6 that are transformed to the alpha form at high temperatures. Alumina powder is formed by crushing crystalline alumina; it is white when pure. Alumina is widely distributed in nature. Combined with silica and other minerals it occurs in clays, feldspars, and micas. It is the major component of BAUXITE and occurs in an almost pure form as CORUNDUM. Alumina is commercially important. A major use is in the production of ALUMINUM metal. It is also used for abrasives, corundum and emery are widely used, as are artificially prepared alumina abrasives. Trade names for alumina abrasives include Alundum and Aloxite. Alumina is also used in ceramics, in pigments, and in the manufacture of chemicals. Clays containing alumina are used in porcelain, pottery, and bricks. Pure alumina is used in making crucibles and other refractory apparatus. Hydrated alumina is used in mordant dyeing to make lake pigments; it is also used in glassmaking, in cosmetics, and in medicine as an antacid.

aluminum (älōō'mīnām), called in British countries **aluminium** (äl'yōōmīn'ēām), metallic chemical element, symbol Al, at no. 13, at wt. 26.9815, m.p. 660.37°C, b.p. 2467°C, sp. gr. 2.6989 at 20°C, valence +3. Aluminum is a silver-white metal with a face-centered cubic crystalline structure. It is a member of group IIIa of the PERIODIC TABLE. It is ductile, malleable, and an excellent conductor of heat and electricity. The pure metal is soft, but it becomes strong and hard when alloyed. Although less conductive than copper wire of the same diameter, aluminum wire is often used for high-tension power transmission because it is lighter and cheaper. Although it is chemically very reactive, aluminum resists corrosion by the formation of a self-protecting oxide coating. It is rapidly attacked by alkalis (such as lye) and by hydrochloric acid. Although it is the most abundant metal in the earth's crust (about 8% by weight), alu-

minum does not occur uncombined but is an important constituent of many minerals, including clay, BAUXITE, mica, feldspar, alum, CRYOLITE, and the several forms of aluminum oxide (alumina) such as emery, corundum, sapphire, and ruby. Commercially, aluminum is prepared by the Hall-Heroult process, which consists essentially of the electrolysis of alumina prepared from bauxite and dissolved in fused cryolite. In an electric furnace an iron tank lined with carbon serves as the cathode and large blocks of carbon serve as the anode, the electric current generates enough heat to keep the cryolite melted. Molten aluminum collects at the bottom of the tank, and oxygen is liberated at the anode. The anode is consumed as it combines with the oxygen to form carbon dioxide. Aluminum foil is used as a wrapping material. Aluminum powder is used in paints. A mixture of powdered aluminum and iron oxide, called THERMITE, is used in welding because of the large amount of heat liberated when it is ignited. The development of methods for coloring aluminum led to its use in jewelry, on wall surfaces, and in colored kitchenware. Important alloys of aluminum include DURALUMIN, aluminum bronze, and aluminum-magnesium, they are used extensively in aircraft and other industries. Although the metal was not isolated until the 19th cent., use of aluminum compounds originated in antiquity. The Romans used various aluminum compounds as astringents, they called these *alum*. Sir Humphry DAVY and other chemists in the early 19th cent. recognized aluminum as the metal and alumina as its oxide. H. C. OERSTED succeeded in obtaining impure aluminum in 1825, but Friedrich WOHLER had greater success and is usually credited with its first isolation, in 1827. H. E. SAINT-CLAIRE DEVILLE first prepared inexpensive pure metal in 1854 and set about perfecting a process for its commercial production. However, it was not until 1886 that the process by which aluminum is produced today was discovered independently by C. M. Hall, a student at Oberlin College, and Paul Heroult, a French metallurgist. The process depends critically on the availability of cheap hydroelectric power.

aluminum oxide: see ALUMINA

alundum: see ALUMINA

Alush (āl'lash), wilderness camping ground of the Israelites. Num. 33:13,14

Alva, Fernando Álvarez de Toledo, duque de: see ALBA, FERNANDO ÁLVAREZ DE TOLEDO DUQUE DE

Alvah (āl'va), duke of Edom. Gen. 36:40. Aliah 1 Chron. 1:51

Alvan (āl'van), Horite. Gen. 36:23. Alhan 1 Chron. 1:40

Alvarado, Juan Bautista (hwan boutēs'ta alvara'-thō), 1809-82, governor of Alta California (1836-42), b. Monterey, Calif. Out of the chaotic times in the neglected Mexican province of Alta California, Alvarado emerged as a brilliant politician. After a small but successful revolt in 1836, he declared California an independent state with himself as governor. He pacified his opponents in San Diego and Los Angeles, but the southern faction continued to view the northern upstart with suspicion until he secured (1838) regular appointment as Mexican governor. He and his uncle, Mariano Guadalupe Vallejo, who acted as military commander, could not accomplish much, and after they disagreed both men were removed. In 1842 Alvarado was one of the leaders of a new and successful revolt in 1844-45, but the new government was unable to withstand the Bear Flag revolt and the Mexican War.

Alvarado, Pedro de (pā'thrō dā), 1486-1541, Spanish conquistador. He went to Hispaniola (1510), sailed in the expedition (1518) of Juan de Grijalva, and was the chief lieutenant of Hernán CORTÉS in the conquest of Mexico. He commanded at Tenochtitlan in the absence of Cortés, and his brutality provoked a brief Indian rebellion. Sent out by Cortés in 1523, he conquered Guatemala and Salvador. He was governor of Guatemala until his death. He met with much opposition from the audiencia in Mexico, but strengthening his power on two voyages to Spain (1527-28, 1536-39), he exercised absolute control. He founded many cities and developed the colony. An expedition to Ecuador (1534-35), made in an attempt to share in the booty Francisco PIZARRO was taking from the Incan empire, ended in defeat. In 1540, Alvarado, sailing for the Moluccas, stopped in Mexico. While there he was influenced by the viceroy Antonio de MENDOZA and by the tales of MARCOS DE NIZA to begin a search for the fabled Cibola. When the Indians of Nueva Galicia unexpectedly revolted in 1541, Alvarado took part against them in the Mixton War. He led a foolhardy attack

and was accidentally killed in the subsequent retreat. Juan Rodríguez CARRILLO took command of the maritime expedition. Alvarado's wife, Doña Beatriz de la CUEVA, succeeded him as governor of Guatemala. His letters concerning the conquest of Guatemala have been published. See J. E. Kelly, *Pedro de Alvarado* (1932).

Alvarez, A. (Alfred Alvarez), 1929-, English writer and critic, b. London, grad. Oxford (8 A., 1952, M.A., 1956). He has been theater critic for the *New Statesman*, a writer for the British Broadcasting Corp., and poetry editor and critic for the *Observer*. He writes in a brisk, contemporary style, free of pedantry. His works include *The New Poetry* (1962), edited by him, *Beyond All This Fiddle* (1968), collected essays, and *The Savage God* (1972), a study of suicide in which he treats in detail the suicide of Sylvia PLATH and his own failed suicide attempt, and *Samuel Beckett* (1973), a critical work.

Álvarez, Jose (Jose Álvarez de Pereira y Cubero) (hōsā' āl'varēth dā pārā'ra ē kōōbā'rō), 1768-1827, Spanish neoclassical sculptor. He was a follower of Canova. Álvarez was employed on the decoration of the Quirinal Palace in Rome. On returning to Madrid he became director of the Academy of San Fernando and sculptor to Ferdinand VII. He is best known for his portrait statues of Spanish royalty and for his mythological figures in marble (e.g., *Nestor and Antilochus*, 1818, Modern Art Mus., Madrid).

Álvarez, Juan (hwān āl'varās), 1780-1867, Mexican general, president of Mexico (1855). An Indian, he distinguished himself in battle under Morelos y Pavón and was later the first governor of Guerrero. In 1854 he led the liberal Revolution of Ayutla, which overthrew (1855) General SANTA ANNA. After two months he yielded the presidency to Ignacio COMONFORT. Álvarez later fought against Maximilian and the French invaders.

Alvear, Carlos María de (kar'lōs mārē'ā dā ālvāār'), 1789-1852, Argentine general and statesman. After distinguished service with the Spanish army in Europe, he returned to Argentina with his friend SAN MARTÍN and became a leader in the domestic revolution of 1812 and a member of the constituent assembly of 1813. He was in command of the patriot army when the Spanish royalists at Montevideo capitulated (1814). In 1815 Alvear was named supreme director of the United Provinces of the Río de la Plata, but was deposed when he attempted to become a dictator. In the war with Brazil he won the decisive battle of Ituzaingó (Feb. 20, 1827). From 1838 until his death he was minister to the United States.

Alvear, Marcelo Torcuato de (marsā'lō tōrkwa'tō), 1868-1942, Argentine statesman and diplomat, president of the republic (1922-28). A member of the Radical party, he became minister to France after a victory of the Radicals in 1916 placed IRIGUYEN in the presidency. Succeeding Irigoyen in 1922, Alvear secured enactment of some reforms, especially agricultural measures, but largely because of a split with Irigoyen his administration, on the whole, accomplished little. Later the breach was healed, and Alvear became the leader of the Radicals. In 1931 he was barred from the presidential race, and in 1937 he was defeated by Roberto M. Ortiz.

Alvend or Elvend (both ēlvēnd', ēl'vēnd), mountain, c. 11,600 ft (3,540 m) high, W Iran. It bears cuneiform inscriptions of Darius and Xerxes.

alveolus (ālvē'alas) see TUNCS

Alverstone, Richard Everard Webster, 1st Viscount (ōl'varstan), 1842-1915, lord chief justice of England (1900-1913). He served on various international arbitration commissions, including those dealing with the Bering Sea Fur-Seal Controversy (1893) and the Venezuela Boundary Dispute (1898-99). In the Alaska Boundary Dispute (1903), he gave the deciding vote against the Canadian claims. He wrote *Recollections of Bar and Bench* (1914).

Alves, Antônio de Castro see CASTRO ALVES, ANTÔNIO DE

Alvin, city (1970 pop. 10,671), Brazoria co., 5 Texas, inc. 1893. The city is chiefly residential, and many of its citizens work in Houston or at the nearby Lyndon B. Johnson Space Center. There is a petrochemical industry in the city, and a junior college is there.

Alvord, Clarence Walworth (āl'vōrd), 1868-1928, American historian, b. Greenfield, Mass. He became (1901) an instructor in history at the Univ. of Illinois (Ph.D., 1908) and was full professor there (1913-20) and at the Univ. of Minnesota (1920-23). Alvord was general editor (1906-20) of the *Illinois Historical Collections*, and he edited the *Centennial History of Illinois* (6 vol., 1918-24) and wrote its first volume. The principal founder of *The Mississippi Valley His-*

torical Review, Alvord served as its managing editor (1914-23). He also wrote *The Mississippi Valley in British Politics* (1917, repr. 1959).

Alvord, Henry Elijah, 1844-1904, American agriculturist, educator, and specialist in dairy husbandry, b. Greenfield, Mass. He pioneered in developing the cooperative creamery system and served (1886-93) as professor and president of various state agricultural colleges. In 1895 he became first chief of the dairy division of the Bureau of Animal Industry, U.S. Dept. of Agriculture.

Alwar (ūl'var, -'wār), city (1971 pop. 100,791), Rajasthan state, N central India. On the Delhi-Jaipur railroad, Alwar is a market for grain, oilseed, cotton, and marble. There are textile and oilseed mills, iron foundries, and chemical and porcelain factories. Turban-making is an important handicraft. The city was the capital of the former Alwar state and is now a district administrative center. An old RAJPUT fort dominates the city.

Alyattes (ālēā'tēz), d. 560 B.C., king of Lydia. During his reign, Alyattes expanded the kingdom. While he was warring with Cyaxares of Media, an eclipse of the sun occurred (585 B.C.). The two kings interpreted the event as a warning omen and made peace. Alyattes continued Lydian conquest of the Ionian cities of Asia Minor. The remains of his tomb can still be seen N of Sardis. He was the father of CROESUS.

Alypius or Alpius (both āl'pī'ēas), fl. c. 360, Greek author of *Introduction to Music*, chief source of modern knowledge of Greek musical notation.

alyssum (āl'is'am), any species of the genus *Alyssum* of the family Cruciferae (MUSTARD family), chiefly annual and perennial herbs native to the Mediterranean area. A few species, notably the perennial golden tuft (*A. saxatile*), are cultivated as rock-garden or border ornamentals for their masses of yellow or white flowers. The annual sweet alyssum (called *A. maritima* but separated by most botanists as *Lobularia maritima*) is a similar plant with fragrant white or lilac blossoms. The alyssums have been called madwort or heal-bite because of an old belief that they cured hydrophobia. *Alyssum* is classified in the division MAGNOLIOPHYTES, class Magnoliopsida, order Capparales, family Cruciferae.

Am, chemical symbol of the element AMERICIUM

AM: see MODULATION, RADIO

Amad (ā'mād), unidentified city of Asher, NW Palestine. Joshua 19:26

Amadas or Amidas, Philip (both ām'ədās), 1550-1618, English navigator. With Arthur Barlowe he was sent by Sir Walter Raleigh in 1584 to explore the North American coast. Their favorable report on Roanoke Island, N.C., led to the colonizing expedition (1585) under Sir Richard Grenville and Sir Ralph LANE.

Amadeus VIII (āmadē'ās), 1383-1451, count (1391-1416) and duke (from 1416) of Savoy, antipope (1439-49) with the name Felix V. In 1434 he appointed his son regent of Savoy and retired to the hermitage of Ripaille, on Lake Geneva, which he had founded. In 1439 the Council of Basel (see BASEL COUNCIL OF), which had been pronounced heretical by the pope, declared EUGENE IV deposed and elected Amadeus, much respected for his probity, to the papacy. Although a layman, Amadeus reluctantly accepted, believing that he could bring peace to the church. As Felix V, he received only scattered recognition from the secular powers. When Nicholas V became pope, Felix yielded his claim. He was subsequently made a cardinal. He was the last of the antipopes.

Amadeus, 1845-90, king of Spain (1870-73), duke of Aosta, son of Victor Emmanuel II of Italy. After the expulsion (1868) of Queen ISABELLA II, Juan PRIM urged the Cortes to elect Amadeus as king. He accepted the crown reluctantly. Just before the new king arrived in Spain, PRIM was assassinated. The upper classes were opposed to Amadeus, who belonged to the anticlerical house of Savoy, and repeated attempts were made on his life. When a new rebellion by the CARLISTS began, Amadeus abdicated and returned to Italy. A year later Alfonso XII was proclaimed king.

Amadis of Gaul (ām'adīs), fr. *Amadis de Gaule* (āmādēs' dā gōl), famous prose romance of chivalry, first composed in Spain or Portugal and probably based on French sources. Entirely fictional, it dates from the 13th or 14th cent., but the first extant version in Spanish, a revision by Garcia de Rodriguez de Montalvo, was published in 1508. The original inspired innumerable variations and continuations, as well as several translations. It was immensely

AMADO, JORGE

popular in France and Spain until superseded by Don Quixote, and it was, indeed, a sign of ineluctance not to be acquainted with its code of honor and knightly perfection. Its influence is apparent in Sir Philip Sidney's *Arcadia*. The story became the subject of a lyric tragedy by Philippe Quinault (1684), with music by Lully, and it inspired the opera *Amadigi* (1715) by Handel.

Amado, Jorge (zhōr'zhī ama'dōō), 1912–, Brazilian novelist. Amado's works deal largely with the sufferings of the common man. Marked by grim and violent realism, his major works include *Cacau* [cacao] (1933), *Suor* [sweat] (1934), the epic novel *Terras do sem fim* (1942, tr. *The Violent Land*, 1945), *Gabriela, cravo e canela* (1958, tr. *Gabriela, Clove and Cinna-mon*, 1962), *Doña Flor* (1966, tr. 1969), and *Tent of Miracles* (tr. 1971). Amado's works are collected as *Obras completas* (18 vol., 1961–69).

Amador Guerrero, Manuel (manwēl' amadōr' gārā'rō), 1833–1909, first president of Panama (1904–8), b. Colombia. A physician, he served as medical officer for the Panama RR and was a leader in the movement for Panamanian independence from Colombia. As the emissary (1903) for the revolutionaries to the United States, he helped obtain U.S. aid for the successful revolution. He was unanimously selected president of the new republic by the constitutional convention despite a stipulation in the constitution that the president be born in Panama.

Amagasaki (a'magasa'kē), city (1970 pop. 553,660), Hyogo prefecture, S Honshu, Japan, a port on Osaka Bay. An important industrial center, with iron and steel factories, chemical plants, and textile mills, it lies on the banks of the Yodo River. Amagasaki has a 16th-century castle.

Amager (a'magər), island (1965 pop. 177,818), 25 sq mi (65 sq km), Copenhagen co., E Denmark, in the Øresund. Northern Amager is occupied by a part of Copenhagen city that has important shipbuilding and harbor facilities. Southern Amager includes fishing ports, beach resorts, and farms.

Amagi (a'ma'gē), city (1970 pop. 43,259), Fukuoka prefecture, N Kyushu, Japan. It is an agricultural center and railway terminus. Textiles are produced in the city.

Amakusa Islands (amakōō'sa), archipelago, c. 340 sq mi (880 sq km), Kumamoto and Kagoshima prefectures, in the East China Sea, off W Kyushu, Japan. There are about 70 islands in the group. Shimo, the largest island, is the site of Hondo, which is the chief town. The interior of the islands is rugged, the coastal lowlands are fertile. Rice, camellia oil, fish, porcelain, and coal are the principal products. Amakusa clansmen made the islands a major center of Christianity in the 16th cent. Villages and historical relics of this period are found in Unzen-Amakusa National Park. In 1637, when Christianity was banned in Japan, the islanders, suffering economic hardship, joined in the rebellion at Shimabara. After the revolt was mercilessly suppressed (1638), the islands passed under the control of the Tokugawa shogunate.

Amal (ā'mal), Asherite 1 Chron 7:35.

Amalasuntha (ā'mālasūn'thā), d. 535, Ostrogothic queen in Italy (534–35), daughter of THEODORIC THE GREAT. After her father's death (526) she was regent for her son Athalaric. He died in 534, and she and her husband, Theodahad, became joint rulers of Italy. Her friendly relations with the Byzantine emperor Justinian I alienated her people. In 535 the Ostrogoths revolted, Amalasuntha was exiled and later murdered by order of her husband Justinian used her murder as his pretext for attacking and reconquering Italy.

Amalekites (ām'alākīts), aboriginal people of Canaan and the Sinai peninsula. They waged constant warfare against the Hebrews until dispersed by Saul. Their ancestor, Amalek, for whom they were named, was a duke of Edom and Esau's descendant. Gen 14:7, 36:12, 16, Ex 17:8–16, Num 13:29, 14:25, 24:20, Judges 3:13, 6:3, 33, 7:12, 1 Sam 15:5–8, 30:1–20, 1 Chron 1:36, 4:43.

Amalfi (amal'fē), town (1971 pop. 6,136), in Campania, S Italy, a small fishing port on the Gulf of Sorrento. Built on a mountain slope, it is also a picturesque seaside resort. According to legend, Amalfi was founded by the Romans, it later became (9th cent. AD) an early Italian maritime republic. It rivaled Pisa, Venice, and Genoa in wealth and power and had a population of about 70,000. Amalfi's maritime code, the *Tavole Amalfitane*, had wide influence until the 18th cent. Amalfi reached its zenith in the 11th cent. Thereafter it declined fairly rapidly, it was captured (1131) by the Normans and sacked (1135, 1137) by the Pisans, and in 1343 a storm de-

stroyed much of the town. Of note in Amalfi is the Sicilian-Arab cathedral (11th cent., with numerous later additions), which has an imposing facade, fine bronze doors cast (1066) in Constantinople, and a stunning cloister (*chiostro del Paradiso*). The Amalfi Coast, running from Salerno to Sorrento, is famous for its rugged scenery.

amalgam (āmāl'gām), ALLOY containing MERCURY. The alloy may be liquid or solid, depending on the proportion of mercury, although all naturally occurring amalgams, i.e., those of gold and silver, are solid. Amalgams are widely used. Silver, gold, and copper amalgams are used in dentistry, and tin amalgam is used in making mirrors.

amalgamation process (āmāl'gāmā'shən), method used for the extraction of gold and silver from their ores. The ore is crushed and treated with mercury, in which the metal dissolves. When the resulting amalgam is heated, the mercury evaporates, leaving the pure gold or silver.

Amalia, duchess of Saxe-Weimar: see ANNA AMALIA.

Amalric I (āmāl'rik, ā'māl'rik) or **Amaury I** (āmō'rē, Fr. amō'rē'), c. 1137–1174, Latin king of Jerusalem (1162–74), brother and successor of Baldwin III. He spent his reign in attempts to gain and hold the suzerainty of Egypt, but was balked by the Turkish sultan NUR AD-DIN, one of whose lieutenants finally obtained control of the country and left it at his death to SALADIN. During Amalric's frequent absences in Egypt, Nur ad-Din repeatedly raided the increasingly weak Latin states of the East. Amalric was succeeded by his son, Baldwin IV.

Amalric II or **Amaury II**, c. 1155–1205, Latin king of Jerusalem (1197–1205) and Cyprus (1194–1205), brother and successor (in Cyprus) of GUY OF LUSIGNAN. His title to Jerusalem was established through his marriage with Isabella, eldest daughter of Amalric I (see JERUSALEM, LATIN KINGDOM OF).

Amalric of Bena (bē'nā), d. 1207?, French professor of philosophy. He taught heretical precepts concerning God, a pantheistic universe, and a progressive Trinity. Before he died, he publicly retracted, but his followers in Champagne formed a heretical sect, the Amalricians. They were condemned by Pope Innocent III and by councils held at Paris (1210) and the Lateran (1215). The heresy resulted in a temporary ban on Aristotle and the Arabic philosophers at the Univ. of Paris.

Amalthaea (āmālthē'a), in Greek mythology, shegoat or nymph who nursed the infant Zeus. It was said that Zeus made one of her magnificent horns into the CORNUCOPIA and set her image among the stars as the constellation Capricorn.

Amalthea (ām'althē'a), in astronomy, one of the 12 known moons, or natural satellites, of JUPITER.

Amam (ā'mām), city of Judah. Joshua 15:26.

Aman (ā'mān), the same as HAMAN.

Amana (āmā'nā), unidentified mountains. Cant. 4:8.

Amana Church Society (āmā'nā), corporate name of a group of seven small villages in E central Iowa, clustered around the Iowa River NW of Iowa City, settled 1855 by members of the Ebenezer Society. The society originated in one of the Pietist religious sects of 17th-century Germany. Led by Christian Metz (1794–1867), 800 members emigrated to the United States in 1842 to escape persecution at home. Settling first near Buffalo, N.Y., they developed a communal way of life that reached its flowering in Iowa. Amana became one of the most successful of such communities in America. In 1932 it was made a cooperative corporation, with separation of religious and economic administration. Long famous for the products of their woolen mills (especially blankets) and farms, the quaint villages also attract many visitors. The name Amana is used for a refrigerator and appliance company there, the company is not owned by the society. There are about 700 members of the society today. See B. M. Shambaugh, *Amana That Was and Amana That Is* (1932); Barbara Yambura, *A Change and a Parting: My Story of Amana* (1960).

Amanita (ām'anī'tā) see MUSHROOM.

Ama-no-hashidate see MIYAZU, Japan.

Amanullah (āmānōō'lā), 1892–1960, emir (1919–26) and king (1926–29) of Afghanistan. To win popular support for his rule he invaded India in an attempt to free Afghanistan from British-ruled India. No serious fighting occurred, however, and the Treaty of Rawalpindi was soon signed (1919). He attempted to introduce a number of Western reforms and changed the country from an emirate to a kingdom. His subjects rebelled against his program, and he fled the country in 1929. He remained in exile in

Switzerland until his death. See study by L. B. Poul-lada (1973).

Amapá (āmāpā'), federal territory (1970 pop. 114,687), 53,013 sq mi (137,304 sq km), extreme N Brazil, bounded on the N by French Guiana and the Atlantic Ocean. Macapa is the capital.

Amapala (āmāpā'la), town (1961 pop. 2,368), S Honduras, on Tigre Island, in the Gulf of Fonseca. It is the chief Pacific port of Honduras. Products (coffee, lumber) are shipped from the mainland to Amapala by launch.

Amara (ama'ra), town (1965 pop. 64,847), SE Iraq, on the Tigris River. A marketplace for dates and grains, it was taken by the British during the Mesopotamian campaign in 1915.

amaranth (ām'arānth'') [Gr. = unfading], common name for the Amaranthaceae (also commonly known as the pigweed family), a family of herbs, trees, and vines of warm regions, especially in the Americas and Africa. The genus *Amaranthus* includes several widely distributed species called amaranths, which are characterized by a lasting red



Green amaranth, *Amaranthus retroflexus*

pigment in the stems and leaves. They have been a poetic symbol of immortality from the time of ancient Greece. *Amaranthus* also includes such weeds as the green amaranth, *A. retroflexus*, and various species commonly called TUMBLEWEED and PIGWEED, as well as several cultivated plants—e.g., love-lies-bleeding, or tassel flower, and Joseph's coat. Other ornamentals in the family are the globe amaranth (genus *Gomphrenia*), sometimes called bachelor's button, and the cockscomb (*Celosia*), both originally tropical annuals. They can be preserved dry and are used in EVERLASTING bouquets. *Amaranthus* is classified in the division MAGNOLIOPHYTES, class Magnoliopsida, order Caryophyllales.

Amarapura (ū'marapōō'ra), town (1962 est. pop. 71,015), Mandalay division, central Burma, on the Irrawaddy River. It is a silk-weaving center and has varied handicraft industries. Amarapura was founded in 1782 and was twice (1783–1823 and 1837–60) the capital of Burma. Its royal palace, great temples, and fortifications are now in ruins.

Amaravati (ū'marāvū'tē), ancient ruined city, Andhra Pradesh state, SE India, near the mouth of the Kistna River. The former capital of the Buddhist Andhra kingdom, it is a well-known archaeological site. Remains include a beautiful Buddhist stupa (1st cent. AD).

Amariah (ām'arī'a) 1 High priest, son of Meraioth 1 Chron 6:7, 52. Perhaps he is the same as 2 and 3. 2 High priest, son of Azariah 1 Chron 6:11. Perhaps he is the same as 1, 3, and 4. 3 Ancestor of Ezra. Ezra 7:3. Perhaps he is the same as 1 and 2. 4 High priest under Jehoshaphat 2 Chron 19:11. Perhaps he is the same as 2. 5 Levite 1 Chron 23:19, 24:23. 6, 7 Contemporaries of Ezra, perhaps the same person. Ezra 10:42, Neh 11:4. 8 A priestly family 2 Chron 31:15, Neh 10:3, 12:2, 13. See IMMER 1 and IMRI 1. 9 Ancestor of the prophet Zephaniah. Zeph 1:1.

Amarillo (āmārīl'ō, -'ā), city (1970 pop. 127,010), seat of Potter co., N Texas, inc. 1899. A commercial, banking, and industrial center of the Texas Panhandle, Amarillo is situated in the midst of treeless plains that are swept by summer duststorms and winter blizzards. The city grew after the coming of the railroad in 1887, and at the turn of the century it was a market for wheat farmers. After the discovery of gas (1918) and oil (1921), Amarillo mushroomed

into an industrial city. In addition to oil and gas, the city's economy is based on cattle ranching, meat-packing, flour milling, zinc smelting, as well as the production of helicopters, synthetic rubber, and farm and dairy items. Nearby are a U.S. government helium plant, Amarillo Air Force Base, which has a Strategic Air Command wing, and an atomic energy project. The city's educational and cultural facilities include Amarillo College, civic and art centers, a symphony orchestra, and a little theater.

Amarna: see TEL EL AMARNA

amaryllis (ām'arīl'is), common name for some members of the Amaryllidaceae, a family of mostly perennial plants with narrow, flat leaves and with lilylike flowers borne on separate, leafless stalks. They are widely distributed throughout the world, especially in flatlands of the tropics and subtropics. Many ornamental plants of this family are mistakenly called lilies; they can be distinguished from members of the LILY family by the anatomical placement of the ovary (see FLOWER) and are considered more advanced in evolution than the lilies. Several fragrant, showy-blossomed species are commonly called amaryllis: the true amaryllis (*Amaryllis belladonna*), or belladonna lily, of S. Africa, and the more frequently cultivated tropical American species of *Sprekelia*, *Lycoreis*, and especially *Hippeastrum* (e.g., the Barbados lily). The large *Narcissus* genus, including jonquils and daffodils, is native chiefly to the Mediterranean region and the Orient, but it has been naturalized and is now widespread in the United States. Although the common names are sometimes used interchangeably, strictly the daffodil is the yellow *N. pseudo-narcissus*, with a long, trumpet-shaped central corona; the jonquil is the yellow *N. jonquilla*, with a short corona, and the narcissus is any of several usually white-flowered species, e.g., the poet's narcissus (*N. poetica*) with a red rim on the corona. The Biblical ROSE OF SHARON may have been a narcissus. Among many others that have become naturalized and are cultivated in Europe and North America are the snowdrops (any species of *Galanthus*), small early-blooming plants of the Old World whose flowers are symbolic of consolation and of promise, and the tuberose (*Polianthes tuberosa*), a waxy-flowered Mexican plant. Economically, the most important plants of the family are of the nonbulbous genus *Agave*, the tropical American counterpart of the African *Aloe* genus of the family Liliaceae (lily family). Different agaves provide soap (e.g., those called amoles—see SOAP PLANT), food and beverages, and hard fiber. Henequen and SISAL HEMP are among the fibers obtained from agaves; fique and Cuban hemp come from other similar genera. Maguey is the Mexican name for various species (chiefly *A. americana*) called American aloe, or century plant, that contain the sugar agavose, sometimes used medicinally but better known as the source of the popular alcoholic beverages PULQUE and MISCAL. The name "century plant" arises from the long intervals between bloomings—from 5 to 100 years. After blooming, the century plant dies back and is replaced by new shoots. The agave cactus (*Leuchtenbergia principis*) is a true CACTUS that resembles the agave. Amaryllis is classified in the division MAGNOLIOPHYTES, class Magnoliopsida, order Sapindales.

Amasa (ām'asa, amā'sa) 1 Cousin of Absalom, with whom he revolted. Later he became David's commander in chief, he was murdered by Joab. 2 Sam 17:25, 19:13, 20:4-13, 1 Kings 2:5. 2 Ephraimite chief. 2 Chron 28:12.

Amasai (āmās'āi, amās'sāi) 1 Chief of the deserters from Saul to David. 1 Chron 12:18. 2 Priest. 1 Chron 15:24. 3 Levite. 1 Chron 6:25,35. 4 Levite contemporary with Hezekiah. 2 Chron 29:12.

Amashai (amā'shāi), priest contemporary with Nehemiah. Neh 11:13. Amashai is perhaps the same as MAASIAI.

Amasiah (ām'asi'ā), captain in Jehoshaphat's army. 2 Chron 17:16.

Amasis I (amā'sis), d. c. 525 B.C., king of ancient Egypt (c. 570-525 B.C.), founder of the XXVI dynasty. He drove the Hyksos out of the Nile delta and pursued them into Palestine. His name also appears as Ahmose.

Amasis II, d. 525 B.C., king of ancient Egypt (525-520 B.C.), of the XXVI dynasty. In a military revolt he deposed APRIES. He erected temples and other buildings at Memphis and Sais and encouraged Greek merchants and artisans to settle at Naucratis. He also established alliances with Greek leaders and maintained his rule partly with the aid of Greek mercenaries. His revision of the laws is said to have influenced the Athenian lawgiver Solon. Amasis II

died just before the Persian invasion (525 B.C.) under CAMBYSES. The name also appears as Ahmose II. **amateur**, in sports, one who engages in athletic competition solely for the love of sport and without any desire for material gain. Unlike the amateur, a professional athlete is paid for competing. The actual rules governing amateurs differ from sport to sport and from country to country. In the United States, students with athletic scholarships are classified as amateurs, even though they do receive a form of remuneration for their competitive activities. In the Soviet Union a large number of athletes who are classified as amateurs nevertheless receive large subsidies from the state. Such contraventions of the basic amateur rule have generally been disregarded by the International Olympic Committee, sponsor of the quadrennial Olympic Games, the world's most prestigious amateur athletic competitions. Occasionally, however, individuals are punished for violations. Jim THORPE was stripped of his two gold medals from the 1912 Olympics because he had once inadvertently played in a professional baseball league; the Austrian skier Karl Schranz was barred from the 1972 Winter Olympics for his endorsements of a ski manufacturer's products. Critics of the amateur code contend that it is not appropriate to contemporary realities; they point out that it was adopted during an era when amateurs were upper-class gentlemen who could afford to compete without remuneration. The major organizations involved in the supervision of amateur athletics in the United States are the National Collegiate Athletic Association (NCAA), responsible for college and university sports, and the Amateur Athletic Union (AAU), responsible for most other areas of amateur competition.

Amati (amā'tē), Italian family of violinmakers of Cremona. The founder of the Cremona school was Andrea Amati (c. 1520-c. 1578), whose earliest violins date from c. 1564. His labels bore the name Amadus, and he is credited with the basic design of the modern violin. His sons were Antonio Amati and Girolamo or Geronimo Amati, who worked together and followed closely their father's patterns in making violins of graceful shape and sweet tone. The Amati instruments had a characteristic amber-colored varnish. Niccolò Amati (1596-1684), son of Girolamo, brought the Amati violin to its height after c. 1645. Antonio STRADIVARI and Andrea Guarneri were pupils of Niccolò. Niccolò's son, Girolamo (1649-1740), was the last of his line to achieve distinction. The Latin forms of the first names, Andreas, Antonius, Hieronymus, and Nicolaus, were generally used on the violin labels, and the family name was sometimes Latinized as Amatus.

Amato, Giovanni Antonio d' (jōvan'nē āntō'nyō dama'tō), 1475-1555, Neapolitan painter, called Il Vecchio [the elder]. He imitated the style of Pietro Perugino. Paintings by him are in many churches in Naples, among them the *Holy Family* in a chapel of San Domenico Maggiore.

Amatory. For persons thus named, see AMALRIC.

Amaziah (ām'azī'ā) 1 King of Judah, son and successor of Jehoash of Judah. The two incidents of his reign were the conquest of Edom, including the capture of Petra, and an unprovoked attack by Amaziah on King Jehoash of Israel. Jehoash took Amaziah prisoner, entered Jerusalem, and sacked the Temple. Amaziah was assassinated at Lachish, and his son Uzziah succeeded him. 2 Kings 14, 2 Chron 25. 2 Simeonite. 1 Chron 4:34. 3 Levite. 1 Chron 6:45. 4 Priest of Bethel, Amos's enemy. Amos 7:10-15.

Amazon, Port. Amazonas (āmāzō'nās), world's second longest river, c. 3,900 mi (6,280 km) long, formed by the junction in N. Peru of two major headstreams, the UCAYALI and the shorter MARAÑÓN. It flows across N. Brazil before entering the Atlantic Ocean near Belem. The Amazon carries more water than any other river in the world. The gradient of the river is very low. Manaus, c. 1,000 mi (1,610 km) upstream, is only c. 100 ft (30 m) higher than Belem and is an ocean port; ships with a draft of 14 ft (4 m) can reach Iquitos, Peru, c. 2,300 mi (3,700 km) from the sea. Peru, Ecuador, and Colombia have international shipping rights on the Amazon. For most of its course, the river has an average depth of c. 150 ft (50 m). The drainage basin is enormous (c. 2,500,000 sq mi/6,475,000 sq km, c. 35% of South America), gathering waters from both hemispheres and covering not only most of N. Brazil but also parts of Bolivia, Peru, Ecuador, Colombia, and Venezuela. In the lowlands stretching E from the Andes is the largest rain forest (selva) in the world—a wet, green land, rich in plant life. The tropical climate is tempered by the heavy rainfall (exceeding 100 in./254 cm annu-

ally in parts of the upper and lower regions) and by high relative humidity; the average temperature at Santarem, 400 mi (644 km) upriver, is 78°F (26°C). Geologically, the Amazon basin is a sediment-filled structural depression between crystalline highlands of Brazil and Guiana. The river bed (1-8 mi/1.6-12.9 km wide) is in a wide flood plain that is up to 30 mi (48 km) wide. For much of its course, the Amazon wanders in a maze of brownish channels amid countless islands, but is unobstructed by falls. Its headstreams, however, arise cold and clear in the heights of the Andes. They descend northward before turning east to join and form the Amazon (which is, however, occasionally called the Solimões from the Brazilian border to the junction with the Rio Negro). Of the Amazon's more than 500 tributaries, the chief ones are the Negro, Japura (Cacqueta), Putumayo (Iça), and Napo, which enter from the north, and the Javari, Jurua, Purús, Madeira, Tapajos, and Xingu rivers, which enter from the south. The Casiquiare River, a natural canal, links the Amazon basin (through the Rio Negro) with the Orinoco basin. Below the Xingu the river reaches its delta, with many islands formed by alluvial deposit and submergence of the land. Around the largest of these, MARAJÓ, the river splits into two large streams. The northern stream is the principal outlet and threads its way around many islands. The southern channel, called the Para River, receives the Tocantins River and has the important port of Belem. The awesome tidal bore (up to 12 ft/3.7 m high) of the Amazon is called *pororoca*; it travels c. 500 mi (800 km) upstream. The river's immense silt-laden discharge is visible far out to sea. The Amazon was probably first seen in 1500 by the Spanish commander Vicente Yañez Pinzon, who explored the lower part. Real exploration of the river came with the voyage of the Spanish explorer Francisco de Orellana down from the Napo in 1540-41; his fanciful stories of female warriors gave the river its name. Not long afterward (1559) the Spanish conquistador Pedro de Ursua led an expedition down from the Marañón River. In 1637-38 the Portuguese explorer Pedro Teixeira led the voyage upstream that definitively opened the Amazon to world knowledge. The river continued to be of enormous importance to explorers and naturalists, among them Charles Darwin and Louis Agassiz. The valley was largely left to its sparse Indian inhabitants (mostly groups of the Guaraní-Tupi linguistic stock and of meager material culture) until the mid-19th cent., when steamship service was regularly established on the river and when some settlements were made. In the late 19th and early 20th cent., the brief wild-rubber boom on the upper Amazon attracted settlers from Brazil's northeastern states, and since the 1930s Japanese immigrants have developed jute and pepper plantations. But the area still remains largely unpopulated and undeveloped, yielding small quantities of forest products (rubber, timber, vegetable oils, Brazil nuts, and medicinal plants) and cacao. The establishment of a health service (chiefly by launch) in World War II was followed by the creation of a UNESCO research institute in 1948, and several developmental programs, both governmental and private, have been set up in Brazil in recent years to foster the valley's development. Oil and manganese resources are exploited near Manaus and in Amapa. In the 1960s the Amazon region began experiencing increased economic development brought on by tax incentives and construction of the Trans-Amazon Highway, the Belem-Brasília Highway, and two rail lines. See C. R. Marham, ed., *Expeditions into the Valley of the Amazon* (1859), W. L. Herndon, *Exploration of the Valley of the Amazon* (1854, repr. 1952), Robin Furneaux, *The Amazon* (1969), Gaspar De Carvajal, *The Discovery of the Amazon* (tr. 1934, repr. 1970), Brian Blanton, *The Last Great Journey on Earth* (1971), J. R. Holland, *The Amazon* (1972).

Amazon (ām'azōn), in Greek mythology, one of a tribe of warlike women who lived in Asia Minor. The Amazons had a matriarchal society, in which women fought and governed while men performed the household tasks. Each Amazon had to kill a man before she could marry, and all male children were either killed or maimed at birth. It was believed that the Amazons cut off one breast in order to shoot and throw spears more effectively. They were celebrated warriors, believed to have been the first to use cavalry, and their conquests were said to have included many parts of Asia Minor, Phrygia, Thrace, and Syria. Several of the finest Greek heroes proved their mettle against the Amazons. Hercules took the golden girdle of Ares from their queen Hippolyte, Theseus abducted Hippolyte's sister Antiope and

then defeated a vengeful army of Amazons at Athens. A contingent of Amazons fought with the Trojans under PENTHESSILEA.

Amazonas (aməzō'nās), state (1970 pop 955,394), 604,032 sq mi (1,564,445 sq km), NW Brazil. The capital is MANAUS.

amazonite: see FELDSPAR.

Ambala (əm'bālā), town (1971 pop 83,649), Haryana state, N central India. It is a district administrative headquarters, a military station, and a transportation center. Automobile parts, pharmaceuticals, scientific instruments, machinery and iron products, porcelain, and glassware are manufactured.

Ambarvalia (əm'bārvāl'ya), in Roman religion, yearly agricultural rite held at the end of May. To insure fertility and disperse evil, each farmer led members of his household and a sacrificial beast in a procession around the boundaries of his fields.

ambassador: see DIPLOMATIC SERVICE.

Ambato (am'batō), city (1970 est pop 75,300), capital of Tungurahua prov., central Ecuador, in a high Andean valley. A major commercial and transportation center, Ambato is noted for the variety of fruit grown in its outskirts and is called the "Garden of Ecuador." Sugarcane, grains, and cotton are also raised, and hides are processed. Picturesque Ambato is a favorite resort of the rich. Among its fine buildings is an old cathedral. The city has been frequently damaged by volcanic eruptions and earthquakes and in 1949 was almost totally destroyed.

amber, yellow to brown fossil RESIN exuded by coniferous trees now extinct. Capable of being highly polished, it is used in the manufacture of beads, amulets, mouthpieces, cigar and cigarette holders, pipes, and other small ornamental objects. When rubbed with a cloth, amber becomes charged with static electricity. The chief source of the world's amber is the Baltic coast of Germany, some is found off the coasts of Sicily and England. The empirical formula of amber is thought to be $C_{10}H_{16}O$. When destructively distilled, amber yields acetic, butyric, valeric, and other acids, water, and hydrocarbons. Baltic amber also contains succinic acid and is often called succinite. An ESSENTIAL OIL (amber oil) is obtained from amber. The best amber is transparent, but some varieties are cloudy. Bubbles of air, leaves, bits of wood, and insects are frequently found in amber, the insects sometimes being of extinct species. Amber was known in the Bronze Age and to the Greeks and Romans, who used it extensively in jewelry. Thales was familiar with its electrical properties, and Pliny recounts several instances of its artistic uses. It is connected with many superstitions and is believed to be a preventive against disease and bad luck.

amberfish: see POMPANO.

Amberg (am'bĕrk), city (1970 pop 41,522), Bavaria, SE West Germany, on the Vils River, near Czechoslovakia. Its manufactures include precision instruments, machinery, blast furnaces, plastics, and porcelain. Nearby are large iron mines known since the Middle Ages. Until 1810, Amberg was capital of the Upper Palatinate. At Amberg in 1796, Archduke Charles of Austria defeated the French under Marshal Jean Baptiste Jourdan. St. Martin's church (15th cent.) and the town hall (14th-16th cent.) are the city's outstanding buildings.

ambergris (ām'bĕgrĕs), waxlike substance originating as a morbid concretion in the intestine of the sperm whale. Lighter than water, it is found floating on tropical seas or cast up on the shore in yellow, gray, black, or variegated masses, usually a few ounces in weight, though pieces weighing several hundred pounds have been found. Ambergris has been greatly valued from earliest times. It is now used as a fixative in perfumes. Its active principle is ambrein, a crystalline alcohol with the empirical formula $C_{25}H_{50}O$.

amberjack: see POMPANO.

ambidexterity: see HANDEDNESS.

Ambiorix (ām'bī'oriks), fl. 54 B.C., Gallic chieftain of the Eburones (in what is now central Belgium). He had been favorably treated by the Romans, but he joined another tribe in attacking Julius Caesar's legates. When he heard of Caesar's approach, he fled across the Rhine.

ambivalence (ām'bīv'əlāns), coexistence of two opposing drives, desires, feelings, or emotions toward the same person, object, or goal. The ambivalent person may be unaware of either of the opposing wishes. The term was coined in 1911 by Eugen Bleuler to designate one of the four symptoms he considered primary to schizophrenia, the others being autism and disturbances of affect (i.e., emotion) and

of association. As Bleuler explained it, "by ambivalence is to be understood the specific schizophrenic characteristic, to accompany identical ideas or concepts at the same time with positive as well as negative feelings (affective ambivalence), to will and not to will at the same time the identical actions (ambivalence of the will), and to think the same thoughts at once negatively and positively (intellectual ambivalence)." Closely related to ambivalence is Bleuler's concept of ambivalence, in which "a definite tendency to contrary or opposite action is combined with every impulse." Bleuler felt that there were normal instances of ambivalence and ambivalence, such as the feeling, as soon as one has done something, that it would have been better to have done the opposite, but the normal person, unlike the schizophrenic, is not prevented by his opposing impulses from deciding and acting. The psychoanalytic movement, following Freud, imparted a narrower meaning to the term in specifying that the opposing forces were feelings of love and hate toward the same person. This specific meaning has attained common usage by psychiatrists, whether or not they see the conflicting emotions as derived from postulated instinctual sources of sexual and destructive wishes. Many psychiatrists prefer to reserve the term ambivalence for the simultaneous presence in schizophrenia of strong destructive and erotic wishes toward a major family member. Mixed feelings of lesser intensity are generally said to be evidence of conflict rather than ambivalence. For example, the spells of doubting and brooding and the indecision characteristic of a person with an obsessive personality or neurosis have been traced to a conflict between obedience and defiance.

Ambler, Eric, 1909-, English novelist. A successful advertising executive, he turned exclusively to writing after his novels—realistic suspense stories—became popular. His heroes are usually ordinary men who become accidentally or innocently involved in international intrigues. Included among his thrillers are *A Coffin for Dimitrios* (1939), *Journey into Fear* (1940), *Passage of Arms* (1959), *To Catch a Spy* (1964), *The Levanter* (1972), and *Dr. Frigo* (1974).

Amboina: see AMBON, Indonesia.

Amboise, Georges d' (zhōrh' daNbwa'z'), 1460-1510, French statesman, cardinal of the Roman Catholic Church. He became archbishop of Rouen in 1493. In 1498, as an intimate friend of the new king, Louis XII, he became chief minister. Subsequently he was appointed cardinal and papal legate in France. He devoted himself primarily to the furtherance of Louis's ambitions in Italy and was lieutenant general in Italy at the conquest of Milan (1500). His ambitions for the papal crown were disappointed by the election of Pope Pius III (1503), but Pius's successor, Pope Julius II, designated him (1503) papal legate in France for life. He negotiated the treaties of Blois (1504) and helped form the League of Cambrai (1508, see CAMBRAI, LEAGUE OF). His domestic administration was beneficent. By his patronage of artists and writers, he contributed to the promotion of the Renaissance in France.

Amboise, Jacques d' (zhak'), 1934-, American dancer and choreographer, b. Dedham, Mass. D'Amboise became a soloist with the New York City Ballet in 1953. He is best known for his roles in such distinctly American dance works as *Falling Station* and *Western Symphony*. He has also danced in several movies, including *Seven Brides for Seven Brothers* (1954) and *Carousel* (1956). His own ballets include *The Chase* (1963), *Quatuor* (1964), and *Irish Fantasy* (1964).

Amboise (aNbwa'z'), town (1968 pop 8,899), Indre-et-Loire dept., N central France, in Touraine, on the Loire. It is a wine and wool market, and its manufactures include precision instruments, shoes, sporting goods, pharmaceuticals, and film and radio equipment. The town is chiefly famous, however, for its Gothic château, a royal residence from the reign of Charles VIII (who was born and died there) to that of Francis II. Leonardo da Vinci, who probably worked on it, is said to be buried in its chapel. Amboise was the scene (1560) of a Huguenot plot against the Guise family. Other old structures in the town include St. Denis Church (12th, 15th, 16th, and 17th cent.), St. Florentin Church (15th cent.), the town hall (16th cent., restored), and the Clos-Luce (15th cent.), where Francis I spent part of his youth and where da Vinci died.

Amboise, conspiracy of, 1560, plot of the Huguenots (French Protestants) and the house of BOURBON to usurp the power of the Guise family, which virtually ruled France during the reign of the young FRAN-

CIS II. The plan, presumably worked out by Louis I de Bourbon, prince de CONDÉ, provided for a march on the castle of Amboise, the abduction of King Francis II, and the arrest of François, duc de Guise, and his brother Charles, cardinal of Lorraine. The cardinal was forewarned, and the rebels, beaten before they had united their forces, were ruthlessly massacred. For weeks the bodies of hundreds of conspirators were hanging from the castle and from every tree in the vicinity. The Huguenots were enraged. A brief period of conciliation followed under the chancellorship of Michel de L'HÔPITAL, appointed by the king's mother, CATHERINE DE' MEDICI. He temporarily halted Protestant persecution until the outbreak (1562) of the Wars of Religion.

Ambon (am'bŏn), island, c. 1,800 sq mi (4,660 sq km), E Indonesia, one of the Moluccas, in the Banda Sea. It is mountainous, well watered, and fertile. Maize and sago are produced, and hunting and fishing supplement the diet. Nutmeg and cloves, once grown in abundance, are produced in limited quantities, and copra is exported. The chief town and seaport, also called Ambon (1961 pop 56,037), is capital of Moluccas prov. It is the seat of the Univ. of Maluku and a private college, and it has an airport. The island was discovered (1512) by the Portuguese, who made it a religious and military headquarters. It was captured by the Dutch in 1605. An English settlement there was destroyed (1623) by the Dutch in what is called the Ambon massacre. Ambon was temporarily under British rule from 1796 to 1802 and again from 1810 to 1814. The town was the site of a major Dutch naval base captured (1942) by the Japanese in World War II, and it was the scene (1950) of a revolt against the Indonesian government during the short-lived South Moluccan Republic. The majority of the population is Christian. The island and town are also called Amboina.

Ambracia: see ARTA.

Ambridge, industrial borough (1970 pop 11,324), Beaver co., W Pa., on the Ohio River, inc. 1905. Founded by and named for the American Bridge Co. In 1901, it is still the home of the bridge company and of one of the largest structural steel plants in the world. Manufactures include steel, foundry and machine-shop products, and electrical equipment. On the northwest edge of town are 17 restored buildings and homes from the old village of Economy, a communistic colony established by members of the HARMONY SOCIETY in 1825. The most successful of the society's communities, it thrived until 1906.

Ambrogio Stefani da Fossano: see BERGOGNONE.

Ambrose, Saint (ām'brōz), 340?-397, bishop of Milan, Doctor of the Church, b. Trier, of Christian parents. Educated at Rome, he became (c. 372) governor of Liguria and Aemilia—with the capital at Milan. He was highly regarded in that office, and popular demand caused his appointment (374) as bishop, although he was reluctant and lacked religious training. After much study he became the chief Catholic opponent of Arianism in the West. He was adviser to Emperor GRATIAN, whom he persuaded to outlaw (379) all heresy in the West. He firmly refused the demands of Justina and the young Emperor VALENTINIAN II to surrender a church of his diocese to the Arians. "The Emperor," he preached, "is in the Church, not above it." He excommunicated THEODOSIUS I for the massacre at Salonica (390) and imposed a heavy public penance on him before reinstating him. Ambrose's eloquent preaching spurred the conversion of St. Augustine. His writings, mostly homilies based on Scripture, have come down to us largely from his hearers. They reveal wide classical learning, knowledge of patristic literature, and a Roman bent toward the ethical and practical. Of his formal works, *On the Duties of the Clergy* (*De officiis ministrorum*) shows the influence of Cicero, *On the Christian Faith* (*De fide*) was written at Gratian's request. Ambrose's method of biblical interpretation was allegorical, following Philo and Origen. About 386 he arranged hymns and psalms for the congregation to sing antiphonally. A PLAINSONG called Ambrosian chant is attached to his name. His hymns, written in the iambic dimeter that became standard in Western hymnody, were widely imitated. Only a few are extant. The Ambrosian Rite used in Milan today is probably a development of a liturgy Ambrose introduced. Feast Dec. 7. See biography by Angelo Paredi (1964), C. Morino, *Church and State in the Teaching of St. Ambrose* (1969).

ambrosia (āmbrō'zhā), in Greek religion, food with which the Olympian gods preserved their immortality. Extraordinarily fragrant, ambrosia was probably conceived of as an idealization of honey. It was accompanied by nectar, wine of the gods.

Ambrosian Library, founded c 1605 in Milan by Cardinal Federigo Borromeo. It became one of the earliest libraries to be opened to the public. The library's collection is rich in classical manuscripts, notably Homer and Vergil, in incunabula, and in Oriental texts. It also contains Leonardo da Vinci's profusely illustrated *Codex Atlanticus*.

Amchitka (ämchit'kä), island, 40 mi (64 km) long, off W Alaska, one of the Aleutian Islands. It was selected in 1967 by the Atomic Energy Commission (AEC) as the site for underground tests of nuclear weapons, thus arousing much criticism, especially from ecological groups. The AEC financed the transplanting of much of the island's animal life. In 1971 the use of Amchitka for the detonation of atomic devices without specific presidential approval was banned. The first test, sanctioned by President Richard Nixon, was made on Nov. 6, 1971.

ameba or **amoeba**, common name for certain one-celled organisms belonging to the class Sarcodina of the phylum PROTOZOA. The many genera of amebas were given their common name because of their resemblance to the genus *Amoeba* (order Amoebida), which includes several large, common species of which the freshwater *Amoeba proteus* is the most familiar. Amebas constantly change the shape of their bodies as a result of the phenomenon known as amoeboid movement, involving the formation of temporary extensions (pseudopodia, or false feet) of the body. Pseudopodia, used in locomotion and feeding, may be rounded at the tip (lobopodia), pointed (filopodia), branched and fused together (rhizopodia), or somewhat rigid and pointed (axopodia). Most amebas are very small (from 5 to 20 microns in diameter) and contain a single nucleus. *A. proteus* averages 0.25 mm in length. Members of the genus *Pelomyxa*, however, may be well over a millimeter (up to 8 mm) in diameter and may contain hundreds of nuclei. Amebas engulf their prey, or particles of appropriate size, with their pseudopodia, forming food vacuoles. Digestive enzymes, manufactured and secreted by the organism, are then poured into these vacuoles, and the particles are digested. Useful compounds are subsequently absorbed into the ameba's body. Useless residues remain in the vacuoles and are ultimately expelled (egested) as the vacuole comes in contact with the membrane at the body surface. Amebas can distinguish food (e.g., algae, diatoms, bacteria, and other protozoans) from other material and use different tactics in approaching plant and animal food. Freshwater amebas take up water constantly through the process of osmosis, and water content is regulated with a pulsating contractile vacuole. Marine amebas lack a contractile vacuole. Respiration is by diffusion of gases through the cell membrane. Under favorable conditions, amebas divide by binary fission (splitting) to produce two daughter amebas, the nucleus dividing by MITOSIS. When an ameba is divided artificially, the portion containing the nucleus forms a new cell membrane and continues as a whole animal, while the other portion lives only as long as its present food supply lasts, ultimately dying, since it cannot ingest food or reproduce. If conditions are unfavorable, e.g., in the absence of food and water, amebas secrete a firm, protective covering and encyst until conditions are again favorable to active division. Although simple in form, amebas are very successful organisms and are found abundantly in a variety of habitats all over the world. Amebas live in fresh water, the oceans, and in the upper layers of the soil, and many have adapted to a parasitic life on the body surface of aquatic animals or in the internal organs of both aquatic and terrestrial animals. Few animals escape invasion by some type of ameba. Some are harmless, but others are pathogenic and cause serious diseases, e.g., *Entamoeba histolytica* causes amoebic dysentery, which is fatal if untreated. Other amoeboid protozoans of the class Sarcodina include the marine radiolarians, which form silicate skeletons, their freshwater counterparts, the heliozoans, and the shell-bearing FORAMINIFERANS. Amebas are classified in the phylum PROTOZOA, class Sarcodina, order Amoebida.

amebiasis: see DYSENTERY

Amecameca (ämä'kämä'kä), town (1970 pop. 21,753), Mexico state, S central Mexico, at the foot of the Popocatepetl and Ixtachuatl volcanoes. The sanctuary of El Sacro Monte, the most venerated spot in Mexico after the shrine of Guadalupe, stands on a hill above Amecameca. The town's history dates back to 1200.

Amen: see AMON

amendment, in law, alteration of the provisions of a legal document. The term usually refers to the alter-

ation of a STATUTE or a CONSTITUTION, but it is also applied in PARLIAMENTARY LAW to proposed changes of a bill or motion under consideration and in judicial PROCEDURE to the correction of errors. A statute may be amended by the passage of an act that is identified specifically as an amendment to it or by a new statute that renders some of its provisions nugatory. Written constitutions, however, for the most part must be amended by an exactly prescribed procedure. The CONSTITUTION OF THE UNITED STATES, as provided in Article 5, may be amended when two thirds of each house of Congress approves a proposed amendment and three fourths of the states thereafter ratify it. Congress decides whether state ratification shall be by vote of the legislatures or by popularly elected conventions. Only in the case of the Twenty-first Amendment (the repeal of prohibition) was the convention system used. The constitutions of many states require that a proposed constitutional amendment be submitted to the voters in a referendum.

Amenemhet I (ä'mënëm'hët, ä'-), d. 1970 B.C., king of ancient Egypt, founder of the XII dynasty. The son of a powerful Theban family, he seized the kingship c 2000 B.C. The XII dynasty ushered in the Middle Kingdom of Egypt. Amenemhet centralized the government and subjected the long-powerful nobles to a virtually feudal state. His son and successor, SESOSTRIS I, was coregent from 1980 B.C. Amenemhet II, d. 1903 B.C., son and successor of Sesostri I, was coregent with his father (1938-1935 B.C.), then sole ruler (1935-1906 B.C.), finally coregent with his son and successor, Sesostri II (see under SESOSTRIS II). He reopened the mines of Sinai. Amenemhet III, d. 1801 B.C., was the son and successor of Sesostri III (see under SESOSTRIS II), with whom he had been coregent. He extended the irrigation system. Thousands of acres in the Faiyum were reclaimed. Under his successor, Amenemhet IV, d. 1792 B.C., the power of the dynasty declined, and his successor, a woman, Senebkemnef, was last of her family. The dynasty of pharaohs named Amenemhet or Sesostri maintained peace throughout their hegemony, thus enabling the arts and sciences to flourish as they never would again in Egypt.

Amenhotep I (ä'mënhotëp, ä'-) or **Amenophis I** (ä'mënöf'is), fl. 1570 B.C., king of ancient Egypt, of the XVIII dynasty, son and successor of Amasis I. His chief exploits were military. He pushed southward into Nubia and reestablished Egypt's boundary at the Second Cataract of the Nile, as previously fixed by Sesostri III. He invaded Syria as far as the Euphrates. His successor, THUTMOSE I, was not his son. Amenhotep II or Amenophis II, son and successor of Thutmose III (see under THUTMOSE), succeeded (1448 B.C.) as coregent and later ruled alone for 26 years. There are records of his prowess in hunting and horsemanship. He put down a revolt in Syria and maintained his father's conquests. His tomb is at Thebes; he also built extensively at Karnak. On his death (c 1420 B.C.) he was succeeded by his son Thutmose IV (see under THUTMOSE). Amenhotep III or Amenophis III succeeded his father, Thutmose IV, c 1411 B.C. His reign (until c 1372 B.C.) marks the culmination and the start of the decline of the XVIII dynasty. It was the age of Egypt's greatest splendor; there was peace in his Asiatic empire (in spite of incursions by Bedouins and Hittites) and he invaded Nubia only once. This is the period of extreme elaboration in Egyptian architecture and sculpture. Amenhotep III built extensively at Thebes, Luxor, and Karnak. His wife TIY was given an unprecedented position as queen consort and exerted much influence over her husband and his son and successor, IKHNATON. The sources of the "soiar monotheism" of the god Aton, elaborated by Ikhnaton, may be traced to the reign of Amenhotep III. Tablets found at Tel-el-Amarna shed light on the sociopolitical conditions in Egypt and Asia Minor in the 14th cent. B.C.

Amenophis: see AMENHOTEP

America [for Amerigo VESPUCCI], the lands of the Western Hemisphere—North America, Central America (sometimes called Middle America), and South America. In English, *America* and *American* are frequently used to refer only to the United States. Martin Waldseemüller was the first to use the name (1507).

American, river, 30 mi (48 km) long, rising in N central Calif. in the Sierra Nevada near Lake Tahoe and flowing SW into the Sacramento River. Two dams on the river, regulating its flow and generating hydroelectric power, are part of the Central Valley Project. The discovery of gold at Sutter's Mill (see SUTTER, John Augustus) along the river in 1848 led to

the California gold rush of 1849 and played an important part in U.S. history.

Americana, defined as all that has been printed about the Americas, printed in the Americas, or written by Americans, but usually restricted to the formative period in the history of the two continents. The Columbus letter (1493), a two-leaf news-sheet announcing to the Spanish court the discovery of the islands of the Indies, is the earliest known printing about America. Richard Hakluyt's *Divers Voyages touching the Discovery of America* was published in London in 1582. Early American books were printed by Juan PABLOS, Stephen DAYE, and William BRADFORD (1722-91). The John Carter Brown Library, Providence, the New York Public Library, the Newberry Library, Chicago, and the Huntington Library, San Marino, Calif., all have fine collections of Americana. See Charles Evans, *American Bibliography, 1639-1800* (13 vol., 1903-55, repr. 1941-62), Joseph Sabin et al., *Bibliotheca Americana* (29 vol., 1868-1937, repr. 1961-62), M. B. Stilwell, *Incunabula and Americana* (2d ed. 1961), J. C. Oswald, *Printing in the Americas* (1937, repr. 1965).

American Academy in Rome, founded in 1894 as the American School of Architecture in Rome by Charles F. McKim and enlarged in 1897 with the founding of the American Academy in Rome for students of architecture, sculpture, and painting. It was incorporated by act of Congress in 1905. In 1913 its charter was amended to include the American School of Classical Studies in Rome. It annually awards to U.S. citizens competitive fellowships bearing a yearly stipend, a travel allowance, and residence in Rome. Fellowships are granted in architecture, painting, sculpture, music, landscape architecture, and art history.

American Academy of Arts and Letters, founded 1904 to further literature and the fine arts in the United States, located in New York City. Its fifty members, who have made notable achievements in art, literature, or music, are selected from the membership of its parent body, the National Institute of Arts and Letters. It gives awards in art, literature, and music, maintains a library (14,000 volumes) and museum, and holds exhibitions of works of art, manuscripts, books, and scores. It also purchases paintings by American artists for distribution to museums.

American architecture. Each group of settlers in North America brought with it the building techniques and the prevailing forms of its home country and thus gave rise to different types of colonial building. But in all areas the differences between American and European conditions and climates, the fact that available building materials were not those of the home country, the dearth of trained architects and craftsmen, and the general poverty of the settlers produced rapid and profound change. Thus in French America, stone building was rare and was often replaced by a sort of stucco over half timber or, in the St. Lawrence valley, by wood, a characteristic low, rectangular plan with high hipped roofs, however, persisted. Only in New Orleans, where the French government sent skilled architects and engineers, was anything produced that approached the sophistication of building in France. The comparatively short Spanish domination of Florida also produced highly complex structures, including the forts at St. Augustine and Matanzas, the St. Augustine cathedral, and several houses, but that building had little enduring influence. In the Southwest, however, the Spanish impress was more permanent; there the settlers borrowed extensively from the Indian techniques of construction in small stone masonry and in adobe and produced work admirably suited to the environment. Mexican baroque details and church forms appeared in a new and simpler guise, as in the Texas, New Mexico, Arizona, and California missions. The Dutch settling in New Amsterdam, who were traders for the most part, rapidly developed a typical 17th-century Dutch village. But outside the large centers they modified their building types. The English settlements were of two basic types: one, in the South, based on the large mansion house and plantation system, the other, in the North, served small-scale individual activities in farming, fishing, lumbering, and commerce. In both cases the settlers tried first to build as they had at home, they erected many-gabled half-timber houses of late Gothic inspiration. In the South, brick rapidly superseded wood as the chief building material, and the growing formality and classicism of English architecture was almost immediately reflected, as in the official buildings of WILLIAMSBURG, Va. In the North the climate rapidly forced the cov-

ering of half-timber houses, the lowering of roof slopes, and the simplification of plans, poverty (except in space and natural resources) prompted simplicity of detail. A type of residence that became popular in the wilderness and on the Western frontier by the mid-18th cent. was the LOG CABIN. During this time a growing prosperity and widening commerce brought a new influx of well-trained craftsmen, and English architectural books became increasingly available. There was a flowering of native craftsmen and designers who adapted the English precedent to American conditions with great skill. The result can be seen especially well in Charleston (S.C.), Annapolis, Philadelphia, Portsmouth (N.H.), Newburyport, Marblehead, and the earlier buildings of Salem (all Mass.). The same period produced many churches in which the current English types by Christopher Wren and James Gibbs received simple, but elegant, American interpretations (e.g., St. Paul's Chapel, New York). The English Restoration style of Wren was superbly adapted in the Wentworth-Gardner house in Portsmouth, N.H. Toward the end of the colonial period, styles based on a direct study of ancient Roman and Greek structures were beginning to appear in Europe. The Adam trend (see ADAM, ROBERT) was soon translated to American use, especially in interior detail, simplifications of Adam's designs were made popular by the books of Asher BENJAMIN. A more monumental aesthetic, which became known as the Federal Style, is typical of the work of Charles BULFINCH in Boston and of Samuel MCINTIRE in Salem, both among the growing number of native-born designers. Presidents George Washington and Thomas Jefferson gave serious thought to architecture and were deeply involved in the planning and building of WASHINGTON, D.C. Both looked to the ancient classic world as the best source of inspiration, and as a result there evolved an American CLASSIC REVIVAL. Jefferson's conception of Roman ideals of beauty and proportion was elegantly expressed in his own house at Monticello and in the Virginia capitol and the Univ. of Virginia. European architects came to the New World in search of commissions and honor. Benjamin Henry LATROBE initiated the Greek revival in his works in Philadelphia and Washington. The later books of Asher Benjamin and those of Minard Lafever gave impetus to the use of classic detail, examples can be found in Louisiana and Maine, in the Carolinas and Wisconsin. Yet certain regional styles persisted beneath this uniformity. The plantation regions still built great mansions, often with two-story colonnades, and farmhouses of a basic 18th-century type still dominated much of New England. In the port cities classic uniformity was greatest. Temple porticoes decorated churches, banks, and public buildings. In the Southwest the Spanish tradition, occasionally (as in California) modified by Eastern influences, remained supreme until the Mexican War. As early as the end of the 18th cent. romanticism, prevalent in Europe, affected American design. The English "castellated Gothic" style began to have American imitators and became increasingly popular in the United States from 1835 on, especially for churches and cottages, the Gothic work of A. J. Davis, Richard Upjohn, and Minard Lafever won instant acclaim, and the widely distributed books of A. J. DOWNING on domestic architecture and landscape gardening increased the trend. Other historic revivals that won wide popularity at the same time were the Italian villa and the Lombard Romanesque styles. The latter was simple, uncluttered, and relatively inexpensive to produce, major advantages for public building just before and during the Civil War, the writings of John Ruskin began to influence American architects profoundly. An epidemic of elaborate American versions of the Victorian Gothic followed but was short-lived. The two decades following the Civil War produced vastly changed building techniques, primarily through industrialization. A new study of the functional basis of house design brought many experimental forms into being. Westward expansion and growing urbanization forced rapid, often crude, building developments. At the same time newly wealthy patrons dictated building in styles characterized by unbridled ostentation. Typical of such work are the designs of Richard Morris Hunt for the sprawling mansions of Newport, R.I. Americans' increased foreign travel brought acquaintance with all types of European building, overwhelming existing local traditions of taste and technique. Under such conditions the development of eclectic taste was inevitable, and in the United States eclecticism dominated architecture from the late 1880s. Many architects went to Paris, if possible to the école des

Beaux-Arts, to receive the traditional doctrines. Until the period just before the Civil War, architect and engineer had been one person, or two with closely related goals. This unity of purpose was defeated by the rage for borrowed styles. The engineer designed the structural elements which the architect decorated, in the process both ignored the principle of the oneness of visible form and structure. Technical achievements of this chaotic era included construction innovations in the use of cast iron, steel, and reinforced concrete. The art of planning interior spaces for efficient functioning evolved, and the building industry was reorganized to make possible the swift and economical erection of projects of almost any size. Henry Hobson RICHARDSON designed massive, dignified buildings that contrasted sharply with the ornate edifices that reflected the prevailing tastes of his day. He is considered the father of modern American architecture. The craft movement implemented by William MORRIS had enormous, lasting influence in the United States. The trend toward functional design, which had been steadily growing, reached its supreme expression in the works of the so-called Chicago school of architecture and in the designs and writings of its architect, Louis Henry SULLIVAN. Sullivan broke completely with the eclectic aesthetic. He used materials in such a way as to emphasize their function. The commercial buildings of Chicago, built under his influence, were unique in the United States for power and originality. Frank Lloyd Wright, generally acknowledged as one of the greatest architects of the 20th cent., was a student of Sullivan and stands alone in his understanding of Sullivan's concepts and in his ability to grant them the breadth of treatment they warranted. The Columbia World Exposition of 1893, however, further endorsed the neoclassical style and historical eclecticism, and major architectural firms, including that of McKim, Mead, and White, adhered firmly to that tradition. Thus, despite the iconoclastic efforts of Sullivan and Wright, its doctrines remained solidly entrenched for many decades. Not until the end of the 1930s was there general acceptance of the subtle, earthy, and elegant houses of the California school, typified by the works of Richard Neutra, and the pristine New England building of the International school, both types influenced by the designs of the BAUHAUS masters. As a result religious, domestic, and business architecture (including skyscrapers) became streamlined, reflecting innovations in the building methods developed to construct them and an expanded interest in the inherent qualities of texture and color of the materials used. See articles on individual architects, such as Frank Lloyd WRIGHT. See also MODERN ARCHITECTURE. See L. H. Sullivan, *Autobiography of an Idea* (1924), Talbot Hamlin, *The American Spirit in Architecture* (1926) and *Greek Revival Architecture in America* (1944, repr. 1964), J. E. Burchard and Albert Bush-Brown, *The Architecture of America: A Social and Cultural History* (rev. ed. 1966), Edgar Kaufman, Jr., ed., *The Rise of an American Architecture* (1970), S. F. Kimball, *Domestic Architecture of the American Colonies and Early Republic* (1922, repr. 1966) and *American Architecture* (1928, repr. 1970), V. J. Scully, *American Architecture and Urbanism* (1969) and *The Shingle Style and the Stick Style* (rev. ed. 1971), Lewis Mumford, ed., *Roots of Contemporary American Architecture* (2d ed. 1959, repr. 1972), J. M. Fitch, *American Building* (Vol. I, 1966, Vol. II, rev. ed. 1972).

American art. This article deals with the art of the North American colonies and of the United States. There are separate articles on NORTH AMERICAN INDIAN ART, PRE-COLUMBIAN ART AND ARCHITECTURE, MEXICAN ART AND ARCHITECTURE, SPANISH COLONIAL ART AND ARCHITECTURE, and CANADIAN ART AND ARCHITECTURE. The North American colonies in the 17th cent. enjoyed neither the wealth nor the leisure to cultivate the fine arts extensively. The colonial craftsmen working in pewter, silver, glass, or textiles followed closely the European model. The 17th-century LIMNERS, generally unknown by name, turned out crude but often charming portraits in the Elizabethan style, the Dutch baroque manner, or the English baroque court style, with the preferred style depending upon the European background of both the artist and his patron. The portrait painters alternated limning with coach and sign painting or other types of craftsmanship, and even in the 18th cent. it was seldom possible to earn a living by working at art alone. The silversmith Paul Revere turned his talents to commercial engraving and the manufacture of false teeth. The crafts in general followed English, Dutch, and Bavarian models, although in furniture some variations appeared in the work of talented

craftsmen such as Samuel McIntire and Duncan Phyfe. In the first half of the 18th cent. a growing demand for portrait painting attracted such artists as John Smibert, Peter Pelham, and Joseph Blackburn from England, Gustavus Hesselius from Sweden, Jeremiah Theus from Switzerland, and Pieter Vanderlyn from Holland. Joseph Badger, Robert Feke, Ralph Earl, John Trumbull, and Charles Willson Peale did not depart widely from the tradition of 18th-century English portraiture, but while their work is more awkward, it is often more vigorous. In the early work of John Singleton Copley this vigor is combined with a great native talent. Another 18th-century American painter, Benjamin West, set up shop in London and became painter to the king and president of the Royal Academy. Although his training and practice were European, his studio became the mecca of American painters who for half a century came to study under him. His teaching of historical painting did not stand them in good stead on their return to America, where no demand existed for such work. Gilbert Stuart, however, emerged from his tutelage a superb portrait painter and after gaining success in England returned to America, where he executed a long series of famous and charming portraits and set a standard rarely surpassed in the United States. Of all the arts, sculpture was, perhaps, the least cultivated in the colonies. Apart from the anonymous carvers of tombstones and ships' figureheads, William Rush is almost the only known native sculptor to have practiced in pre-Revolutionary and early Federalist times. The period from the birth of the republic to the Civil War did not see much increase in the demand for the fine arts. Such early painters as Washington Allston, Samuel F. B. Morse, John Vanderlyn, and John Trumbull, who sought a market in America for historical painting in the classical manner of Jacques Louis David, were quickly disillusioned. Portrait painting alone could provide the patronage enjoyed by such men as Mather Brown, Henry Benbridge, Edward Savage, Thomas Sully, John Neagle, Chester Harding, and the miniaturists Edward G. Malbone and John Wesley Jarvis. None of these men, with the exception of Allston, produced work equal to that of Stuart or Copley, but all of them created paintings that expressed the energy and self-confidence of the builders of the new American nation. The colonial period saw the gradual rise of a number of excellent GENRE painters—Henry Inman, William Sidney Mount, Richard C. Woodville, David G. Blythe, Eastman Johnson, and George Caleb Bingham. These were the earliest painters of the American scene. J. J. Audubon created an extraordinary, detailed series of paintings of American birds. It is significant that he had to go to England for recognition and publication of his work. John Quidor painted scenes and legendary figures from the works of Fenimore Cooper and Washington Irving. The first half of the 19th cent. witnessed development of the first school of American landscape painting. Thomas Doughty and Thomas Cole led the HUDSON RIVER SCHOOL, which was continued by Asher B. Durand, John F. Kensett, and Frederick E. Church. The land and peoples west of the Mississippi were described in paintings by Frederick Remington, George Catlin, Charles M. Russell, and Seth Eastman; and by the panorama painters of the wilderness Albert Bierstadt and Thomas Moran. Despite this tendency toward the panoramic, the better work of these men showed a direct response to nature which has never ceased to be an important factor in American art. The characteristic American passion for objects realistically portrayed found remarkable expression in the paintings of William Harnett and John F. Peto, as well as in the still-life works of Charles Willson Peale and his children. The strain of primitivism, first evident in the limners, was more pronounced and popular in the early 19th cent. with works by Edward Hicks and Erastus Salisbury Field; it was continued by Grandma Moses in the 20th cent. In sculpture, portraiture provided the main source of patronage. John Frazee and Hezekiah Augur with little training produced forceful and original work in marble and wood. Horatio Greenough began the long tradition of the American sculptor trained in Italy, where he was soon followed by Thomas Crawford, Hiram Powers, and Harriet Hosmer. The American sculptors in Italy were greatly influenced by the Danish neoclassicist A. B. Thorvaldsen. Works of greater originality were produced by Clark Mills, Thomas Ball, and particularly by William Rimmer, whose untutored sculpture was enormously powerful. In painting, the post-Civil War period, one of unprecedented patronage for the arts from government and private sources, produced works of enduring worth

and striking individuality. Much of the more popular work of the period, such as the historical and mural paintings of Leutze and the vistas of Bierstadt, have relatively little aesthetic interest today. But Whistler, Ryder, Eakins, and Winslow Homer produced works that rank among the finest achievements in American art. The four are strikingly dissimilar. James Whistler, an expatriate, cultivated a delicate art of suggestion in his oils and etchings alike. Albert Pinkham Ryder, a hermit, produced a visionary art of profound emotional impact. Thomas Eakins painted sympathetic portraits of extraordinary psychological insight and uncompromising honesty. Winslow Homer's watercolors are among the strongest realistic interpretations of pure landscape and seascape ever painted. This period also saw the development of the romantic landscape painters George Inness, Alexander H. Wyant, Homer D. Martin, and Ralph Blakelock. In Inness, and perhaps even more in William Morris Hunt, the influence of the Barbizon school was brought to America. Although French influence had begun to supplant German, the work of the portrait painters William M. Chase and Frank Duveneck reflected contemporary currents in Munich, as the earlier genre painters had reflected the influence of artists in Düsseldorf. John La Farge, who studied in Paris, did much to widen the American cultural horizon. His religious murals and stained glass set a new standard for these arts. John Singer Sargent, working chiefly in England, excelled in society portraiture, and Elihu Vedder and Edwin Abbey in illustration. At the close of the century John Twachtman, Childe Hassam, Ernest Lawson, and Mary Cassatt worked under the direct influence of French impressionism. Under the same influence, Maurice Prendergast created original, boldly colorful images of passing urban scenes. In sculpture after the Civil War there was an increased demand for commemorative work. In the late 19th cent., John Quincy Adams Ward introduced a strong note of realism into a tradition suffering from the vapid classicism of the Italianates. His student Daniel Chester French also devoted his talents to monumental sculpture. William Rimmer's extensively illustrated *Art Anatomy* (1877) was admired by artists and physicians alike. The workshop of John Rogers produced small figures and genre groups that became popular, and later Frederick Remington's small bronzes extended the subject matter of native realism westward to include the cowboy. Neoclassic tendencies dominated in the work of Olin Warner and Augustus Saint-Gaudens, both of whom studied in Paris. Among the early 20th-century sculptors, Paul Bartlett, Karl Bitter, Frederick MacMonnies, George Barnard, and Lorado Taft exhibited a continuing conflict between naturalistic and idealized modes of representation. A significant cultural development of the era was the founding and expansion of American museums, whose collections were important to the art student and public alike. Museums, together with the rapid growth of art galleries, private collections, and art schools, widened the understanding of the European past and lessened the naivete of earlier periods. Under the impetus of new techniques of reproduction the art of illustration flourished. The work of Edwin Abbey, Arthur Frost, and Howard Pyle was outstanding, appearing in *Harper's* and numerous other illustrated magazines and books. American art turned in the 20th cent. to exploitation of new techniques and new expression. The functional precision of the machine strongly influenced all the arts. The development of PHOTOGRAPHY forced a reevaluation of the representational nature of painting, while the formal and expressive capacities of modern European art opened fresh fields for the artist. In reflecting the radical European tendencies, American art in general maintained a more constant interest in local color and subject matter. Early in the century a vigorous movement toward realism in subject matter and freedom in technique was headed by Robert Henri, John Sloan, and George Luks. With others they formed the EIGHT, a group that sought to communicate something of the reality of everyday life through art. Dubbed the "Ashcan School" they included in their number William Glackens, Everett Shinn, and George Bellows. At his revolutionary 291 Gallery for contemporary photographs and paintings Alfred STIEGLITZ offered America early glimpses of fauve and cubist work and in addition exhibited abstract paintings by such Americans as Max Weber, Marsden Hartley, and John Marin. The full force of European modern art was presented to shocked Americans in the famous ARMORY SHOW of 1913, organized by Arthur B. Davies, Walt Kuhn, and other artists. Under the influence of this exhibition, the early work of such

Americans as Joseph Stella, Yasuo Kuniyoshi, Charles Demuth, and Stuart Davis revealed new abstract tendencies. George Bellows and Rockwell Kent remained popular realists, and Edward Hopper and Charles Burchfield developed a more poignant and intensely personal realism. John Marin caught the imposing breadth of nature in his watercolors, while Georgia O'Keeffe and Charles Sheeler combined realism with varying degrees of precise formal design. Peter Blume, Ivan Albright, and Edwin Dickinson developed differing and complex surrealist styles. A chauvinistic espousal of the American scene flourished under Thomas Hart Benton and Grant Wood in the early 1930s, while the same decade and the 1940s saw the rise of more personally meaningful, socially conscious art in the work of Ben Shahn, Philip Evergood, Reginald Marsh, Jacob Lawrence, Isabel Bishop, and Raphael and Moses Soyer. Several years later this social awareness was given bitter expression in the paintings of Jack Levine. Government sponsorship of the arts during the years of the Great Depression was the chief means by which many artists were able to continue work. Two independent programs, the Dept. of the Treasury's Section of Fine Arts and the Federal Art Project of the Works Progress Administration, were responsible for the embellishment of many public buildings with murals and the creation of smaller works for display in public institutions. The Farm Security Administration supported the photographic documentation of rural America, a project that employed a number of outstanding photographers and resulted in a dreadful and moving portrait of America in crisis. World War II brought an influx of European painters who were to influence the course of American art. They included Joan Miro, Salvador Dali, Max Ernst, and Yves Tanguy. In painting since 1945 the work of all but the most intensive realists, such as Andrew Wyeth, has tended increasingly toward abstraction. Such artists as Arshile Gorky, Irene Rice Pereira, Morris Graves, and Mark Tobey have developed and employed abstraction in works of highly personal symbolic content, whereas painters such as Jackson Pollock, Willem de Kooning, Adolph Gottlieb, and Franz Kline have created a bold and unique imagery that has made American painting a dominant influence in world art (see ABSTRACT EXPRESSIONISM). The POP ART movement of the 1950s and 60s revealed an aesthetic that made use of the mass-produced artifacts of urban culture and rejected the concepts of beauty and ugliness. Its major practitioners include Andy Warhol, Roy Lichtenstein, Jasper Johns, and Robert Rauschenberg. OP ART was an exercise in pure visual sensation, often exploiting techniques that give the illusion of movement. Developments in painting of the late 1960s and 70s include minimalism, POST-PAINTERLY ABSTRACTION, and photo-realism (see MODERN ART). American sculpture in the 20th cent. produced works in the traditional styles, including Gutzon Borglum's Mt. Rushmore monument, the classicizing figures of Paul Manship, and Mahonri Young's naturalistic athletes and laborers. However, the dominant tendency has been toward abstract design and expressive form, a trend to which William Zorach, Gaston Lachaise, and, more recently, Leonard Baskin contributed figurative work. Alexander Calder pioneered in the use of mobile welded metal forms, adding motion as a new dimension in sculpture. In the 1940s and 50s the free play of abstract forms in light and space and the use of new materials were vigorously exploited by David Smith, Theodore Roszak, Herbert Ferber, Isamu Noguchi, and Richard Lippold. Recent styles in sculptural abstraction have been developed in individual directions by John Chamberlain, Eva Hesse, Carl Andre, Louise Nevelson, and Tony Smith. See articles about individual artists, e.g., Thomas EAKINS. See Holger Cahill and A. H. Barr, *Art in America* (1935), A. T. Gardner, *Yankee Stonecutters* (1945), John Baur, *Revolution and Tradition in Modern American Art* (1958), Oliver Larkin, *Art and Life in America* (rev. ed. 1960), J. C. T. Flexner, *First Flowers of Our Wilderness* (1947) and *That Wilder Image* (1962), Lucy Lippard, *Pop Art* (1967), *The Artist in America* (1967, comp. by ed. of *Art in America*), Sam Hunter, *Modern American Painting and Sculpture* (1959), Wayne Craven, *Sculpture in America* (1968), Barbara Novak, *American Painting of the Nineteenth Century* (1969), Irving Sandler, *Triumph of American Painting: A History of Abstract Expressionism* (1970), John K. Howat, *The Hudson River and Its Painters* (1972).

American Association of University Professors (AAUP), organization of college and university teachers. It was founded (1915) for the purpose of defending faculty rights, most notably ACADEMIC

FREEDOM and tenure (see TENURE, in education). Its major activities involve protecting teachers from harassment or arbitrary dismissal for espousing unpopular causes, and assuring due process in those cases where a teacher is charged with incompetence or moral turpitude. See Louis Joughin, *Academic Freedom and Tenure: A Handbook of the AAUP* (1969).

American Ballet Theatre, one of the foremost international dance companies of the 20th cent. It was founded in 1937 as the Mordkin Ballet and reorganized as the Ballet Theatre in 1940 under the direction of Lucia Chase and Rich Pleasant. It became the American Ballet Theatre in 1956. Its repertoire has included newly staged classical ballets and innovative modern dance works, many concerned with specifically American themes. Most of the company's seasons have been presented in New York City, but it has also toured throughout Europe and the Middle East. George Balanchine, Adolph Bolm, Michael Fokine, Leonide Massine, and Bronislava Nijinska have staged works for the company, as has the brilliant British choreographer Antony Tudor, who was introduced to the American public with such works as *Pillar of Fire* (1942) and *Romeo and Juliet* (1943). Agnes de Mille has staged nearly all of her dance works for the company, including *Fall River Legend* (1948). Jerome Robbins's *Fancy Free* (1944) and Michael Kidd's *On Stage* (1945) were also created for the company. Dancers who have gained fame or reached their peak with the American Ballet Theatre include Alicia ALONSO, Alicia MARKOVA, Erik BRUHN, Nora KAYE, and Jenny Workman.

American Bar Association (ABA), voluntary organization of lawyers admitted to the bar of any state. Founded (1878) largely through the efforts of the Connecticut Bar Association, it is devoted to improving the administration of justice, seeking uniformity of law throughout the nation, and maintaining high standards for the legal profession. It is composed of over 25 committees that deal with such diverse legal topics as maritime law, professional ethics, legal education, the judicial system, and legal aid for the indigent. Through its main office in Chicago, the ABA coordinates the activities of state and local bar associations. In 1974 its membership exceeded 170,000. Affiliated organizations include the American Law Student Association, and the American Bar Foundation, a group devoted to legal research and education.

American Civil Liberties Union (ACLU), nonpartisan organization devoted to the preservation and extension of the basic rights set forth in the U.S. Constitution. Founded (1920) by such prominent figures as Jane Addams, Helen Keller, Judah Magnus, and Norman Thomas, the ACLU grew out of earlier groups that had defended the rights of conscientious objectors during World War I. Its program is directed toward three major areas of civil liberties: inquiry and expression, including freedom of speech, press, assembly, and religion, equality before the law for everyone, regardless of race, nationality, political opinion, or religious belief, and due process of law for all. Its most significant and successful activities have involved court tests of important civil liberties issues. Since its founding, the ACLU has participated directly or indirectly in almost every major civil liberties case contested in American courts. Among those are the so-called Scopes monkey trial in Tennessee (1925), the Sacco-Vanzetti case (1920s), the Federal court test (1933) that ended the censorship of James Joyce's *Ulysses*, and the landmark *Brown vs. Board of Education* (1954) school desegregation case. The ACLU has about 130,000 members in its state organizations. The national office, located in Chicago, also supports lobbying and educational activity on behalf of civil liberties issues. See Charles L. Markmann, *The Noblest Cry* (1965).

American Colonization Society, organized Dec. 1816-Jan. 1817, at Washington, D.C., to transport free Negroes from the United States and settle them in Africa. The freeing of many slaves, principally by idealists, created a serious problem in that no sound provisions were made for establishing them in society on an equal basis with white Americans anywhere in the United States. Robert FINLEY, principal founder of the colonization society, found much support among prominent men, notably Henry Clay. Money was raised—with some indirect help from the federal government when (1819) Congress appropriated \$100,000 for returning to Africa Negroes illegally brought to the United States. In 1821 an agent, Eli Ayres, and Lt. R. F. Stockton of the U.S. navy purchased land in Africa, where subsequently Jehudi ASHMUN and Ralph R. Gurley laid the founda-

tions of LIBERIA The colonization movement came under the bitter attack of the abolitionists, who charged that in the South it strengthened slavery by removing the free Negroes The Negroes themselves were not enthusiastic about abandoning their native land for the African coast The colonization society, with its associated state organizations, declined after 1840 More than 11,000 Negroes were transported to Liberia before 1860 From 1865 until its dissolution in 1912, the society was a sort of trustee for Liberia See P J Staudenraus, *The African Colonization Movement* (1961), W L Garrison, *Thoughts on African Colonization* (1832, repr 1968)

American Ephemeris and Nautical Almanac see EPHEMERIS

American Federation of Labor and Congress of Industrial Organizations (AFL-CIO), a federation of autonomous labor unions in the United States, Canada, Mexico, Panama, and U.S. dependencies, formed in 1955 by the merger of the American Federation of Labor (AFL) and the Congress of Industrial Organizations (CIO)

American Federation of Labor In 1881 representatives of workers' organizations, meeting in Pittsburgh, formed the Federation of Organized Trades and Labor Unions in the United States and Canada In 1886 at another conference in Columbus, Ohio, this group reorganized as the American Federation of Labor Opposed to the socialistic and political ideals of the KNIGHTS OF LABOR, the AFL was, instead, a decentralized organization recognizing the autonomy of each of its member national craft unions Individual workers were not members of the AFL but only of the affiliated local or national union, and from its inception it emphasized organization of skilled workers on a craft, or horizontal, basis, as opposed to an industrial, or vertical, basis The AFL's object was to define and protect separate craft jurisdictions, to encourage legislation favorable to its members, and to provide assistance in organizing workers The AFL was against the direct entry of organized labor into politics, and, operating under the precepts developed by Samuel GOMPERS, it was relatively static as a force for social change, although it did secure higher wages, shorter hours, workmen's compensation, and laws against child labor It also helped to secure the 8-hr day for government employees and the exemption of labor from antitrust legislation (see CLAYTON ANTITRUST ACT) Under the leadership of Gompers, that of William GREEN, and then George MEANY, the AFL became the largest labor federation in the United States, with a membership of over 10 million at the time of its merger with the CIO in 1955 Divorced throughout most of its history from the radical element in American labor, the AFL was split in 1935 when dissident elements within the federation protested its conservative organization policies with regard to the mass-production industries The formation of the Committee for Industrial Organization (later the Congress of Industrial Organizations) by the dissidents resulted in the suspension (1936) and then expulsion (1937) from the AFL of 10 affiliates Two of these unions later rejoined—the INTERNATIONAL LADIES GARMENT WORKERS UNION (ILGWU) in 1940 and the UNITED MINE WORKERS OF AMERICA (UMW) in 1946 The UMW left again in 1947 because of a difference with the AFL leadership over the filing of non-Communist affidavits as required by the Taft-Hartley Labor Act The federation maintained its prevailing craft-union philosophy, even in the face of the growth of mass-production industries that made the organization of workers along craft lines more difficult

Congress of Industrial Organizations Within the AFL in the early 1930s a strong minority faction evolved advocating the organization of workers in the basic mass-production industries (such as steel, auto, and rubber) on an industry-wide basis John L LEWIS of the UMW led this faction in forming a Committee for Industrial Organization in 1935 This group (changing its name in 1938 to Congress of Industrial Organizations) immediately launched organizing drives in the basic industries The spectacular success of those drives, particularly in auto and steel, enhanced the CIO's prestige to the point where it seriously challenged the AFL's hegemony within U.S. organized labor After fruitless negotiation the parent body revoked the charters of the 10 dissident international unions The CIO, under the presidency of Lewis until 1940 and of Philip MURRAY thereafter until his death in 1952, followed more militant policies than the AFL The CIO's Political Action Committee, headed by Sidney HILLMAN of the Amalgamated Clothing Workers Union, played an active role in the CIO's attempt to urge its membership into more active political participation The CIO

grew rapidly until its affiliated international unions numbered 32 at the time of the 1955 merger, with an estimated membership of five million Its growth, however, was marked by internal dissension, one such dispute led to the withdrawal in 1938 of one of its original constituent unions, the ILCWU, and that union's reaffiliation with the AFL Another dispute, this time over Lewis's support of Wendell Willkie in the 1940 presidential election, led Lewis to resign the CIO presidency Coolness developed between Lewis and Murray and culminated in the withdrawal (1942) of the UMW from the CIO and its subsequent brief reaffiliation (1946-47) with the AFL In the same period that the AFL was grappling with the problem of gangster-dominated affiliates, the CIO was faced with the problem of the extent to which their affiliates were Communist-dominated In 1948 after a bitter struggle the CIO barred Communists from holding office in the organization, and in 1949-50 it expelled 11 of its affiliated unions, which were said to be Communist-dominated During World War II the CIO (like the AFL) pledged a no-strike policy The CIO joined (1945) the World Federation of Trade Unions (WFTU), exacerbating its relations with the AFL since the latter had refused to participate in the WFTU because of possible Communist domination of that body This obstacle to U.S. labor unity was removed by the CIO's withdrawal from the WFTU in 1949, and relations were further improved by subsequent cooperation of the AFL and the CIO in helping to form the International Confederation of Free Trade Unions

Merger During the entire period of the alienation of the CIO from the AFL, the idea of merger was being considered by elements in both federations By the early 1950s both federations had proved their sustaining power as labor organizations, it had become evident that craft and industrial unions could exist side by side within the labor movement Furthermore, labor's concern over the apparent antiunion policies of President Eisenhower's administration (the first Republican administration in 20 years) gave new impetus to the movement for labor unity The death in 1952 of the presidents of both organizations paved the way for the appointment of leaders more amenable to unity The AFL chose George Meany, and the CIO picked Walter P REUTHER An indication of the possibility of a merger occurred in 1953 when a no-raiding agreement was signed between the two organizations It was followed in 1955 by a merger agreement At its first convention the merged organizations, now called the American Federation of Labor and Congress of Industrial Organizations (AFL-CIO), elected Meany as its president The organization has five operating levels The first is the biennial convention, in which ultimate authority is vested The second level is the executive council, which governs between conventions and is composed of the executive officers (president and secretary-treasurer) and 27 vice presidents (17 from former AFL and 10 from former CIO unions) A general board (the convention in microcosm) acts on the third level as an advisory body to the council On the fourth level the executive officers handle the day-to-day operations of the organization, they are advised on the fifth level by an executive committee consisting of the executive officers and 6 vice presidents (3 from each of the former AFL and CIO organizations) In addition to these levels of authority, the AFL-CIO carried over autonomous departments from the AFL (such as the Building Trades Dept.) and added an Industrial Union Dept. to handle the problems of the former CIO unions The AFL-CIO also created a series of standing committees to handle problems in specific spheres of the federation's interests, the most notable of these is the Committee on Political Education The AFL-CIO supported the Democratic presidential candidates in 1956, 1960, 1964, and 1968 In 1972, however, Meany led the AFL-CIO into a neutral stance, supporting neither major candidate Committed to advancing the welfare of its members, the AFL-CIO has lobbied actively against the so-called right-to-work laws, which outlawed union shops (see CLOSED SHOP), and other legislation deemed inimical to organized labor's interests In 1957 the AFL-CIO adopted antiracket codes, and the convention expelled the INTERNATIONAL BROTHERHOOD OF TEAMSTERS (which under Dave BECK and James R. HOFFA had gained a notorious reputation) for alleged failure to meet the parent organization's ethical standards The AFL-CIO took a major step in 1961 in the direction of settling internal disputes by setting up a mandatory arbitration procedure A submerged dispute between George Meany and Walter Reuther finally erupted in 1968 Reuther,

continuously critical in the 1960s of the AFL-CIO's conservative approach to civil rights and social welfare programs, sought a reorganization of the executive council To apply pressure, he began to withhold the \$1 million annual dues of the United Automobile Workers of America (UAW) For this the UAW was suspended By 1974 the AFL-CIO had 110 national and international unions, with a membership of some 13.5 million See Samuel Gompers, *Seventy Years of Life and Labor* (1925, repr 1967), Arthur Goldberg, *AFL-CIO Labor United* (1956, repr 1964), Philip Taft, *The A F of L from the Death of Gompers to the Merger* (1959, repr 1970), Walter Galenson, *The CIO Challenge to the AFL* (1960), Paul Jacobs, *The State of the Unions* (1963), Len DeCaux, *Labor Radical* (1970)

American Federation of State, County, and Municipal Employees (AFSCME), largest union of public employees in the United States It began as a number of separate locals organized by a group of Wisconsin state employees in the early 1930s By 1935 there were 30 locals that became a separate department within the American Federation of Government Employees In 1936, AFSCME received its charter By 1955, at the time of the AFL-CIO merger, the union had 100,000 members The following year it merged with the 30,000-member Government and Civil Employees Organizing Committee The union has over 500,000 members, about two thirds of whom are blue-collar workers The single largest occupational area is hospital and health workers with about 150,000 members

American Federation of Teachers (AFT), an affiliate of the AFL-CIO It was formed (1916) out of the belief that the organizing of teachers should follow the model of a labor union, rather than that of a professional association In the 1960s and early 70s the AFT experienced a period of rapid growth, expanding from 55,000 to almost 250,000 members This increase in membership was largely due to an increasing willingness on the part of American teachers to use militant labor union tactics, including strikes and the threat of strikes, in contract negotiations In 1973-74 the AFT negotiated unsuccessfully for a merger with the NATIONAL EDUCATION ASSOCIATION See American Federation of Teachers, *Organizing the Teaching Profession* (1955), T M Stinnett, *Turmoil in Teaching* (1968), Stephen Cole, *The Unionization of Teachers* (1970), and R J Braun, *Teachers and Power* (1972)

American Film Institute, nonprofit organization established in Washington, D.C., in 1967 by the National Endowment for the Arts to preserve and catalog American films and to provide work grants for new and established filmmakers The institute operates a movie theater at the John F Kennedy Center for the Performing Arts in Washington, D.C., and provides financial and research assistance to U.S. museums and other organizations that present film programs It maintains the Center for Advanced Film Studies in Beverly Hills, Calif., where it holds professional seminars and workshops, with a library of more than 3,000 books and film scripts The institute also publishes detailed catalogs of feature films produced in the United States after 1921

American foxhound, breed of sturdy, medium-sized HOUND developed in America over 300 years ago It stands about 23 in (58 cm) high at the shoulder and weighs between 60 and 70 lb (27-32 kg) The smooth, hard, "hound-marked" coat is usually black, tan, and white The American foxhound, with its great endurance and keen sense of smell, was once widely used in packs of as many as 15 or 20 dogs to hunt fox and other small game Today, however, it is more commonly bred for field trial competition See DOG

American Fur Company, chartered by John Jacob ASTOR (1763-1848) in 1808 to compete with the great fur-trading companies in Canada—the North West Company and the Hudson's Bay Company Astor's most ambitious venture, establishment of a post at ASTORIA, Oregon, to control the Columbia River valley fur trade, was made under a subsidiary, the Pacific Fur Company His early operations around the Great Lakes were under another subsidiary, the South West Company, in which Canadian merchants had a part The War of 1812 destroyed both companies In 1817, after an act of Congress excluded foreign traders from U.S. territory, the American Fur Company commanded the trade in the Lakes region An alliance made in 1821 with the Chouteau interests of St. Louis gave the company a monopoly of the trade in the Missouri River region and later in the Rocky Mts (see MOUNTAIN MEN) The company was one of the first great American trusts

It maintained its monopoly by the customary early practice of buying out or crushing any small company that threatened opposition. When Astor withdrew in 1834, the company split and the name became the property of the former northern branch under Ramsey Crooks, but popular usage still applied it to succeeding companies. The American Fur Company strongly influenced the history of the frontier, not only by preparing the way for permanent settlement but by opening Great Lakes commercial fishing, steamboat transportation, and trade in lead. See G. L. Nute, *Calendar of the American Fur Company's Papers* (1945), B. DeVoto, *Across the Wide Missouri* (1948), H. M. Chittenden, *The American Fur Trade of the Far West* (3 vol., 1902, repr. 1954), J. U. Terrell, *Furs by Astor* (1963), D. S. Lavelander, *The First in the Wilderness* (1964), P. C. Phillips, *The Fur Trade* (1961, repr. 1967).

American Geographical Society (AGS), oldest geographical society in the United States, founded 1852 in New York City. Its purpose is to advance the science of geography through discussion and publication. The society has the largest private geographical library in the Western Hemisphere. Its archives contain many rare maps and globes, historic letters, and artifacts from explorations. The society is noted for its support of scientific research and exploration, for its research facilities (extensively used by the Federal government during the 1919 Paris Peace Conference and again during World War II), and for its cartographic work. *The Geographical Review* is its quarterly journal. See J. K. Wright, *Geography in the Making: The American Geographical Society 1851-1951* (1952).

American Indian languages, languages of the native peoples of the Western Hemisphere and their descendants. A number of the American Indian languages that were spoken at the time of the European arrival in the New World in the late 15th cent. have become extinct, but many of them are still in use today. The classification "American Indian languages" is geographical rather than linguistic, since those languages do not belong to a single linguistic family, or stock, such as the Indo-European or Hamito-Semitic language families. The American Indian languages cannot be differentiated as a linguistic unit from other languages of the world but are grouped into a number of separate linguistic stocks having significantly different phonetics, vocabularies, and grammars. There is no part of the world with as many distinctly different native languages as the Western Hemisphere. Because the number of American Indian tongues is so large, it is convenient to discuss them under three geographical divisions: North America (excluding Mexico), Mexico and Central America, and South America and the West Indies. It is not possible to determine exactly how many languages were spoken in the New World before the arrival of Europeans, nor how many people spoke these languages. Some scholars estimate that the Western Hemisphere at the time of the first European contact was inhabited by 40 million people who spoke 1,800 different tongues. Another widely accepted estimate suggests that at the time of Columbus more than 15 million speakers throughout the Western Hemisphere used more than 2,000 languages, the geographic divisions within that estimate are 300 separate tongues native to some 1.5 million Indians in America N of Mexico, 300 different languages spoken by roughly 5 million people in Mexico and Central America, and more than 1,400 distinct tongues used by 9 million Indians in South America and the West Indies. Recent studies suggest that some 700 American Indian languages survive, that they are spoken by nearly 12 million people, most of whom live in Central and South America. In the United States no more than 250,000 American Indians currently speak their native languages, which number about 200. By the middle of the 20th cent., as a result of European conquest and settlement in the Western Hemisphere, perhaps two thirds of the many Indian languages had already died out or were dying out, but others flourished. Still other aboriginal languages are only now being discovered and investigated by researchers. Some authorities suggest that about one half of the American Indian languages N of Mexico have become extinct. Of the tongues still in use, more than half are spoken by fewer than 1,000 persons per language, most of the speakers are bilingual. Only a few tongues, like Navaho and Cherokee, can claim more than 50,000 speakers. Mexico and Central America, however, have large Indian populations employing a number of American Indian languages, such as Nahuatl (spoken by 800,000 people) and the Mayan tongues (native to more than one million people).

In South America the surviving Quechuan linguistic family accounts for several million people. Another flourishing language stock of South American Indians is Tupi-Guarani. A language family consists of two or more tongues that are distinct and yet related historically in that they are all descended from a single ancestor language, either known or assumed to have existed. The languages of a family are closely related in phonetics, grammar, and vocabulary. The attempts made to classify American Indian languages into such families have encountered various obstacles. One is the absence of written records of these languages except in the case of Aztec and Maya. Even there the texts are comparatively few in number, the Spanish conquerors destroyed almost all the texts they found. Another problem is that most records of any linguistic value were made after 1850. Also, there are at present insufficient numbers of trained persons able to record many of the American Indian languages and collect data, especially in Mexico and Central and South America. The absence of grammars handed down from the past, owing to either the dearth of writing or the destruction of written texts, has further hampered the study of the American Indian tongues. Linguistic scholars, therefore, have to turn to native informants to gain material for the analysis of these languages. The languages in America N of Mexico are best known, those of Mexico and Central America are less so, and those of South America and the West Indies are the least studied. Systematic investigation has shown the American Indian languages to be highly developed in their phonology and grammar, they are not at all primitive, whether they are the tongues of the sophisticated Aztecs and Incas or of peoples of simpler cultures, such as the Eskimos or Paiutes. There is great diversity among the American Indian languages with respect to phonology and grammar. The tongue of the Greenland Eskimos, for example, has only 17 phonemes, whereas that of the Navahos has 47 phonemes. Some languages have nasalized vowels similar to those of French. Many have the consonant known as the glottal stop. Some American Indian languages have a stress accent reminiscent of English, and others have a pitch accent of rising and falling tones similar to that of Chinese. Still others have both stress and pitch accents. A grammatical characteristic of widespread occurrence in American Indian languages is polysynthesis. A polysynthetic language is one in which a number of word elements are joined together to form a composite word that functions as the sentence does in Indo-European languages. Thus, a sentence or phrase is expressed by one long word unit, each element of which has meaning usually only as part of the sentence or phrase and not as a separate item. In a polysynthetic language, no clear distinction is made between a word and a sentence. For example, a series of words expressing several connected ideas, such as "I am searching for my lost horse," would be merged to form a single word or meaning unit. Edward Sapir, a major scholar in the field of American Indian languages, first presented the following, much-quoted word unit from Southern Paiute: *witokuchumpunkuruganiyugwiv-antümü*, meaning "they-who-are-going-to-sit-and-cut-up-with-a-knife-a-black-female-(or male-) buffalo." It is thought that the numerous aboriginal tongues showing polysynthesis may originally have been the offshoots of a single parent language. The existence of gender as found in Indo-European languages is encountered only infrequently in American Indian tongues. In the Algonquian languages, nouns are classified as animate and inanimate. Noun cases like those of Latin occur in some languages, but a lack of case distinction similar to English usage is more common (at least N of Mexico). A number of American Indian tongues have a form for the plural of the noun that differs from the singular form, but many others have the same form for both, as in the English noun *sheep*. Asia is generally accepted as the original home of the American Indians, although linguistic investigations have not yet established any definite link between the American Indian languages and those spoken in Asia or elsewhere in the Eastern Hemisphere. Some scholars postulate a connection between the Eskimo-Aleut family and several other families or subfamilies (among them Altaic, Paleosiberian, Finno-Ugric, and Sino-Tibetan). Others see a relationship between members of the Nadene stock (to which Navaho and Apache belong) and Sino-Tibetan, to which Chinese belongs, however, such theories remain unproved.

Languages of North America The most widely accepted classification of American Indian languages N of Mexico (although some included are also spo-

ken in Mexico and Central America) is that made by Edward Sapir in 1929. Sapir arranged the numerous linguistic groups in six major unrelated linguistic stocks, or families. There are ESKIMO-ALEUT, Algonquian-Wakashan, Nadene, Penutian, Hokan-Siouan, and Aztec-Tanoan. The Algonquian-Wakashan language family of North America was one of the most widespread of Indian linguistic stocks, in historical times, tribes speaking its languages extended from coast to coast. Today the surviving languages of the Algonquian-Wakashan family are native to some 80,000 Indians in Canada, the Great Lakes region, Montana, Wyoming, Oklahoma, and the NE United States. The Algonquian branch of the family once had some 50 distinct tongues, among them Algonquin, Arapaho, Blackfoot, Cheyenne, Cree, Delaware, Kickapoo, Micmac, Ojibwa (or Chippewa), Penobscot, Sac and Fox, Shawnee, and Yurok. Two other important branches of the Algonquian-Wakashan stock are Salishan and Wakashan. Among the tribes speaking Salishan languages are the Bella Coola, Clallam, Coeur d'Alene, Colville, Flathead, Nisqualli, Okanogan, Pend d'Oreille, Puyallup, Shuswap, Spokane, and Tillamook. The Salishan tongues are spoken in British Columbia, Washington, Oregon, Idaho, and Montana. Tribes speaking Wakashan languages (used along the Pacific Northwest coast) include the Nootka, Nitinat, Makah, Kwakiutl, Bella Bella, and Kitamat. Polysynthesis characterizes the Algonquian-Wakashan languages, which are inflected and make great use of suffixes. Prefixes are employed to a limited extent. The Nadene languages form another linguistic family, its branches include ATHABASCAN, Eyak, Haida, and Tlingit. The Eyak, Haida, and Tlingit tongues are spoken in parts of Canada and Alaska. As a whole, the Nadene languages have tones that convey meaning and some degree of polysynthesis. The verb is characterized by a reliance on aspect and voice rather than on tense. The Penutian linguistic stock includes several branches, such as the Maidu, Wintun, and Yokuts language groups, all of which are native to California. Probably also in the Penutian family are the Sahaplin, Chinook, and Tsimshian languages of the Pacific Northwest coast, as well as other tongues in Mexico and parts of Central America. Penutian languages resemble those of the Indo-European family in several ways (for example, they have true cases for the noun). The Hokan-Siouan family is thought to include a number of linguistic groups, but the classification of some of them is still disputed. Among the groups generally considered branches of the Hokan-Siouan stock are Muskogean, whose languages include such tongues as Choctaw, Chickasaw, Creek, and Seminole and are spoken in Oklahoma and Florida; Caddoan, composed of the Caddo, Wichita, Pawnee, and Arikara languages found in Oklahoma and North Dakota; Yuman, with individual languages (such as Cocopa, Havasupai, Kamia, Maricopa, Mohave, Yavapai, and Yuma) in Arizona and California; Iroquoian, to which belong the Seneca, Cayuga, Onondaga, Mohawk, Oneida, Wyandot, and Tuscarora languages spoken in New York, Wisconsin, and Oklahoma, as well as the Cherokee tongue found in Oklahoma and North Carolina, and Siouan, which includes Catawba (in South Carolina), Winnebago (in Wisconsin and Nebraska), Osage (in Nebraska and Oklahoma), Dakota and Assiniboin (in Minnesota, North Dakota, South Dakota, Montana, and Nebraska), and Crow (in Montana). Languages of the Hokan-Siouan stock are also found in Mexico and parts of Central America. These Hokan-Siouan languages tend to be agglutinative, various word elements, each having a fixed meaning and an independent existence, are merged to form a single word. The two principal branches of the Aztec-Tanoan linguistic stock are Uto-Aztecan and Tanoan, and their languages are spoken in areas extending from the NW United States to Mexico and Central America. Uto-Aztecan has such subdivisions, or groups, as NAHUATLAN, whose languages are spoken in Mexico and parts of Central America, and Shoshonean, to which Comanche, Hopi, Paiute, Shoshone, and Ute belong. Ute and Paiute are found in Utah, Nevada, California, and Arizona; Comanche and Shoshone are spoken in Wyoming, Nevada, Utah, California, and Oklahoma; Hopi is found in Arizona. The languages of the Tanoan branch of Aztec-Tanoan are spoken in the Rio Grande valley, New Mexico, and Arizona. Zuñi (found in New Mexico) may be connected with Tanoan. The Aztec-Tanoan languages show a degree of polysynthesis. They differentiate clearly between the noun and the verb.

Languages of Mexico and Central America Of the languages of Mexico and Central America, about 24

linguistic groups, or stocks, have been identified, it is still not clear which of these can be classified together to reduce the number of groups. Among these groups is Yuman, whose tongues are spoken in Baja California and are related to the Yuman languages found in the United States. In both, Yuman falls within the larger Hokan-Siouan classification, which, in Mexico and parts of Central America, also includes the Coahuiltecan, Guaycuran, and Jicaque stocks, or groups. The Otomian stock (current in central Mexico and including the Otomi language) forms part of the larger Macro-Otomanguean division, in which the Mixtecan and Zapotecan stocks of Mexico are often placed. The Nahuatl group, as indicated earlier, is classified under Uto-Aztecan, some of whose languages are found in Mexico and parts of Central America. Uto-Aztecan is itself a branch of the greater Aztec-Tanoan stock. Nahuatl, or Aztec, is a language of the Nahuatl group. Mayan, which is found in Yucatan and parts of Central America and to which the language Maya belongs, is part of the larger Penutian linguistic stock. The Penutian stock also has as members the Huave, Mixe-Zoque, and Totonacan branches, whose languages are spoken in Mexico and Guatemala. In Mexico and parts of Central America, there are still more than one million speakers of the modern dialects of Maya proper, which was the official language of the ancient Mayan empire before the Spanish conquest of the New World. The languages of two South American stocks, Cariban and Chibchan, can also be found in Central America.

Languages of South America and the West Indies More than 100 distinct linguistic stocks have been proposed for South America, and more than 1,000 separate languages have been discovered on that continent and in the West Indies. The latter had two aboriginal stocks, Arawakan and Cariban, which are also found in South America. When more is known about the South American Indian languages, some of the stocks may turn out to be sufficiently closely related so as to allow linguists to group them together and thus reduce the number of basic stocks. The principal linguistic groups of South America and the West Indies are usually said to be eight: Chibchan, Cariban, Ge, QUECHUA, Aymara, Araucanian, Arawakan, and Tupi-Guarani. Before the European conquest, Chiban flourished in the areas now designated as Colombia, Ecuador, Panama, Costa Rica, and Nicaragua. It belongs to the larger Macro-Chibchan stock. Some Chibchan languages still survive in Colombia and Central America. Cariban and Ge are families of the greater Ge-Pano-Carib linguistic stock. In the aboriginal period the Cariban languages were important in the West Indies, Brazil, Peru, the Guianas, Venezuela, and Colombia. Today a number of them are still found in N South America and in some of the West Indian islands. Ge languages were spoken in E Brazil in pre-conquest times. About 50 of them are still in use in that country. Quechua (also called Kechua or Quichua), Aymara, and Araucanian are linguistic families assigned to the Andean branch of the larger Andean-Equatorial stock. Aymara today consists of 14 languages native to about one million people in Peru and parts of Bolivia, where those languages were also current in pre-conquest times. A number of languages, the most important of which is Mapuche, make up the Araucanian family, which thrives in Chile and Argentina. The Arawakan and Tupi-Guarani families belong to the Equatorial branch of the Andean-Equatorial languages. Arawakan is considered the most extensive South American linguistic stock. In the aboriginal period (before 1500), Arawakan tongues were spoken in the West Indies and 5 Brazil and along the eastern side of the Andes. Some Arawakan languages have died out, particularly in the West Indies, but others still survive there and in South America, especially in Venezuela, Colombia, Brazil, the Guianas, Peru, Paraguay, and Bolivia. The Tupi-Guarani family of languages is next to the Arawakan in extent. The Tupian subdivision reaches from the coast of E Brazil along the Amazon River to the Andes. The Guaranian subdivision is found in Paraguay, Brazil, Argentina, and Bolivia. Some 120 Tupi-Guarani languages have survived. The two dominant members of this large family are Tupi and Guaraní. Tupi serves as a lingua franca for the Indians in Brazil. Guaraní is co-official with Spanish in Paraguay, and it is spoken by one million people in Paraguay and Brazil. The linguistic diversity of South America is unparalleled. There are many other families and hundreds of additional languages that have yet to be researched and definitely classified. Written literature in the usual sense does not exist in the American Indian languages, however, there are folk

literatures. Communication by writing among the American Indians in the aboriginal period was limited to the Maya and the Aztecs. Both cultures used a form of picture writing to represent their ideas. About 800 of the Maya hieroglyphs, or symbols, are known, and in recent years substantial progress has been made in deciphering them. The computer is also expected to be of service in the effort to solve the puzzle of Maya writing. Not many texts of the Maya survive, the most numerous being inscriptions on buildings. The Incas of Peru used a system of knotted cords, ropes, or strings to communicate. Called the quipu, it is considered a form of writing. The color and shape of the knotted cords were the clues to meaning. For instance, green cords signified grain, and red cords, soldiers. One knot stood for the number 10, two knots, 20, a double knot, 100. Among Indians of E North America, beaded wampum belts often contained pictographic symbols for communication. Another means of nonlinguistic communication among many of the North American Indians was SIGN LANGUAGE, consisting of gestures with the hands and arms. One advantage of sign language was that it made communication possible among Indian tribes having different languages. In addition, smoke signals were used by some American Indians to convey information, but they were capable only of giving simple messages, such as "enemies in the area" or some previously agreed-upon message. The American Indian languages have contributed numerous place-names in the Western Hemisphere, especially in the United States, many of whose states have names of Indian origin. The European languages that are official today in countries of the New World, such as English, Spanish, and Portuguese, have borrowed a number of words from aboriginal languages. English, for example, has been enriched by such words as *moccasin*, *moose*, *mukluk*, *raccoon*, *skunk*, *terrapin*, *tomahawk*, *totem*, and *wampum* from North American Indian languages, by *chocolate*, *coyote*, and *tomato* from Mexican Indian tongues, by *barbecue*, *cannibal*, *hurricane*, *maize*, and *potato* from aboriginal languages of the West Indies, and by *coca*, *condor*, *guano*, *jaguar*, *llama*, *maraca*, *pampa*, *puma*, *quinine*, *tapioca*, and *vicuña* from South American Indian languages. Some American Indian languages, among them Navaho, Apache, and Cherokee, have been used for wartime communications by the U.S. military to evade enemy decipherment. Navaho Indians cooperated with the American armed forces during World War II as the transmitters of vital messages in their formidably difficult language. Unfortunately, the outlook for the future of the American Indian languages is not good. Most of them will probably die out, perhaps all of them will. At the present time, the aboriginal languages of the Western Hemisphere are gradually being replaced by the Indo-European tongues of the European conquerors and settlers of the New World—English, Spanish, Portuguese, French, and Dutch. Apparently there is no role for the American Indian languages as languages of world importance. Moreover, because of the almost total absence of writing and the earlier destruction of most of what writing did exist, the American Indian languages lack great literatures, although they do possess rich oral traditions. The investigation of these languages contributes much to a scientific knowledge of language in general, since these tongues possess a number of linguistic features not otherwise known. Some groups of native Americans in the United States are working to revitalize the languages of their peoples as a result of recently increased ethnic consciousness and feelings of cultural identity. See Edward Sapir in *Selected Writings in Language, Culture, and Personality*, ed. by D. G. Mandelbaum (1949), J. A. Mason in *Handbook of South American Indians*, ed. by J. H. Stewart (Vol. 6, 1950), Franz Boas, *Handbook of American Indian Languages* (1911-38, repr. 1969), Jesse Sawyer, ed., *Studies in American Indian Languages* (1971), Esther Matteson et al., *Comparative Studies in Amerindian Languages* (1972).

American Indian Movement (AIM), organization of the American Indian civil rights movement. In 1972, members of AIM briefly took over the headquarters of the Federal Bureau of Indian Affairs in Washington, D.C. They complained that the Bureau had created the tribal councils on reservations in 1934 as a way of perpetuating paternalistic control over Indian development. In 1973, about 200 Sioux, led by members of AIM, seized the tiny village of Wounded Knee, S. Dak., site of the last great massacre of Indians by the U.S. cavalry in 1890. Among their demands was a review of more than 300 treaties between the Indians and the federal govern-

ment that AIM alleges have been broken. Wounded Knee was occupied for 70 days before the militants surrendered. The leaders were subsequently brought to trial, but the case was dismissed on grounds of misconduct by the prosecution.

Americanization, term used to describe the movement during the first quarter of the 20th cent. whereby the immigrant in the United States was induced to assimilate American speech, ideals, traditions, and ways of life. As a result of the great emigration from E and S Europe between 1880 and the outbreak of World War I (see IMMIGRATION), the Americanization movement grew to crusading proportions. Fear and suspicion of the newcomers and of their possible failure to become assimilated gave impetus to the movement. Joined by social workers interested in improving the slum conditions surrounding the immigrants and by representatives of the business and industrial world some of whom feared the source of cheap labor might be subverted by spread of radical social doctrines, organizations were formed to propagandize and to agitate for municipal, state, and federal aid to indoctrinate the immigrants into American ways. Leading the drive were the Daughters of the American Revolution, the North American Civic League for Immigrants (a New England group), the Committee for Immigrants in America, and the National Americanization Committee (both with headquarters in New York City). The coming of World War I with the resultant heightening of U.S. nationalism strengthened the movement. The Federal Bureau of Education and the Federal Bureau of Naturalization joined in the crusade and aided the private Americanization groups. Large rallies, patriotic naturalization proceedings, and Fourth of July celebrations characterized the campaign. When the United States entered into the war, Americanization was made an official part of the war effort. Many states passed legislation providing for the education and Americanization of the foreign-born. The anti-Communist drive conducted by the Dept. of Justice in 1919-20 stimulated the movement and led to even greater legislative action on behalf of Americanization. Virtually every state that had a substantial foreign-born population had provided educational facilities for the immigrant by 1921. The passage of this legislation and the quota system of immigration caused the Americanization movement to subside, private groups eventually disbanded. See John Higham, *Strangers in the Land* (1963), M. M. Gordon, *Assimilation in American Life* (1964).

American Labor party, organized in New York by labor leaders and liberals in 1936, primarily to support Franklin Delano Roosevelt's New Deal and the men favoring it in national and local elections. It gathered strength in New York state and particularly in New York City and had considerable weight there in tipping the scales toward chosen Democratic or Republican candidates. After 1939 it was much torn by strife between left-wing and right-wing factions, chiefly concerning policy toward the USSR. In 1944 an anti-Communist group led by David DUBINSKY, defeated in the primaries, dropped out and formed the Liberal party. In 1948 the party polled over 500,000 votes for Henry A. Wallace for President, but many members withdrew in opposition to his candidacy. Failing to poll 50,000 votes in the 1954 New York state election, it lost its place on the New York ballot. In 1956 the party was voted out of existence by its New York state committee.

American Landrace swine, relatively new breed of swine developed from Danish Landrace hogs imported in 1934 by the U.S. Dept. of Agriculture. They are totally white. Noted for their smoothness, length of body, and lean carcasses, these swine are prolific, fast-growing, and sturdy. They are found primarily in the central Corn Belt area.

American Legion, national association of male and female war veterans, founded (1919) in Paris. Membership is open to veterans of World Wars I and II, the Korean War, and the Vietnam War. The preamble to the organization's constitution, adopted at the convention in St. Louis that same year, expresses its purposes in part as "to uphold and defend the Constitution of the United States, to maintain law and order, to foster and perpetuate a one hundred percent Americanism, to safeguard and transmit to posterity the principles of justice, freedom, and democracy, to consecrate and sanctify our comradeship by our devotion to mutual helpfulness." To achieve these ends the American Legion has done much work in social welfare, particularly in the areas of veterans' benefits and child care. The largest of the veterans' associations, it is organized into a system of 58 state departments and some 16,000 lo-

cal posts. Its national headquarters is in Indianapolis. The annual convention, at which policies are formulated, gains much attention, and the political force of the organization is considerable. The efforts of the American Legion have been bent not only to obtaining benefits for veterans but also to building up the military strength of the United States and to attacking so-called subversive or anti-American teachings and organizations. Although it is organized on a nonpartisan, nonpolitical basis, its policies have been criticized as reactionary by many opponents. There is also a women's auxiliary for the wives, mothers, sisters, and daughters of veterans. See Raymond Moley, *The American Legion Story* (1966).

American Library Association, founded 1876, organization whose purpose is to increase the usefulness of books through the improvement and extension of library services. As the major professional association for librarians and libraries, it seeks to maintain high standards for all branches of library service through functions ranging from the accreditation of library training schools to the recognition of outstanding books. The association was involved in early attempts to expand library services to all people. It supported public access to library shelves, tax-supported libraries, books made available for home loan, and research libraries sponsored by the government and major educational institutions. After the advent of audio-visual equipment, it promoted expansion of library programs to include the new electronic materials. The organization, based in Chicago, consisted of some 37,000 members in the early 1970s.

American literature in English began with the writings of English adventurers and colonists in the New World chiefly for the benefit of readers in the mother country. Some of these works reached the level of literature, as in the robust and perhaps truthful account of his adventures by Captain John Smith and the sober, tendentious journalistic histories of John Winthrop and William Bradford in New England. From the beginning, however, the literature of New England was also directed to the edification and instruction of the colonists themselves, intended to direct them in the ways of the godly. The first work published in the Puritan colonies was the *Bay Psalm Book* (1640), and the whole effort of the divines who wrote furiously to set forth their views—among them Roger Williams and Thomas Hooker—was to defend and promote visions of the religious state. They set forth their visions—in effect the first formulation of the concept of national destiny—in a series of impassioned histories and jeremiads from Edward Johnson's *Wonder-Working Providence* (1654) to Cotton Mather's epic *Magnalia Christi Americana* (1702). Even their poetry was offered uniformly to the service of God. Michael Wigglesworth's *Day of Doom* (1662) was uncompromisingly theological, and Anne Bradstreet's poems, issued as *The Tenth Muse Lately Sprung Up in America* (1650), were pious. The best of the Puritan poets, Edward Taylor, whose work was not published until two centuries after his death, wrote metaphysical verse worthy of comparison with that of George Herbert. Sermons and tracts poured forth until austere Calvinism found its last utterance in the words of Jonathan Edwards. In the other colonies writing was usually more mundane and on the whole less notable, though the journal of the Quaker John Woolman is highly esteemed, and some critics maintain that the best writing of the colonial period is found in the witty and urbane observations of William Byrd, a gentleman planter of Westover, Virginia.

A New Nation and a New Literature. The approach of the American Revolution and the achievement of the actual independence of the United States was a time of intellectual activity as well as social and economic change. The men who were the chief molders of the new state included excellent writers, among them Thomas Jefferson and Alexander Hamilton. They were well supported by others such as Philip Freneau, the first American lyric poet of distinction and an able journalist, the pamphleteer Thomas Paine, later an attacker of conventional religion, and the polemicist Francis Hopkinson, who was also the first American musical composer. The variously gifted Benjamin Franklin forwarded American literature not only through his own writing but also by founding and promoting newspapers and periodicals. Many literary aspirants, such as John Trumbull, Timothy Dwight, Joel Barlow, and the other CONNECTICUT WITS, used English models. The infant American theater showed a nationalistic character both in its first comedy *The Contrast*

(1787), by Royall Tyler, and in the dramas of William Dunlap. The first American novel, *The Power of Sympathy* (1789), by William Hill Brown, only shortly preceded the Gothic romance, *Wieland* (1799), by the first professional American novelist, Charles Brockden Brown. Recognition in Europe, and especially in England, was coveted by every aspiring American writer and was first achieved by two men from New York: Washington Irving, who first won attention by presenting American folk stories, and James Fenimore Cooper, who wrote enduring tales of adventure on the frontier and at sea. William Cullen Bryant had by 1825 made himself the leading poet of America with his delicate lyrics extolling nature and his smooth, philosophic poems in the best mode of romanticism. Even more distinctly a part of the romantic movement were such poets as Joseph Rodman Drake, Fitz-Greene Halleck, and Henry Wadsworth Longfellow. Longfellow won the hearts of Americans with glib, moralizing verse and also commanded international respect. Ralph Waldo Emerson and Henry David Thoreau stood at the center of TRANSCENDENTALISM, a movement that made a deep impression upon their native land and upon Europe. High-mindedness, moral earnestness, the desire to reform society and education, the assertion of a philosophy of the individual as superior to tradition and society—all these were strongly American, and transcendentalists such as Emerson, Thoreau, Margaret Fuller, and Bronson Alcott insisted upon such principles. Men as diverse as James Russell Lowell, Boston "Brahmin" poet, and critic, and John Greenleaf Whittier, the bucolic poet, joined in support of the abolitionist cause, while the more worldly and correct Oliver Wendell Holmes reflected the vigorous intellectual spirit of the time, as did the historians William Hickling Prescott, George Bancroft, Francis Parkman, and John Lothrop Motley. The solemn histories were as distinctly American as the broadly humorous writing that became popular early in the 19th cent. This was usually set forth as the sayings of semiliterate, often raffish, and always shrewd American characters like Hosea Biglow (James Russell Lowell), Artemus Ward (Charles Farrar Browne), Petroleum Vesuvius Nasby (David Ross Locke), Josh Billings (Henry Walker Shaw), and Sut Lovingood (G. W. Harris). Far apart from these was Edgar Allan Poe, whose skilled and emotional poetry, clearly expressed aesthetic theories, and tales of mystery and horror won for him a more respectful audience in Europe than—originally, at least—in America. In the 1850s came Nathaniel Hawthorne's novel *The Scarlet Letter* (1850), depicting the gloomy atmosphere of early Puritanism, Herman Melville's *Moby-Dick* (1851), which infused into an adventure tale of whaling days profound symbolic significance, and the rolling measures of Walt Whitman's *Leaves of Grass* (1st ed. 1855), which employed a new kind of poetry and proclaimed the optimistic principles of American democracy.

The Literature of a Reunited Nation. The rising conflict between the North and the South that ended in the Civil War was reflected in regional literature. The crusading spirit against Southern slavery in Harriet Beecher Stowe's overwhelmingly successful novel *Uncle Tom's Cabin* (1852) was matched by the violent anti-Northern diatribes of William Gilmore Simms. While the Civil War was taking its inexorable course, the case for reunion was set forth in the purest and most exact statement of American political ideals, the Gettysburg Address of President Abraham Lincoln. Once the war was over, literature gradually regained a national identity amid expanding popularity, as writings of regional origin began to find a mass audience. The stories of the California gold fields by Bret Harte, the rustic novel of Edward Eggleston, *The Hoosier Schoolmaster* (1871), the rhymes of James Whitcomb Riley, the New England genre stories of Sarah Orne Jewett and Mary E. Wilkins Freeman, the sketches of Louisiana by George W. Cable, even the romance of the Old South woven by the poetry of Henry Timrod and Sidney Lanier and the fiction of Thomas Nelson Page—all were seized eagerly by the readers of the reunited nation. The outstanding example of genius overcoming any regionalism in scene can be found in *Huckleberry Finn* (1884), by Mark Twain. The connection of American literature with writing in England and Europe was again stressed by William Dean Howells, who was not only an able novelist but an instructor in literary REALISM to other American writers. Though he himself had leanings toward social reform, he did encourage what has come to be called "genteel" writing, long dominant in American fiction. The mold for this sort of writing was broken by the American turned Englishman,

Henry James, who wrote of people of the upper classes but with such psychological penetration, subtlety of narrative, and complex technical skill that he is recognized as one of the great masters of fiction. His influence was quickly reflected in the novels of Edith Wharton and others and continued to grow in strength in the 20th cent. The realism preached by Howells was turned by some writers away from bourgeois milieus, particularly by Stephen Crane in his poetry and in his fiction—*Maggie: A Girl of the Streets* (1893) and the Civil War story, *The Red Badge of Courage* (1895), these were forerunners of NATURALISM, which reached heights in the hands of Theodore Dreiser and Jack London, the latter a fiery advocate of social reform as well as a writer of Klondike stories. Ever since the Civil War, voices of protest and doubt have been heard. Mark Twain (with Charles Dudley Warner) had in *The Gilded Age* (1873) held the postwar get-rich-quick era up to scorn. By the early 20th cent. Henry Adams was musing upon the effects of the dynamo's triumph over man, and Ambrose Bierce literally abandoned a civilization he could not abide. Poetry, meanwhile, had tended to the pretty-pretty—with the startling exception of the Amherst recluse, Emily Dickinson, whose terse, precise, and enigmatic poems, published in 1890, after her death, placed her immediately in the ranks of major American poets. Drama after the Civil War and into the 20th cent. continued to rely, as it had before, on spectacles, on the plays of Shakespeare, and on some of the works of English and Continental playwrights. A few popular plays such as *Uncle Tom's Cabin* and *Rip Van Winkle* were based on American fiction, others were crude melodrama. Realism, however, came to the theater with some of the plays of Bronson Howard, James A. Herne, and William Vaughn Moody. A revolution in poetry was announced with the founding in 1912 of *Poetry: A Magazine of Verse*, edited by Harriet Monroe. It published the work of Ezra Pound and the proponents of imagism (see IMAGISTS)—Amy Lowell, H. D. (Hilda Doolittle), John Gould Fletcher, and their English associates, all declaring against romantic poetry and in favor of the exact word. Other poets moved along their own paths. Edwin Arlington Robinson, who wrote dark, brooding lines on man in the universe, Edgar Lee Masters, who used free verse for realistic biographies in *A Spoon River Anthology* (1915), his friend Vachel Lindsay, Carl Sandburg, who tried to capture the speech, life, and dreams of America, and Robert Frost, who wrote with evocative simplicity and won universal admiration.

The Lost Generation and After. The years immediately after World War I brought a highly vocal rebellion against established social, sexual, and aesthetic conventions and a vigorous attempt to establish new values. Young artists flocked to Greenwich Village, to Chicago, and to San Francisco, determined to protest and intent on making a new art. Others went to Europe, living mostly in Paris as expatriates. They willingly accepted the name given them by Gertrude Stein: the lost generation. Out of their disillusion and rejection, the writers built a new literature, impressive in the glittering 1920s and the years that followed. Romantic clichés were abandoned for extreme realism or for complex symbolism and created myth. Language grew so frank that there were bitter quarrels over censorship, as in the troubles about James Branch Cabell's *Jurgen* (1919) and—much more notably—Henry Miller's *Tropic of Cancer* (1931). The influence of new psychology and of Marxian social theory was strong. Out of this highly active boiling of new ideas and new forms came writers of recognizable stature in the world: Ernest Hemingway, F. Scott Fitzgerald, William Faulkner, Thomas Wolfe, John Dos Passos, John Steinbeck, e. e. Cummings. Eugene O'Neill became the greatest by far of the dramatists the United States has produced. Other writers also enriched the theater with comedies, social reform plays, and historical tragedies. Among them were Maxwell Anderson, Philip Barry, Elmer Rice, S. N. Behrman, Marc Connelly, Lillian Hellman, Clifford Odets, and Thornton Wilder. The social drama and the symbolic play were further developed by Arthur Miller, William Inge, and Tennessee Williams. By the 1960s the influence of foreign movements was much felt with the development of "off-Broadway" theater. One of the new playwrights who gained special notice was Edward Albee. The naturalism that governed the novels of Dreiser and the stories of Sherwood Anderson was intensified by the stories of the Chicago slums by James T. Farrell and later Nelson Algren. Violence in language and in action was extreme in some of the novels of World War II, nota-

bly those of James Jones and Norman Mailer. Not unexpectedly, after World War I, Negro writers came forward, casting off the sweet melodies of Paul Lawrence Dunbar and speaking of social oppression. Countee Cullen, James Weldon Johnson, Claude McKay, and Langston Hughes were succeeded by Richard Wright, Ralph Ellison, James Baldwin, and LeRoi Jones. Poetry after World War I was largely dominated by T. S. Eliot and his followers, who imposed intellectuality and a new sort of classical form that had been urged by Ezra Pound. Eliot was also highly influential as a literary critic and contributed to making the period 1920-60 one that was to some extent dominated by literary analysts and promoters of various warring schools. Among those critics were H. L. Mencken, Edmund Wilson, Lewis Mumford, Malcolm Cowley, Van Wyck Brooks, John Crowe Ransom, Yvor Winters, Lionel Trilling, Allen Tate, R. P. Blackmur, Robert Penn Warren, and Cleanth Brooks. The victories of the new over the old in the 1920s did not mean the disappearance of the older ideals of form even among lovers of the new. Much that was traditional lived on in the lyrics of Conrad Aiken, Sara Teasdale, Edna St. Vincent Millay, and Elinor Wylie. In the later years of the period two poets gained world recognition, though they had been quietly writing before. Wallace Stevens and William Carlos Williams. The admirable novels of Willa Cather did not resort to new devices; the essays of E. B. White were models of pure style, as were the stories of Katherine Anne Porter and Jean Stafford. Humor left the broadness of George Ade's *Fables* (1899) for the acrid satire of Ring Lardner and the highly polished writing of Robert Benchley and James Thurber. The South still produced superb writers, notably Carson McCullers, Flannery O'Connor, and Eudora Welty, whose works, while often grotesque, were also compassionate and humorous. The tension, horror, and meaninglessness of contemporary American life became a major theme of novelists during the 1960s and 70s. While authors such as Saul Bellow, Bernard Malamud, Hortense Calisher, and Philip Roth presented the varied responses of urban intellectuals, usually Jews, and John Updike and John Cheever treated the middle class, William Burroughs and Joyce Carol Oates unsparingly depicted the violence inherent in American life at all levels of society. Irony and so-called "black humor" were the weapons of authors like Roth, Joseph Heller, and Jules Feiffer. However, other writers, notably Donald Barthelme, Jerzy Kosinski, Thomas Pynchon, and Kurt Vonnegut, Jr., expressed their view of the world as unreal, as mad, by writing fantasies that were by turn charming, obscure, exciting, profound, and terrifying. Although the poets Allen Ginsberg, Theodore Roethke, and Lawrence Ferlinghetti gained initial recognition as part of the BEAT GENERATION, their individual reputations were soon firmly established. Writers of "perceptual verse" such as Charles Olson, Robert Creeley, Denise Levertov, and Robert Duncan became widely recognized during the 1960s. One of the most provocative and active poets of the decade was Robert Lowell, who often wrote of the anguish and corruption in modern life. His practice of revelation about his personal life evolved into so-called "confessional poetry," which was also written by such poets as Anne Sexton, Sylvia Plath, and, in a sense, John Berryman. Accomplished poets with idiosyncratic styles were Elizabeth Bishop and James Dickey. The pressure and fascination of actual events during the 1960s intrigued many writers of fiction, and Truman Capote, John Hersey, James Michener, and Norman Mailer wrote with perception and style about political conventions, murders, demonstrations, and presidential elections. For more information, consult the individual entries on any of the authors mentioned in this article. See Robert E. Spiller et al., ed., *Literary History of the United States* (3d ed. 1963), E. H. Emerson, ed., *Major Writers of Early American Literature* (1972), Ihab Hassan, *Contemporary American Literature, 1945-1972* (1973).

American Medical Association (AMA), professional physicians' organization (founded 1847). Its goals are to promote public health, protect the welfare of American physicians, and support the growth of medical science. Among its many activities, the AMA investigates alleged cases of medical quackery, engages in medical research on drugs, foods, cosmetics, and other substances, and sponsors an extensive health education program. The organization helps set standards for American medical schools and in-hospital doctor training programs; it was largely responsible for the upgrading of American medical education that took place in the early

20th cent. The AMA maintains close relationships with the state and county medical societies, and in some areas the societies require all physicians to belong to the AMA. Although the AMA's headquarters is in Chicago, it also maintains an office in Washington, D. C., in order to follow closely legislation that may affect the medical profession. The organization has consistently opposed—since the mid-1930s—proposals for a comprehensive system of national health insurance. The AMA is composed of over 20 different subdivisions that deal with a variety of medical topics, including medical education, maternal and child care, medicolegal problems, and mental health. It also has a section for each of the medical specialties. As of 1974 it had approximately 204,000 members.

American Museum of Natural History, incorporated in New York City in 1869 to promote the study of natural science and related subjects. Buildings on its present site were opened in 1877. Among the buildings since added are the Hayden Planetarium (opened 1935) and the Roosevelt Memorial building (completed 1936). It maintains exhibitions in all branches of natural history, including anthropology and ecology. As a result of its wide explorations and its program of research, the museum has acquired specimens and data of great value. Resources are derived from endowment, grants from the city, and a membership fund. Among the facilities for study are an extension library, illustrated lectures, publications, programs for young people, a special school service whereby the museum cooperates with city schools, circulating exhibits, habitat groups of animals and plants, a mineral and gem collection, an unrivaled assemblage of skeletons of extinct animals, especially dinosaurs, and replicas of invertebrates in glass.

American National Theatre and Academy (ANTA), a tax-exempt, nationwide organization, chartered by Congress in 1935 to encourage outstanding theater in the United States. ANTA relies on money raised by popular subscription. Since 1946 it has concentrated its support on independent touring companies; it maintains an information service, an artist and speaker program, and various other activities. As the U.S. center of the International Theatre Institute, it has sponsored the exchange of foreign productions and artists. See their quarterly *Newsletter*, H. H. Taubman, *The Making of the American Theatre* (rev. ed. 1967).

American Negro spirituals, religious folk songs. Beginning in the late 19th cent., when a celebrated chorus from Fisk Univ. traveled throughout the United States and abroad, wide attention was given to the spirituals of the American Negro. This body of song was long thought to be the spontaneous creation of the Negro and the only original folk music of the United States. Research into its origin centered mainly on the nature and extent of its African ancestry. Because Negro slaves were brought to the United States from many parts of Africa, no single musical source is clear. Elements that African music and American Negro spirituals have in common include syncopation, polyrhythmic structure, the pentatonic scale, and a sort of responsive rendition of text. Audience participation increased the improvisatory nature of the spirituals, with the result that tens and even hundreds of versions of a single text idea exist. Early in the 20th cent. Cecil SHARP explored the extent of American folk-song literature, much of which he demonstrated to be of British ancestry. After that discovery G. P. JACKSON traced the considerable influence of revivalist and evangelist songs from the early 19th-century camp meetings of the Southern white population. Jackson claimed, using hundreds of comparative examples, that many Negro spirituals were adapted from or inspired by these white spirituals. Thus it can be assumed that African musical traditions were amalgamated with the religious songs of the white South, which had many sources, to produce a form of folk music that was distinctly Negro in character. The Negro spiritual is, above all, a deeply emotional song. The words are most often related to biblical passages, but the predominant effect is of patient, profound melancholy, even though the condition of slavery is very seldom referred to. The spiritual was directly related to the sorrow songs that were the source material of the blues (see JAZZ). A number of more joyous spirituals influenced the content of gospel songs (see GOSPEL MUSIC). Collections and arrangements have been made by Rosamond Johnson and J. W. Johnson, R. N. Dett, George L. White, John A. Lomax and Alan Lomax, Roland Hayes, and others. See G. P. Jackson, *White Spirituals in the Southern Uplands* (1933), *Spiritual Folk-Songs of*

Early America (1937), and *White and Negro Spirituals* (1943), LeRoi Jones, *Blues People* (1963), H. A. Chambers, ed., *Treasury of Negro Spirituals* (1963), H. W. Odum and G. B. Johnson, *The Negro and His Songs* (1925, repr. 1964), W. F. Allen, *Slave Songs of the United States* (1857, repr. 1965).

American party: see KNOW-NOTHING MOVEMENT

American Philosophical Society, first scientific society in America, founded (1743) in Philadelphia. It was an outgrowth of the Junto formed (1727) by Benjamin Franklin. Franklin was the first secretary of the society, and Thomas Hopkinson the first president. In 1769 it merged with the American Society for Promoting Useful Knowledge. The combined organization elected Franklin its first president, an office he held until his death. David Rittenhouse and Thomas Jefferson were his immediate successors. The society, which has a notable library located in Philadelphia, takes its members from people of distinction in all fields of intellectual and scientific study.

American Red Cross: see RED CROSS

American Revolution, 1775-83, struggle by which the THIRTEEN COLONIES on the Atlantic seaboard of North America won independence from Great Britain and became the United States. It is also called the American War of Independence. By the middle of the 18th cent., differences in life, thought, and interests had developed between the mother country and the growing colonies. Local political institutions and practice diverged significantly from English ways, while social customs, religious beliefs, and economic interests added to the potential sources of conflict. The British government, like other imperial powers in the 18th cent., favored a policy of MERCANTILISM, the NAVIGATION ACTS were intended to regulate commerce in the British interest. These were only loosely enforced, however, and the colonies were by and large allowed to develop freely with little interference from England. Conditions changed abruptly in 1763. The Treaty of Paris in that year ended the FRENCH AND INDIAN WARS and removed a long-standing threat to the colonies. At the same time the ministry (1763-65) of George GRENVILLE in Great Britain undertook a new colonial policy intended to tighten political control over the colonies and to make them pay for their defense and return revenue to the mother country. The tax levied on molasses and sugar in 1764 caused some consternation among New England merchants and makers of rum, the tax itself was smaller than the one already on the books, but the promise of stringent enforcement was novel and ominous. It was the STAMP ACT, passed by the British Parliament in 1765, with its direct demand for revenue that roused a violent colonial outcry, which was spearheaded by the Northern merchants, lawyers, and newspaper publishers who were directly affected. Everywhere leaders such as James Otis, Samuel Adams, and Patrick Henry denounced the act with eloquence, societies called the SONS OF LIBERTY were formed, and the Stamp Act Congress was called to protest that Parliament was violating the rights of trueborn Englishmen in taxing the colonials, who were not directly represented in the supreme legislature. The threat of boycott and refusal to import English goods supported the colonial clamor. Parliament repealed (1766) the Stamp Act but passed an act formally declaring its right to tax the colonies. The incident was closed, but a barb remained to wound American feelings. Colonial political theorists—not only radicals such as Samuel Adams, Patrick Henry, Josiah QUINCY (1744-75), and Alexander MACDOUGALL but also moderates such as John DICKINSON, John ADAMS, and Benjamin FRANKLIN—asserted that taxation without representation was tyranny. The teachings of 18th-century French philosophers and continental writers on law, such as Emmerich de Vattel, as well as the theories of John LOCKE, were implicit in the colonial arguments based on the theory of NATURAL RIGHTS. The colonials claimed that Parliament had the sovereign power to legislate in the interest of the entire British Empire, but that it could only tax those actually represented in Parliament. Trouble flared when the Chatham ministry adopted (1767) the TOWNSHEND ACTS, which taxed numerous imports, care was taken to levy only an "external" or indirect tax in the hope that the colonials would accept this. The indirect taxes were challenged too, and although the duties were not heavy, the principle was attacked. Incidents came in interrupted sequence to make feeling run higher and higher—the seizure of a ship belonging to John HANCOCK in 1768, the bloodshed of the BOSTON MASSACRE in 1770, the burning of H. M. S. GASPEE in 1772. Even repeal of

the Townshend Acts in 1770 did no more than temporarily quiet the turmoil, for the tax on tea was kept as a sort of token of Parliament's supremacy. Indignation in New England at the monopoly granted to the East India Company led to the BOSTON TEA PARTY in 1773. Despite the earnest pleas of William Pitt the elder (see CHATHAM, WILLIAM PITT, 1ST EARL OF) and Edmund BURKE, Parliament replied with coercive measures. These (and the QUEBEC ACT) the colonials called the INTOLERABLE ACTS, and resistance was prompt. The Sons of Liberty and individual colonials were already spreading statements of the colonial cause to win over merchant and farmer, workman and sailor. Committees of correspondence had been formed to exchange information and ideas and to build colonial unity, and in 1774 these committees prepared the way for the CONTINENTAL CONGRESS. The representatives at this First Continental Congress, except for a few radicals, had not met to consider independence, but wished only to persuade the British government to recognize their rights. A plan of reconciliation offered by Joseph GALLOWAY was rejected. It was agreed that the colonies would refuse to import British goods until colonial grievances were righted, those grievances were listed in petitions to the king, and the congress adjourned. Before it met again the situation had changed. On the morning of April 19, 1775, shots had been exchanged by colonials and British soldiers, men had been killed, and a revolution had begun (see LEXINGTON AND CONCORD, BATTLES OF). On the very day (May 10, 1775) that the Second Continental Congress met, Ethan ALLEN and his Green Mountain Boys, together with a force under Benedict Arnold, took Fort Ticonderoga from the British, and two days later Seth WARNER captured Crown Point. Boston was under British siege, and before that siege was climaxed by the costly British victory usually called the battle of Bunker Hill (June 17, 1775) the Congress had chosen (June 15, 1775) George WASHINGTON as commander in chief of the Continental armed forces. The war was on in earnest. Some delegates had come to the Congress already committed to declaring the colonies independent of Great Britain, but even many stalwart upholders of the colonial cause were not ready to take such a step. The lines were being more clearly drawn between the pro-British LOYALISTS and colonial revolutionists. The time was one of indecision, and the division of the people was symbolized by the split between Benjamin Franklin and his Loyalist son, William FRANKLIN. The Loyalists were numerous and included small farmers as well as large landowners, royal officeholders, and members of the professions; they were to be found in varying strength in every colony. A large part of the population was more or less neutral, swaying to this side or that or else remaining inert in the struggle, which was to some extent a civil war. So it was to remain to the end. Civil government and administration had fallen apart and had to be patched together locally. In some places the result was bloody strife, as in the partisan raids in the Carolinas and Georgia and the Mohawk valley massacre in New York; elsewhere hostility did not produce open struggles. In January, 1776, Thomas Paine wrote a pamphlet, *Common Sense*, which urged the colonial cause. Its influence was tremendous, and it was read everywhere with enthusiastic acclaim. Militarily, however, the cause did not prosper greatly. Delegations to the Canadians had been unsuccessful, and the QUEBEC CAMPAIGN (1775-76) ended in disaster. The British gave up Boston in March, 1776, but the prospects were still not good for the ill-trained, poorly armed volunteer soldiers of the Continental army when the Congress decided finally to declare the independence of the Thirteen Colonies. The DECLARATION OF INDEPENDENCE is conventionally dated July 4, 1776. Drawn up by Thomas Jefferson (with slight emendations), it was to be one of the great historical documents of all time. It did not, however, have any immediate positive effect. The British under Gen. William HOWE and his brother, Admiral Richard Howe, came to New York harbor. After vain attempts to negotiate a peace, the British forces struck. Washington lost Brooklyn Heights (see LONG ISLAND, BATTLE OF), retreated northward, was defeated at Harlem Heights in Manhattan and at White Plains, and took part of his dwindling army into New Jersey. Thomas Paine in a new pamphlet, *The Crisis*, exhorted the revolutionists to courage in desperate days, and Washington showed his increasing military skill and helped to restore colonial spirits in the winter of 1776-77 by crossing the ice-ridden Delaware and winning small victories over forces made up mostly of Hessian mercenaries at Trenton

(Dec. 26) and Princeton (Jan. 3). In 1777 the British attempted to wipe out the flickering revolt by a concerted plan to split the colonies with converging expeditions concentrated upon the Hudson valley. Gen. William Howe, instead of taking part in it, moved into Pennsylvania, defeated Washington in the battle of Brandywine (Sept. 11), took Philadelphia, and beat off (Oct. 4) Washington's attack on Germantown. Meanwhile the British columns under Gen. John BURGEOYNE and Gen. Barry ST. LEGER had failed (see SARATOGA CAMPAIGN), and Burgoyne on Oct. 17, 1777, ended the battle of Saratoga by surrendering to Gen. Horatio GATES. The victory is commonly regarded as the decisive battle of the war, but its good effects again were not immediate. The Continental army still had to endure the hardships of the cruel winter at VALLEY FORGE, when only loyalty to Washington and the cause of liberty held the half-frozen, half-starved men together. Among them were three of the foreign idealists who had come to aid the colonials in their struggle—Johann KALB, Baron von STEUBEN, and the marquis de LAFAYETTE. At Valley Forge, Steuben trained the still-raw troops, who came away a disciplined fighting force giving a good account of themselves in 1778. Sir Henry CLINTON, who had succeeded Howe in command, decided to abandon Philadelphia for New York, and Washington's attack upon the British in the battle of Monmouth (see MONMOUTH, BATTLE OF) was cheated of success mainly by the equivocal actions of Gen. Charles LEE. The warfare in the Middle Atlantic region settled almost to stagnation, but foreign aid was finally arriving. Agents of the new nation—notably Benjamin Franklin, Arthur Lee, Silas DEANE, and later John Adams—were striving to get help, and in 1777 Pierre de BEAUMARCHAIS had succeeded in getting arms and supplies sent to the colonials in time to help win the battle of Saratoga. That victory made it easier for France to enter upon an alliance with the United States, for which Franklin and the comte de Vergennes (the French foreign minister) signed (1778) a treaty. Spain entered the war against Great Britain in 1779, but Spanish help did little for the United States, while French soldiers and sailors and especially French supplies and money were of crucial importance. The warfare had meanwhile shifted from the quiescent North to other theaters. George Rogers CLARK by his daring exploits (1778-79) in the West, climaxed by the second capture of Vincennes, established the revolutionists' prestige on the frontier. Gen. John SULLIVAN led an expedition (1779) against the British and Indians in upper New York. The chief fighting, however, was in the South. The British had taken Savannah in 1778. In 1780, Sir Henry Clinton attacked and took Charleston (which had resisted attacks in 1776 and 1779) and sent Gen. Charles CORNWALLIS off on the CAROLINA CAMPAIGN. Cornwallis swept forward to beat Horatio Gates soundly at Camden (Aug., 1780), and only guerrilla bands under Francis MARION, Andrew PICKENS, and Thomas SUMTER continued to oppose the British in Virginia. Another low point had been reached in American fortunes. Bitter complaints of the inefficiency of the Congress, political conniving, lack of funds and food, and the strains of long-continued war had increased widespread apathy and disaffection, and the British tried to take advantage of the division among the people. In 1780 occurred the most celebrated of the disaffections, the treason of Benedict ARNOLD. Lack of pay and shortages of clothing and food drove some Continental regiments into a mutiny of protest in Jan., 1781. The dark, however, was already lifting. A crowd of frontiersmen with their rifles defeated a British force at Kings Mt. in Oct., 1780, and Nathanael GREENE, who had replaced Gates as commander in the Carolina campaign, and his able assistant, Daniel MORGAN, together with Thaddeus KOSCIUSKO and others, ultimately forced Cornwallis into Virginia. The stage was set for the YORKTOWN CAMPAIGN. Now the French aid counted greatly, for Lafayette with colonial troops held the British in check, and it was a Franco-American force that Washington and the comte de ROCHAMBEAU led from New York to Virginia. The French fleet under Admiral de GRASSE played the decisive part. Previously naval forces had been of little consequence in the Revolution. State navies and a somewhat irregular national navy had been of less importance than Revolutionary privateers. Esek HOPKINS had led a raid in the Bahamas in 1776, John BARRY won a name as a gallant commander, and John Paul JONES was one of the most celebrated commanders in all U.S. naval history, but their exploits were single incidents. It was the French fleet—ironically the same one defeated by the British under Admiral Rodney the next year in

the West Indies—which bottled up Cornwallis at Yorktown. Outnumbered and surrounded, the British commander surrendered (Oct. 17-19, 1781), and the fighting was over. The rebels had won the American Revolution. The Treaty of Paris (see PARIS, TREATY OF) formally recognized the new nation in 1783, although many questions were left unsettled. The United States was floundering through a post-war depression and seeking not too successfully to meet its administrative problems under the Articles of Confederation (see CONFEDERATION, ARTICLES OF). The leaders in the new country were those prominent either in the council halls or on the fields of the Revolution, and the first three Presidents after the Constitution of the United States was adopted were Washington, Adams, and Jefferson. Some of the more radical Revolutionary leaders were disappointed in the turn toward conservatism when the Revolution was over, but liberty and democracy had been fixed as the highest ideals of the United States. The American Revolution had a great influence on liberal thought throughout Europe. The struggles and successes of this youthful democracy were much in the minds of those who brought about the French Revolution, and most assuredly later helped to inspire revolutionists in Spain's American colonies. Naturally the stirring events of the birth of the country have been often represented in U.S. literature. It has given dramatic material to playwrights from William Dunlap to Maxwell Anderson, to novelists from James Fenimore Cooper and William G. Simms to S. Weir Mitchell, Paul Leicester Ford, and Kenneth Roberts. Older histories, still read for their literary value, are those of George Bancroft, John Fiske, and G. O. Trevelyan. Countless excellent studies have been made of particular aspects and incidents, some examples are H. E. Wildes, *Valley Forge* (1938), R. B. Morris, ed., *The Era of the American Revolution* (1939), Carl Van Doren, *Secret History of the American Revolution* (1941) and *Mutiny in January* (1943), Lynn Montross, *Rag, Tag and Bobtail: The Story of the Continental Army* (1952), Carl Berger, *Broadsides and Bayonets: The Propaganda War of the American Revolution* (1961). For works of more general interest, see C. H. McIlwain, *The American Revolution: A Constitutional Interpretation* (1923, repr. 1973), J. F. Jameson, *The American Revolution Considered as a Social Movement* (1926, new ed. 1961), J. C. Miller, *Origins of the American Revolution* (1943, new ed. 1959), C. R. Ritcheson, *British Politics and the American Revolution* (1954), L. H. Gipson, *The Coming of the Revolution* ("New American Nation" series, 1954), E. S. Morgan, *The Birth of the Republic, 1763-89* (1956), Henry Steele Commager and R. B. Morris, ed., *Spirit of Seventy-Six* (1958), Samuel Flagg Bemis, *The Diplomacy of the American Revolution* (rev. ed. 1957), Howard Peckham, *The War for Independence* (1958), R. R. Palmer, *The Age of the Democratic Revolution* (1959), J. B. Mitchell, *Decisive Battles of the American Revolution* (1962), Bernard Bailyn, *The Ideological Origins of the American Revolution* (1967), Richard Morris, *The American Revolution Reconsidered* (1967), J. P. Greene, ed., *The Reinterpretation of the American Revolution* (1968), Merrill Jensen, *The Founding of a Nation* (1968), J. R. Alden, *A History of the American Revolution* (1969), W. C. Stinchcombe, *The American Revolution and the French Alliance* (1969), G. S. Wood, *The Creation of the American Republic, 1776-1787* (1969), Don Higginbotham, *The War of American Independence* (1971), Richard Morris, ed., *The American Revolution, 1763-1783* (1971), Pauline Maier, *From Resistance to Revolution* (1972), S. G. Kurtz and J. H. Hutson, *Essay on the American Revolution* (1973).

American saddle horse, breed of LIGHT HORSE with great beauty, easy gait, and stamina. Also known as the Kentucky saddler, it was developed from the THOROUGHBRED and MORGAN. It is noted for its tremendous showy action in all gaits, its well-formed, swanlike neck with aristocratic arch, and its uplifted tail. It is most popular as a show horse and possesses an exceptional aptitude for training. It has nevertheless been subjected to a variety of cruelties in order to train it to particular gaits. The breed is characterized by a satin coat of brown, black, or chestnut, often with white face and leg markings. It stands 15 to 16 hands (60-64 in./150-160 cm) high and weighs approximately 1,000 lb (450 kg).

American Samoa, unincorporated territory of the United States (1970 pop. 27,159), comprising the eastern half of the SAMOA island chain in the South Pacific. The group (76 sq mi/197 sq km) consists of six major islands: TUTUILA, the MANU'a group (Ta'u, Ofu, and Olosega), Rose and Sand Islands, and SWAINS ISLAND. PAGO PAGO, the capital, is on Tutuila.

Most of the islands are mountainous, heavily wooded, and surrounded by coral reefs. Subsistence agriculture and the export of canned fish, copra, coconuts, and handicrafts became the mainstays of the economy after the U.S. naval base at Pago Pago closed down in 1951. Nearly all the land is owned by the Polynesian natives, who are considered American nationals, although they do not vote in U.S. elections. American Samoa was defined by a treaty in 1899 between the United States, Great Britain, and Germany, which gave the United States control of all Samoan islands east of long 171° W. American Samoa was under the jurisdiction of the U.S. Navy Dept. until 1951, at which time administration was transferred to the Dept. of the Interior. Executive power rests in the territorial governor, who is appointed by the Secretary of the Interior. There is a bicameral legislature, consisting of a senate (18 members chosen by county councils), and a house of representatives (20 members elected by popular vote, plus one nonvoting member from Swains Island, which is privately owned). The 1967 constitution gave the legislature power for the first time to appropriate funds from local revenues. There is also an independent judiciary.

American Society for the Prevention of Cruelty to Animals (ASPCA), founded (1866) in America by Henry Bergh to shelter homeless animals, to assist farmers in caring for their livestock, and to cooperate with law enforcement agencies in the prosecution of game-law violators. The ASPCA is patterned on the English organization, the Royal Society for the Prevention of Cruelty to Animals, founded in 1824 through the efforts of Richard Martin (1754-1834), an Irish member of Parliament. See study by Lloyd Alexander (1964).

American University, at Washington, D.C., United Methodist, founded by Bishop J. F. Hurst, chartered 1893, opened in 1914. It was at first a graduate school, an undergraduate college was opened in 1925. Programs provide for student research at many government institutions.

American University of Beirut, at Beirut, Lebanon, English language, founded 1866 as Syrian Protestant College, rechartered 1920 as the American Univ. of Beirut. It has faculties of arts and sciences, engineering and architecture, and agricultural sciences as well as schools of medicine, nursing, pharmacy, and public health.

American Veterans Committee (AVC), founded in 1943 as an organization of veterans of World War II. It is now open to veterans of the two world wars, the Korean War, and the Vietnam War. The AVC differs from other veterans' groups in its opposition to benefits for veterans beyond those based on service-incurred disabilities or the needs of readjustment to civilian life ("Citizens first, veterans second"). The AVC's interest is not limited to veterans' affairs; it has been active in supporting civil rights legislation and increased government activity to maintain economic prosperity and expand social welfare programs. It is affiliated with the World Veterans Federation, a Paris-based organization concerned with the maintenance of peace and international cooperation.

American Veterans of World War II and Korea (Amvets), founded 1944, organization of veterans of World War II and the Korean and Vietnam wars. The Amvets had posts in every state by 1947, when Congress granted a national charter to the organization. It is mainly concerned with veterans' benefits and rights.

American water spaniel, breed of medium-sized SPORTING DOG developed in the American Midwest. It stands about 17 in. (43.2 cm) high at the shoulder and weighs between 30 and 40 lb (13.6-18.1 kg). Its dense and closely curled coat ranges in color from solid liver to dark chocolate. A sturdy, muscular dog, the American water spaniel is a versatile scent hunter, flushing, or springing, game birds rather than pointing them. It is a strong swimmer and retrieves both on land and water. It is also used for hunting rabbits and other small animals. See DOG.

Americas, University of the, at Cholula, Mexico, founded 1940 as Mexico City College. The school achieved university status in 1963. It publishes several periodicals, including *The Aztec*, *The Mayan*, and *Meso-American Notes*.

America's Cup: see SAILING.

americium (āmā'ī'shēəm), synthetic, radioactive chemical element, symbol Am, at. no. 95, mass no. of most stable isotope 243, m.p. about 1000°C, b.p. unknown, sp. gr. 13.67 at 20°C, valence +2, +3, +4, +5, or +6. Americium is a silver-white metal thought to have either a loose-packed cubic or a

close-packed double hexagonal crystalline structure. The pure metal has been prepared by reduction of americium trifluoride with barium vapor at about 1100°C. It tarnishes slowly in dry air. Americium-243, the most stable isotope, has a half-life of over 7,000 years. Americium-241, which has a half-life of about 460 years, is more often used in chemical investigations since it is easily prepared in a fairly pure form. Americium is a member of the ACTINIDE SERIES in group IIIB of the PERIODIC TABLE. It was discovered in 1944 by G. T. Seaborg, R. A. James, L. O. Morgan, and A. Ghiorso, who bombarded plutonium-239 with neutrons to form plutonium-241, which decays to form americium-241.

Americus (āmē'īkəs), city (1970 pop. 16,091), seat of Sumter Co., SW Ga., inc. 1855. It is a manufacturing city, a livestock market, and a processing center for the area's timber, crops (peanuts, corn, cotton), and minerals (kaolin and bauxite). Charles Lindbergh made his first solo flight from Souther Field there. Georgia Southwestern College is in Americus. ANDERSONVILLE is nearby.

Amersfoort (a'mērsfōrt), city (1971 pop. 78,908), Utrecht prov., central Netherlands. It is a transportation and manufacturing center. Points of interest include a 14th-century water gate, the 15th-century Gate of Our Lady, and the old town, which has medieval houses. Johan van Oldenbarnevelt, the Dutch statesman, was born there in 1547.

Ames, Ezra, 1768-1836, American painter, b. Framingham, Mass. Early in his life he worked as a carriage painter, miniaturist, engraver, and decorator, first in Worcester, Mass., and later in Albany, N.Y., where he settled. His portrait of Governor Clinton of New York (1818, Albany Inst. of History and Art) established his renown as a vigorously realistic portraitist. Among his many skillful likenesses are those of Gouverneur Morris (N.Y. Historical Society) and Stephen van Rensselaer (New York State Historical Association). See monograph by Theodore Bolton and I. F. Cortelyou (1955).

Ames, Fisher, 1758-1808, American political leader, b. Dedham, Mass., son of Nathaniel Ames. Admitted to the bar in 1781, he began political pamphleteering and by a speech in the Massachusetts convention that ratified the Federal Constitution started on the road to becoming a leading Federalist. As a Congressman (1789-97) and after his retirement he was high in party councils, a staunch follower of Hamilton, and a vicious opponent of Jefferson. Of Ames's able speeches perhaps the best known was that made in 1796 when the House was disposed to nullify Jay's Treaty by withholding appropriations, he spoke for the treaty. He was the archetype of the New England conservative of his period, a strong proponent of order and of the rights of property. See biography by W. E. Bernhard (1965).

Ames, James Barr, 1846-1910, American jurist, b. Boston, grad. Harvard Law School, 1873. At Harvard he became associate professor (1873), professor (1877), and dean (1895). A disciple of C. C. LANGDELL, Ames insisted that legal education should require the study of actual cases instead of abstract principles of law. He was instrumental in introducing the case method in the teaching of law, a method in general use by American law schools at the time of his death. Ames's careful historical and legal scholarship is displayed in his *Lectures on Legal History* (1913).

Ames, Joseph, 1689-1759, English bibliographer. He compiled *Typographical Antiquities* (1749), a valuable list of English books printed before 1600.

Ames, Nathaniel, 1708-64, American almanac maker, b. Bridgewater, Mass. His *Astronomical Diary and Almanack*, begun in 1725 and issued annually after c. 1732 from Dedham, Mass., was highly popular and served as a model for Franklin's *Poor Richard's Almanack* and later almanacs. It had a circulation of 60,000 copies. After Ames's death it was continued until 1795 by his son Nathaniel, Jr. The elder Ames was a physician and also after 1750 landlord of the Sun Tavern at Dedham. He was the father of Fisher Ames. See Samuel Briggs, ed., *The Essays, Humor, and Poems of Nathaniel Ames* (1891, repr. 1969).

Ames, Oakes, 1804-73, American manufacturer, railroad promoter, and politician, b. Easton, Mass. With his brother Oliver he managed the family's well-known shovel factory at Easton. The business grew under demands from the expanding Midwest frontier and the Western gold diggings. Active in founding the Republican party in Massachusetts, Ames served in the U.S. House of Representatives from 1863 to 1873. Interested in the construction of the Union Pacific RR, Ames secured control of the CRÉDIT MOBILIER OF AMERICA after ousting T. C. DU-

RANT, its founder. The financial scandals of that company brought upon Ames in 1872 public disgrace and the censure of Congress.

Ames, city (1970 pop. 39,505), Story Co., central Iowa, on the Skunk River, inc. 1870. Its chief manufactures are electronic equipment and water-analysis and water-treatment equipment. Iowa State Univ. of Science and Technology is located in Ames and contributes significantly to the economy. The National Animal Disease Laboratory and the Iowa State Center, a large cultural, educational, and athletic complex, are also in the city.

Amesbury, rural district (1971 pop. 27,611), Wiltshire, S. central England. There are British remains that predate the Roman occupation. In 980 the widow of King Edgar founded Amesbury Abbey, where Queen Guinevere of Arthurian legend is believed to have died. STONEHENGE, the chief megalithic monument in Britain, is nearby.

Amesbury, town (1970 pop. 11,388), Essex Co., NE Mass., on the Merrimack River, inc. 1668. Rubber, metal, and vinyl products are manufactured. John Greenleaf Whittier lived there most of his life, and his house is preserved. Josiah Bartlett was born in Amesbury.

amethopterin (ām'ēthōp'tērīn), drug used in halting the growth of actively proliferating tissues, e.g., the malignant cells associated with several forms of leukemia. By binding to an ENZYME that controls the metabolism of folic acid, amethopterin interferes with synthesis of NUCLEIC ACIDS and therefore with tissue cell reproduction. It is sold under the trade name Methotrexate.

amethyst (ām'āthīst) [Gr., = non-drunkenness], variety of QUARTZ, violet to purple in color, used as a gem. It is the most highly valued of the semiprecious quartzes. It is associated with a number of superstitions, being regarded as a love charm, as a potent influence in improving sleep, and as a protection against thieves and drunkenness. Brazil, Uruguay, Sri Lanka, Siberia, and parts of North America are important sources of supply. The so-called Oriental amethyst, or purple sapphire, is not quartz but a variety of corundum, a much harder and rarer stone.

Amharic (ām'hār'īk), language of Ethiopia belonging to the South Ethiopic group of Ethiopian Semitic languages, which, in turn, belong to the Southeast Semitic subdivision of the Semitic subfamily of the Hamito-Semitic family of languages (see HAMITO-SEMITIC LANGUAGES). The official tongue of Ethiopia since the 14th cent., Amharic is spoken by about 7 million people in that country. Amharic employs a modification of the Ethiopic script (see ETHIOPIC). The earliest extant texts in Amharic go back to the 14th cent. Amharic has been considerably influenced in its grammar and vocabulary by the nearby Cushitic tongues. See Wolf Leslau, *Amharic Textbook* (1968), Charles A. Ferguson, *The Ethiopian Language Area* (1971).

Amherst, Jeffrey Amherst, Baron (ām'ārst), 1717-97, British army officer. He served in the War of the Austrian Succession and in the early part of the Seven Years War. In 1758 he was sent to America as a major general to lead the Louisbourg campaign in the last of the French and Indian Wars. The capture (1758) of the French fortress gave Britain her first important victory in the war, and Amherst replaced James Abercromby as supreme commander in America. The next year (1759), pushing northward from Albany, he took Crown Point and Ticonderoga, but he arrived too late to help General Wolfe take Quebec. He directed (1760) the capture of Montreal and returned (1763) to England. In the American Revolution, Amherst refused to command British troops in New England, but in 1778 he became commander in chief of home defenses. Amherst, for whom Amherst College is named, was created baron in 1776 and was made a field marshal in 1796. See his journal (ed. by J. C. Webster, 1931), biography by J. C. Long (1933).

Amherst, town (1971 pop. 9,966), N. central N.S., Canada. Amherst is an industrial center. Its products include steel, aircraft parts, clothing, luggage, and insulating materials. Nearby are salt beds. Across the border in New Brunswick is Fort Beauséjour National Historic Park. Sir Charles Tupper, the Canadian statesman, was born in Amherst.

Amherst, town (1970 pop. 126,331), Hampshire Co., W. Mass., in a fertile farm area, inc. 1759. Named for Lord Jeffrey Amherst, it is a lovely, tree-lined college town. Emily Dickinson was born and lived there all her life. Helen Hunt Jackson was also born there, and Ray Stannard Baker, Eugene Field, Robert Frost, and Noah Webster lived in the town. It is the seat of

the Univ. of Massachusetts, Hampshire College, and AMHERST COLLEGE

Amherstburg, town (1971 pop 5,169), S Ont., Canada, on the Detroit River. It is the site of Fort Malden National Historic Park. Fort Malden was built (1797-99) to replace the post lost when Detroit was ceded to the United States.

Amherst College, at Amherst, Mass., for men, founded 1821. A liberal arts institution, Amherst maintains a cooperative program with Smith College, Mount Holyoke College, Hampshire College, and the Univ. of Massachusetts.

Ami (ā'mī), servant of Solomon whose descendants came out of exile. Ezra 2:57. Amos. Neh. 7:59.

Amici, Giovanni Battista (jōvān' nē bāt-tēs'tā amē'-chē), 1786-1863, Italian astronomer, mathematician, and naturalist. He became director of the observatory and professor of anatomy at Florence and published papers on various scientific subjects. His most important work was in designing and improving physical and astronomical apparatus, especially the microscope and reflecting telescope.

Amida (ām'ida, amī'da), ancient city, E Asia Minor, on the Tigris River. It became (A.D. 230) a Roman colony and was later (4th cent.) captured by Shapur II of Persia. It is the modern DIYARBAKIR, Turkey.

Amidas, Philip: see AMADAS, PHILIP

amide (ām'id), organic compound formed by reaction of an acid chloride, acid anhydride, or ester with an amine. See AMINO GROUP, CARBOXYL GROUP.

Amidism: see PURE LAND BUDDHISM

Amiel, Henri Frédéric (ānrē' frādārēk' amyēl'), 1821-81, Swiss critic. He was unsuccessful and unnoticed during his life, but the posthumous publication of his *Journal intime* (1883, tr. of augmented ed. 1936) aroused great interest. It is a document of scrupulous self-observation. See Van Wyck Brooks, *Malady of the Ideal* (1913).

Amiens (amyān'), city (1968 pop 122,864), capital of Somme dept., N France, in PICARDY, on the Somme River. It is a rail hub and a large market for the truck farming carried on in the surrounding Somme marshlands. Also an important textile center (since the 16th cent.), it has been particularly famous for its velvet. Other products are chemicals, soap, tires, and electrical equipment. Originally a Gallo-Roman town, it was an episcopal see from the 4th cent. The historic capital of Picardy, it was overrun and occupied by many invaders. It was conquered by Henry IV in 1597. There, in 1802, the treaty of Amiens was signed. It was severely devastated in both World Wars and has been rebuilt since 1945, largely in the medieval style. Of interest is the Cathedral of Notre Dame (begun c. 1220), the largest Gothic cathedral in France. It is 470 ft (143 m) long and has a nave 140 ft (43 m) high, the transept dates from the 14th cent., the spire (370 ft/113 m high) and the large rose window were added in the 16th cent.

Amiens, Treaty of, 1802, peace treaty signed by France, Spain, and the BATAVIAN REPUBLIC on the one hand and Great Britain on the other. It is generally regarded as marking the end of the FRENCH REVOLUTIONARY WAR and setting the stage for the Napoleonic Wars (see NAPOLEON I). By its terms England was to give up most conquests made in the wars and France was to evacuate Naples and restore Egypt to the Ottoman Empire. England retained Ceylon and Trinidad but abandoned its claim to the French throne. The peace, though much acclaimed, lasted barely a year, in 1803, England refused to restore Malta to the Knights Hospitalers, thereby causing a resumption of hostilities.

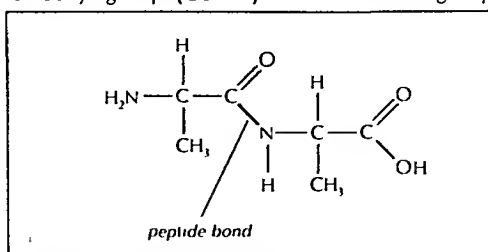
Amin, Idi (ē'dē amēn'), c. 1925-, Ugandan political leader, president of Uganda (1971-). He advanced in the Ugandan armed forces from private (1946) to commander in chief (1966). He seized political power in 1971, toppling the regime of Milton Obote, and soon established dictatorial control. In 1972 he ordered the expulsion of most of Uganda's Asians. He was often at odds with Uganda's neighbors, accusing them of plotting against him.

Aminadab, variant of AMINADAB

amine (amēn', ām'ēn) see under AMINO GROUP

amino acid (amē'nō), any one of a class of simple organic compounds containing carbon, hydrogen, oxygen, nitrogen, and in certain cases sulfur. These

compounds are distinguished by the presence of two characteristic groups of atoms known as the carboxyl group (COOH) and the amino group



Peptide bond between two molecules of the amino acid alanine

(NH₂) The amino group is said to be α to the carboxyl group when both groups are attached to the same carbon atom. The 22 α-amino acids commonly found in animals are ALANINE, ARGinine, ASPARAGINE, ASPARTIC ACID, CYSTEINE, GLUTAMIC ACID, GLUTAMINE, GLYCINE, HISTIDINE, HYDROXYLYSINE, HYDROXYPROLINE, ISOLEUCINE, LEUCINE, LYSINE, METHIONINE, PHENYLALANINE, PROLINE, SERINE, THREONINE, TRYPTOPHAN, TYROSINE, and VALINE. More than 100 less common amino acids also occur in biological systems, particularly in plants. Every amino acid except glycine can occur as either of two optically active stereoisomers, D or L, the more common ISOMER in nature is the L-form. When the carboxyl carbon atom of one amino acid covalently binds to the amino nitrogen atom of another amino acid with the release of a water molecule, a peptide bond is formed. Two or more amino acids thus linked are known as a peptide. When 2 to 10 amino acids are thus joined in a chain, the resultant molecule is known as an oligopeptide. A chain of more than 10 amino acids can usually be called a polypeptide, and a chain of about 50 or more, a PROTEIN. The chemical and indeed physiological characteristics of a given oligopeptide, polypeptide, or protein are completely determined by the sequence and interactions of its constituent amino acids. Amino acids are released in the intestinal tract by the digestion of food proteins and are then carried in the blood stream to the body cells, where they are used for growth, maintenance, and repair. During cellular anabolism amino acids are linked to form oligopeptides, polypeptides, and proteins, the amino acid sequences of the latter are determined by NUCLEIC ACIDS. Cellular catabolism breaks amino acids down into smaller fragments. Many of the amino acids necessary in metabolism can be synthesized in the human or animal body when needed, these are called nonessential. Others cannot be synthesized in sufficient quantities, these are termed essential and must be provided in the diet.

amino group, in chemistry, FUNCTIONAL GROUP that consists of a nitrogen atom attached by single bonds to hydrogen atoms, ALKYL GROUPS, ARYL GROUPS, or a combination of these three. An organic compound that contains an amino group is called an **amine**. Amines are derivatives of the inorganic compound AMMONIA, NH₃. When one, two, or all three of the hydrogens in ammonia are replaced by an alkyl or aryl group, the resulting compound is known as a primary, secondary, or tertiary amine, respectively. Like ammonia, the amines are weak bases because the unshared electron pair of the nitrogen atom can form a coordinate bond with a proton (see CHEMICAL BOND). Amines will react with a mineral acid to form an amine salt, e.g., with hydrochloric acid to form an amine hydrochloride. A water-insoluble amine can be made to dissolve by adding acid to form its water-soluble amine salt. Amines react similarly with alkyl halides to form alkyl ammonium salts. Amines can be synthesized by reacting ammonia with an alkyl halide and neutralizing the resulting alkyl ammonium salt with an alkali, e.g., sodium hydroxide. This procedure yields a mixture of primary, secondary, and tertiary amines that is easily separated into its three components by fractional distillation. Amines can also be prepared by the reaction of ammonia with an alcohol or by the reduction of any of a variety of compounds containing nitrogen in a higher oxidation state. Amines take part in many kinds of chemical reactions, in particular, they can react with an acid chloride, acid anhydride, or ester to form an amide. All reactions of amines involve bonding of an electron-deficient atom to the amino nitrogen through its unshared electron pair. The most important amine is ANILINE, an aromatic amine.

Aminopterin: see METABOLITE

Amiot, Joseph: see AMYOT, JOSEPH

Amis, Kingsley, 1922-, English novelist. His first and best-known novel, *Lucky Jim* (1953), a brilliant comic satire on academic life, classified him as one of England's ANGRY YOUNG MEN. His cultural and social disillusionment, always well laced with a fine sense of comedy, is also apparent in *That Certain Feeling* (1955), *Take a Girl Like You* (1960), and *Ending Up* (1974). Of Amis's other novels *The Anti-Death League* (1966) and *Colonel Sun: A James Bond Adventure* (1968) are espionage novels, while *The Green Man* (1969) is a ghost story, *Girl, 20* (1971) a comedy, and *The Riverside Villas Murder* (1973), a mystery. In addition to several volumes of poetry, Amis has published numerous nonfiction works, including *Socialism and the Intellectuals* (1957), *What Became of Jane Austen?* (1970), and *On Drink* (1972). Amis's wife, Elizabeth Jane Howard, 1923-, is also a novelist. Among her works are *The Beautiful Visit* (1950), *After Julius* (1965), and *Odd Girl Out* (1971).

Amish Church: see MENNONITES

Amistad National Recreation Area: see NATIONAL PARKS AND MONUMENTS (table)

Amisus: see SAMSUN

amitosis: see MITOSIS

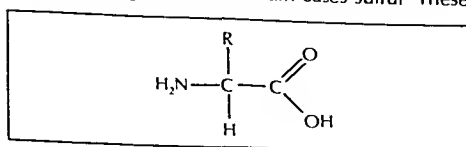
Amittai (āmīt'āi), father of Jonah. Jonah 1:1.

Ammah (ām'ā), hill near Gibeon. 2 Sam. 2:24.

Amman (āmān'), city (1970 est. pop. 570,000), capital of Jordan, N central Jordan, on the Jabbok (Wadi Zerka) River. Jordan's largest city and industrial and commercial heart, it is also a transportation hub, especially for pilgrims en route to Mecca. Amman, which is built on a series of hills and valleys, is noted for its locally quarried colored marble. Industries include the manufacture of textiles, leather and leather goods, cement, marble, tiles, flour, and tobacco products. On a site occupied since prehistoric times, Amman is the biblical Rabbah, or Rabbath-Ammon, capital of the Ammonites. It was conquered by King David in the 11th cent. B.C. but regained independence under Solomon (Deut. 3:11, Joshua 13:25, 15:60, 2 Sam. 11:1, 12:26-29, 17:27, 1 Chron. 20:1, Jer. 49:23, Ezek. 21:20, 25:5, Amos 1:14). The city was taken by Assyria in the 8th cent. B.C. and by Antiochus III c. 218 B.C. Ptolemy II Philadelphus named it Philadelphia, by which it was known throughout the Roman and Byzantine periods. It belonged to the Decapolis, a commercial league of free cities organized in the 1st cent. B.C. It was also a leading city of Rome's Arabian provinces. After the Arab conquest of 635, the city, which then became known as Amman, experienced a steady decline, it was only a small village when Emir Abdullah (later king) made it the capital of newly created Trans-Jordan in 1921. Growth was particularly rapid after World War II, when Amman absorbed refugees from Palestine. The city is the site of the Univ. of Jordan (est. 1962) and a Muslim college. Historical monuments include a Roman amphitheater (1st cent. B.C.), remains of a temple that was probably built by Hercules, and some tombs and a section of wall that date to the 9th or 8th cent. B.C. Amman suffered some damage during the civil war in Jordan in 1970.

Ammanati, Bartolomeo (bartōlōmē'ō ām-mānā'-tē), 1511-92, Italian sculptor and architect. He studied under Bandinelli in Florence and assisted Jacopo Sansovino in his work on the Library of St. Mark's, Venice. Ammanati, whose style was greatly influenced by Michelangelo's Medici tombs, made a colossal statue of Hercules, at Padua. In Rome he collaborated with Vignola and Vasari in their work at the villa of Pope Julius III. His best work here was in the Ruspoli Palace and in the court of the Collegio Romano. Returning to Florence in 1557, he became architect to Cosimo de' Medici. He made the Santa Trinita bridge over the Arno and a number of fountains, among them the Neptune fountain for the Piazza della Signoria. He built the court facade of Pitti Palace, the Guigni Palace, and a cloister of Santo Spirito. Pious in his old age, he wrote a recantation of his secular work and destroyed some of it. The poet Laura Battiferri was his wife.

Ammann, Othmar Hermann (ōt'mār, ō'mōn), 1879-1965, American civil engineer, b. Switzerland, grad. Federal Polytechnic Institute, Zurich, 1902. He came to the United States in 1904 and was naturalized in 1924. He served (1925-39) with the Port of New York Authority and was its director of engineers from 1937 to 1939. An authority on bridges, he participated in either the designing or the construction of Hell Gate, George Washington, Triborough, Bronx-Whitestone, and Verrazano-Narrows (at its opening in 1964, the longest and heaviest suspen-



General formula of an amino acid

sion bridge in the world) bridges in New York City, and San Francisco's Golden Gate Bridge

ammeter (ām'mē'tər), instrument used to measure the magnitude of an electric current in amperes or units that are multiples or fractions of amperes. An ammeter is usually combined with a voltmeter and an ohmmeter in a multipurpose instrument. Most ammeters are based on the d'Arsonval GALVANOMETER and are of the analog type, i.e., they give current values that can vary over a continuous range as indicated by a scale and pointer. However, digital ammeters, which provide current values that are composed of a group of digits, are becoming increasingly common.

Ammi (ām'i), figurative name of Israel after reconciliation with God. Hosea 2:1. See LOAMMI.

Ammianus Marcellinus (āmēā'nās marsīlī'nās), c.330-c.400, Roman historian, b. Antioch. After retiring from a successful military career, he wrote a history of the Roman Empire as a sequel to that of Tacitus, his model. The history, in 31 books, covered the years from A.D. 96 to 378, only Books XIV-XXXI, covering the years A.D. 353-78, survive. Though written in an extremely rhetorical style, his work is reliable and impartial, and his literary ability has been highly esteemed by modern scholars. A pagan and an admirer of Julian the Apostate, Ammianus was not prejudiced against Christianity. See E.A. Thompson, *Historical Work of Ammianus Marcellinus* (his work tr. by J.C. Rolfe 1935, repr. 1963).

Ammiel (ām'ēēl) 1 Spy. Num. 13:12. 2 Father of MACHIR. 2:3. Porter of the Temple. 1 Chron. 26:5. 4 See ELIAM. 1

Ammihud (ām'ihād, āmī'hād) 1 Ancestor of Joshua. Num. 1:10, 2:18, 7:48, 53, 10:22, 1 Chron. 7:26. 2 Simeonite. Num. 34:20. 3 Naphtalite. Num. 34:28. 4 Judahite. 1 Chron. 9:4. 5 Father of a king of Geshur. 2 Sam. 13:37.

Aminadab (āmīn'ādāb) 1 Aaron's father-in-law. Ex. 6:23, Num. 1:7, 2:3, 7:12, 10:14, Ruth. 4:19, 20, 1 Chron. 2:10. Aminadab. Mat. 1:4, Luke. 3:33. 2 Head of a Levitical family. 1 Chron. 15:10-12. 3 The same as IZEHAR.

Ammi-nadib (ām'īnādīb, āmīn'adīb), word of uncertain significance. Cant. 6:12.

Ammishaddai (ām'īshād'āi), Danite, father of AHIEZER. 1 Num. 1:12, 2:25, 7:66, 71, 10:25.

Ammizabad (āmīz'ābād), son of BENAIAH. 1 Chron. 27:6.

Ammon (ām'an), in the Bible, people living E of the Dead Sea. Their capital was Rabbath-Ammon, the present-day Amman (Jordan). Their god was Milcom, to whom Solomon built an altar. 1 Kings 11:5, 2 Kings 23:13. A Semitic people, they flourished from the 13th cent. B.C. to the 8th cent. B.C. and were then absorbed by the Arabs. Excavations in Jordan show that they had a highly developed kingdom. They were hostile to the Hebrews, to whom they were related. The ancestor for whom they were named was Lot's son Ben-Ammi. Gen. 19:38, Deut. 2:19, 20:37, 23:34, Judges 3:13, 1 Sam. 11:2, 2 Sam. 10:12, 2 Chron. 20, Neh. 2:10, 4:7, Jer. 49:1-6.

Ammon, Egyptian god. See AMON.

ammonia, chemical compound, NH₃, colorless gas that is about one half as dense as air at ordinary temperatures and pressures. It has a characteristic pungent, penetrating odor. It is extremely soluble in water, one volume of water dissolves about 1,200 volumes of the gas at 0°C (90 grams of ammonia in 100 cc of water), but only about 700 volumes at room temperature and still less at higher temperatures. The solution is alkaline because much of the dissolved ammonia reacts with water, H₂O, to form ammonium hydroxide, NH₄OH, a weak BASE. The ammonia sold for household use is a dilute water solution of ammonia in which ammonium hydroxide is the active cleansing agent. It should be used with caution since it can attack the skin and eyes. The vapors are especially irritating—prolonged exposure and inhalation cause serious injury and may be fatal. Water solutions of ammonia are also called ammonium hydrate, aqua ammonia, or ammonia water, the solution may contain up to 30% ammonium hydroxide by weight at room temperature and pressure. Ammonia solutions are used to clean, bleach, and deodorize, to etch aluminum, to saponify oils and fats, and in chemical manufacture. Anhydrous (water-free) ammonia gas is easily liquefied under pressure (at 20°C liquid ammonia has a vapor pressure of about 120 lb per sq in.). It is used in REFRIGERATION because the liquid absorbs a relatively large amount of heat when it evaporates. The major use of ammonia and its compounds is as FERTILIZERS. Ammonia is also used in large amounts in the OST-

WALD PROCESS for the synthesis of nitric acid, in the SOLVAY PROCESS for the synthesis of sodium carbonate, in the synthesis of numerous organic compounds used as dyes, drugs, and in plastics, and in various metallurgical processes. Ammonia takes part in many chemical reactions. In some reactions, commonly called ammoniation reactions, a single new compound is formed by the addition of a molecule of some other substance to a molecule of ammonia. Ammonia reacts with strong acids to form stable ammonium salts with hydrogen chloride it forms AMMONIUM CHLORIDE, with nitric acid, AMMONIUM NITRATE, and with sulfuric acid, AMMONIUM SULFATE. Ammonium salts of weak acids are readily decomposed into the acid and ammonia. Ammonium carbonate, (NH₄)₂CO₃·H₂O, is a colorless-to-white crystalline solid commonly known as smelling salts, in water solution it is sometimes called aromatic spirits of ammonia. Ammonia reacts with certain metal ions to form complex ions called amines. Ammonia also reacts with Lewis acids (electron acceptors), e.g., sulfur dioxide or trioxide or boron trifluoride. Another kind of reaction, commonly called ammonolysis, occurs when one or more of the hydrogen atoms in the ammonia molecule is replaced by some other atom or radical. Chlorine gas, Cl₂, reacts directly with ammonia to form monochloramine, NH₂Cl, and hydrogen chloride, HCl. Products of such ammonolyses include amides, amines, imides, imines, and nitrides. Ammonia also takes part in OXIDATION AND REDUCTION reactions. It burns in oxygen to form nitrogen gas, N₂, and water. In the presence of a catalyst (e.g., platinum) it is oxidized in air to form water and nitric oxide, NO. It reduces hot-metal oxides (e.g., cupric oxide) to the metal. Ammonia forms a minute proportion of the atmosphere, it is found in volcanic gases and as a product of decomposition of animal and vegetable matter. Ammonia is prepared commercially in vast quantities. The major method of production is the HABER PROCESS, in which nitrogen is combined directly with hydrogen at high temperatures and pressures in the presence of a catalyst. It is obtained as a by-product of the destructive distillation of coal. Ammonia is also prepared synthetically by the cyanamide process. Nitrogen gas combines with calcium carbide, CaC₂, at high temperatures to form calcium cyanamide, CaCN₂, and carbon, the calcium cyanamide reacts with steam to form calcium carbonate, CaCO₃, and ammonia. For use in the laboratory, ammonia is prepared by heating an ammonium salt with a strong base. It can also be prepared by reacting a metal nitride with water. Liquid ammonia is used in the chemical laboratory as a solvent. It is a better solvent for ionic and polar compounds than ethanol, but not as good as water, it is a better solvent for nonpolar covalent compounds than water, but not as good as ethanol. It dissolves alkali metals and barium, calcium, and strontium by forming an unstable blue solution containing the metal ion and free electrons that slowly decomposes, releasing hydrogen and forming the metal amide. Compared to water, liquid ammonia is less likely to release protons (H⁺ ions), is more likely to take up protons (to form NH₄⁺ ions), and is a stronger reducing agent. Because strong acids react with it, it does not allow strongly acidic solutions, but it dissolves many alkalies to form strongly basic solutions. Because ammonia was formerly obtained by destructive distillation of horns and hooves of animals, its water solution was called spirits of hartshorn. Ammonia has also been called alkaline air and volatile alkali.

ammoniac or **gum ammoniac** (āmō'nēāk'), yellowish substance with a sickening, bitter taste, obtained from the milky exudate of the injured stem of a plant (*Dorema ammoniacum*) found in Iran, India, and S. Siberia. It is a gum resin, soluble in alcohol and ether. It is used in industry in the manufacture of porcelain cements and in medicine as an expectorant. When gum ammoniac is distilled, it yields a liquid, oil of ammoniac.

ammonite (ām'anīt), one of a type of extinct marine CEPHALOPOD mollusk, related to the NAUTILUS and resembling it in having an elaborately coiled and chambered shell. Unlike the interiors of nautilus shells, the chambers of ammonite shells display intricately-shaped septa and sutures. The type included numerous species, which were widely distributed during the Mesozoic era, about 200 million years ago. Ammonites are classified in the phylum MOLLUSCA, class Cephalopoda, subclass Ammonoidea.

ammonium chloride (āmō'nēām klōr'īd), chemical compound, NH₄Cl, a white or colorless, odorless,

water-soluble, cubic crystalline salt with a biting taste, commonly known as sal ammoniac. It is prepared commercially by reacting AMMONIA, NH₃, with hydrogen chloride, HCl, and is used chiefly in the manufacture of electric dry-cell batteries, in soldering fluxes, in textile printing, and in making other compounds. It is also used in certain medical treatments. It occurs in nature in volcanic regions.

ammonium group, in chemistry, a positively charged nitrogen atom joined by single bonds to four other atoms or groups. The simplest ammonium group, NH₄⁺, is formed by PROTONATION of AMMONIA, NH₃, e.g., by its reaction with hydrogen chloride, HCl, to form ammonium chloride, NH₄Cl, an ammonium compound. Organic ammonium compounds are formed by the reaction of an alkyl halide with an amine (see AMINO GROUP), for example, ethyl chloride, C₂H₅Cl, reacts with triethylamine, (C₂H₅)₃N, to form tetraethyl ammonium chloride, (C₂H₅)₄N⁺Cl⁻. They are also formed by reaction of an amine with a mineral acid or by reaction of an alkyl halide with ammonia.

ammonium nitrate, chemical compound, NH₄NO₃, that exists as colorless, rhombohedral crystals at room temperature but changes to monoclinic crystals when heated above 32°C. It is extremely soluble in water and soluble in alcohol and liquid ammonia. It is prepared commercially by reaction of nitric acid and AMMONIA. Major uses are in FERTILIZERS and EXPLOSIVES. For fertilizers it is in the form of small clay-coated pellets. For explosives it is sometimes mixed with other substances, e.g., TNT, so that it is more easily detonated. It is also used in solid-fuel rocket propellants, in pyrotechnics, and in the production of nitrous oxide.

ammonium sulfate, chemical compound, (NH₄)₂SO₄, a colorless-to-gray, rhombohedral crystalline substance that occurs in nature as the mineral mascagnite. It is soluble in water and insoluble in alcohol or liquid ammonia. It is prepared commercially by passing AMMONIA, obtained from destructive distillation of coal, into sulfuric acid and is used as a FERTILIZER, in preparing other ammonium compounds, and for fireproofing.

amnesia [Gr. =forgetfulness], condition characterized by loss of MEMORY for long or short intervals of time. It may be caused by injury, shock, senility, severe illness, or mental disease. Some cases of amnesia involve the unconscious suppression of a painful experience and everything reminding of it including the individual's identity (see DEFENSE MECHANISM). Retrograde amnesia is loss of memory of events just preceding temporary loss of consciousness, as from head injury, it is evidence that memory proceeds in two stages, short term and long term. One form of the condition known as tropic amnesia, or coast memory, affecting white men in the tropics, is probably a variety of HYSTERIA. APHASIA of the amnesic variety is caused by an organic brain condition and is not to be confused with other forms of amnesia. To cure amnesia, attempts are made to establish ASSOCIATIONS with the past by suggestion, and HYPNOTISM is sometimes employed.

amnesty (ām'nāstē), in law, exemption from prosecution for criminal action. It signifies forgiveness and the forgetting of past actions. Amnesties are usually extended to a group of persons during a period of prolonged disorder or insurrection. The criminals are offered a promise of immunity from prosecution if they will abandon their unlawful activities. After a revolution or civil war the victorious side will often extend amnesty to the losers, e.g., the United States granted a qualified amnesty to the Confederate forces after the Civil War. An amnesty is distinguished from a PARDON, which is an act of forgiveness after the criminal has already been convicted.

Amnon. 1 David's eldest son. He raped his half sister Tamar and was killed for it by her brother Absalom. 2 Sam. 3:2, 13. 2 Judahite. 1 Chron. 4:20.

amobarbital (ām'ōbār'bītal), drug that acts as a nervous system DEPRESSANT. See BARBITURATE.

amoeba. See AMEBA.

Amok (ā'mōk), post-Exilic Jewish family. Neh. 12:7, 20.

Amol (āmōl'), city (1966 pop. 40,076), Mazandaran prov., N Iran, near the Caspian Sea. It is an agricultural trade center. Amol was a provincial capital under the Abbasids in the 9th cent.

amole. See SOAP PLANT.

Amon (ā'mōn) 1 King of Judah, son and successor of Manasseh. He was inattentive to the worship of God, and biblical accounts denounce him strongly. Jeremiah was his contemporary. Amon was murdered, and Josiah succeeded him. 2 Kings 21:19-26,

2 Chron 33 20-25 2 Ahab's governor of Samaria 1 Kings 22 26, 2 Chron 18 25 3 See AMI

Amon (ā'mān, ā'-) or **Ammon** (ā'mān) or **Amen** (ā'mēn), Egyptian deity. He was originally the chief god of Thebes, he and his wife Mut and their son Khensu were the divine Theban triad of deities. Amon grew increasingly important in Egypt, and eventually he (identified as Amon Ra, see RA) became the supreme deity. He was identified with the Greek Zeus (the Roman Jupiter). Amon's most celebrated shrine was at Siwa in the Libyan desert, the oracle of Siwa later rivaled those of Delphi and Dodona. He is frequently represented as a ram or as a human with a ram's head.

amontillado (āmōn'tīlā'dō), dry SHERRY noted for its delicate bouquet, resembling the wine of Montilla, Spain, from which it derives its name. A blend of pale, dry sherries of the *palma* type, it assumes in aging a darker color.

Amor: see EROS

Amora'im (āmōrā'īm) [from Heb *amar*=to interpret], term referring to those Jewish scholars, predominantly in Palestine at Caesarea and Tiberias (A.D. c.200-c.350) and in Babylonia at Sura and Pumbedita (A.D. c.200-c.510), who interpreted the MISHNA and other Tanna'itic collections (see TALMUD). They ultimately saw as their chief function the compilation of a final, explanatory text for the HALAKAH. They thus constitute the link between the early tradition of the TANNA'IM and their own successors, the Saboraim, who edited the final compilation of the Talmud in the 6th cent. Their authority did not supersede that of the Tanna'im, but, as expositors, they were able to make additions to the halakah as contemporary conditions necessitated. These discussions constitute the section of the Talmud known as the Gemara. In addition, they were responsible for much of the nonlegal or aggadic material that appears in the Talmud and in the Midrashim (see MIDRASH). See H. L. Strack, *Introduction to the Talmud and Midrash* (1931), Jacob Neusner, *There We Sat Down* (1972).

Amorites (āmō'rīts), a people of Canaan. There is evidence of them also in Babylonia, where in the 18th cent. B.C. they established a dynasty at Babylon, their most powerful king was Hammurabi. At the time of Joshua the Amorites were living both E and W of the Dead Sea. They were subdued and gradually absorbed by the Israelites. Gen 10 16, 14 7, 15 16, Num 13 29, 21 13, 21-32, Deut 1 4-7, 4 47, 48, Joshua 5 1, 10 6.

amortization (ām'örtəzā'shən, āmōr'-), reduction, liquidation, or satisfaction of a debt. The term *amortization* may also refer to the sum used for that purpose. The term is commonly used in ascertaining the investment value of securities. Thus, if a security is bought at more than its face value (i.e., at a premium), a part of the premium is periodically charged off in order to bring the value of the security to par at maturity, if the security is bought at less than its face value, the discount is similarly charged off. Paying off a mortgage or any other debt by installments or by a SINKING FUND is amortization. Amortization by paying off a certain number of bonds each year is practiced by public corporations. National governments of limited credit as well as private companies commonly amortize by sinking funds. Governments with stronger credit usually refund debts by issuing new bonds. The satisfying of a debt by a single payment may be termed amortization. Amortization of a fixed asset refers to the DEPRECIATION of a nonmaterial investment over its estimated average life. See H. A. Finney, *Principles of Financial Accounting* (1968).

Amos (ām'ās), book of the Old Testament. Although it is placed third in order of the books of the Minor Prophets, it is chronologically the earliest. The prophet was a shepherd of Tekoa in the southern kingdom of Judah, but he preached in the northern kingdom of Israel under Jeroboam II (reigned c.753-753 B.C.). Israel was at the peak of its political power but was ridden with social injustices, Amos inveighed especially against hypocritical worship, oppression of the poor, and immorality. The book falls into three parts. God's judgment on various Gentile nations and on Judah and Israel (1-2), three sermons on the doom of Israel (3-6), and five visions of destruction (7-9), of which the last promises redemption. The name of another Amos occurs in the genealogy of Luke 3 25. See studies by Erling Hammershaimb (tr 1970) and H. J. Routenberg (1971), see also bibliography under OLD TESTAMENT.

Amoy (āmōi) or **Hsia-men** (shēā-mūn), city (1970 est. pop. 400,000), S Fukien prov., China, on Amoy island, at the mouth of the Chiu-lung River. It has an

excellent natural harbor and is connected to the mainland by a railroad (built 1957) that crosses on a dike. Fishing, shipbuilding, and food processing are the major industries, machine tools and chemicals are also manufactured. Opposite Amoy proper, across the inner harbor, is the island of Ku-lang Hsü, the former foreign settlement and a fine residential section. Amoy was one of the earliest seats of European commerce in China, with Portuguese (16th cent.) and Dutch (17th cent.) establishments. It was captured (1841) by the British in the OPIUM WAR and became a TREATY PORT in 1842. It was long a Chinese port of emigration, mainly to SE Asia. Amoy Univ. is there.

Amoz (ām'ōz), father of the prophet Isaiah. Isa 1 1.

AMP: see ADENOSINE MONOPHOSPHATE

ampelopsis (ām'pīlōp'sās) [from Gr. =looking like a vine], botanically, name for woody ornamental vines of the genus *Ampelopsis*, but from long association also used in horticultural practice for the VIRGINIA CREEPER, BOSTON IVY, and others of related genera of the family Vitaceae (GRAPE family). Species of *Ampelopsis* native to Asia and North America have showy berries of various colors. The pepper-vine (*A. arborea*) is indigenous to the S United States. *Ampelopsis* is classified in the division MAGNOLIOPHYTA, class Magnoliopsida, order Rhamnales, family Vitaceae.

Ampère, André Marie (ām'pēr, Fr. āndrā' mārē' ānpēr'), 1775-1836, French physicist, mathematician, and natural philosopher. He was professor of mathematics at the École Polytechnique, Paris, and later at the Collège de France. Known for his contributions to electrodynamics, including the formulation of Ampère's law, he confirmed and amplified the work of Oersted on the relationship of electricity and magnetism, and he invented the astatic needle. The ampere was named for him. His writings include *Recueil d'Observations electro-dynamiques* (1822) and *Essai sur la philosophie des sciences* (2 vol., 1834-43, vol. 1 repr. 1838). See his *Correspondance* pub. by L. de Launay (3 vol., 1936-43).

ampere (ām'pēr), abbr. amp or A, basic unit of electric current. It is the fundamental electrical unit used with the MKS SYSTEM of units of the METRIC SYSTEM. The ampere is officially defined as the current in a pair of equally long, parallel, straight wires 1 meter apart that produces a force of 0.000002 newton (2×10^{-7} N) between the wires for each meter of their length. Current meters such as ammeters and galvanometers are calibrated in reference to a current balance that actually measures the force between two wires. Until 1948 the ampere was defined as the flow of 1 COULOMB of charge per second, the coulomb being then considered the fundamental unit. The old (international) ampere equals 0.999835 new (absolute) ampere. The milliamper (mA), equal to one-thousandth of an ampere, and the microampere (μ A), equal to one-millionth of an ampere, are units often used in measuring small currents.

amphetamine (āmfēt'āmēn), any one of a group of drugs that are powerful central nervous system STIMULANTS. Amphetamines have stimulating effects opposite to the effects of DEPRESSANTS such as alcohol, NARCOTICS, and BARBITURATES. They raise the blood pressure by causing the body to release EPINEPHRINE, postpone the need for sleep, and can reverse, partially and temporarily, the effects of fatigue. Amphetamines enhance mental alertness and the ability to concentrate, and also cause wakefulness, euphoria, and talkativeness. They have been used for short periods of time in weight-control programs to suppress appetite, in conjunction with some forms of psychotherapy to treat chronic alcoholism, and to treat narcolepsy and certain psychological disorders such as depression. They were used as vasoconstrictors in inhalant therapy to shrink nasal mucous membranes in such conditions as nasal allergies and asthma, now such inhalants have been banned because of their toxicity. Amphetamines have been thought to have a calming effect on some hyperactive children, the use of these drugs to treat such children has been very controversial. Amphetamines are potent drugs that can produce severe systemic effects, including cardiac irregularities and gastric disturbances. Popularly known as bennies, speed, or uppers, they are also addictive and easily abused. Users can become psychologically dependent on the drugs and, by developing tolerance for them, can require increasingly large doses (see DRUG ADDICTION AND DRUG ABUSE). Chronic use often results in insomnia, hyperactivity, and irritability. Amphetamine-induced psychosis often mimics schizophrenia. Amphetamine addiction has been common

among such diverse groups as truck drivers, students, and athletes, who have used the drugs for increased energy, alertness, or endurance. Addiction to amphetamines can result in psychosis or death from overexhaustion or cardiac arrest. Benzedrine is the trade name for the drug amphetamine, dextro-amphetamine is marketed as Dexedrine. Methamphetamine, a potent stimulant marketed as Desoxyn, is the most rapidly acting amphetamine.

Amphiaras (ām'fēār'ās), in Greek legend, a prophet, one of the ill-fated SEVEN AGAINST THEBES. He foresaw the disaster of the expedition, but his wife, Eriphyle, bribed by Polyneices with the magic necklace of Harmonia, compelled him to go. Before setting out he commanded his sons, Alcmaeon and Amphilocheus, to avenge his death on Eriphyle and to make a second expedition against Thebes. Amphiaras also was one of the Argonauts.

amphibian, in aviation. see SEAPLANE.

amphibian, in zoology, cold-blooded VERTEBRATE animal of the class Amphibia. There are three living orders of amphibians: the FROGS and TOADS (order Anura, or Salientia), the SALAMANDERS and NEWTS (order Urodela, or Caudata), and the CAECILIANS, or limbless amphibians (order Apoda, or Gymnophiona), a little known tropical group. Amphibians, the most primitive of the terrestrial vertebrates, are intermediate in evolutionary position between the FISH and the REPTILES. Typically they undergo a metamorphosis from an aquatic, water-breathing, limbless larva (called a tadpole) to a terrestrial or partly terrestrial, air-breathing, four-legged adult. The eggs are usually deposited in water or in a protected place where their moisture will be conserved, they have neither shells nor the sets of membranes that surround the eggs of reptiles and other higher vertebrates. Some amphibians lay their eggs in dry places, and the young undergo the larval stage within the egg, emerging as small adults, in these the eggs have evolved various protective structures. Adult amphibians differ from reptiles in having moist skins, without scales or with small, hidden scales. All living amphibians are specialized for their way of life, none representing the main amphibian stock from which the reptiles evolved. The salamanders and newts are superficially the most similar to ancestral amphibians, having long tails and front and hind legs of approximately equal size. Frogs and toads are highly modified for jumping, with large, muscular hind legs and no tails, while the caecilians have lost all external traces of limbs.

amphibious warfare (āmfīb'ēās), employment of a combination of land and sea forces to take or defend a military objective. The general strategy is very ancient and was extensively employed by the Greeks, e.g., in the Athenian attack on Sicily in 415 B.C. The term is, however, of modern coinage. It is sometimes applied to the joint operations of the Allied army and naval forces in the disastrous Gallipoli campaign (1915) of World War I. Amphibious warfare was widely employed in World War II. When the Japanese entered the war on a large scale in Dec., 1941, they used combined air, land, and naval operations to capture strategic islands such as the Philippines, Java, and Sumatra. However, the Japanese landings, like the Allied landing in N. Africa (Nov., 1942), encountered little opposition and did not offer a true illustration of the problems of amphibious warfare. The problem faced by the Allies in the reconquest of Europe and the Pacific islands was how to land their forces on a heavily defended coast line. It was solved by the construction of special vessels called landing craft that were seaworthy and yet capable of allowing tanks and infantry to emerge without difficulty into shallow water for landing. The typical Allied amphibious operation consisted of heavy and continued air and naval bombardment of the enemy defenses, followed by a landing of troops with complete equipment from landing craft, the landing forces were supported in the early stages by naval guns until land artillery could come into action. By use of this method the Allies were able to invade heavily defended Pacific islands such as Tarawa (1943) and Saipan (1944), Iwo Jima (1945), and Okinawa (1945). In Europe the Allies made landings on Sicily (1943) and Italy (1943-44), but the most spectacular example of amphibious warfare was the invasion of Normandy by the Allies from England on June 6, 1944 (see NORMANDY CAMPAIGN). That action was a prime example of combined movements of naval craft, land forces, and aircraft (used for offense, protection of other forces, and transport). The U.S. invasion of Inchon (1950) during the Korean War and the British and French invasion of Egypt during the Sinai crisis (1957) utilized the same basic tactics. More recently

research has been conducted to evolve practical amphibious technique for nuclear warfare. See) A Isely and P A Crowl, *The US Marines and Amphibious War* (1951), Bernard Fergusson, *The Watery Maze The Story of Combined Operations* (1961)

amphibole (ām'fəbōl'), any of a group of widely distributed rock-forming minerals, magnesium-iron silicates, often with traces of calcium, aluminum, sodium, titanium, and other elements. The amphibole minerals are closely related in crystal structure, but they crystallize in two different systems, orthorhombic and monoclinic, their close structural relationship is reflected in uniform prism angles of about 56° and 124° and in good cleavages parallel to these prisms. They are commonly green to black, but may be colorless, white, yellow, blue, or brown. The amphibole minerals are found both in igneous and metamorphic rocks. The commonest form is hornblende, other species include anthophyllite, cummingtonite, tremolite, actinolite, riebeckite, and glaucophane. A variety of jade, called nephrite, consists of actinolite in a finely fibrous form.

amphictyony (ām'fīk'tēō'nē, -ō'nē, -ānē'), in ancient Greece, a league connected with maintaining a temple or shrine. There were a number of these, but by far the most important was the Great Amphictyony or Delphic Amphictyony, a league originally of 12 tribes. It had meetings in the spring at the temple of Demeter at Anthela near Thermopylae and in the autumn at Delphi. The Amphictyonic Council passed legislation regarding religious matters and had power to declare a sacred war against an offender. Each tribe had two votes. By the 6th cent. B.C. the religious organization had begun to have political influence. The greater city-states, by using pressure on the lesser, got control of more tribal votes and were able to control laws and policy. The significance of the Amphictyonic Council was shown by Philip II of Macedon, who, after managing to get on the council by securing the votes of the Phocians, used sacred wars as a pretext for furthering his conquests in Greece. This one large unifying organization, therefore, in the end had no real unifying power in divided Greece. The Great Amphictyony continued in existence (but with no power) until late in the Roman Empire.

Amphilochus (ām'fīl'əkəs), in Greek legend, son of AMPHARAUS and ERIPHYLE and brother of Alcmæon. He was one of the EPICURI and with his brother slew Eriphyle for her treachery in bringing about their father's death.

Amphion (ām'fēōn) see ANTIOPE 1

amphioxus see LANCELET

Amphipolis (ām'fī'pālīs), ancient city of Macedonia, on the Strymon (Struma) River near the sea and NE of latē Thessalonikī. The place was known as Ennea Hodoi [nine ways] before it was settled and was of interest because of the gold and silver and timber of Mt. Pangaeus (Pangaion), to which it gave access. Athenian colonists were driven out (c. 464 B.C.) by Thracians, but a colony was established in 437 B.C. Amphipolis became one of the major Greek cities on the N Aegean. This colony was captured by Sparta, and Brasidas and Cleon were both killed in a battle there in 422 B.C. After it was returned to Athens in 421 B.C., it actually had virtual independence until captured (357 B.C.) by Philip II of Macedon. He had promised to restore it to Athens, and his retention of Amphipolis was a major cause of the war with Athens. It was the capital (168-148 B.C.) of Macedonia Prima, one of the Roman republics. Paul, Silas, and Timothy passed through Amphipolis (Acts 17:1). Nearby is the modern Greek village of Amfipolis.

amphitheater, open structure used for the exhibition of gladiatorial contests, struggles of wild beasts, sham sea battles, and similar spectacles. There is no Greek prototype of amphitheaters, which were primarily Roman and were built in many cities throughout the empire. More or less well-preserved examples are at Rome (see COLOSSEUM), Verona, and Capua in Italy, at Nîmes and Arles in France, at Cirencester in England, and at sites in Sicily, Greece, and North Africa. The typical amphitheater was elliptical in shape, with seats, supported on vaults of masonry, rising in many tiers around an arena at the center, corridors and stairs facilitated the circulation of great throngs. The arena itself was usually built over the quarters for gladiators, wild animals, and storage. Until the erection of the Colosseum (A.D. 80), practically all amphitheaters were of wood, the notable exception being that of stone built at Pompeii c. 70 B.C. The word *amphitheater* is now applied to modern structures which may bear little resemblance to their ancient prototypes.

Amphitrite (ām'fītrī'tē), in Greek mythology, queen of the sea, daughter of Nereus. She was the wife of Poseidon and mother of Triton.

Amphitryon (ām'fītrēōn, -ōn'), in Greek mythology, son of Alcaeus. While betrothed to Alcmene, he accidentally killed her father, Electryon. Alcmene and Amphitryon fled to Thebes, but she demanded that he defeat Pterelaos, her father's enemy. This Amphitryon did, but on the night of his return Zeus took Amphitryon's form and came into Alcmene's bed. That night she conceived children by both Zeus and Amphitryon. Hercules was the son of Zeus, Iphicles the son of Amphitryon.

amphotericin B (ām'fātēr'isīn), ANTIBIOTIC that halts the growth of several disease-causing fungi. It is produced by bacteria of the genus *Streptomyces*. It is used in lotion or ointment form to treat fungus infections of the skin and is given internally only to patients with potentially fatal fungus infections. Amphotericin B is not effective against bacterial infections.

amphoterism (ām'fātēr'izēm), in chemistry, the property of certain substances of acting either as acids or as bases depending on the reaction in which they are involved. Many hydroxide compounds are amphoteric. For example, aluminum hydroxide, $Al(OH)_3$, reacts as a base with common acids to form salts, e.g., with sulfuric acid, H_2SO_4 , to form aluminum sulfate, $Al_2(SO_4)_3$. It reacts as an acid with strong bases to form aluminates, e.g., with sodium hydroxide, $NaOH$, to form sodium aluminate, $NaAlO_2$. Organic molecules that contain both acidic (e.g., carboxyl) and basic (e.g., amino) FUNCTIONAL GROUPS are usually amphoteric.

ampicillin (ām'pīsil'īn), ANTIBIOTIC chemically related to PENICILLIN but having a broader spectrum of antibacterial activity. The penicillin antibiotics inhibit the synthesis of bacterial cell wall components.

Amplias (āmp'lēās) or **Ampliatius** (āmplēāt'ās), Christian in Rome to whom Paul sent greetings. Rom. 16:8.

amplifier, device in which a varying input signal controls a flow of energy to produce an output signal that varies in the same way but has a larger amplitude, the input signal may be a current, a voltage, a mechanical motion, or any other signal, and the output signal is usually of the same nature. The most common types of amplifiers are electronic and have ELECTRON TUBES or TRANSISTORS as their principal components. Tube and transistor amplifiers are used in radio and television transmitters and receivers, stereophonic phonographs, and intercoms. Amplifiers in their simplest form have either a single transistor or a single electron tube known as a triode. In the single-triode amplifier, a varying input voltage is fed to the triode, which acts upon the input to produce a larger varying output voltage, the ratio of the output voltage to the input voltage is called the voltage gain. For many purposes a single tube or transistor does not provide the signal with sufficient gain, or amplification, a problem that can be overcome by a cascade, or multistage, amplifier. In a cascade amplifier the output of the first amplifying device (tube or transistor) is fed as input to the second amplifying device, whose output is fed as input to the third, and so on until an adequate signal amplification has been achieved. In a device such as a radio receiver, several amplifiers boost a weak input signal until it is powerful enough to drive a speaker, producing audible sound. Another less common group of electronic amplifiers use magnetic devices as their principal components. There are also many kinds of mechanical amplifiers, e.g., the power steering system of an automobile. See OPERATIONAL AMPLIFIER.

amplitude (ām'plitūd'od'), in physics, maximum displacement from a zero value or rest position. In the HARMONIC MOTION of a pendulum, the amplitude of the swing is the greatest distance reached to either side of the central rest position. Amplitude is important in the description of a wave phenomenon such as light or sound. In general, the greater the amplitude of the wave, the more energy it transmits (e.g., a brighter light or a louder sound).

amplitude modulation see MODULATION, RADIO

amputation, removal of all or part of a limb or other body part. Although amputation has been practiced for centuries, the development of sophisticated techniques for treatment and prevention of infection has greatly decreased its necessity. Surgical amputation is currently performed in cases of bone and tissue cancers, gangrene, and uncontrollable infections of the arm or leg. An amputation is performed as far above the affected area as is necessary to remove all unhealthy tissue and to leave a portion of sound tissue with which to pad the bone stump.

Whenever possible amputations are performed at points on the limb that permit the fitting of prosthetic devices (see ARTIFICIAL LIMB). Ceremonial amputation of finger joints has been practiced in parts of Australia and Africa in conjunction with male initiation rites. In some areas of New Guinea females have finger joints amputated to signify mourning.

Amram (ām'rām) 1 Moses' father, ancestor of a Levitical family. Ex. 6:18,20, Num. 3:19,27, 26:58,59, 1 Chron. 6:2,3,18, 23:12,13, 24:20, 26:23. 2 See HEMDAN 3. Jew who had married a foreign wife. Ezra 10:34.

Amram ben Scheschna (shēsh'nā) or **Amram Gaon** (ga'ōn), d. c. 875, Hebrew scholar, head of the Jewish academy at Sura in Persia. He is chiefly known as the author of the *Seder Rab Amram*, a compilation of the order of prayers, with their context for the whole year and the liturgical laws governing the ceremonial observances of all the holidays. This book is the oldest surviving Jewish prayer book, serving as a basis for later compilations. See David Hedegård, ed., *Seder R. Amram Gaon* (Vol. I, 1951).

Amraphel (ām'rāfēl, āmrā'fāl) see CHEDORLOMER and HAMMURABI

Amravati (ām'ra-vā'tē), town (1971 pop. 193,636), Maharashtra state, central India. The town is a district administrative center. It is the site of the Great Stupa (c. A.D. 200) of the Andhra Dynasty.

Amritsar (ām'rī'tsār), city (1971 pop. 432,663), Punjab state, NW India. It is a district administrative center, as well as a trade and industrial city where carpets, fabrics of goat hair, and handicrafts are made. The center of the SIKH religion, Amritsar was founded in 1577 by Ram Das, the fourth guru [Hindustani, = teacher], on land given by AKBAR. The Golden Temple (refurbished 1802), set in the center of a lake, is especially sacred to Sikhs. The city was the center of a Sikh empire in the early 19th cent., and modern Sikh nationalism was founded there. Khalsa College, a branch of Punjab Univ., is in Amritsar. The Amritsar massacre took place in the Jallianwala Bagh, an enclosed park, in April, 1919, hundreds of Indian nationalists were killed and thousands wounded when they were fired upon by the troops under British control.

Amru al-Kais (ām'rōō al-kīs), fl. 6th cent., Arabic poet. His verse, like much of the poetry of the pre-Islamic period, is intensely subjective and stylistically perfect. He was esteemed by Arabs as the great model for erotic poetry. He is thought to have lived in high favor with the imperial court at Constantinople. Amru al-Kais' work is represented in the MUALLAQAT. His name is also spelled Imru al-Kais.

Amsdorf, Nikolaus von (nē'kōlous fən āms'dōrf), 1483-1565, German Protestant reformer. He became a devoted supporter of Martin Luther. Elector John Frederick I of Saxony appointed Amsdorf bishop of Naumburg in 1541, but after the elector was captured by Holy Roman Emperor Charles V, the office was withdrawn (1547). A zealous defender of Luther's doctrines, Amsdorf attacked all who deviated from them in the slightest, including Melancthon. He took part in the founding of the Univ. of Jena and superintended the Jena edition of the works of Luther.

Amstelveen (ām'stēlvān), town (1971 pop. 70,202), North Holland prov., W Netherlands, a suburb of Amsterdam. Schiphol international airport is there.

Amsterdam (ām'stārdām', Dutch am'stardam'), city (1971 pop. 820,406), constitutional capital and largest city of the Kingdom of the Netherlands, North Holland prov., W Netherlands, on the IJ, an inlet of the IJsselmeer. The city derives its name from the fact that it is situated where the small, bifurcated Amstel River (which empties into the IJ) is joined by a sluice dam (originally built c. 1240). A major port, Amsterdam is also the seat of one of the world's chief stock exchanges, a center of the diamond-cutting industry, and one of the great commercial, intellectual, and artistic capitals of Europe. Its manufactures include food products, clothing, printed materials, and metal goods. Amsterdam is connected with the North Sea by the North Sea Canal (opened in 1876), which can accommodate large oceangoing vessels, and by the older North Holland Canal (opened 1824). The Amsterdam-Rhine Canal connects the city with the Rhine delta and thus with industrial NW Germany, with which there is considerable transit trade. Amsterdam is a major road and rail hub and is served by nearby Schiphol airport. Because of the underlying soft ground, Amsterdam is built on wooden and concrete piles. The city is cut by about 40 concentric and radial canals that are flanked by streets and crossed by some 400 bridges. Because of the canals, the city is sometimes called

the "Venice of the North." The many old and picturesque houses along the canals, once patrician dwellings, are now mostly offices and warehouses. The main streets of Amsterdam are the Dam, on which stand the Nieuwe Kerk (15th-17th cent.) and the 17th-century Dam Palace (formerly the city hall, since 1808 a royal palace), the Damrak, with the stock exchange (completed 1903), and the Kalverstraat and Leidenschestraat, which are the chief shopping centers. Outstanding buildings are the Oude Kerk [old church], built in 1334, the weigh-house (15th cent.), the city hall (16th cent.), and the Beguinage (Dutch *Begijnenhof*), or almshouses, of the 17th cent. Amsterdam was chartered c 1300 and in 1369 joined the Hanseatic League. Having accepted the Reformation, the people of Amsterdam in 1578 expelled their pro-Spanish magistrates and joined the rebellious Netherlands provinces. The commercial decline of Antwerp and Ghent and a large influx of refugees from all nations (notably of Flemish merchants, of Jewish diamond cutters and merchants, and of French Huguenots), contributed to the rapid growth of Amsterdam after the late 16th cent. The Peace of Westphalia (1648), by closing the Scheldt (Escaut) to navigation, further stimulated the growth of Amsterdam at the expense of the Spanish Netherlands. Amsterdam reached its apex as an intellectual and artistic center in the 17th cent., when, because of its tolerant government, it became a center of liberal thought and of book printing. The city was captured by the French in 1795 and became the capital of the Kingdom of the Netherlands, which was ruled by Louis Bonaparte. The constitution of 1814 made it the capital of the Netherlands, the sovereigns are usually sworn in at Amsterdam and now reside in a palace outside the city. However, The Hague is the seat of government. During World War II, Amsterdam was occupied by German troops from 1940 to 1945 and suffered severe hardship, including famine. Most of the city's Jews (c.75,000 in 1940) were deported and killed by the Germans. Rembrandt and the other Dutch masters are best represented in the world famous Rijks Museum, or National Museum, founded in 1808 by Louis Bonaparte. Among the many other notable museums are the municipal museum (with a magnificent Van Gogh collection) and Rembrandt's house. Amsterdam is also famous for the Concertgebouw Orchestra. The Univ. of Amsterdam, which was founded as an academy in 1632 and achieved university status in 1876, is the largest center of learning in the Netherlands. The city is also the site of the Free Univ. (1880, Calvinist). Near Amsterdam is the Bosplan, an enormous man-made national park.

Amsterdam, city (1970 pop. 25,524), Montgomery co., E central N.Y., on the Mohawk River, inc. 1885. It is an industrial city where carpets, rugs, clothing, and novelties are manufactured. The area was settled in 1783 and was named Amsterdam because many of the early settlers were from the Netherlands. Nearby stands Fort Johnson, home of the British colonial leader Sir William Johnson.

Amtrak, federally chartered corporation authorized to operate virtually all intercity passenger railroad routes in the United States. Officially known as the National Railroad Passenger Corporation, Amtrak was created by an act of Congress in Oct., 1970. Its establishment was preceded by more than two decades of continuous operating deficits by privately run passenger railroads. At the time of Amtrak's creation, more than 100 of the nation's 500 passenger railroad lines had filed discontinuation-of-service petitions with the Interstate Commerce Commission. Given an initial funding of \$40 million and \$100 million in federal loan guarantees, Amtrak was designed to be a profit-making enterprise even though it is quasi-public in structure. Its board of directors is composed of three representatives of the railroad industry, four private investors from among those holding the corporation's preferred stock, and eight officers appointed by the President. Amtrak began operation in 1971 and immediately reduced the number of intercity passenger rail routes by one half, retaining service only in areas of high density travel. In its first year Amtrak had over 180 routes serving some 300 cities. The corporation reported increasing travel and decreasing deficits in its early years of operation. Its government funding also increased in these years.

Amu Darya (ä'mōō dār'ya, ämōō' dār'yä'), river, c 1,600 mi (2,580 km) long, formed by the junction of the Vakhsh and Pandj rivers, which rise in the Pamir mts. of central Asia. It flows generally northwest, marking much of the USSR-Afghanistan border before flowing through the Kara-Kum desert of

Turkmenistan and Uzbekistan, Central Asian USSR, and entering the S. Aral Sea through a large delta. The river drains c 180,000 sq mi (466,200 sq km). It flows swiftly until it reaches the Kara-Kum where its course braids into several channels. The Amu Darya is rich in fish and it provides water for irrigation. The Kara-Kum Canal (c.500 mi/800 km long) carries water from the Amu Darya near Kelif across S. Turkmenistan to Ashkhabad and supplements the flow of the Tedzhen and Murgab rivers. The Amu Darya is paralleled by the Trans-Caspian RR, which has lessened the river's importance as a transport route. In ancient times the Amu Darya was called the Oxus and figured importantly in the history of Persia and in the campaigns of Alexander the Great.

amulet (äm'yälit), object or formula that credulity and superstition have endowed with the power of warding off harmful influences. The use of the amulet to avert danger and to dispel evil has been known in different religions and among diverse peoples. Like the talisman and the charm, the amulet is believed to be the source of an impersonal force that is an inherent property of the object rather than the manifestation of a deity working through that object (see **FETTER** and **TABOO**). Although amulets are most often worn on the body, hanging from the neck or strapped to the arm or leg, they may also serve as protective emblems on walls and doorways (e.g., the Jewish mezuzah). Sometimes the amulet consists of a spoken, written, or drawn magic formula, such as **ABRACADABRA** and the **MAGIC SQUARE**, or of a symbolic figure, such as the wheel of the sun god and the Aryan swastika. In many cultures the teeth, claws, and other parts of an animal are believed to communicate their properties to the wearer. Although belief in amulets is very widespread in primitive societies, it has survived in modern civilization. Common superstition has endowed such things as the rabbit's foot with the property of being able to bring good luck. In some modern religious practices, amulets such as the Jewish phylactery and the Christian cross are more strictly related to ritual and serve as personal reminders to the wearers of their relationship to God.

Amundsen, Roald (rō'äl ä'mōōnsən), 1872-1928, Norwegian polar explorer, the first man to reach the South Pole. He served (1897-99) as first mate on the *Belgica* (under the Belgian Adrien de Gerlache) in an expedition to the Antarctic, and he commanded the *Gjøa* in the arctic regions in the first negotiation of the **NORTHWEST PASSAGE** (1903-6), the *Gjøa* was the first single ship to complete the route through the Northwest Passage. His account appeared in English as *Amundsen's North West Passage* (1908). He then purchased Fridtjof Nansen's *Fram* and prepared to drift toward the North Pole and then finish the journey by sledge. The news that Robert E. Peary had anticipated him in reaching the North Pole caused Amundsen to consider going south. He was successful in reaching the South Pole on Dec. 14, 1911, after a dash by dog team and skis from the Bay of Whales (an inlet of Ross Sea). He arrived there just 35 days before Robert F. SCOTT. This story he told in *The South Pole* (tr. 1913). He had added much valuable scientific and geological information to the knowledge of Antarctica. In 1918, back in the arctic regions, he set out to negotiate the Northeast Passage in the *Maud*. After two winters he arrived at Nome, the first after N. A. E. Nordenskjöld to sail along the whole northern coast of Europe and Asia. Amundsen then turned to air exploration. He and Lincoln ELLSWORTH in 1925 failed to complete a flight across the North Pole, but the next year in the *Norge*, built and piloted by Umberto Nobile, they succeeded in flying over the pole and the hitherto unexplored regions of the Arctic Ocean N. of Alaska. A bitter controversy followed with Nobile as to the credit for the success. Yet in 1928 when Nobile crashed in the *Italia*, Amundsen set out on a rescue attempt that cost him his life. The story of the ventures with Ellsworth written by the two of them appear in *Our Polar Flight* (1925) and *The First Crossing of the Polar Sea* (1927). See the autobiographical *My Life as an Explorer* (tr. 1927), biographies by Charles Turley (1935) and J. A. Kugelmass (1955).

Amur (ä'mōōr'), Chin. *Hei-lung Chiang*, river, c 1,800 mi (2,900 km) long, formed by the confluence of the Shilka and Argun rivers, NE Asia, at the Soviet-Chinese border, the Amur-Shilka-Onon system is c.2,700 mi (4,350 km) long. The Amur flows generally southeast, forming for more than 1,000 mi (1,610 km) the border between the Soviet Union and China, then NE through the Far Eastern USSR before entering the Tartar Strait opposite Sakhalin island. Its chief tributaries are the Ussun, Sungari, Zeya,

and Bureya rivers. One of the chief waterways of Asia, the Amur is navigable for small craft for its entire length during the ice-free season (May-Nov.). The chief ports are the Soviet cities of Khabarovsk (the head of large craft navigation), Komsomolsk, and Nikolayevsk.

Amurath, For Ottoman sultans thus named, see **MURAD**.

Amvets: see **AMERICAN VETERANS OF WORLD WAR II AND KOPEA**.

amygdalin (ämig'dälīn) see **BENZALDEHYDE**.

amylase (äm'alās'), ENZYME having physiological, commercial, and historical significance, also called **diastase**. It is found in both plants and animals. Amylase was purified (1835) from malt by Anselme Payen and Jean Persoz. Their work led them to suspect that similar substances, now known as enzymes, might be involved in biochemical processes. Amylase hydrolyzes **STARCH**, **GLYCOGEN**, and **DEXTRIN** to form in all three instances **GLUCOSE**, **MALTOSE**, and the limit-dextrins. Salivary amylase is known as **ptyalin**, although humans have this enzyme in their saliva, some mammals, such as horses, dogs, and cats, do not. Ptyalin begins polysaccharide digestion in the mouth, the process is completed in the small intestine by the pancreatic amylase, sometimes called **amylolysin**. The amylase of malt digests barley starch to the disaccharides that are attacked by yeast in the fermentation process.

amyloplast (äm'älöp'lās'), also called **leucoplast**, a special organelle, or plastid, occurring in the **CYTOPLASM** of plant cells. They are nonpigmented. Amyloplasts have the specific abilities to transform glucose, a simple sugar, into starch through the process of polymerization, and to store one or more starch grains within their stretched membranes. Especially large numbers of amyloplasts occur in subterranean storage tissues of some plants such as those that comprise the tuber of the common potato.

amylopsin (äm'älöp'sīn) see **AMYLASE**.

Amyot, Jacques (zhāk äm'yō'), 1513-93, French humanist, translator of Heliodorus' *Aethiopica* (1547), of Longus' *Daphnis and Chloë* (1559), and particularly of Plutarch's *Lives* (1559).

Amyot or Amiot, Joseph (zhōzēf'), 1718-1794?, French Roman Catholic missionary in China, a Jesuit. He wrote a long treatise on the history, sciences, and customs of the Chinese (15 vol., 1776-89). He was one of the first Europeans to make Chinese literature, antiquities, and customs known to Europe. He was an early authority on the Manchu language.

Amyraut, Moïse (mōēz' ämērō'), or **Moses Amyrault** (ämīrāl'dās), 1596-1664, French Protestant theologian. As pastor of Saumur he won a reputation as a theologian and orator, and he was appointed (1631) to present to Louis XIII the protest of the synod against infractions of the Edict of Nantes. He became professor of theology at Saumur and wrote extensively on theological subjects.

Amytal (äm'töl'), trade name for the drug amobarbital, a **BARBITURATE**.

Amzi (äm'zī) 1 **Levite** 1 **Chron** 6:46 2 One of a priestly family **Neh** 11:12

Anab (ä'nāb), hill town, SW Palestine **Joshua** 11:21, 15:50

Anabaptists (än'äbäp'tists) [from Gr. =rebaptizers], name applied, originally in scorn, to certain Christian sects holding that infant baptism is not authorized in Scripture and that baptism should be administered to believers only. A convert if baptized in infancy must be rebaptized. Anabaptists were prominent in Europe during the 16th cent., forming part of the radical wing of the Reformation. Their principal centers were in Germany, Switzerland, Moravia, and the Netherlands. They are to be distinguished from the **BAPTISTS**, primarily an English group. The religious ideas of the Anabaptists antedate the Reformation. Although they were never united either politically or doctrinally, Anabaptists held certain views in common for which they were persecuted everywhere. Among these were their desire for radical religious, social, and economic reform and their advocacy of the separation of church and state. In their beliefs great stress was placed upon individual conscience and private inspiration. Perhaps their most characteristic and most influential belief was their conception of the church as a voluntary association of believers. Martin Luther regarded them as enemies of the Reformation and added to their persecution. Most of the Anabaptists were peace loving and moderate, but extremists led by Thomas MÜNZER, a Saxon pastor, helped to incite the Peasants' War. Leaders like Melchior Hoffman, a Swabian farmer, spread doctrines of an imminent

return of Christ and the "reign of God," without church or dogma. In Münster c 1533 some of the Anabaptists set up a theocracy, first under the direction of Bernard Rothmann, a preacher, and Jan Matthis, a fanatical Dutch baker, then under Bernhard Knipperdollinck. In 1534 JOHN OF LEIDEN proclaimed himself King David and ruled this theocracy in which communal ownership of property and polygamy were practiced. This extreme form of Anabaptism ended with the execution of the leaders in 1535. Another group of Anabaptists, under the leadership of MENNO SIMONS, became MENNONITES. Others, descendants of the followers of Jacob Hutter, moved in 1874 from Russia to South Dakota (see Hutterian Brethren). See studies by C. P. Clasen (1972) and K. P. Davis (1974).

Anabasis (anāb'āsīs) see XENOPHON

anabolism: see METABOLISM

Anacletus, Saint. see CLETUS, SAINT

Anaconda (ānākōn'dā), city (1970 pop. 9,771), seat of Deer Lodge co., SW Mont.; inc. 1887. Marcus Daly chose this place (1883) to build the smelter for the Anaconda Copper Mining Company and in the 1890s tried unsuccessfully to make it the state capital. The present high-stacked smelter (585 ft/178 m high), one of the largest in the world, dominates the life of the city and produces copper, zinc, and manganese.

anaconda: see BOA

Anacreon (anāk'rēon, -ōn), fl. c 521 B.C., Greek lyric poet, b. Teos in Ionia. He lived at Samos and at Athens, where Hipparchus patronized him. His poetry, graceful and elegant, celebrates the joys of wine and love. Little of his verse survives. The Anacreontics were poems in the style of Anacreon written from Hellenistic to late Byzantine times.

Anadyr (anādīr'), river, c 695 mi (1,120 km) long, rising on the Anadyr Plateau, NE Far Eastern USSR, and flowing S then E into Anadyr Bay, an inlet of the Bering Sea. The Anadyr basin, a lowland between the Anadyr and Koryak ranges, is mostly covered by tundra. There are coal and gold deposits near the river's mouth. The town of Anadyr, capital of Chukchi National Okrug, Khabarovsk Krai, is a port on the bay.

anae-, for words beginning thus, see ANE-

anagram [Gr. = something read backward], rearrangement of the letters of a word or words to make another word or other words. A famous Latin anagram was an answer made out of a question asked by Pilate. The question was *Quid est veritas?* [What is truth?], and the answer *Est vir qui adest* [it is the man who is here]. An anagram that reads the same backward as forward is a palindrome, e.g., "Able was I ere I saw Elba."

Anah (ā'nā), name appearing several times in the genealogy of Esau's family. Three persons may be distinguished, but if the genealogy refers to tribes rather than to persons, Anah may be a single tribal name. Gen. 36, 1 Chron. 1.

Anaharath (ān'ahā'rāth), unidentified town of E central Palestine. Joshua 19:19.

Anaheim (ān'āhīm), city (1970 pop. 166,701), Orange co., S Calif., SE of Los Angeles, inc. 1870. Anaheim was founded by Germans in 1857 as an experiment in communal living. Lying in an area of citrus fruit and walnut groves, the city is an important industrial center and one of the great tourist and convention centers in the United States. In Anaheim are Disneyland (opened 1955), a gigantic amusement park, the Anaheim Stadium, home of the American League's California Angels baseball team, and the Anaheim Convention Center. Among the city's manufactures are electronic equipment, guidance systems, paper converters, metal fabricators, greeting cards, and processed foods.

Anahuac (ānā'wāk) [Aztec, =near the water], geographical term used variously in Mexico before the Spanish Conquest. Today it commonly refers to that part of the central plateau of Mexico comprising the Pánuco and Lerma river systems and the lake basin of the Valley of Mexico.

Anaiah (ān'ā'ā, ānā'yā), name of two persons who returned from the Exile. Neh. 8:4, 10:22.

Anak (ā'nāk), in the Bible, ancestor of the Anakim or Anakims, a race of giants inhabiting Hebron and its vicinity at the time of the conquest of Canaan. ARBA is cited as Anak's father, and his sons are given as Ahiman, Sheshai, and Talmai. Joshua and Caleb practically eradicated the race. Num. 13:22, 28, 33, Deut. 1:28, 9:2, Joshua 11:21, 14:15, 15:13, 14, 21:11, Judges 1:20.

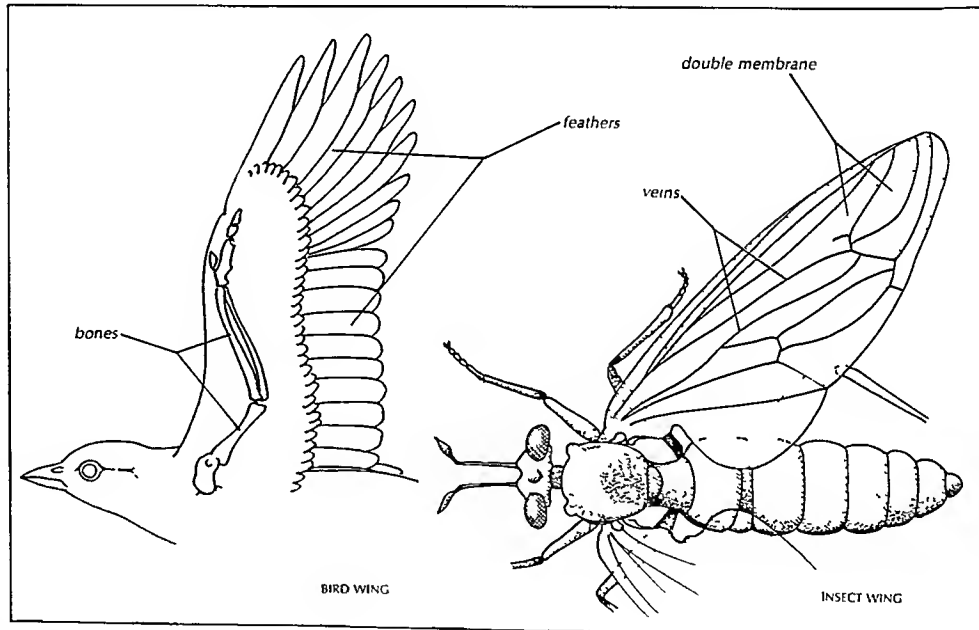
analgesic (ān'aljē zīk), any of a diverse group of drugs used to relieve pain. Analgesic drugs include

the nonnarcotics such as the SALICYLATES, the narcotic drugs such as MORPHINE, and synthetic drugs with morphinelike action (see NARCOTIC). ASPIRIN and other salicylates reduce fever and inflammation as well as relieve pain. Salicylate substitutes such as phenacetin or acetaminophen (Tylenol) are often given to individuals sensitive or allergic to salicylates. Phenylbutazone (Butazolidin) and chemically similar drugs reduce pain in diseases associated with inflammation such as rheumatic and arthritic disorders, but these drugs are very toxic and are not used where salicylates alone are effective. Narcotic analgesics depress the central nervous system and alter the perception of pain. They are used to alleviate pain not relieved by the salicylates. Besides morphine and codeine, this group includes the synthetic narcoticlike substances propoxyphene (Darvon) and MEPERIDINE (Demerol).

analog circuit, electronic circuit that operates with currents and voltages that vary continuously with time, having no abrupt transitions between levels. Generally speaking, analog circuits are contrasted with DIGITAL CIRCUITS, which function as though currents or voltages were at one of a set of discrete levels, all transitions between levels being ignored. Since most physical quantities, e.g., velocity and temperature, vary continuously, an analog circuit provides the best means of representing them. However, for rapid calculations in a computer, digital circuits are often preferred. Thus, high-speed converters are required to change the data from one form to another.

analog computer: see COMPUTER

analogy, in biology, the similarities in function, but differences in evolutionary origin, of body structures in different organisms. For example, the wing of a bird is analogous to the wing of an insect, since



Analogy in bird and insect wings

both are used for flight. However, there is no common ancestral origin in the evolution of these structures. While the wings of birds are modified skeletal forelimbs, insect wings are extensions of the body wall. Although insects and birds do have a very remote common ancestry (more than 600 million years ago), the wings of the two groups evolved after their ancestries had separated. See also HOMOLOGY.

analysis, branch of MATHEMATICS that utilizes the concepts and methods of the CALCULUS. It includes not only basic calculus, but also advanced calculus, in which such underlying concepts as that of a LIMIT are subjected to rigorous examination, differential and integral equations, in which the unknowns are FUNCTIONS rather than numbers, as in algebraic equations, complex variable analysis, in which the variables are of the form $z = x + iy$, where i is the imaginary unit, VECTOR analysis and TENSOR analysis, DIFFERENTIAL GEOMETRY, and many other fields.

analysis, chemical: see CHEMICAL ANALYSIS

analysis situs: see TOPOLOGY

analytic geometry, branch of GEOMETRY in which points are represented with respect to a coordinate system, such as CARTESIAN COORDINATES, and in which the approach to geometric problems is pri-

marily algebraic. Its most common application is in the representation of equations involving two or three variables as curves in two or three dimensions or surfaces in three dimensions. For example, the linear equation $ax + by + c = 0$ represents a straight line in the xy -plane, and the linear equation $ax + by + cz + d = 0$ represents a plane in space, where a , b , c , and d are constant numbers (coefficients). In this way a geometric problem can be translated into an algebraic problem and the methods of algebra brought to bear on its solution. Conversely, the solution of a problem in algebra, such as finding the roots of an equation or system of equations, can be estimated or sometimes given exactly by geometric means, e.g., plotting curves and surfaces and determining points of intersection. In plane analytic geometry a line is frequently described in terms of its slope, which expresses its inclination to the coordinate axes, technically, the slope m of a straight line is the (trigonometric) tangent of the angle it makes with the x -axis. If the line is parallel to the x -axis, its slope is zero. Two or more lines with equal slopes are parallel to one another. In general, the slope of the line through the points (x_1, y_1) and (x_2, y_2) is given by $m = (y_2 - y_1) / (x_2 - x_1)$. The conic sections are treated in analytic geometry as the curves corresponding to the general quadratic equation $ax^2 + bxy + cy^2 + dx + ey + f = 0$, where a , b , c , d , e , and f are constants and a , b , and c are not all zero. In solid analytic geometry the orientation of a straight line is given not by its slope but by its direction cosines, λ , μ , and ν , the cosines of the angles the line makes with the x -, y -, and z -axes, respectively, these satisfy the relationship $\lambda^2 + \mu^2 + \nu^2 = 1$. In the same way that the conic sections are studied in two dimensions, the 17 quadric surfaces, e.g., the ellipsoid, paraboloid, and elliptic paraboloid, are studied in solid

analytic geometry in terms of the general equation $ax^2 + by^2 + cz^2 + dxy + exz + fyz + px + qy + rz + s = 0$. The methods of analytic geometry have been generalized to four or more dimensions and have been combined with other branches of geometry. Analytic geometry was introduced by Rene Descartes in 1637 and was of fundamental importance in the development of the CALCULUS by Sir Isaac Newton and G. W. Leibniz in the late 17th cent. More recently it has served as the basis for the modern development and exploitation of ALGEBRAIC GEOMETRY.

Anamim (ān'amīm), unidentified tribe of Egypt. Gen. 10:13, 1 Chron. 1:11.

Anammelech (anām'alēk), god of an otherwise unknown Samaritan cult. 2 Kings 17:31.

Anan (ā'nān), sealer of the covenant. Neh. 10:26.

Anan (an'an), city (1970 pop. 58,467), Tokushima prefecture, E Shikoku, Japan, on the Kii Channel. It is a fishing port and agricultural center.

Anan ben David (ānān'), fl. 8th cent., Babylonian Jewish theologian, founder of the Ananites from whom the KARAITES claim spiritual descent. He is said to have been a descendant of BOSTANAI BEN CHANINAI. Anan rejected the Talmudic tradition and in its place sought a return to Scripture as the sole source for God's Law. It is evident from those writ-

ings attributed to him that he made use of rabbinic methods of scriptural interpretation in the formulation of legal decisions to meet the needs of his age. These decisions often represent a quite ascetic attitude. See Leon Nemoy, *Karaite Anthology* (1952).

Ananda (ā'nandā) see PALI LITERATURE

Anani (ānā'nī), descendant of David 1 Chron 3 24

Ananiah (ā'nānī'ā) 1 Ancestor of AZARIAH 20 2 Benjaminite town, probably just N of Jerusalem Neh 11 32

Ananias (ān'ānī'ās) [Gr, = Heb ANANIAH and HANANIAH] 1 Man who, with his wife Sapphira, held back part of a gift to the church and lied about it. They were rebuked by Peter and fell dead Acts 5 1-11. The name has become a term for liar. 2 High priest at Jerusalem, a Roman sympathizer, hated by most of the Jews for his oppression and his alliance with the Roman interest. He was assassinated between A.D. 60 and 67 Acts 23 2-5, 24. 3 Christian at Damascus who took charge of Paul after his conversion Acts 9 10-22. 4 One of the THREE HOLY CHILDREN.

Ananites: see ANAN BEN DAVID, KARAITES

anaphylaxis (ān'afalāk'sīs), hypersensitive state that may develop after introduction of a foreign protein or other antigen into the body tissues. When an anaphylactic state exists, a second dose of the same protein (commonly an antibiotic such as penicillin, or certain insect venoms) will cause a violent allergic reaction. Anaphylaxis results from the production of specific antibodies in the tissues in very high concentration; the violent reaction is produced by the neutralization of antigens by the antibodies. The histamines released during the reaction are thought to cause the most damage, i.e., severe vasodilation and loss of capillary fluid, resulting in circulatory collapse. Other symptoms include urticaria or edema, choking, coughing, shock, and loss of consciousness. Death may occur within 5 to 10 min if no medical help is available. Anaphylaxis differs from IMMUNITY, in immunity, antibodies circulate in the blood and neutralize antigens without producing a violent reaction. See also ALLERGY, SERUM SICKNESS.

anaplasmosis (ān'aplāzmō'sīs), infectious blood disease in cattle, sheep, and goats, caused by a protozoan of the genus *Anaplasma*. The organism parasitizes red blood cells causing their destruction and producing emaciation, anemia, jaundice, and, occasionally, death. The disease is present in the warmer regions of the world and is most prevalent in the United States in the Gulf states, lower plains, and California. Wild ruminants such as deer and antelope may be asymptomatic carriers. Transmission of the disease occurs mainly by the spread of infected blood through insect vectors, especially ticks and biting flies. The incubation period varies from three to four weeks. Infected animals first show a fever, which may rise to 107°F (62°C) in severe cases, and then jaundice and anemia set in. They are often hyperexcitable and may attack attendants just before death. Pregnant cows will frequently abort. Treatment of anaplasmosis consists of antibiotic therapy and blood transfusions. Control is extremely difficult because of the wide range of insects capable of transmitting the disease, the presence of carriers in wild-animal populations, and the difficulty of detecting infected animals. Continuous feeding of antibiotics, segregation of affected animals, and vaccination are the only effective means of control.

Anarajapura: see ANURADHAPURA, Sri Lanka

anarchism (ān'arkīzəm) [Gr, =having no government], theory that equality and justice are to be sought through the abolition of the state and the substitution of free agreements between individuals. Central to anarchist thought is the belief that society is natural and that men are good but are corrupted by artificial institutions. Also central in anarchism are the belief in individual freedom and the denial of any authority, particularly that of the state, that hinders man's development. Zeno of Citium, founder of Stoic philosophy, is regarded as the father of anarchism. In the Middle Ages the anarchist tradition was closely linked to utopian, millenarian religious movements such as the Brethren of the Free Spirit of the 13th cent. and the Anabaptists of the 16th cent. The philosophy of modern political anarchism was outlined in the 18th and 19th cent. by William GODWIN, P. J. PROUDHON, and others. Mikhail BAKUNIN attempted to orient the First INTERNATIONAL toward anarchism but was defeated by Karl MARX. Bakunin gave modern anarchism a collectivist and violent tone that has persisted despite the revisionary efforts of Piotr Kropotkin and Leo Tolstoy. Political anarchism in Russia was sup-

pressed by the Bolsheviks after the Russian Revolution. Anarchism's only real mass following was in Latin countries, where its doctrines were often combined with those of SYNDICALISM, especially in Spain. In the United States, early anarchists such as Josiah WARREN were associated with cooperatives and with utopian colonies. After the Haymarket riot in Chicago in 1886 and the assassination of President McKinley in 1901 a law was passed forbidding anarchists to enter the country. The SACCO-VANZETTI CASE attests to the fear of anarchism in the United States. As an organized movement, anarchism is almost dead, but it retains importance as a philosophical attitude and a political tendency. See George Woodcock, *Anarchism* (1962), L. I. Krimerman and L. Perry, ed., *Patterns of Anarchy* (1966), Atindranath Bose, *History of Anarchism* (1967), Roderick Kedward, *The Anarchists* (1971), Gerald Runkle, *Anarchism, Old and New* (1972).

Anasazi culture (ān'asa'zē) see BASKET MAKERS, CLIFF DWELLERS, PUEBLO INDIANS

Anastasia, Saint (ānastā'shā), 4th cent., Roman noblewoman, kind to the poor, martyred under Diocletian. She is mentioned in the Canon of the Mass. In the Roman Catholic Church, her feast is Dec 25 and is commemorated in the Christmas Mass at dawn. In the Orthodox Eastern Church her feast is Dec 22.

Anastasia (Anastasia Nikolayevna) (ānastā'shā nyīkalī'āfnā), 1901-1918, youngest daughter of Czar Nicholas II, last of the Russian czars. It is generally believed that she was killed with the rest of her immediate family after the Russian Revolution, however, several women later claimed to be Anastasia. See study by M. Maurette (1955).

Anastasius I (ānastā'shās, -zhas), c. 430-518, Roman emperor of the East (491-518), successor of Zeno, whose widow he married. He broke the power that the Isaurians had enjoyed since Leo I, made peace with Persia, maintained friendly relations with Theodoric the Great, and made Clovis I an ally. He built a wall to protect Constantinople against the Slavs and Bulgars. His reign saw the revision of tax collection and the abolition of gladiatorial contests. His Monophysite inclinations stirred religious unrest throughout the empire. Anastasius was succeeded by Justin I.

Anath (ā'nāth), father of SHAMGAR

anathema (ānā'thīma) [Gr, =set aside, as a devoted object], traditional Christian decree of EXCOMMUNICATION in its severest form. The usual form of a canon of a council is, "If anyone (says such and such or does so-and-so), let him be anathema." References to it appear in 1 Cor 16 22 and Gal 1 8-9.

Anathoth (ān'āthōth, -thōth) 1 Town, NE of Jerusalem, near the modern Anata, Jordan. It was the home of Jeremiah Jer 1 1, 1 Chron 12 3, 1 Kings 2 26, Neh 7 27. Its adjective is Antiothite, Anetothite, Anathothite 1 Chron 27 12, 123. 2 Chief of the people Neh 10 19. 3 Benjamite 1 Chron 7 8.

Anatolia (ān'atō'lēā) [Gr, =sunrise], Asian part of Turkey, usually synonymous with ASIA MINOR.

Anatolian languages (ān'atō'lēān), subfamily of the Indo-European family of languages (see INDO-EUROPEAN, table). The progress made in the identification, decipherment, and analysis of the Indo-European Anatolian languages from extant texts owes much to 20th-century scholarship. These Anatolian languages were spoken in Anatolia, or Asia Minor, from about the 2d millennium B.C. and gradually became extinct during the first few centuries A.D. They include Cuneiform Hittite, Hieroglyphic Hittite, Luwian (also called Luvian or Luish), Palaic, Lycian, and Lydian. The Anatolian languages are the tongues of Indo-European-speaking invaders of Anatolia and became mixed to some extent with indigenous languages of the region. Much of the vocabulary of the Anatolian languages was apparently borrowed from these native tongues, but their grammar continued to be essentially Indo-European. The principal known member of the Anatolian division of the Indo-European family is Hittite, the tongue of the HITTITES, who entered and conquered much of Anatolia early in the 2d millennium B.C. The oldest surviving written records of Hittite, dated at about the 15th or 14th cent. B.C., are among the earliest extant remains of any Indo-European language. From c. 1500 to 1200 B.C., Hittite was written both in CUNEIFORM (a system of writing taken over from Mesopotamia) and in HIEROGLYPHICS (a form of picture writing unrelated to the hieroglyphics of Egypt). After the fall of the Hittite Empire (c. 1200 B.C.) the use of cuneiform ceased, but writing in hieroglyphics continued until the 7th cent.

B.C. Cuneiform and Hieroglyphic Hittite are separate but closely related languages. A near relative of Hittite was Luwian, the Anatolian language of the now extinct Luvian people. Dominant in a large part of S Anatolia during the period of the Hittite Empire, Luwian was written in cuneiform, and its surviving documents go back to the 14th cent. B.C. In areas of N Anatolia, Palaic flourished. Also close to Hittite, it was written in cuneiform. Grammatical features common to Hittite, Luwian, and Palaic include two genders, one of which combines masculine and feminine as a common gender and the other of which is neuter, two moods, indicative and imperative, the first of which has a present and a preterite tense, and two voices, active and middle. Lycian, a language of SW Anatolia for which there are written records dated from about the 5th to 4th cent. B.C., may have been a continuation of Luwian. Lycian was written in a form of the Greek alphabet, as was Lydian. Lydian was spoken in W Anatolia, and the surviving written records date from about the 5th to 4th cent. B.C. The term "Anatolian languages" is also used to refer to all languages, Indo-European and non-Indo-European, that were spoken in Anatolia in ancient times. See E. H. Sturtevant and E. A. Hahn, *A Comparative Grammar of the Hittite Language* (2d ed. 1951), Johannes Friedrich, *Extinct Languages* (tr. 1957, repr. 1971).

anatomy, branch of biology concerned with the study of body structure of plants and animals, including man; the study of plant structures is often called comparative morphology. Comparative anatomy is concerned with the structural differences of various animal forms. The study of similarities and differences in anatomical structures forms the basis for CLASSIFICATION of both plants and animals. Embryology (see EMBRYO) deals with developing plants or animals until hatching or birth (or germination, in plants). CYTOLOGY covers the internal anatomy of the cell, while HISTOLOGY is concerned with the study of aggregates of similarly specialized cells, called tissues. There are four basic types of tissue in the human body: epithelial tissue (see EPITHELIUM), muscular tissue (see MUSCLE), CONNECTIVE TISSUE, and nervous tissue (see NERVOUS SYSTEM). Human anatomy is often studied by considering the individual systems that are composed of groups of tissues and organs, such systems include the skeletal system (see SKELETON), muscular system, cutaneous system (see SKIN), circulatory system (including the LYMPHATIC SYSTEM), respiratory system (see RESPIRATION), DIGESTIVE SYSTEM, REPRODUCTIVE SYSTEM, URINARY SYSTEM, and ENDOCRINE SYSTEM. Little was known about human anatomy in ancient times because dissection, even of corpses, was forbidden. In the 2d cent., Galen, largely on the basis of animal dissection, made valuable contributions to the field that remained authoritative until the 14th and 15th cent., when a limited number of cadavers were made available to the medical schools. A better understanding of the science was soon reflected in the discoveries of Vesalius, William Harvey, and John Hunter.

Anau: see ANNAU, USSR

Anaxagoras (ān'aksāg'aras), c. 500-428 B.C., Greek philosopher of Clazomenae. He is credited with having transferred the seat of philosophy to Athens. He was closely associated with many famous Athenians and is thought to have been the teacher of Socrates. His belief that the sun was a white-hot stone and that the moon was made of earth that reflected the sun's rays resulted in a charge of atheism and blasphemy, forcing him to flee to Lampsacus, where he died. Rejecting Empedocles' four elements (earth, air, fire, and water), Anaxagoras posits an infinity of particles, or "seeds," each unique in its qualities. All natural objects are composed of particles having all sorts of qualities, a preponderance of similar though not identical particles creates the difference between wood and stone. Anaxagoras' universe, before separation, was an infinite, undifferentiated mass. The formation of the world was due to a rotary motion produced in this mass by an all-pervading mind (nous). This led to the separating out of the "seeds" and the formation of things. Although Anaxagoras was the first to give mind a place in the universe, he was criticized by both Plato and Aristotle for only conceiving of it as a mechanical cause rather than the originator of order. See D. E. Gershenson and D. A. Greenberg, *Anaxagoras and the Birth of Physics* (1964).

Anaximander (anāk'sīmān'dār), c. 611-c. 547 B.C., Greek philosopher, b. Miletus, pupil of THALES. He made the first attempt to offer a detailed explanation of all aspects of nature. Anaximander argued

that since there are so many different sorts of things, they must all have originated from something less differentiated than water, and this primary source, the boundless or the indefinite (*apeiron*), had always existed, filled all space, and, by its constant motion, separated opposites out from itself, e.g., hot and cold, moist and dry. These opposites interact by encroaching on one another and thus repay one another's "injustice." The result is a plurality of worlds that successively decay and return to the indefinite. The notion of the indefinite and its processes prefigured the later conception of the indestructibility of matter. Anaximander also had a theory of the relation of earth to the heavenly bodies, important in the history of astronomy. His view that man achieved his physical state by adaptation to environment, that life had evolved from moisture, and that man developed from fish, anticipates the theory of evolution. See C. H. Kahn, *Anaximander and the Origins of Greek Cosmology* (1960), Paul Selegman, *The Apeiron of Anaximander* (1974).

Anaximenes (än'äksim'inēz), Greek philosopher, 6th cent. B.C., last of the Milesian school founded by THALES. With Thales he held that a single element lay behind the diversity of nature, and with ANAXIMANDER he sought a principle to account for diversity. He believed that single element to be air. The principle of diversification he taught was rarefaction and condensation. Different objects were therefore merely different degrees of density of the one basic element. Anaximenes anticipates the spirit of modern scientific practice that seeks to explain qualitative differences quantitatively.

ancestor worship, ritualized propitiation and invocation of dead kin. Closely related to the primitive concept of ANIMISM, ancestor worship is based on the belief that the spirits of the dead continue to dwell in the natural world and have the power to influence the fortune and fate of the living. Ancestor worship has been found in various parts of the world and in diverse cultures. It was a minor cult among the Romans (see MANES). The practice reached its highest elaboration in W. Africa and in the ancient Chinese veneration of ancestors. It is also well developed in the Japanese SHINTO cult and among the peoples of Melanesia. See APOTHEOSIS, TOTEM. See J. G. Frazer, *The Belief in Immortality and the Worship of the Dead* (3 vol., 1913-24, repr. 1968).

Anchieta, José de (zhōōzē' dī ānshēā'ta), 1530-97, Brazilian Jesuit missionary, b. Canary Islands of Spanish parents. A tireless traveler and pioneer, he spread Portuguese control and settlement and was a founder of the city of São Paulo. He wrote in Spanish, Latin, Portuguese, and Tupi and wrote poetry as well as prose tracts on history, philosophy, and religion. He is usually regarded as the first Brazilian writer. See H. G. Dominican, *Apostle of Brazil* (1958).

An-ch'ing (an-ch'ing) or **Anking** (an'king), city (1970 est. pop. 160,000), SW Anhwei prov., China. A port and trading center on the Yangtze River, it was capital of the province until 1949. It was formerly called Huaining.

Anchises (änkī'sēz), in Greek mythology, Trojan shepherd. He was seduced by Aphrodite, and from this union Aeneas was born. When Anchises boasted of the goddess's love, Zeus crippled him.

anchor, device cast overboard to secure a ship, boat, or other floating object by means of weight, friction, or hooks called flukes. In ancient times an anchor was often merely a large stone, a bag or basket of stones, a bag of sand, or, as with the Egyptians, a lead-weighted log. The Greeks are credited with the first use of iron anchors, while the Romans had metal devices with arms similar to modern anchors. The ordinary modern anchor consists of a shank (the stem, at the top of which is the anchor ring), a stock (the crosspiece at the top of the shank, either fixed or removable), a crown (the bottom portion), and arms, attached near the base of the shank at a right angle to the stock and curving upward to end in flat, triangular flukes. Other types of anchors include the patent anchor, which has either no stock at all or a stock lying in the same plane as the arms, the stream, or stern anchor, lighter than the regular anchor and used in narrow or congested waters where there is no room for the vessel to swing with the tide, and the grapnel, a small four-armed anchor used to recover lost objects. A sea anchor is a wooden or metal framework covered with canvas and weighted at the bottom, it is a temporary device used by disabled ships. Modern ships have several anchors, usually there are two forward and two aft. Formerly made of wrought iron, anchors are now usually made of forged steel.

Anchorage (äng'kärj), city (1970 pop. 48,029), Anchorage census div., S central Alaska, a port at the head of Cook Inlet, inc. 1920. It is the largest city in the state, the administrative and commercial heart of S central and W Alaska, one of the nation's key defense centers, and a vital transportation hub. Glenn Highway connects the city to the Alaska Highway, and the international airport there, one of the nation's busiest, is a regular stop on intercontinental and transpolar flights. Adjacent to the city are two huge U.S. military bases, Fort Richardson and Elmendorf Air Force Base, the latter contains the headquarters for the entire Alaska command (including navy and coast guard). Anchorage is also a focus for the state's oil, coal, and natural gas industries, anticipated pipelines from areas where new discoveries have been made are expected to result in the expansion of these industries. Tourism also contributes to the city's economy. Anchorage was founded (1915) as construction headquarters for the Alaska RR and grew as a railroad town. It also became a fishing center, a market and supply point for gold-mining regions to the north, and the metropolis for the coal mining and farming of the Matanuska valley. World War II brought the establishment of the large military bases and the enormous growth of air and rail traffic. The city suffered severe damage in the 1964 earthquake. Points of interest include Earthquake Park and several notable museums. A "Fur Rendezvous" winter carnival is held in Anchorage every year. The city is the seat of Alaska Methodist Univ. Portage Glacier and Lake Hood are nearby, and Mt. McKinley is visible from the city.

anchoret or **anchorite**: see HERMIT

anchovy: see HERRING

anchovy pear: see BRAZIL NUT

Anchoruma (ängkō-dō'ma), mountain, Bolivia. See ILLAMPU.

Ancona (ängkō'na), city (1971 pop. 110,017), capital of Ancona prov., chief city of Marche region, central Italy, on a promontory in the Adriatic Sea. It is a leading Adriatic port and an industrial and commercial center. Manufactures include ships, musical instruments, and refined sugar. There is a fishing industry and an annual fish fair. Late in the 4th cent. B.C., Greeks from Syracuse took refuge in Ancona. The city prospered under the Romans, and its harbor was enlarged (2d cent. A.D.) by Emperor Trajan. In the 9th cent. it became a semi-independent maritime republic under the nominal rule of the popes, to whose direct control it passed in 1532. The city was badly damaged in World War II. Noteworthy buildings include the Romanesque Cathedral of San Ciriaco (11th-13th cent.) and the Venetian-Gothic Merchants' Loggia (15th cent.).

Ancre, Concino Concini, marquis d': see CONCINI

Ancren Riwle (äng'krēn rē'dōlā) or **Ancrene Wisse** (äng'krēnā wī'sā) [Mid. Eng., = anchoresses' rule], English tract written c. 1200 by an anonymous English churchman for the instruction of three young ladies about to become religious recluses. The work, important as a sample of early Middle English prose, is a charming mixture of realism and humor, didacticism and tenderness. It is also important for its depiction of the manners and customs of the time. French and Latin versions of the work are also extant. See edition by J. R. R. Tolkien (1962), study by Arne Zettersten (1965).

Ancus Martius (äng'kās mar'shās), fourth king of ancient Rome (640?-616? B.C.). This semilegendary king is supposed to have enlarged the area of Rome.

Ancyra, Turkey. See ANKARA.

Ändalsnes (ön'dalsnäs"), town (1960 pop. 2,202), Møre og Romsdal co., W Norway, at the head of the Romsdalsfjord. It is a popular tourist resort. In World War II, the town was heavily damaged when the Germans pushed back (1940) an Allied landing.

Andalusia (ändälōō'zhā, -shā), Span. *Andalucía* (än'dalōōthē'a), region (1970 pop. 5,971,277), 33,675 sq mi (87,218 sq km), S Spain, on the Mediterranean Sea, the Strait of Gibraltar, and the Atlantic Ocean. Spain's largest and most populous region, it covers all of S Spain, comprising the provinces of Almería, Cádiz, Córdoba, Granada, Huelva, Jaén, Málaga, and Seville (Sevilla), all named for their chief cities. Andalusia is crossed in the north by the Sierra Morena and in the south by mountain ranges that rise in the snow-capped Sierra Nevada to the highest peak in mainland Spain, Mulhacén (11,417 ft/3,480 m), between the ranges lies the fertile basin of the Guadalquivir River. With its subtropical climate, Andalusia has many affinities with Africa, which it faces. Barren lands contrast with richly fertile regions where cereals, grapes, olives, sugarcane, and citrus and

other fruits are produced. Industries, based generally on local agricultural produce, include wine making, flour milling, and olive-oil extracting. Cattle, bulls for the ring, and fine horses are bred. The rich mineral resources, exploited since Phoenician and Roman times, include copper, iron, zinc, and lead. Mediterranean peoples have been attracted to this region since ancient times, and because of this Andalusia is one of Europe's most strikingly colorful regions. In the 11th cent. B.C., the Phoenicians settled there and founded several coastal colonies, notably Gadir (now Cádiz) and, supposedly, the inland town of Tartessus, which became the capital of a flourishing kingdom (sometimes identified with the biblical TARSHISH). Greeks and Carthaginians came in the 6th cent. B.C., the Carthaginians were expelled (3d cent. B.C.) by the Romans, who included S Spain in the province of Baetica. The emperors Trajan, Hadrian, and Theodosius were born in the region. Visigoths ended Roman rule in the 5th cent. A.D., and in 711 the MOORS, crossing the Strait of Gibraltar, established there the center of their western *emirate* (see CORDOBA). Andalusia remained under Moorish rule until most of it was conquered in the 13th cent. by the kings of Castile, the Moorish kingdom of GRANADA survived, it, too, fell to the Catholic kings in 1492. The Moorish period was the golden age of Andalusia. Agriculture, mining, trade, and industries (textiles, pottery, and leather working) were fostered and brought tremendous prosperity, the Andalusian cities of Córdoba, SEVILLE, and Granada, embellished by the greatest Moorish monuments in Spain, were celebrated as centers of culture, science, and the arts. From the 16th cent. Andalusia generally suffered as Spain declined, although the ports of Seville and Cádiz flourished as centers of trade with the New World. Gibraltar was ceded to Britain in 1713, and in 1833 Andalusia was divided into the present eight provinces. With Catalonia, Andalusia was a stronghold of anarchism during the Spanish republic (est. 1931), however, it fell early to the Insurgents in the SPANISH CIVIL WAR of 1936-39. Despite the natural wealth of the region, poverty is widespread, Andalusian farm laborers are among the poorest in Europe, and many unemployed Andalusians have migrated to other Western European countries. The region has seen recurrent demonstrations against the national government of Francisco Franco. Moorish influence is still strong in the character, language, and customs of the people, which may account for the widespread hostility other segments of the Spanish population feel toward Andalusians. However, Andalusian songs, dances, and festivals, influenced by the large groups of gypsies who live in the region, enjoy great popularity.

Andalusia (ändälōō'shā, -zhā), city (1970 pop. 10,092), seat of Covington co., S Ala., in a farming and forestry area, inc. 1844. Its manufactures include processed peanuts and pecans, meat products, textiles, lumber, and plywood. Lurleen B. Wallace State Junior College is in Andalusia.

Andaman and Nicobar Islands (än'daman, nīk'ōbar), union territory (1971 pop. 115,090), India, in the Bay of Bengal. Port Blair (1971 pop. 26,212), in the Andamans, is the capital. Comprising the Andaman Islands (2,508 sq mi/6,496 sq km) in the south and the Nicobar Islands (707 sq mi/1,831 sq km) in the north, the territory chiefly exports tropical products and lumber. The territory is administered by the home minister in the central Indian government. Known to Europeans since the 7th cent. A.D., the Andamans, consisting of more than 200 islands, were the site of a British penal colony from 1858 to 1945. An earlier attempt by the British to colonize the islands was abandoned in 1796. The population is made up of native Negritos and settlers from the Indian mainland. The Nicobars, which comprise 19 small islands, are separated from the Andamans by a channel that is 90 mi (145 km) wide. The native population is of Mongoloid stock. The Nicobars became a British possession in 1869. See study by Lidio Cipriani (1966).

Andelys, Les (läzaNdälē'), town (1968 pop. 7,438), in Eure dept., N France, Normandy, on the Seine. The twin communities of Grand-Andely and Petit-Andely form a commercial center, with a distillery, metalworks, glassworks, and silk and leather industries. On the border between Normandy proper and the Norman VEXIN, it was of considerable strategic importance in the Middle Ages. The impressive Chateau Gaillard was built (1197) by Richard I of England.

Anderlecht (än'därlicht), commune (1970 pop. 103,796), Brabant prov., central Belgium, on the

Charleroi-Brussels Canal, an industrial and residential suburb of Brussels. Erasmus lived (1517-21) in Anderlecht, and his house is now a museum.

Andermatt (an'dərmāt), village (1970 pop. 1,589), Uri canton, S central Switzerland. It is a road junction, health resort, and sports center. The St. Gotthard Tunnel runs beneath the village. Andermatt has a 12th-century church.

Andernach (an'dərnākh), city (1970 pop. 27,140), Rhineland-Palatinate, W West Germany, a port on the Rhine River. Its manufactures include chemicals, steel, wood products, and construction materials. Drusus founded a Roman frontier garrison there about A.D. 12. In 939 at Andernach, Emperor Otto I defeated the rebellious dukes Geselbert of Lotharinga and Eberhard of Franconia. From 1167 to 1801 the city belonged to the archbishopric of Cologne. In 1815 it passed to Prussia. Andernach has a Romanesque church (13th cent.), a 16th-century town hall, and parts of its medieval city wall.

Andersen, Hans Christian, 1805-75, Danish poet, novelist, and writer of fairy tales. Reared in poverty, he left Odense at 14 for Copenhagen. He failed as an actor, but his poetry won him generous patrons including King Frederick VI. In 1829 his fantasy *A Journey on Foot from the Holmen Canal to the Eastern Point of Amager* was published, followed by a volume of poetry in 1830. Granted a traveling pension by the king, Andersen wrote sketches of the European countries he visited. His first novel, *Improvvisatoren* (1835), was well received by the critics. His sentimental novels were for a time considered his forte. However, with his first book of fairy tales, *Eventyr* (1835), he found the medium of expression that was to immortalize his genius. He produced about one volume a year and was recognized as Denmark's greatest author and as a storyteller without peer. His tales are often tragic or gruesome in plot. His sense of fantasy, power of description, and acute sensitivity contributed to his mastery of the genre. Among his many widely beloved stories are "The Fir-Tree," "The Little Match Girl," "The Ugly Duckling," "The Snow Queen," "The Little Mermaid," and "The Red Shoes." See his *Fairy Tales*, tr. by R. P. Keigwin (4 vol., 1956-60), his autobiography (1855, tr. 1871), *A River—A Town—A Poet*, autobiographical selections by A. Dreslov (1963), biographies by F. Book (tr. 1962), R. Godden (1955), M. Stirling (1965), and S. Toksvig (1934, repr. 1969).

Andersen Nexø, Martin (mārt'ēn an'dərsən nēkso), 1869-1954, Danish novelist. Born one of 11 children in a Copenhagen slum, he spent his impoverished childhood largely on the island of Bornholm. Both locales appear centrally in his novels. His famous proletarian novels *Pelle the Conqueror* (4 vol., 1906-10, tr. in 1 vol., 1930) and *Ditte, Daughter of Man-kind* (5 vol., 1917-21, tr. in 1 vol., 1931) relate the struggles of the poor, focusing attention on conditions of poverty in Denmark. Though admittedly a propagandist for communism and social reform, he transcended that role and created a memorable group of tender human portraits. He also wrote about Russia, where he spent many of his later years. The first two volumes of his four-volume autobiography have been translated as *Under the Open Sky* (1938). See Harry Slochower, *Three Ways of Modern Man* (1937).

Anderson, Carl David, 1905-, American physicist, b. New York City, grad. California Institute of Technology (B.S., 1927, Ph.D., 1930). Associated with the institute's physics department from 1930, he became professor in 1939. For his discovery (1932) of the positron, he shared with V. F. Hess the 1936 Nobel Prize in Physics. The meson (or mesotron) was discovered in cosmic rays in 1936 by Anderson and his associate S. H. Neddermeyer and almost simultaneously by J. C. Street and E. C. Stevenson at Harvard.

Anderson, Elizabeth Garrett, 1836-1917, English physician. A sister of Millicent Garrett Fawcett, Elizabeth also worked for woman suffrage. With difficulty she obtained a private medical education under accredited physicians and in London hospitals. In 1865 she was licensed to practice by the Scottish Society of Apothecaries. In London in 1866 she opened a dispensary, later a small hospital, for women and children, the first in England to be staffed by women physicians. It was known after 1918 as the Elizabeth Garrett Anderson Hospital. Largely as a result of her efforts, British examining boards opened their examinations to women. See biography by Jo Manton (1965).

Anderson, Jack, 1922-, American newspaper columnist, b. Long Beach, Calif. After serving as a Mormon missionary (1941-44) and a term as a war corre-

spondent during 1945, he was hired by Drew Pearson for the staff of his column, "Washington Merry-Go-Round." Anderson took over the column after Pearson's death in 1969. Controversial because of his unorthodox methods of obtaining news stories, Anderson has nonetheless produced vital information, especially concerning the Watergate affair. Anderson and Pearson collaborated on *The Case Against Congress* (1969).

Anderson, John, 1893-1962, Scottish-Australian philosopher, b. Scotland. A graduate of the Univ. of Glasgow, he taught (1918-27) at the universities of Cardiff, Glasgow, and Edinburgh before becoming professor of philosophy at the Univ. of Sydney, Australia (1927-58). His extreme concern for independence of thought led to a controversial academic career because he attacked many institutions (including Christianity, social welfare, and Communism) for encouraging servility. Philosophically he warred against ultimates of every sort, but his philosophy was inclusive rather than negative, stressing the complexity of experience—a complexity not reducible to any ultimate units or wholes—and the limits of any one description of it. His articles were collected in *Studies in Empirical Philosophy* (1962).

Anderson, Dame Judith, 1898-, Australian actress, originally named Frances Margaret Anderson. She made her debut in Sydney in 1915 and by 1924 had become celebrated for her powerful portrayals of classical and modern roles. In 1937 she made her London debut in *Macbeth* with Laurence Olivier. The title role in *Medea* by Robinson Jeffers, which she originated in 1947, was a personal triumph. Anderson's notable films include *Rebecca* (1940) and *Cat on a Hot Tin Roof* (1958). She was made a Dame of the British Empire in 1960.

Anderson, Margaret C., 1886-1973, American author, editor, and publisher, b. Indianapolis, Ind. As editor and publisher of *The Little Review* (1914-29), one of the most famous of the American LITTLE MAGAZINES, she included articles on controversial subjects and pieces by such writers as Vachel Lindsay, William Butler Yeats, Ernest Hemingway, Ezra Pound, and André Breton. From 1917 to 1920, *The Little Review* published excerpts from James Joyce's then unpublished novel *Ulysses* (1922). Because of their alleged obscenity, the U.S. Post Office burned four issues of the magazine containing the excerpts. In 1920, Anderson and her associate Jane Heap were convicted of publishing obscene matter, fined \$100, and fingerprinted. After 1923, Anderson lived in France. See her autobiography (3 vol., 1930, repr. 1971, 1951, repr. 1969, 1969).

Anderson, Marian, 1902-, American contralto, b. Philadelphia. She was the first Negro to be named a permanent member of the Metropolitan Opera Company, and she was also the first Negro to perform at the White House. Anderson first sang in Philadelphia church choirs, then studied with Giuseppe Boghetti. She began her concert career in 1924 and achieved her first great successes in Europe. Her rich, wide-ranged voice was superbly suited to both opera and the Negro spirituals that she included in her concerts and recordings. In 1939 the Daughters of the American Revolution (DAR) forbade her to perform at Constitution Hall in Washington, D.C. Eleanor Roosevelt resigned her DAR membership in protest and sponsored Anderson's concert at the Lincoln Memorial. In 1955 she made her debut with the Metropolitan Opera Company. She was appointed alternate delegate to the United Nations in 1958 and in 1963 was awarded the President's Medal of Freedom. See her autobiography, *My Lord, What a Morning* (1956).

Anderson, Mary, 1872-1964, American labor expert, chief (1919-44) of the Women's Bureau, U.S. Dept. of Labor, b. Sweden. She emigrated to the United States in 1888. After some years as an industrial worker in garment and shoe factories, she became an organizer for the National Boot and Shoe Workers' Union and one of the founders of the National Women's Trade Union League. In 1918 she was appointed assistant to the chief of the Women's Bureau, becoming its chief in 1919. See her autobiography, *Woman at Work* (1951, repr. 1973).

Anderson, Maxwell, 1888-1959, American dramatist, b. Atlantic, Pa., grad. Univ. of North Dakota, 1911. His plays, many of which are written in verse, usually concern social and moral problems. Anderson was a journalist until the successful production in 1924 of *What Price Glory?*, a war drama written with Laurence Stallings. *Winterset* (1935), based on the Sacco-Vanzetti case, is probably Anderson's most successful verse tragedy. He wrote many historical dramas including *Elizabeth the Queen*

(1930), *Mary of Scotland* (1933), *Valley Forge* (1934), *Joan of Lorraine* (1947), *Anne of the Thousand Days* (1948), and *Barefoot in Athens* (1951). Among his other plays are *Both Your Houses* (1933), *High Tor* (1937), *The Star Wagon* (1937), *Key Largo* (1939), and *The Eve of St. Mark* (1942). He also wrote the librettos for Kurt Weill's *Knickerbocker Holiday* (1938) and *Lost in the Stars* (1940). A collection of his poetry, *Notes on a Dream*, was published in 1972. See study by M. D. Bailey (1957), bibliography by Martha Cox (1958, repr. 1974).

Anderson, Robert, 1805-71, American army officer, defender of Fort Sumter, b. near Louisville, Ky., grad. West Point, 1825. He fought in the Black Hawk, Seminole, and Mexican wars and was promoted to major in 1857. In Nov. 1860, he took command of the U.S. force in the harbor of Charleston, S.C., where he distinguished himself in the Fort Sumter controversy. Anderson, made a brigadier general in the regular army (May, 1861), commanded the Dept. of Kentucky (June-Oct.). He retired from active service in Oct., 1863. In Feb., 1865, he was brevetted major general for his gallant service in the defense of Fort Sumter.

Anderson, Sherwood, 1876-1941, American novelist and short-story writer, best known for his novel *Winesburg, Ohio*, b. Camden, Ohio. After serving briefly in the Spanish-American War, he became a successful advertising man and later a manager of a paint factory in Elyria, Ohio. Dissatisfied with his life, however, Anderson abandoned both his job and his family and went to Chicago to become a writer. His first novel, *Windy McPherson's Son* (1916), concerning a boy's life in Iowa, was followed by *Marching Men* (1917), a chronicle about the plight of the working man in an industrial society. In *Winesburg, Ohio* (1919), his greatest novel, he explores the loneliness and frustration of small-town lives. This work contains perhaps the most successful expression of the theme that dominates all Anderson's works—the conflict between organized industrial society and the subconscious instincts of the individual. In his later novels—*Poor White* (1920), *Many Marriages* (1923), and *Dark Laughter* (1925)—he continues to explore, but generally with less skill, the spiritual and emotional sterility of a success-oriented machine age. Anderson's unique talent, however, found its best expression in his short stories. Such collections as *The Triumph of the Egg* (1921), *Horses and Men* (1923), and *Death in the Woods* (1933) contain some of his most compassionate and penetrating writing. In 1927, Anderson moved to Marion, Va., where he bought and edited two newspapers, one Republican and one Democratic. See his autobiographical *Story Teller's Story* (1924) and *Tar: A Midwest Childhood* (1926), memoirs (1942), letters (ed. by H. M. Jones and W. B. Rideout, 1953), biography by Irving Howe (1966), study by W. A. Sutton (1972), P. P. Appel, ed., *Homage to Sherwood Anderson* (1970).

Anderson. 1 City (1970 pop. 70,787), seat of Madison co., E central Ind., on the White River, inc. 1838. It is a manufacturing center in a rich farm area, products include automotive parts, steel tools, and corrugated paper boxes. The city's industrial growth began with the discovery of natural gas in 1887. The automotive industry was established in 1901. Anderson College is there. The city has a fine-arts center and a symphony orchestra. Nearby Mounds State Park has numerous prehistoric mounds. The Moravians operated an Indian mission nearby (1801-6). 2 City (1970 pop. 27,556), seat of Anderson co., NW 5 C., settled in the 17th cent., inc. 1828. The commercial center of a farming and livestock area, its manufactures include textiles, fiberglass products, and sewing machines. A junior college is there.

Anderson, river, c. 465 mi (750 km) long, rising in several lakes in NW Mackenzie dist., Northwest Territories, Canada. It meanders north and west before receiving the Carnwath River and flowing north to Liverpool Bay, an arm of the Arctic Ocean. The village of Staton is at its mouth.

Andersonville, village (1970 pop. 274), 5W Ga., near Americus, inc. 1881. In Andersonville Prison, tens of thousands of Union soldiers were confined during the Civil War under conditions so bad that more than 12,000 soldiers died. It is now a national historic site (see NATIONAL PARKS AND MONUMENTS, table). Andersonville National Cemetery, nearby, contains more than 13,000 soldiers' graves. See study by O. L. Fitch (1968).

Andersson, Dan (dan an'dərsən'), 1888-1920, Swedish poet, novelist, and short-story writer. Although his entire life was lived in extreme poverty, Andersson dealt in his works with religious and

ANDERSSON, KARL JOHAN

metaphysical rather than social problems. He worked as a laborer and achieved no recognition for his writing during his lifetime. Today he is considered one of the foremost Swedish writers. Among his best-known works are *Kolarhistorier* [the charcoal-burner's tales] (1914), *Kolvaktarens visor* [the charcoal-burner's songs] (1915), and the novel *De tre hemlösa* [three homeless ones] (1918).

Andersson, Karl Johan (yōō'hān an'darsōn'), 1827-67, Swedish explorer in Africa. In 1850 he and Francis Galton set out from Walvis Bay (in South West Africa) to explore Damaraland and Ovamboland, but they were able only to reach the Etosha Pan. On a second trip Andersson reached Lake Ngami, for years the goal of explorers, and penetrated for 60 mi (97 km) beyond it. A subsequent journey (1859) took him to the Kubango River in what is now Botswana. He died while seeking out the upper reaches of the Kunene River. He wrote *Lake Ngami* (1855) and *The Okavango River* (1861). *Notes of Travel in South Africa* is a posthumous account of his last trip and was reprinted in 1969.

Anderton shearer: see COAL MINING

Andes (ān'dēz), mountain system, more than 5,000 mi (8,000 km) long, W South America. The ranges run generally parallel to the Pacific coast and extend from Tierra del Fuego northward, across the equator, as the backbone of the entire continent. The Falkland Islands are a continuation of the Andes, and evidence shows that the system is continued in Antarctica. The Andes go through seven South American countries—ARGENTINA, CHILE, BOLIVIA, PERU, ECUADOR, COLOMBIA, and VENEZUELA. A geologically young system, the Andes were originally uplifted in the Cretaceous and Tertiary periods. They are still rising, volcanoes and earthquakes are common. The folded ranges are discontinuous—merging and bifurcating within the system—but as a whole they form one of the world's most important mountain masses. They are loftier than any other mountains except the Himalayas, with many snow-capped peaks more than 22,000 ft (6,700 m) high. Far south in Tierra del Fuego, the mountains run east and west, then turn north between Argentina and Chile. The westernmost of the mountains run into the sea, lining the coast of S Chile with islands. In the Patagonian Andes are high, glacier-fed lakes in both Argentina and Chile. The highest range of the Andes is on the central and northern Argentine-Chilean border, Aconcagua (22,835 ft/6,960 m, highest mountain of the Western Hemisphere) and Tupuncato are there. Between the peaks is Uspallata Pass, with the Transandine Railway and the Christ of the Andes. Other major peaks such as Llullaillaco flank the main range, and in N Chile subandean ranges enclose the high, cold Desert of Atacama. The central Andes broaden out in Bolivia and Peru in multiple ranges (c. 400 mi/640 km wide) with high plateau country (the altiplano) and many high intermontane valleys, where the great civilization of the Inca had its home. High in the mountains on the Peru-Bolivia border is Lake Titicaca. In Bolivia are the notable volcanoes, Illimani and Illampu, and in S Peru is El Misti. The western or coastal range in Peru has lofty peaks (notably Huascarán) and is crossed by the highest railroad of the Andes (from La Oroya to Lima). The ranges approach each other again in Ecuador, where the N Andes begin. Between two volcanic cordilleras (including the cloud-capped Chimborazo and Cotopaxi) are rich intermontane basins. In Colombia the Andes divide again, the western range running between the coast and the Cauca River, the central between the Cauca and the Magdalena rivers, and the eastern running north parallel to the Magdalena River, then stretching out on the coast into Venezuela. The Andes continue in some of the islands of the West Indies, and in Panama N Andean spurs connect with the mountains of Central America and thus with the Sierra Madre and the Rocky Mts. The Andes have an immense influence on the patterns of communication, climate, weather, and life in South America. Andean waters reach the Orinoco, the Amazon, and the Rio de la Plata. The plateaus and valleys of Bolivia, Peru, Ecuador, and Colombia have been peopled since remote times and saw the rise of not only the Inca and the Chibcha but some of the earliest Indian civilizations in the Western Hemisphere. Agriculture was the basis of these cultures (the native llama and alpaca were domesticated later), and the lands there are still tilled mainly for subsistence crops. Commercially the Andes have always been important for great mineral wealth, especially copper, silver, and tin. Oil has been found in the foothills of the N Andes. Certain Andean areas have developed a tourist trade. See Isaiah Bowman, *The Andes of Southern*

Peru (1916), A. G. Ogilvie, *Geography of the Central Andes* (1922), Claude Arthaud and F. Hebert-Stevens, *The Andes Roof of America* (tr. 1956), P. E. James, *Latin America* (1969), Takehide Kazami, *The Andes* (1972).

Andhra Pradesh (ān'drā pra'dāsh), state (1971 pop. 43,394,951), 106,052 sq mi (274,675 sq km), SE India, on the Bay of Bengal. The capital is HYDERABAD. The state was created in 1956 from the Telugu-speaking portions of Madras and Hyderabad states. It includes the northern portion of the Coromandel Coast of the Bay of Bengal. Although mountainous in the Eastern Ghats, Andhra Pradesh is largely on a plain drained by the Penner, the Krishna, and the Godavari rivers. Rice, sugarcane, peanuts, and cotton are raised, coal, chrome, and manganese are mined. The state takes its name from the Andhra dynasty (c. 230 B.C.-A.D. 230), which ruled most of the Deccan plateau. Among the political forces within Andhra Pradesh is a movement advocating separation from India. The state is governed by a chief minister and cabinet responsible to a bicameral legislature with one elected house and by a governor appointed by the president of India.

Andizhan (āndīzhān', Rus. andyēzhān'), city (1970 pop. 188,000), capital of Andizhan oblast, Uzbekistan, Central Asian USSR, in the Fergana Valley, on the Andizhan-Say River. It is an industrial center in an irrigated area that produces cotton and silk. Andizhan's history dates back to the 9th cent.

Andkhui (āndkhō'ē), city (1967 pop. 30,000), N Afghanistan, in Afghan Turkistan, near the USSR border. Wool is its chief product, and it has a noted trade in fruits and karakul (Persian lamb) skins. Andkhui is also known for its handwoven rugs. Legend attributes the city's founding to Alexander the Great (4th cent. B.C.). It was subject to the khanate of Bukhara for some time, until a Russo-Afghan boundary commission assigned it to Afghanistan in 1885.

Andocides (āndōs'īdēz), c. 440-390 B.C., one of the Ten Attic Orators (see ORATORY). In 415 B.C. he was accused of mutilating the hermae (sacred pillars topped by busts of the gods) and, in association with ALCIBIADES, of other sacrilege. He went into exile, and one of his speeches was a plea to be restored to citizenship. After he returned in 403, he was again accused (399) of sacrilege and again successfully defended himself.

Andong (an'dūng'), city (1970 est. pop. 76,000), E South Korea. It is a railroad junction and commercial center in an agricultural area where rice, hemp, cotton, and tobacco are grown.

Andorra (āndōr'a), Fr. *Andorre* (aNdōr'), small state (1970 est. pop. 21,000), 191 sq mi (495 sq km), high in the E Pyrenees between France and Spain, under the joint suzerainty of the president of France and the bishop of Urgel (Spain). It has iron and lead deposits, marble quarries, and extensive pine forests. Drained by the Valira River, Andorra comprises several high mountain valleys that are generally poor in soil but support large flocks of sheep. Livestock raising, the traditional source of livelihood, is being supplemented by a growing tourist trade, the picturesque little state now attracts over 500,000 visitors a year. Smuggling remains an important economic activity. In the 9th cent., Emperor Charles II is reputed to have made the bishop of Urgel overlord of Andorra. The French counts of Foix contested this overlordship, and finally in 1278 an agreement was

reached providing joint suzerainty. The rights of the count passed by inheritance through the house of Albret to Henry IV of France, and from the French kings to the French presidents. In actuality Andorra is independent, it pays homage to France and Spain only through nominal yearly gifts—960 francs and 460 pesetas, respectively. A semifederal state with an ancient communal agrarian organization, Andorra is governed by a council of 24 members, elected by the heads of families and led by a syndic. It has two radio stations, one of them French-controlled. The people, Catalan speaking and Roman Catholic, live in six villages, Andorra la Vella (1971 est. pop. 8,000, Span. *Andorra la Vieja*) is the most important.

Andover (ān'dōvər), town (1970 pop. 23,695), Essex co., NE Mass., inc. 1646. Chiefly a textile producer in the 19th cent., Andover now makes toiletries, electronic equipment, chemicals, rubber products, and other items. Two preparatory schools (Phillips Andover Academy, 1778, for boys, and Abbot Academy, 1829, for girls) are in Andover. The Addison Gallery of American Art and the Robert S. Peabody Foundation archaeological museum are on the Phillips Andover campus. In 1832, Samuel Francis Smith wrote the words for "America" in Andover. Harriet Beecher Stowe lived in the town and is buried there.

Andrada e Silva, José Bonifácio de: see BONIFÁCIO, JOSÉ

Andrássy, Julius, Count (ōn'drāsh-shē), 1823-90, Hungarian politician. One of the leading figures in the 1848-49 Hungarian revolution, he supported the liberal program of Louis KOSSUTH and after the Hungarian defeat he went into exile, mostly in Paris and London, until 1858. With Francis DEAK he then rose to prominence in the negotiations leading to the Ausgleich [compromise] of 1867, which created the AUSTRO-HUNGARIAN MONARCHY. Andrássy was (1867-71) the first constitutional premier of Hungary. He opposed Austrian interference, attained the creation of a separate Hungarian defense force, put down the opposition led by Kossuth's partisans, and established Magyar supremacy at the expense of Slavic and other minorities of the kingdom. In 1870 his influence was largely responsible for keeping Austria-Hungary neutral in the Franco-Prussian War. As foreign minister of the Dual Monarchy (1871-79) he reversed the anti-Prussian policy of his predecessor, Beust, held Austria-Hungary to the THREE EMPERORS' LEAGUE, and signed (1879) the Dual Alliance with Germany (see TRIPLE ALLIANCE AND TRIPLE ENTENTE). His chief program was to limit Russian expansion in the Balkans and to maintain the status quo among the Slavic peoples. At the Congress of Berlin (see BERLIN, CONGRESS OF) in 1878, he obtained for the Dual Monarchy the right to occupy BOSNIA AND HERCEGOVINA. This step provoked much opposition in Hungary because it further increased the Slavic element in the empire, and Andrássy resigned.

Andrássy, Julius, Count, 1860-1929, Hungarian politician, son of the elder Count Andrássy. He occupied several cabinet posts before becoming (1900) minister of the interior of Hungary in the coalition cabinet under WEKERLE. He opposed the Austrian diplomacy of 1914, and as foreign minister (late in 1918) he severed all connections with Germany in the hope of obtaining a separate peace for Austria-Hungary. In 1921 he was involved in the second attempt of King Charles (Emperor CHARLES I) to regain the Hungarian throne, and he later led the royalist opposition to Admiral Horthy and Count Stephen Bethlen. He wrote a number of political and historical studies, notably, in German, *Bismarck, Andrássy, and Their Successors* (1924, tr. 1927).

André, Brother (aNd'rā', an'-), 1845-1937, Canadian Roman Catholic mystic, b. St. Gregoire d'Iberville, Que. His secular name was Alfred Bissette, Bassette, or Bessette. For about 40 years he was a porter at a school in Montreal. His simple, devout life began (c. 1900) to attract attention. Many miraculous cures were attributed to him. Through his efforts the Oratory of St. Joseph was built in Montreal. See biographies by H. P. Bergeron (1938), K. K. Burton (1952), and Alden Hatch (1959).

Andre, Carl, 1935-, American sculptor, b. Quincy, Mass. A student of Patrick Morgan and Frank Stella, Andre produces sculptures of elemental, classic form. His works reflect the quarries, shipyards, and islands of his birthplace and his years spent as a freight-train brakeman. His celebrated floor pieces include *144 Pieces of Lead* (Mus. of Modern Art, New York City).

André, John (āndrā', ān'drē), 1751-80, British spy in the American Revolution. He was captured (1775) by Gen. Richard Montgomery in the Quebec cam-



paign but was exchanged and became adjutant general under Sir Henry Clinton. Major Andre negotiated with Benedict ARNOLD for the betrayal of West Point and was captured (Sept. 23, 1780), when returning to New York, by John Paulding, David Williams, and Isaac Van Wart, near Tarrytown, N.Y. He was tried, condemned, and hanged at Washington's headquarters at Tappan, despite protests from Clinton. Major Andre's charming personality and his talents in the arts had won him many American friends, who mourned him as a romantically tragic young man. See studies by J. T. Flexner (1953) and J. H. Smith (1969).

Andrea del Sarto: see SARTO, ANDREA DEL

Andreanof Islands: see ALEUTIAN ISLANDS

Andrée, Salomon August (sa'lōdmōn ou'gäst āndrā'), 1854-97, Swedish polar explorer. An aeronautical engineer, he was the first to attempt arctic exploration by air. His first attempt by balloon in 1896 was unsuccessful, owing largely to bad weather. In 1897, however, he set out again in a balloon called the *Eagle*. Beset by mishaps from the start, Andree and his party reached as far as 82° 56'N, where insufficient food and clothing halted their progress. All three members of the party died of exposure. Search expeditions failed, and it was not until 1930 that a Norwegian scientific expedition accidentally found the remains and diaries of Andree and his two companions. These diaries are included in *Andree's Story* (tr. 1930). See G. P. Putnam, *Andree the Record of a Tragic Adventure* (1930), and fictionalized life, *The Flight of the Eagle* by P. O. Sundman (1970).

Andreini, Isabella Canali (ē'zabēl'ā āndrēē'nē), 1562-1604, Italian actress. Beautiful, elegant, and well-educated, she was one of the most famous performers of her time. She joined the Gelosi troupe, becoming a leading player, and married the troupe's manager, Francesco Andreini, in 1578. She wrote the pastoral *Mirtilla* (1588), her collected letters appeared in 1607. Andreini was lauded by the poets Tasso and Marini. See Rosamond Gilder, *Enter the Actress* (1931).

Andrew, Saint [Gr. =manly], one of the Twelve Disciples, brother of Peter. Mat. 4:18, 10:2, Mark 3:18, 13:3, Luke 6:14, John 1:40-42, 6:8,9, 12:22, Acts 1:13. According to tradition he was a missionary in Asia Minor, Macedonia, and S. Russia and was martyred at Patras in Greece. He is said to have died on an X-shaped cross (St. Andrew's cross). He is patron saint of Russia and Scotland. Feast Nov. 30.

Andrew II, d. 1235, king of Hungary (1205-35), son of Bela III. He continued his predecessors' policy of transferring crownlands to the magnates, and the lesser nobles forced him to issue a Golden Bull (1222), which served as a charter of feudal privilege. This "Magna Carta" expanded in 1231, extended the old nobility's privileges (immunities from local courts, taxes, and military service abroad) to the lesser nobles, most of whom were freemen in the king's service. It made royal ministers responsible to the diet, which was to meet annually, and gave the right of resistance to the nobles if any of the bull's provisions were violated. Foreigners were not to receive office without consent of the diet, and offices were not to be hereditary. Nobles were also protected against arbitrary arrest or punishment. Andrew took part (1217) in the Fifth Crusade. Initially welcoming the Teutonic Knights to S. Transylvania in 1211, he later became alarmed at their growing power and expelled them in 1225. He was the father of St. Elizabeth of Hungary and of Bela IV, his successor.

Andrew, John Albion, 1818-67, Civil War governor of Massachusetts (1861-66), b. Windham, Maine. He practiced law in Boston, but his antislavery sympathies drew him into politics. He was one of the organizers of the Free-Soil party and later of the Republican party. Soon after taking office as governor, he secured both special legislation placing the militia in readiness and an appropriation for transporting it to Washington. When Lincoln's call came, the 6th Massachusetts regiment was the first to reach the capital. The same spirit characterized Andrew's actions throughout the war, and his zeal was imparted to the people. When peace came, he advocated a policy of friendship and leniency toward the South. See biography by H. G. Pearson (1904), W. B. Hesseltine, *Lincoln and the War Governors* (1948).

Andrewes, Lancelot (ān'drōz), 1555-1626, Anglican divine, bishop of Chichester (1605), of Ely (1609), and of Winchester (1619). One of the most learned men of his time, he was among the first to be selected to create a new English version of the Bible, the Authorized Version. He was royal chap-

lain to Elizabeth, James I, and Charles I. His preaching gained him great favor with King James, who was keenly interested in theology. The great theologian of the High Church party of the 17th cent., Andrewes was opposed to Puritanism, his position being somewhat similar to that of LAUD. His outstanding characteristics were his goodness and piety. His contributions to charity were also noteworthy. His *XCVI Sermons* were edited (1629) by bishops Laud and Buckeridge, his *Private Devotions*, translated (1647) from his noble prayers in Greek and Latin, passed through a number of editions. Richard Crashaw, the poet, paid him a beautiful tribute in "Upon Bishop Andrewes' Picture before His Sermons," and Milton, a Puritan, wrote a Latin elegy on his death. See biographies by M. F. Reidy (1955) and P. A. Welsby (1958), T. S. Eliot, *For Lancelot Andrewes* (1928).

Andrew Johnson National Historic Site. see NATIONAL PARKS AND MONUMENTS (table)

Andrews, Charles McLean, 1863-1943, American historian, b. Wethersfield, Conn. He was associate professor at Bryn Mawr (1889-1907) and professor at Johns Hopkins Univ. (1907-10) and Yale (1910-31). Andrews, a leader in the reinterpretation of British colonial policy in America, studied the colonies in the light of the larger imperial problem, and his seminar in colonial institutions at Yale stimulated much able research in this field. His long, distinguished career reached a climax with *The Colonial Period of American History* (4 vol., 1934-38, Vol. I-III, *The Settlements*, Vol. IV, *England's Commercial and Colonial Policy*). This excellently received work won him the 1935 Pulitzer Prize for history and, in 1937, the gold medal for history and biography awarded only every 10th year by the National Institute of Arts and Letters. His other books include *Colonial Self-Government, 1652-1689* (1904, repr. 1968, in the "American Nation" series), *The Fathers of New England* (1919), and *Colonial Folkways* (1919, both in the "Chronicles of America" series), and *The Colonial Background of the American Revolution* (1924, repr. 1961). He also compiled manuscript and bibliographical guides and wrote works on various historical subjects. See biography by A. S. Eisenstadt (1956).

Andrews, Lorrin, 1795-1868, American missionary to the Hawaiian Islands, b. present-day Vernon, Conn., grad. Princeton Theological Seminary, 1825. He founded (1831) on Maui a training school for teachers, offered courses in printing (which he had himself learned from a book), and began (1834) publishing the first Hawaiian newspaper. After 1841 he had posts in the royal Hawaiian government, becoming (1852) an associate justice of the supreme court. His great cultural contribution was his *Dictionary of the Hawaiian Language* (1865, rev. by H. H. Parker, 1922).

Andrews, Roy Chapman, 1884-1960, American naturalist and explorer, b. Beloit, Wis., B.A. Beloit College, 1906, M.A. Columbia Univ., 1913. Connected with the American Museum of Natural History, New York City, from 1906, he was its director from 1935 to 1942. Between 1908 and 1914 he made several trips to Alaska, along the coast of Asia, and in Malayan seas to study aquatic mammals. He later conducted (1917-30) several expeditions into central Asia to study both fossil and living plants and animals; he discovered some of the world's great fossil fields, which have yielded the remains of many ancient animals (including *Baluchitherium*, the largest known land mammal) and plants previously unknown to science. He described these expeditions in several books and discussed them all in *The New Conquest of Central Asia* (1932). His writings also include *Meet Your Ancestors* (1945), *In the Days of the Dinosaur* (1959), and the autobiographical works *Under a Lucky Star* (1943) and *An Explorer Comes Home* (1947).

Andrews Air Force Base, U.S. military installation, 4,279 acres (1,732 hectares), central Md., est. 1943. It is the chief military airport of Washington, D.C., as well as the headquarters for the air force's high-priority airlift command.

Andreyev, Leonid Nikolayevich (lyānyē't' nyīka-lī'vīch āndrā'yaf), 1871-1919, Russian writer. Andreyev's early stories were realistic studies of everyday life. Gorky was attracted by the note of social protest in his work and used his influence to obtain publication of Andreyev's first volume of short stories. After an enormous initial success Andreyev turned to more metaphysical themes, frequently employing allegory and symbol. He declared his anti-Bolshevism, and his friendship with Gorky was terminated. Andreyev went to Finland at the Bolshe-

vik accession to power and died there. His strongest dramatic works include *The Red Laugh* (1905) and *King Hunger* (1907), an acerbic portrait of Russian society. Besides the popular drama of a circus clown, *He Who Gets Slapped* (1916, tr. 1921), his best-known plays are *Anathema* (1904, tr. 1910), an allegory on the futility of goodness, and *The Pretty Sabine Women* (1912, tr. 1914), a political satire. The pessimism of his later writings cost Andreyev his popularity. His name also appears as Andreev. See *Letters of Gorky and Andreev*, ed. by Peter Yershov (1958), biographical studies by A. S. Kaun (1924, repr. 1969), J. B. Woodward (1969), and J. M. Newcombe (1973).

Andria (ān'drēā), city (1971 pop. 77,514), in Apulia, S. Italy. It is an agricultural market, handling wine, olives, and almonds. Andria was founded in the 11th cent. It was a favorite residence of Emperor Frederick II, who built (13th cent.) nearby the imposing Castel del Monte with eight round towers. There is a restored 12th-century cathedral, which has an 8th-century crypt.

Andric, Ivo (ē'vō an'drīch), 1892-, Yugoslav novelist, b. Bosnia. As a student Andric worked for the independence and unity of the South Slavic peoples, and after the formation in 1918 of the Kingdom of the Serbs, Croats, and Slovenes (later Yugoslavia), he served in diplomatic posts. His best-known work is a historical trilogy (1945) on Bosnia: *The Bridge on the Drina* (tr. 1959), *Bosnian Story* (tr. 1959), and *Young Miss Andric*. His other works include poems and novellas. The misery of man's struggle for existence is his principal theme. Andric was awarded the 1961 Nobel Prize in Literature. His later stories and novellas include *Devil's Yard* (1954, tr. 1962), *Faces* (1960), *Vizier's Elephant* (tr. 1962), cited in the Nobel Prize presentation, and *The Pasha's Concubine* (tr. 1968).

androgen (ān'drəjən) see TESTOSTERONE

Androgeus (āndrōj'ēās) see MINOS

Andromache (āndrō'mākē), Greek legend, Trojan woman, wife of Hector and mother of Astyanax. After the Trojan War she was carried away by NEOPTOLEMUS, whose father, Achilles, had slain her husband Neoptolemus died, and she married Hector's brother Helenus. She is mentioned in the *Iliad*. The plays of Euripides and Racine that bear her name tell of her captivity by Neoptolemus.

Andromeda, in astronomy, northern CONSTELLATION located to the NE of Pegasus and to the S of Cassiopeia. Its brightest star, Alpheratz (Alpha Andromedae), marks the northeast corner of the Great Square in Pegasus. The constellation also contains the bright stars Mirach (Beta Andromedae) and Almach (Gamma Andromedae) and the famous Great Nebula, or ANDROMEDA GALAXY, the only galaxy visible to the naked eye in the Northern Hemisphere. Andromeda reaches its highest point in the evening sky in November.

Andromeda (āndrōm'īdā), in Greek mythology, princess of Ethiopia, daughter of Cepheus, king of Ethiopia, and Cassiopeia. According to most legends Cassiopeia angered Poseidon by saying that Andromeda (or possibly Cassiopeia herself) was more beautiful than the nereids. Poseidon sent a sea monster to prey upon the country; he could be appeased only by the sacrifice of the king's daughter. Andromeda in sacrifice was chained to a rock by the sea, but she was rescued by PERSEUS, who killed the monster and later married her. Cassiopeia, Cepheus, and Andromeda were all set among the stars as constellations.

Andromeda Galaxy, cataloged as M31 and NGC 224, visible to the naked eye as a faint patch in the constellation Andromeda, also known as the Great Nebula in Andromeda. It is the closest spiral galaxy at 2 million light-years distance and is part of the local group of galaxies that includes the Milky Way, which it resembles in shape and composition. The Andromeda Galaxy has a linear diameter of about 120,000 light-years, as compared to about 90,000 light-years for the Milky Way, and contains at least 200 billion stars, or twice as many as the Milky Way. It has a companion satellite galaxy, M32.

Andronicus I (Andronicus Comnenus) (āndrānī'kās kōmnē'nās), 1120?-1185, Byzantine emperor (1183-85), nephew of John II. He acceded to the throne by strangling his cousin ALEXIUS II. Though notorious in his younger years for his scandalous morals, he was a competent, if cruel, ruler. He took strict measures to protect the peasants against the great landowners, enforced honesty on the tax collectors, and was the terror of corrupt officials. His severity and his failure to stop the rapid advance of WILLIAM II of Sicily against the capital led to his overthrow and

the elevation of ISAAC II Andronicus was tortured to death by the rabble. He was the last of the Comneni to hold the throne of Constantinople.

Andronicus II (Andronicus Palaeologus) (pālēōl'ā-gās), 1258-1332, Byzantine emperor (1282-1328), son and successor of Michael VIII. He devoted himself chiefly to church affairs, renewing the schism by renouncing (1282) the union established at the Second Council of Lyons. He made a treaty with the rising kingdom of Serbia. He also made an unsuccessful alliance with ROGER DE FLOR against the Turks but could not prevent their taking most of Asia Minor. His reign, shared from 1295 to 1320 with his son Michael IX, was cut short by his grandson, who forced him into a monastery and became emperor as Andronicus III.

Andronicus III (Andronicus Palaeologus), c 1296-1341, Byzantine emperor (1328-41), grandson of Andronicus II, whom he deposed after a series of civil wars. His chief minister was John Cantacuzene (later Emperor John VI). During his reign the Ottoman Turks gained almost complete control of Asia Minor, while STEPHEN DUSHAN of Serbia conquered part of Macedonia and Albania. He was succeeded by his son, John V.

Andronicus, apostle at Rome. Rom. 16:7.

Andronicus, Livius* see LIVIUS ANDRONICUS

Andropov, Yuri Vladimirovich (yōō'rē vladīyē-mīravīch āndrō'pōf), 1914-, Russian public official. As ambassador to Hungary from 1954 to 1957, he played a major role in the suppression of the 1956 anti-Communist uprising there. In 1957 he was appointed head of liaison between the Communist party of the Soviet Union and its fraternal parties within the Communist bloc. He promoted the idea of regional economic specialization within the bloc and helped to direct the ideological campaign against the Chinese Communists. In 1967 he was appointed chairman of the state security committee, or secret police. In 1973 he was named a member of the Politburo, the ruling body of the Communist party.

Andros, Sir Edmund (ān'drōs), 1637-1714, British colonial governor in America, b. Guernsey. As governor of New York (1674-81) he was bitterly criticized for his high-handed methods, and he was embroiled in disputes over boundaries and duties (see NEW JERSEY), going so far as to arrest Philip CARTERET. When James II, partly influenced by Edward RAN DOLPH, consolidated all the New England colonies into the Dominion of New England, he named (1686) Andros governor. In 1688, New York and the Jerseys were also put under his control. The suppression of charters and colonial assemblies, interference with local customs and rights, and Andros's overbearing ways caused intense friction. After news of the overthrow of James II in 1688 reached the colonies, the colonials in Boston rebelled (1689), seized Andros and other officials, and sent them to England as prisoners. He was soon released and later was governor of Virginia (1692-97) and governor of Guernsey, (1704-6). See V. F. Barnes, *Dominion of New England* (1923).

Andros, island (1971 pop. 10,457), 146 sq mi (378 sq km), SE Greece, in the Aegean Sea, the northernmost and second largest of the CYCLADES. Andros (1971 pop. 1,827) is the capital and chief town. The island produces silk, wine, and lemons and has manganese deposits. Colonized by Athens in the 5th cent. B.C., Andros rebelled in 410 B.C., became a free state, and later passed successively to Macedon, Pergamum, and Rome. Seized (1204) from the Byzantines by Venice and made a principality, it remained almost entirely under Venetian rule until its conquest (1514) by the Turks. In 1829 it passed to Greece.

Androskoggin (āndraskōg'īn), river, c 175 mi (280 km) long, rising in NE N.H., flowing south and east to enter the Atlantic Ocean at Bath, Maine. Hydroelectric plants, using the river's steep gradient, supply power to nearby towns. The area is a major pulp and paper producer, the practice of floating logs downstream has hindered the river's further development for power.

Andros Island see BAHAMA ISLANDS

Androuet du Cerceau (āndrōō-ā' dū sērsō'), family of French architects active in the 16th and 17th cent. It was founded by Jacques Androuet, c 1520-c 1584, surnamed du Cerceau [Fr., = circle], from the emblem of a circle marking his workshop. He is best known for his writings and his fanciful engravings of decorative architectural elements. Attributed to him are designs for two châteaux, Verneuil and Charleval. Of his two sons, who both worked on the Louvre, Baptiste Androuet du Cerceau, c 1545-1590,

designed the Pont Neuf spanning the Seine at Paris and became supervisor of royal construction in Paris, while Jacques Androuet du Cerceau, the younger, c 1556-1614, worked on the Tuileries. Baptiste's son Jean Androuet du Cerceau, c 1585-1650, is known for his mansions in Paris, one of which is the Hôtel de Sully.

Andrusov, Treaty of (ān'drōōsōf', Rus. āndrōō-sāf'), 1667, signed by Poland and Russia at the village of Andrusov, Russia, (present-day Androsovo, RSFSR). It ended the war of Czar ALEXIS of Russia against JOHN II of Poland. Russia gained the Smolensk and Seversk provinces and the Ukraine E of the Dnepr (left-bank Ukraine), including Kiev.

Andújar (andōō'har), city (1970 pop. 31,464), Jaén prov., S Spain, in Andalusia, on the Guadalquivir River. Its pottery and its water-cooling jars made of porous stone are famous. A painting by El Greco hangs in the 12th-century Gothic Church of Santa Maria.

anecdote (ān'tkōt'), brief narrative of a particular incident. An anecdote differs from a SHORT STORY in that it is unified in time and space, is uncomplicated, and deals with a single episode. The literal Greek meaning of the word is "not published," and it still retains some such sense of confidentiality. Sometimes an anecdote is inserted into a novel as an interval in the main plot, as in Laurence Sterne's *Tristram Shandy*. Famous books of anecdotes include the *Deipnosophistae* of Athenaeus and Plutarch's *Lives*.

Anegada* see VIRGIN ISLANDS

Aneirin* see ANEURIN

Anem (ā'nēm), the same as EN GANNIM 2

anemia, condition in which the concentration of hemoglobin in the circulating blood is below normal. Such a condition is caused by a deficient number of erythrocytes (red blood cells), an abnormally low level of hemoglobin in the individual cells, or both these conditions simultaneously. Regardless of the cause, all types of anemia cause similar signs and symptoms because of the blood's reduced capacity to carry oxygen. These symptoms include pallor of the skin and mucous membranes, weakness, dizziness, easy fatigability, and drowsiness. Severe cases show difficulty in breathing, heart abnormalities, and digestive complaints. One of the most common anemias, iron-deficiency anemia, is caused by insufficient iron, an element essential for the formation of hemoglobin in the erythrocytes. In most adults (except pregnant women) the cause is chronic blood loss rather than insufficient iron in the diet, and, therefore, the treatment includes locating the source of abnormal bleeding in addition to the administration of iron. Pernicious anemia causes an increased production of erythrocytes that are structurally abnormal and have attenuated life spans. This condition rarely occurs before age 35 and is inherited, being more prevalent among persons of Scandinavian, Irish, and English extraction. It is caused by the inability of the body to absorb vitamin B₁₂ (which is essential for the maturation of erythrocytes) from food and is treated by repeated injections of vitamin B₁₂. There are several conditions that cause the destruction of erythrocytes, thereby producing anemia. Allergic-type reactions to bacterial toxins and various chemical agents, among them sulfonamides and benzene, can cause hemolysis, which requires emergency treatment. In addition, there are unusual situations in which the body produces antibodies against its own erythrocytes, the mechanism triggering such reactions remains obscure. Any disease or injury to the bone marrow can cause anemia, since that tissue is the site of erythrocyte synthesis. Bone marrow destruction can also be caused by irradiation, disease, or various chemical agents. There are several inherited anemias that are more common among dark-skinned people. SICKLE CELL ANEMIA is inherited as a recessive trait almost exclusively among blacks; the condition is characterized by a chemical abnormality of the hemoglobin molecule that causes the erythrocytes to be misshapen. Thalassemia major (Cooley's anemia) is the most serious of the hereditary anemias that occur more frequently among those of Mediterranean, Middle Eastern, and S. Chinese ancestry. The erythrocytes are abnormally shaped and many are nucleated. Symptoms include enlarged liver and spleen and jaundice. Thalassemia major usually causes death before adulthood is reached.

anemometer. see WIND

anemone (anēm'anē) or windflower, any of the perennial herbs, wild or cultivated, of the genus *Anemone* of the family Ranunculaceae (BUTTERCUP

family). A rich legendary history has gained the anemone many names and attributes. It is said to have sprung from the blood of Adonis, Romans considered it valuable in preventing fever, it has been applied for bruises and freckles, for some it is tainted with evil, and by the Chinese it has been associated with death. The name windflower is accounted for in several ways, one of which is Pliny's statement that anemone blossoms are opened by the wind. Anemones contain an acrid compound called anemonin. It is poisonous but was formerly used medicinally. Best known of the wild kinds are the white- or purplish-flowered wood anemone (*A. quinquefolia*), sometimes known specifically as windflower, and the greenish-white-flowered tall anemone, or thimbleweed (*A. virginiana*), with thimble-shaped fruit. The most common cultivated kinds include the tall, autumn-flowering Japanese anemone (*A. japonica*) for gardens and the florists' poppy anemones (*A. coronaria*), native to the Mediterranean area. Similar to the anemone is the wild rue anemone of another buttercup-family genus (*Anemone* or *Synedemon*). The PASQUEFLOWER is sometimes included in *Anemone*. Anemones are classified in the division MAGNOLIOPHYTA, class Magnoliopsida, order Ranunculales, family Ranunculaceae.

Aner (ā'nār) 1 Ally of Abraham. Gen. 14:13, 24. 2 Levitical town, E of the Jordan. 1 Chron. 6:70.

aneroid altimeter: see AIR NAVIGATION

aneroid barometer: see BAROMETER

anesthesia (ān'isthē'zhā) [Gr., = insensibility], loss of sensation, especially that of pain, induced by drugs. General anesthetics, usually employed in surgical operations of long duration, cause unconsciousness and are usually inhalation anesthetics. These inhalant gases include ether, halothane, and cyclopropane. Anesthesia of short duration may be induced by intravenous injection of sodium pentothal, a procedure used to initiate unconsciousness in most surgical operations. Rectal anesthetics such as tribromoethanol (Avertin) are also used in this manner, usually supplemented later by inhalation anesthetics. Nitrous oxide is used when deep unconsciousness is not required. Local anesthetics (e.g., novocaine and ethyl chloride) are used in dentistry and in minor surgery and affect sensation only in the region of application. Spinal anesthesia is produced by injecting the anesthetic beneath the membrane of the spinal cord. This method is often used in surgery of the abdomen and legs. Caudal anesthesia, used in obstetrics, is produced by injecting the anesthetic into the sacral canal. Muscle relaxants, such as curare and its derivatives, are used to reduce the amount of conventional anesthetic required. Body temperature may be lowered in conjunction with the use of anesthetics. Extensive heart and brain surgery can be carried out at body temperatures which are 10° F or more below normal. The metabolic rate is so much reduced that cells are not damaged by the lack of circulating blood. The various forms of anesthesia are frequently used in combination, in the United States, a skilled anesthesiologist is present at all major operations. Anesthetics are also used in the treatment of certain types of mental illness. Early experimenters with nitrous oxide (laughing gas) were Sir Humphry Davy of England and Horace Wells of the United States. Ether was used as a general anesthetic in the United States by Crawford W. Long in 1842, but more general use of ether came after a demonstration at the Massachusetts General Hospital in Boston by William T. G. Morton in 1846. Sir James Y. Simpson in 1847 was the first to employ a general anesthetic in obstetrics. Safer and more efficient anesthetics are continually discovered, as anesthesiologists perfect new ways of combining and administering them. See ACUPUNCTURE. See T. E. Keys, *History of Surgical Anesthesia* (rev. ed. 1963), Frederick Prescott, *The Control of Pain* (1965).

anesthesiology (ān'tisthē'zēōl'ajē), branch of MEDICINE concerned primarily with procedures for rendering patients insensitive to pain, and for supporting life systems under the strains of ANESTHESIA and surgery. The anesthesiologist will induce unconsciousness for various clinical purposes and will perform cardiac and respiratory resuscitation when necessary.

Aneto, Pico de (pē'kō dā anā'tō), Fr. *Pic de Nethou* or *Pic d'Anethou*, peak, 11,168 ft (3,404 m) high, NE Spain, in the Maladetta group near the French border. It is the highest peak of the Pyrenees.

Anetothite (ān'tiōthīt) see ANATHOTH

Aneurin (ā'nyōōrīn, ā'-) or **Aneirin** (ā'nīrēn), fl. c 600, Welsh bard whose reputed writings are con-

tained in a 13th-century manuscript, *Book of Aneirin*. Included in this manuscript is *Gododin*, a 900-line elegiac poem of a defeat of the Welsh by the Saxons. The poem is one of the oldest extant works of Welsh literature and contains probably the earliest explicit allusion to King Arthur.

aneurysm (än'yöörizəm), localized dilatation of a blood vessel, particularly an artery. Dilatation of an artery, and therefore weakness of that portion of the arterial wall, may be congenital, or it may be caused by syphilis, high blood pressure, arteriosclerosis, bacterial and fungus infections, or penetrating injury as from a bullet or knife. An aneurysm may be asymptomatic, or it may cause varying symptoms depending upon its location and on whether the expanding mass is pressing on adjacent nerves or vital organs. The weakened arterial walls of an aneurysm are always in danger of sudden rupture, with resulting hemorrhage and death. Aneurysms occur most commonly in the large arteries, the aorta, the largest vessel in the body, is the one most often affected. They also occur in the arteries within the skull and in other areas of the body. The only treatment is surgical, where feasible, i.e., excision of the dilated saclike portion of the affected artery. This may require replacement by an arterial graft, a portion of vessel similar in size. There has also been successful replacement with tubes made of synthetic material.

ANFO, ammonium nitrate and fuel oil. See EXPLOSIVE.

Angara (äng'gärä, Rus ün'gärä'), river, c 1,150 mi (1,850 km) long, SE Siberian USSR, the outlet of Lake Baykal. After leaving the southwestern end of Lake Baykal, it flows north past Irkutsk and Bratsk, then turns west after receiving the Ilim River and flows into the Yenisei River near Strelka. Below its junction with the Ilim River the Angara is known also as the Upper Tunguska (Rus Verkhnyaya Tunguska). The Angara is navigable between Irkutsk and Bratsk, below Bratsk there are many rapids. At Bratsk is a large dam with one of the world's largest hydroelectric power plants (c 4.5 million kw), a smaller hydroelectric station is at Irkutsk. Iron, coal, and gold deposits are found in the Angara basin. The Upper Angara River (Rus Verkhnyaya Angara), c 200 mi (320 km) long, rises NE of Lake Baykal and flows SW through the Buryat Autonomous Republic into the lake, it is partly navigable.

Angara Shield, Asia. See SIBERIAN PLATFORM.

angel [Gr, =messenger], bodiless, immortal spirit, limited in knowledge and power, accepted in the traditional belief of Judaism, Christianity, and Islam. Angels appear frequently in the Bible, often in critical roles, e.g., visiting Abraham and Lot (Gen 18, 19), wrestling with Jacob (Gen 32:24-32), and guiding Tobit (Tobit 5). In the Gospels an angel announced the Incarnation to the Virgin Mary (Luke 1), and an angel at the empty tomb revealed the Resurrection (Mat 28:1-7). The Bible also speaks of guardian angels, protecting individuals or nations (Dan 10:10-21, Mat 18:10). The hierarchy of angels in three choirs appears early in the Christian era, the classes are, from the highest: seraphim, cherubim, thrones, dominations, virtues, powers, principalities, arch-angels, angels. Eph 1:21, Col 1:16. From these two passages Dionysius the Areopagite fixed the number and order of angels in *The Celestial Hierarchy*. Roman Catholics and the Orthodox venerate angels, and the cult of guardian angels is especially extensive in the West (feast of Guardian Angels Oct 2). Protestants have generally abandoned the cult of angels. The angels of Hell, or dark angels, or devils, are the evil counterpart of the heavenly host, the chief of them, Satan (or Lucifer), was cast out of heaven for leading a revolt. They are often viewed as the initiators of evil temptations (Job 1-2, Isa 14:4-23, Mat 25:41, Luke 10:18, Eph 6:12, Jude 9). Famous literary treatments of angels are those of John Milton's *Paradise Lost* and Dante's *Divine Comedy*. See ARCHANGEL, CHERUB, SERAPH, GABRIEL, MICHAEL, RAPHAEL, SATAN.

Angel Fall, waterfall, Sp. *Salto Ángel*, 3,212 ft (979 m) high, SE Venezuela, in the Guiana Highlands. Springing from Auyan-Tepui Mesa, it is the highest uninterrupted waterfall in the world.

angelfish: see BUTTERFLY FISH.

Angelholm (äng'älhöl'm), city (1970 pop. 18,364), Kristianstad co., SW Sweden, on Skålderviken Bay (an arm of the Kattegat), chartered 1516. It is a beach resort and has tanneries. The city is also known as Engelholm.

angelica (änjē'līkə), any species of the genus *Angelica*, plants of the family Umbelliferae (CARROT family), native to the Northern Hemisphere and New

Zealand, valued for their potency as a medicament and protection against evil spirits and the plague, which probably accounts for the name, angelica is a poetic symbol for inspiration. The roots and fruits yield angelica oil, which is used in perfume, confectionery, medicine, and for flavoring liqueurs (such as angelica). The species most often used for these purposes is *A. archangelica*, a subarctic and alpine plant of the Old World once extensively grown but now seldom cultivated outside Germany. This and a few other species are sometimes used as ornamentals. Angelica is classified in the division MAGNOLIOPHYTA, class Magnoliopsida, order Umbellales, family Umbelliferae.

Angelico, Fra (fra anjē'līkō), c 1400-1455, Florentine painter, b. Vicchio, Tuscany. He was variously named Guido (his baptismal name), or Guidolino, di Pietro, and Giovanni da Fiesole. After his death he was called Il Beato Fra Giovanni Angelico, although he was never officially beatified. Angelico's style is remarkable for its purity of line and color and its spiritual expressiveness. He took his vows c 1425 in the Dominican order. The first painting of certain date (1433) by Angelico is his *Madonna of the Linen Guild* (St. Mark's convent, Florence). It is supposed that his activity began at least 10 years earlier, and that he first painted small pictures, such as *St. Jerome Penitent* (Princeton Univ.) and miniatures. Other works suggested for this period (1423-33) are *Virgin and Child Enthroned with Twelve Angels* (Staedel Inst., Frankfurt), *Virgin and Child with Angels* (National Gall., London), *Madonna of the Star and Naming of the Baptist* (both St. Mark's convent). It is thought that Angelico was first influenced by Gentile da Fabriano, and that he soon adopted Masaccio's advances in spatial conception. Critics have assigned to the 1430s such works as the *Annunciation* (Cortona), *Coronation of the Virgin* (Louvre), *Deposition* and *Last Judgment* (both St. Mark's convent). In 1436, under the protection of Cosimo de' Medici, the Dominicans of Fiesole moved to St. Mark's convent in Florence. Fra Angelico supervised the fresco decoration of the building. Among the works considered to be by his hand are the *Crucifixion with St. Dominic* (cloisters) and the great *Crucifixion* (chapter house). In the convent also are frescoes *Noli mi Tangere*, *Annunciation*, *Transfiguration*, *Mocking of Christ*, *Presentation in the Temple*, *Virgin and Child with Saints*, and others. In 1445 he was summoned to Rome by Pope Eugenius IV to decorate the Cappella del Sacramento in the Vatican. In 1447 he visited Orvieto, where, assisted by his pupil Benozzo Gozzoli, he painted *Christ as Judge* and the *Prophets* in the Cappella Nuova of the cathedral. Returning to Rome, he designed in the following year his greatest and most unified scenes—episodes from the lives of St. Stephen and St. Lawrence. However, the execution of this project was probably carried out mainly by pupils. Fra Angelico treated none but religious subjects. Adapting the artistic innovations of his time (e.g., sculptural clarity of form and spatial depth), he interpreted them in terms of the greatest spirituality. Angelico endowed the new forms with his own incomparable sense of coloring and unity. In the United States he is represented by the *Crucifixion* (Fogg Mus., Cambridge), *Assumption and Dormition of the Virgin* (Gardner Mus., Boston), *Temptation of St. Anthony Abbot* (Mus. of Fine Arts, Houston, Texas), and *Crucifixion and Nativity* (both Metropolitan Mus.).

Angel Island, largest island in San Francisco Bay, W Calif. Discovered by the Spanish in 1775, it came under U.S. control in 1851. The U.S. army used the island as a base from 1863 to 1946, in 1952 a radar and missile site was established. During World War II, enemy prisoners of war were confined on Angel Island. Part of the island is now a state park.

Angell, James Burrill, 1829-1916, American educator, editor, and diplomat, b. Scituate, R.I., grad Brown, 1849, and studied abroad. He became professor of modern languages at Brown. Resigning in 1860, he served as editor of the *Providence Journal*. Later, as president of the Univ. of Vermont (1866-71) and of the Univ. of Michigan (1871-1909), Angell became known as an administrator. In this period he served also as minister to China (1880-81) and to Turkey (1897-98). See his *Reminiscences and Selected Addresses* (1912, repr. 1971), biography by S. W. Smith (1954).

Angell, James Rowland, 1869-1949, American educator and psychologist, b. Burlington, Vt., grad Univ. of Michigan (B.A. 1890, M.A. 1891), M.A. Harvard, 1892, son of James B. Angell. After study abroad, he taught at the Univ. of Minnesota, then at the Univ. of Chicago (1894-1920), where he became

professor and head of the psychology department (1905), dean of the university faculties (1911), and acting president (1918-19). He served as president of Yale from 1921 until his retirement in 1937, in his administration the physical facilities of Yale were greatly expanded. In 1937 he became educational counselor of the National Broadcasting Company. His writings include several standard psychology textbooks, *Chapters from Modern Psychology* (1912), *American Education* (1937), and articles on psychology and education.

Angell, Sir Norman, 1872?-1967, British internationalist and economist, whose name originally was Ralph Norman Angell Lane. He came to fame with *The Great Illusion* (1910, rev. ed. 1933), in which he posited that the common economic interests of nations make war futile. At the close of World War I he worked for a generous peace and international cooperation. In *Peace with the Dictators?* (1938) he attacked the British Conservative party's policy of condoning Japanese and Italian aggression. After World War II he urged unity among the Western democracies in such works as *Defence and the English-speaking Role* (1958). Knighted in 1931, Norman Angell was awarded the 1933 Nobel Peace Prize. See his autobiography (1951).

Angelus (än'jələs), family name and dynasty of three Byzantine emperors (1185-1204). See ISAAC II, ALEXIUS III, ALEXIUS IV.

Angelus [Lat, =angel], daily prayer of the Roman Catholic Church, said usually three times daily, as announced by a bell, traditionally at six in the morning, at noon, and at six in the evening. It is said in honor of the Incarnation and consists of three repetitions of the Hail Mary together with verses and a prayer. It takes its name from the opening word of the Latin version: *Angelus Domini nuntiavit Mariae* [the angel of the Lord declared unto Mary].

Angelus Silesius (än'jələs silē'zhəs), pseud. of Johannes Scheffler (yö'hän'əs shēf'lar), 1624-77, German poet. He is best known for his pastoral lyric cycles *Heilige Seelenlust* (1657-68) and *Cherubinischer Wandersmann* (1674-75), which can be interpreted as Christian as well as pantheistic. Scheffler's mysticism strongly influenced 18th-century PIETISM. See study by J. L. Sammons (1967).

Ängermanälven (öng'ärmanäl'vən), river, c 280 mi (450 km) long, rising in Vasterbotten prov., W central Sweden, and flowing generally southeast through narrow lakes and past Sollefteå and Kramfors to the Gulf of Bothnia at Harnösand. The Faxälven is its chief tributary. The river is used to float logs downstream to sawmills. There are numerous hydroelectric power plants on the river. Sando bridge (866 ft/264 m long, opened 1943), one of the world's longest concrete arch bridges, spans the river.

Angers (änzhä'), city (1968 pop. 134,959), capital of Maine-et-Loire dept., W France, in Anjou, on the Maine River. A business and trade center, it is known for its wine. It also has glassworks, printing plants, and factories making electronic and photographic equipment, textiles, food, paper products, and tiles. On its outskirts are the largest slate quarries in France. Of pre-Roman origin, Angers became the seat (870-1204) of the powerful counts of ANJOU and the historic capital of the province. There is a fine cathedral (12th-13th cent.) and a museum containing 14th-century tapestries and a large collection of the sculpture of David d'Angers. The 13th-century castle was among the buildings damaged in World War II. Schools of fine arts and medicine are located there.

Angevin (än'jəvīn) [Fr, =of Anjou], name of two medieval dynasties originating in France. The first ruled over parts of France and over Jerusalem and England, the second ruled over parts of France and over Naples, Hungary, and Poland, with a claim to Jerusalem. The older house issued from one Fulk, who became count of ANJOU in the 10th cent. Fulk V (see FULK) of Anjou, one of his descendants, became (1131) king of Jerusalem. A younger son inherited the kingship of Jerusalem as Baldwin III and was succeeded by Almaric I, Baldwin IV, and Baldwin V, with whom the branch ended (1186). Fulk V's elder son, GEOFFREY IV (Geoffrey Plantagenet), inherited Anjou. He married Matilda of England, daughter of King Henry I of England, and conquered Normandy. Their son became (1154) the first Angevin (or Plantagenet) king of England as Henry II. His successors were Richard I, John, Henry III, Edward I, Edward II, Edward III, and Richard II, after whom the English branch split into the houses of Lancaster and of York. A nephew of Richard I and John became (1196) duke of Brittany as Arthur I. From his sister

and her husband, Peter of Dreux, a Capetian noble who became Duke PETER I of Brittany, the subsequent rulers of Brittany issued The Breton line of the Angevins came to an end with the marriages of Anne of Brittany and her daughter to the kings of France. The second house of Anjou was a cadet branch of the Capetians and originated with Charles, a younger brother of King Louis IX of France. Charles was made count of Anjou by Louis, acquired Provence by marriage, and in 1266 was invested by the pope with the kingdom of Naples and Sicily as Charles I. Charles lost Sicily but retained Naples. His successors were Charles II, Robert, and Joanna I of Naples and Provence. On the death (1382) of Joanna I the succession to Naples was contested by two cadet branches, both descended from Charles II of Naples. The first was represented by Charles of Durazzo (Charles III of Naples), a great-grandson through the male line, and by his children, Lancelot and Joanna II. They retained, for the most part, actual possession of the kingdom, despite the efforts of the rival line, issued from Margaret, a daughter of Charles II. Margaret married Charles of Valois, their son and grandson were kings Philip VI and John II, respectively, of France. John made his younger son, Louis, duke of Anjou, Joanna I of Naples adopted Louis as heir, Louis thus became Louis I of Naples and Provence. His successors were Louis II, Louis III, and Rene. Although the last two were successively designated as heirs by Joanna II, Naples was seized by King Alfonso V of Aragon and eventually remained in Spanish hands. Rene became duke of Lorraine by marriage. His nephew and heir, Charles, count of Maine, died in 1481 without issue, and Anjou, Maine, Provence, and the Angevin claim to Naples all passed to the French crown. The theoretical claim to Jerusalem stemmed from Charles I of Naples, whom Pope John XXI invested (c 1276) with the title. Rene's claim to the title was transmitted to the house of Lorraine. The Hungarian branch of Anjou began (1308) with Charles Robert (King Charles I of Hungary), a grandson of Charles II of Naples. Charles I's son became king of Hungary and Poland as Louis I. Hungary passed to Louis's daughter Mary and to her husband Sigismund (later Holy Roman emperor), and Poland passed to Ladislaus II of Poland, husband of Louis's daughter Jadwiga.

Angilbert, Saint (äng'gīlbärt), d. B14, Frankish statesman and courtier under Charlemagne, abbot of Centula (now Saint-Riquier), near Amiens. He was highly regarded in the Carolingian revival as a writer of Latin poetry. Feast Feb. 18.

angina pectoris (äng'jēnā pēk'tarīs), condition characterized by chest pain and caused by occlusion (closure) of the coronary arteries, resulting in insufficient supply of oxygen to the heart muscle, in rare cases, it occurs in the absence of coronary artery disease. The pain is usually experienced under or to the left of the sternum (breastbone) and radiates to the left shoulder and down the upper arm, less frequently, it spreads to the right shoulder. The attack usually subsides without residual discomfort and, when precipitated by physical exertion, is quickly halted when the subject rests. Angina pectoris occurs usually after the age of 50, more often in men than women, and frequently follows exertion, excitement, eating, or exposure to cold. Associated symptoms are faintness and difficulty in breathing. Drugs (e.g., amyl nitrite or nitroglycerine) that dilate the blood vessels of the heart are used in treatment.

angiosperm (äng'jēspūrm'), term used for any flowering plant in which the ovules, or young seeds, are enclosed within the ovary (that part of the pistil specialized for seed production), in contrast to the gymnosperms, in which the seeds are exposed during all stages of development. The angiosperms constitute the division MAGNOLIOPHYTES and include all our agricultural crops (including the cereal grains and other grasses), all garden flowers and horticultural plants, all the common broad-leaved shrubs and trees, and all the usual field, garden, and roadside weeds. The angiosperms are the best known and most economically important of all plants.

Angkor (äng'kôr), site of several capitals of the KHMER EMPIRE, N of Tônlé Sap, NW Cambodia, for five and a half centuries the heart of the empire. Extending over an area of 40 sq mi (104 sq km), the ruins contain some of the most imposing monuments in the world. The first capital was founded by Yasovarman I (889-900) and was centered around the pyramidal temple of Phnom Bak Kheng. To the southeast of the original capital, a new temple com-

plex, Angkor Wat [Angkor temple], was created under Suryavarman II (1113-50). Planned as a sepulcher and a monument to the divinity of the monarch, it is probably the largest religious structure in the world. Surrounded by a vast moat, the temple is approached by means of an extensive causeway bordered on either side by balustrades in the form of giant Nagas (divine serpents). This avenue leads to a magnificent entrance gate. The temple proper is reached through three series of galleries separated by paved courts. The middle series has four corner towers, above it, the highest series also has four corner towers and is joined to the central sanctuary by colonnades. The architecture of Angkor Wat, derived from the stupa form, is enormously impressive, but the most remarkable feature of the temple compound is its sculptural ornament, covering thousands of feet of wall space. The decoration is in the form of low relief of impeccable craftsmanship, illustrating scenes from the legends of Vishnu and Krishna, with some historical events from the life of the king. More delicate in proportions than their Indian prototypes, many of the figures, in their elegance of gesture and stateliness of pose, bear a resemblance to modern Cambodian dancers. In 1177, Angkor was sacked by the Chams, and Angkor Wat fell into ruins. Jayavarman VII (1181-c 1218) established a new capital, Angkor Thom [the great Angkor], N of Phnom Bak Kheng. The buildings of an already existing city were used as residential palaces and governmental buildings, an excellent system of moats and canals was constructed. At the four entrances of the capital, there are gateways, they open onto four avenues that meet at the Bayon, the temple in the center of the city. Before each gateway is a bridge decorated with a balustrade in the shape of a giant Naga, supported on each side by 27 carved figures. Above the gates are carved imposing stone faces, generally thought to symbolize the Bodhisattva Lokeshvara. Under Jayavarman VII the Bayon was used as a Buddhist sanctuary, but it underwent alterations during a later Hindu period. The central tower bears a giant image of Buddha, which has been interpreted as the incarnation of Jayavarman VII. Surrounding the main structure is a forest of more than 50 smaller towers studded with multiple heads of the king as a Buddhist god. The buildings are covered with elaborate decoration, more spontaneously and realistically rendered than that at Angkor Wat and again illustrating historical episodes from the king's life. Angkor was raided in the 14th and 15th cent by the Thai. It was abandoned in 1434 for Phnom Penh. Overgrown by the jungle, the ruins were discovered by the French in 1861. Many of the monuments were subsequently restored to their former glory. See Madeleine Giteau, *Khmer Sculpture and the Angkor Civilization* (1966), Bernard Groslier and

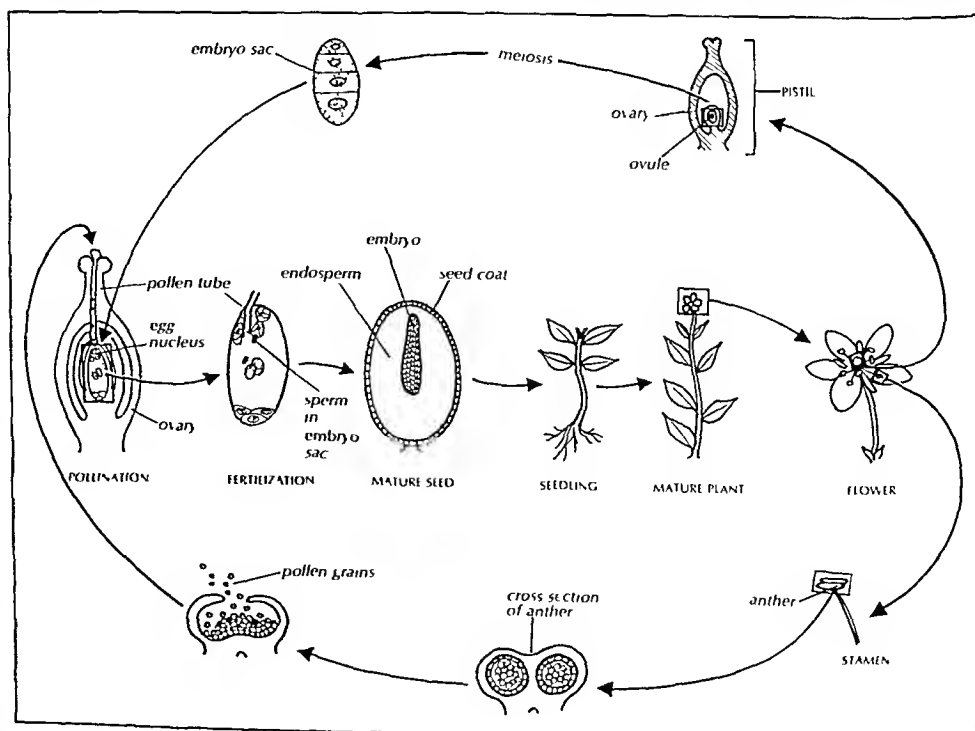
Jacques Arthaud, *The Arts and Civilization of Angkor* (rev. ed 1966), Jan Myrdal and Gun Kessle, *Angkor: An Essay on Art and Imperialism* (1971), John Audric, *Angkor and the Khmer Empire* (1972).

angle, in mathematics, figure formed by the intersection of two straight lines, the lines are called the sides of the angle and their point of intersection the vertex of the angle. Angles are commonly measured in degrees (°) or in radians. If one side and the vertex of an angle are fixed and the other side is rotated about the vertex, it sweeps out a complete circle of 360° or 2 π radians with each complete rotation. Half a rotation from 0° or 0 radians results in a straight angle, equal to 180° or π radians, the sides of a straight angle form a straight line. A quarter rotation (half of a straight angle) results in a right angle, equal to 90° or $\pi/2$ radians, the sides of a right angle are perpendicular to one another. An angle less than a right angle is acute, and an angle greater than a right angle is obtuse. Two angles that add up to a right angle are complementary. Two angles that add up to a straight angle are supplementary. One of the GEOMETRIC PROBLEMS OF ANTIQUITY is the trisection of the angle.

angler, common name for a member of the family Ceratidae, European and American bottom-dwelling predaceous fishes. The angler lies on the bottom and lures its prey with a long, wormlike appendage that extends forward and dangles over its mouth. When the lure is touched, the huge mouth opens automatically. The deep-sea anglers are fantastic fishes, many with luminescent lures, that live at depths of 200 to 600 fathoms. The various species grow from 6 to 40 in (15-500 cm) long. The parasitic males attach themselves to the females and do not develop eyes and digestive organs. The sargassum fishes, less than 6 in (15 cm) long, have armlike pectoral fins and mottled coloration adapted to merge with the seaweed in which they live, they are found in warm Atlantic waters, as are the B- to 12-in (20-30 cm) batfishes, named for their jointed pectoral fins. The goosefish, the largest angler, reaches 4 ft (120 cm) and 50 lb (23 kg) and is capable of swallowing fish as big as itself. Angler fish are classified in the phylum CHORDATA, subphylum Vertebrata, class Osteichthyes, order Lophiiformes, family Ceratidae.

Angles· see ANGLO-SAXONS

Anglesey or Anglesea (both äng'gälsē), island (1971 pop. 59,705), 275 sq mi (712 sq km), NW Wales. Beaumaris is the chief town. It is a region of low, rolling hills. The principal industries are agriculture and stock raising. Two bridges over the Menai Strait connect the island to the mainland. The town of Menai Bridge has long been a stock-trading center for NW Wales. Anglesey is said to have been the last refuge of the druids from the Romans in Britain. Penrynnydd, at the center of the island, was the home of Owen Tudor, founder of the house of



Life cycle of an angiosperm

Tudor In 1974, Anglesey became part of the new nonmetropolitan county of Gwynedd

anglesite (äng'gläsīt), pale green, blue, yellow-to-white, or colorless mineral, a sulfate of lead, $PbSO_4$, that is formed by oxidation of GALENA, crystallizing in the orthorhombic system and occurring also in granular or massive form It is widely distributed and commonly associated with galena and other lead minerals It is a minor lead ore

Anglican Communion, the body of churches in all parts of the world that are in communion with the Church of England (see ENGLAND, CHURCH OF) The Communion is composed of regional churches, provinces, and separate dioceses bound together by mutual loyalty as expressed in the Lambeth Conference of 1930 There are 20 national member churches, including the Protestant Episcopal Church of America (see EPISCOPAL CHURCH, PROTESTANT), the Scottish Episcopal Church, the Church in Wales, the Church of Ireland (see IRELAND, CHURCH OF), and the Nippon Sei Ko Kai (Japan) There are separate dioceses in Jerusalem and Egypt There are over 46 million baptized members Worship is liturgical and is regulated by the BOOK OF COMMON PRAYER See Stephen Neill, *Anglicanism* (3d ed 1965), C E Simcox, *The Historical Road of Anglicanism* (1968)

angling: see FISHING

Anglo-Catholic movement: see OXFORD MOVEMENT

Anglo-Norman literature, body of literature written in English, in the French dialect known as Anglo-Norman, from c 1100 to c 1250 Initiated at the court of Henry I, it was supported by the wealthy, French-speaking aristocracy who controlled England after the Norman conquest The dominant literary forms were histories, sacred and secular biographies, and homilies, romance and fiction were relatively scarce Perhaps the most important historian was Geoffrey Gaimar, whose two-part history of England, *Histoire des Bretons* and *Estorie des Engles*, was written in verse Philippe of Thaün, the earliest known Anglo-Norman poet, was noted for the moral allegory the *Bestiaire* Of secular works, Thomas's *Tristan* (c 1170) is notable both artistically and as an early source for the Tristram and Isolde legend See M D Legge, *Anglo-Norman Literature and Its Background* (1963)

Anglo-Saxon Chronicle, collective name given several English monastic chronicles in Anglo-Saxon, all stemming from a compilation made from old annals and other sources c 891 Although the work was thought for some time to have been commissioned by King Alfred, there is no positive evidence to substantiate this claim, his encouragement of learning, however, undoubtedly inspired the compilation of the chronicle The original chronicle was later edited with additions, omissions, and continuations by monks in various monasteries The account begins with the start of the Christian era and extends to 1154 Much of the very early material is drawn from Bede's history From the period of the wars between Saxons and Danes onward, most of the annals are original and are the sole source for information about certain events The writing is generally in sparse prose, but some poems are inserted, notably the stirring "Battle of Brunanburh" (see BRUNANBURH) The four chronicles recognized as distinct are called the Winchester Chronicle, the Abingdon Chronicle, the Worcester Chronicle, and the Peterborough Chronicle See Charles Plummer, ed., *Two of the Saxon Chronicles Parallel* (1892-99), Dorothy Whitelock et al., ed., *The Anglo-Saxon Chronicle* (1962), Cecily Clark, ed., *The Peterborough Chronicle* (2d ed 1970)

Anglo-Saxon literature, the literary writings in Old English (see ENGLISH LANGUAGE), composed between c 650 and c 1100 There are two types of Old English poetry: the heroic, the sources of which are pre-Christian Germanic myth, history, and custom, and the Christian Although nearly all Old English poetry is preserved in only four manuscripts—indicating that what has survived is not necessarily the best or the most representative—much of it is of high literary quality Moreover, the Old English heroic poetry is the earliest extant in all of Germanic literature It is thus the nearest we can come to the oral pagan literature of Germanic culture, and it is also of inestimable value as a source of knowledge about many aspects of Germanic society WIDSITH, a 7th-century Old English poem, is one of the earliest and thus of particular historic and linguistic interest BEOWULF, a complete epic, is the oldest surviving Germanic epic as well as the longest and most important poem in Old English It originated as a pa-

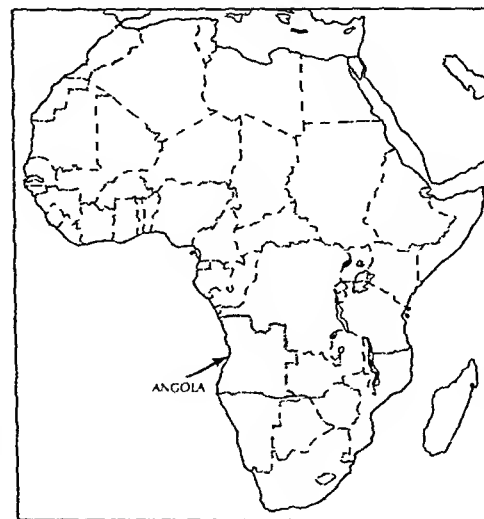
gan saga transmitted orally from one generation to the next, court poets known as scopos were the bearers of tribal history and tradition The version of *Beowulf* that is extant was composed by a Christian poet probably early in the 8th cent However, intermittent Christian themes found in the epic, although affecting in themselves, are not integrated into the essentially pagan tale The epic celebrates the hero's fearless and bloody struggles against monsters and extols courage, honor, and loyalty as the chief virtues in a world of brutal force The elegaic theme, a strong undercurrent in *Beowulf*, is central to *Deor*, *The Wanderer*, *The Seafarer*, and other poems In these works, a happy past is contrasted with a precarious and desolate present The *Finnsburgh* fragment, *The Battle of Maldon*, and *The Battle of Brunanburh* (see MALDON and BRUNANBURGH), which are all based on historical episodes, mostly celebrate great heroism in the face of overwhelming odds In this heroic poetry, all of which is anonymous, greatness is measured less by victory than by perfect loyalty and courage in extremity Much of the Old English Christian poetry is marked by the simple belief of a relatively unsophisticated Christianity, the names of two authors are known CAEDMON—whose story is charmingly told by the Venerable BEDE, who also records a few lines of his poetry—is the earliest known English poet Although the body of his work has been lost, the school of Caedmon is responsible for poetic narrative versions of biblical stories, the most dramatic of which is probably Genesis B CYNEWULF, a later poet, signed the poems *Elene*, *Juliana*, and *The Fates of the Apostles*, and no more is known of him The finest poem of the school of Cynewulf is *The Dream of the Rood*, the first known example of the dream vision, a genre later popular in MIDDLE ENGLISH LITERATURE Other Old English poems include various riddles, charms (magic cures, pagan in origin), saints' lives, gnomic poetry, and other Christian and heroic verse The verse form for Old English is an alliterative line of four stressed syllables and an unfixed number of unstressed syllables broken by a caesura and arranged in one of several patterns Lines are conventionally end-stopped and unrhymed The form lends itself to narrative, there is no lyric poetry in Old English A stylistic feature in the heroic poetry is the kenning, a figurative phrase, often a metaphorical compound, used as a synonym for a simple noun, e.g., the repeated use of the phrases *whale-road for sea* and *twilight-spoiler for dragon* (see OLD NORSE LITERATURE) Old English literary prose dates from the latter part of the period Prose was written in Latin before the reign of King ALFRED (reigned 871-99), who worked to revitalize English culture after the devastating Danish invasions had ended As hardly anyone could read Latin, Alfred translated or had translated the most important Latin texts He also encouraged writing in the vernacular Didactic, devotional, and informative prose was written, and the Anglo-Saxon Chronicle, probably begun in Alfred's time as an historical record, continued for over three centuries Two preeminent Old English prose writers were AELFRIC, Abbot of Eynsham, and his contemporary WULFSTAN, Archbishop of York Their sermons (written in the late 10th or early 11th cent) set a standard for homiletics A great deal of Latin prose and poetry was written during the Anglo-Saxon period Of historic as well as literary interest, it provides an excellent record of the founding and early development of the church in England, and reflects the introduction and early influence there of Latin-European culture See also ENGLISH LITERATURE See G P Krapp and E V K Dobbie, ed., *The Anglo-Saxon Poetic Records* (6 vol., 1932-53), G K Anderson, *The Literature of the Anglo-Saxons* (1949, repr 1962), S B Greenfield, *A Critical History of Old English Literature* (1965), C I Wrenn, *A Study of Old English Literature* (1967)

Anglo-Saxons, name given to the Germanic-speaking peoples who settled in England after the decline of Roman rule there The Angles (Lat *Angli*), who are mentioned in Tacitus' *Germania*, seem to have come from what is now Schleswig in the later decades of the 5th cent Their settlements in the eastern, central, and northern portions of the country were the foundations for the later kingdoms known as EAST ANGLIA, MERCA, and NORTHUMBRIA The SAXONS, a Germanic tribe who had been continental neighbors of the Angles, also settled in England in the late 5th cent after earlier marauding forays there The later kingdoms of SUSSEX, WESSEX, and ESSEX were the outgrowths of their settlements The Jutes, a tribe about whom very little is known except that they probably came from the area around the mouths of the Rhine, settled in Kent (see KENT, KING-

DOM OF) and the Isle of Wight The term "Anglo-Saxons" was first used in Continental Latin sources to distinguish the Saxons in England from those on the Continent, but it soon came to mean simply the "English" The more specific use of the term to denote the non-Celtic settlers of England prior to the Norman Conquest dates from the 16th cent In more modern times it has also been used to denote any of the people (or their descendants) of the British Isles See P Hunter Blair, *An Introduction to Anglo-Saxon England* (1954, repr 1962), F M Stenton, *Anglo-Saxon England* (3d ed 1971), D M Wilson, *The Anglo-Saxons* (rev ed 1971), D J V Fisher, *The Anglo-Saxon Age, 400-1042* (1973)

Angmagssalik (angmag'salik), settlement and trading post (1969 pop 2,530), E Greenland, on the Denmark Strait just S of the Arctic Circle It was founded in 1894 Its radio-meteorological station (est 1925) is the oldest on Greenland

Angola (äng-gō'la) or **Portuguese West Africa**, Portuguese territory (1973 est pop 5,850,000), including the exclave of Cabinda, 481,351 sq mi (1,246,700 sq km), SW Africa LUANDA is the capital, other important cities are NOVA LISBOA, LOBITA, BEN GUELA, and MOSSAMEDES Angola is bounded by the Atlantic Ocean on the west, by Zaïre on the north and northeast, by Zambia on the east, and by South West Africa on the south The Bie Plateau, which forms the central region of the territory, has an average altitude of 6,000 ft (1,830 m) Rising abruptly from the coastal lowland, the plateau slopes gently eastward toward the Congo and Zambesi basins and forms one of Africa's major watersheds The uneven topography of the plateau has resulted in the formation of numerous rapids and waterfalls, which are used for the production of hydroelectric power The territory's principal rivers are the Cuanza and the Cunene Rainfall in Angola is generally low, and nearly all the land is desert or savanna The northeast, however, has densely forested valleys that yield hardwoods, and palm trees are cultivated along a narrow coastal strip where precipitation is heavy Its mineral, power, and agricultural resources make Angola, which is nearly 14 times the size of metropolitan Portugal, the most valuable Portuguese possession in Africa Diamond mining is the principal industry Oil has been produced and refined near Luanda since the 1950s, and the exploitation of large reserves off Cabinda began in 1968 Angola's important deposits of copper, iron, and manganese ores remain largely undeveloped Livestock, notably sheep and goats, is raised in much of the savanna region Coffee is the most important cash crop of Angola, which is one of the world's major producers Europeans own most of the coffee plantations Maize, sisal, and some sugarcane are also raised for export Fishing is important along the coast Among Angola's industries are railroad shops, foundries, cereal mills, fish and palm oil processing plants, meat and fish canneries, and enterprises that manufacture jute, cotton textiles, and paper An important source of revenue is the Benguela railroad, which carries metals from the mines of Zaïre and the Zambian Copperbelt, the railroad extends from Beira, Mozambique, to Angola's port of Lobito Angola also has several shorter rail lines and a fairly good road network Luanda and Lobito are among the best shipping ports in Africa Angola's population is overwhelmingly black African, and most of the people speak a Bantu language, the Mbundu are the



largest ethnic group. The number of Europeans has greatly increased since 1951, when immigration was officially encouraged, there is also a sizable mixed (*mestiço*) population. Most of the Europeans live in urban areas. All Angolans are citizens of Portugal. Although Roman Catholicism is the state religion, Protestant missionaries are active, and various tribal religions are practiced. The Portuguese first explored Angola in the late 15th cent., and except for a short occupation (1641-48) by the Dutch, it has always been under Portugal's control. Although they failed to discover the gold and other precious metals they were seeking, the Portuguese found in Angola an excellent source of slaves for their colony in Brazil. Portuguese colonization of Angola began in 1575, when a permanent colony was founded at Luanda. By this time the Mbundu dynasty had established itself in central Angola. Portugal's attempts to subjugate the Mbundu ended in 1902, when Portuguese troops finally broke the back of the kingdom and captured the 81e Plateau. Construction of the Benguela railroad followed, and white settlers arrived in the Angolan highlands. The modern development of Angola began only after World War II. In 1951 the colony was designated an overseas province, and Portugal initiated plans to develop industries and hydroelectric power. Although the Portuguese professed the aim of a multiracial society of equals in Angola, many Africans still suffered repression. Inspired by nationalist movements elsewhere, they rose in revolt in 1961. When the uprising was quelled by the Portuguese army, many native Angolans fled to Zaire and other neighboring countries. In 1962 a group of refugees in Zaire, led by Holden Roberto, organized the Revolutionary Government of Angola-in-Exile (GRAE). It maintains supply and training bases in Zaire, wages guerrilla warfare in Angola, and, while developing contacts with both Western and Communist nations, obtains its chief support from the Organization of African Unity (OAU). Angola's fragmented liberation movement comprises two other guerrilla groups as well. The Movimento Popular de Libertação de Angola (MPLA) has headquarters in Zambia and is most active among educated Angolan Africans and *mestiços* living abroad. The third rival group is the União Nacional para a Independência Total de Angola (UNITA), which was established in the mid-1960s. In 1972, with Zambian mediation, the heads of GRAE and MPLA assumed joint leadership of a newly formed Supreme Council for the Liberation of Angola, but their military forces did not merge. As a result of the guerrilla warfare, Portugal was forced to keep more than 50,000 troops in Angola by the early 1970s. The four main areas of military activity were along the Zaire frontier in the north, along the Zambian and South West African borders in the southeast, in the area around Luanda, and in the Cabinda exclave. In 1972 the Portuguese national assembly changed Angola's status from an overseas province to an "autonomous state," with the authority to elect its own governing bodies, draft its own budget, collect its own taxes, and pass legislation concerning internal affairs. Portugal was to retain responsibility for defense and foreign relations and to exercise a supervisory role over the Angolan economy and administration. In 1973 elections were held for a legislative assembly. In April, 1974, the Portuguese government was overthrown in a military uprising. In May of that year the new government proclaimed a truce with the guerrillas in an effort to promote peace talks. By later in the year Portugal seemed intent on granting Angola independence, but not as soon as Mozambique (which was scheduled to become independent in June, 1975). The Angolan situation was complicated by the large number of whites (estimated at 500,000) resident there, by continued conflict among the black African liberation movements, and by the desire of some Cabindians for their oil-rich region to become independent as a separate nation. See David Birmingham, *The Portuguese Conquest of Angola* (1965); D. L. Wheeler and Rene Pelissier, *Angola* (1971); Basil Davidson, *In the Eye of the Storm: Angola's People* (1972).

Angora, Turkey. See ANKARA.

angora cat. See CAT.

Angostura: see CIUDAD BOLIVAR.

angostura bark (äng gäst'ōr'a -styōō'r'a), bitter bark of a South American tree (*Cusparia trifoliata*) of the Rut family. Formerly valued as a tonic and quinine substitute, it is now used in angostura bitters, an aromatic appetizer often added to cocktails.

Angoulême, Charles de Valois, comte d'Auvergne, duc d' (sharl də välvä' kōnt dövērn'yä duk dā'gōōlēm'), 1573-1650. Illegitimate son of King Charles IX of France. He turned against King Henry

IV, conspired with Henriette d'Entragues, his half sister, and was imprisoned until 1616. After his release he held military commands. He left memoirs.

Angoulême, Margaret of or Marguerite d': see MARGARET OF NAVARRE.

Angoulême, Marie Thérèse Charlotte, duchesse d' (marē' tārēz'sharlōt'dushēs'), 1778-1851, wife of Louis Antoine d'Angoulême, daughter of Louis XVI and Marie Antoinette. She was imprisoned (1792-95) during the French Revolution. Energetic and ambitious, she exerted considerable political influence after the restoration of the French monarchy during the reigns of Louis XVIII and Charles X. She died in Frohsdorf, Austria.

Angoulême (aNgōōlēm'), city (1968 pop. 50,883), capital of Charente dept., W France, on the Charente River. A former river port, it is now a major road and rail center. Its paper industry dates from the 15th cent., and it has copper foundries, and plants making electric motors, soap, and shoes. It was an early episcopal see and became (9th cent.) the seat of the counts of ANGOUMOIS. Ceded (1360) to England, it was reconquered (1373) by Charles V. Its remarkable Cathedral of St. Pierre was begun c.1110.

Angoumois (aNgōōmwa'), region and former province, W France, now coextensive with most of Charente dept. ANGOULÊME is the historic capital and chief city. In the region is the Charente valley, with its excellent vineyards, the brandy made from their grapes is named for Cognac, the chief distillery center. In pre-Roman times the region was occupied by the Santones and Pictones, two Gallic peoples. Part of the kingdom of AQUITAINE under Charlemagne's empire, Angoumois became a county in the 9th cent. and was united with the French crown in 1307. Under the Treaty of Bretigny (1360) Angoumois, then ruled by the counts of Angoulême, was recognized as English territory, but in 1371 it became a fief of the dukes of Berry, a branch of the French royal family. When Francis I, formerly the count of Angoulême, became king in 1515, Angoumois was definitively incorporated into the French crown lands.

Angra do Heroísmo (äng'grä döō ärdōēzh'mōō), town (1960 pop. 13,929), capital of Angra do Heroísmo dist., Portugal, in the Azores, on Terceira island. It is a port and was until 1832 capital of the Azores. There is an old castle in the town.

Angren (än-gryēn'), city (1969 est. pop. 94,000), Uzbekistan, Central Asian USSR. The largest lignite-mining center in Soviet Central Asia, it was developed during and after World War II.

angry young men, term applied to a group of English writers of the 1950s whose heroes share certain rebellious and critical attitudes toward society. This phrase, which was originally taken from the title of Leslie Allen Paul's autobiography, *Angry Young Man* (1951), became current with the production of John Osborne's play *Look Back in Anger* (1956). The word *angry* is probably inappropriate, *dissident* or *disgruntled* perhaps is more accurate. The group not only expressed discontent with the staid, hypocritical institutions of English society—the so-called Establishment—but betrayed disillusionment with itself and with its own achievements. Included among the angry young men were the playwrights John Osborne and Arnold Wesker and the novelists Kingsley Amis, John Braine, John Wain, and Alan Sillitoe. In the 1960s these writers turned to more individualized themes and were no longer considered a group.

Ångström, Anders Jons (än'därs yōns öng'ström), 1814-74, Swedish physicist. He was educated at the Univ. of Uppsala and in 1839 became a member of its faculty. He is particularly noted for his study of light, especially spectrum analysis. He mapped the solar spectrum, discovered hydrogen in the solar atmosphere, and was the first to examine the spectrum of the aurora borealis. A unit of length used to measure light waves is named for him.

ångström (äng'sträm), abbr. Å, unit of length equal to 10⁻¹⁰ METER (0.0000000001 meter), it is used to measure the wavelengths of visible light and of other forms of ELECTROMAGNETIC RADIATION, such as ultraviolet radiation and X rays. The ångström is named in honor of Swedish physicist Anders J. Ångström.

Anguier, François (fran'swa' aNgä'y'), 1604-69, French sculptor. He is noted for the monuments of the Longuevilles and of Jacques Souvire (Louvre). His most ambitious work is probably the mausoleum of Henri II, duc de Montmorency, in Moulins. His brother Michel Anguier, 1614-86, collaborated in this project. The works of both brothers reflect the

classical baroque influence of Algardi, with whom they studied in Rome. In Paris, Michel executed the marble group *The Nativity*, now in the Church of Saint-Roch. He also made decorations for the apartments of Anne of Austria in the Louvre and worked on reliefs for the triumphal arch at Porte Saint-Denis. A third brother, Guillaume Anguier, 1628-1708, a painter, was director of the Gobelins tapestry factory.

Anguilla (äng-gwī'l'a), island (1971 est. pop. 6,000), 35 sq mi (91 sq km), British West Indies, one of the Leeward Islands. Salt mining, fishing, and stock raising are the mainstays of the economy. In 1967 the British possessions of Anguilla, St. Kitts, Nevis, and Sombroero were united in the self-governing state of St. Kitts-Nevis-Anguilla, associated with Great Britain. Anguilla, claiming political and economic discrimination, seceded in 1967 and returned to British colonial rule in 1971. See SAINT KITTS-NEVIS.

angular momentum: see MOMENTUM.

Angus, earls of: see DOUGLAS, ARCHIBALD.

Angus, county (1971 pop. 97,312), 874 sq mi (2,264 sq km), NE Scotland, formerly (until 1928) called Forfarshire. FORFAR is the county town. The terrain varies from wild rugged mountains (the Sidlaw Hills and part of the Grampians) to the fertile valleys of the North and South Esk and the Isla rivers. Oats, barley, and root crops are grown, cattle, sheep, and horses are raised. The coastal towns engage in fishing and boat building. Angus is a center of the Scottish textile industry, jute and linen are processed at DUNDEE, ARBROATH, BRECHIN, and MONTROSE. Many relics of early Pictish and Roman occupation and the famous Glamis Castle are in Angus. Under the Local Government Act of 1973, Angus became part of the Tayside region.

Angus cattle (äng'gäs), breed of black polled (hornless) beef cattle, originated in Scotland and introduced in 1873 to the United States, where they have become well established. Often called Black Angus or Aberdeen Angus cattle, they have low, compact bodies and are noted for the fine quality of their flesh. As a breed, they lack the size of Shorthorn and Hereford cattle. In recent years, the Red Angus breed of cattle has been derived from red cattle born in registered black herds.

angwantibor: see LORIS.

Anhalt (än'hält), former state, c. 900 sq mi (2,330 sq km), central Germany, surrounded by the former Prussian provinces of Saxony and Brandenburg, located in what are now the Halle and Magdeburg districts of East Germany. Dessau, the capital, and Köthen were the chief cities. A level area except for the outliers of the lower Harz mts. in the west, it was drained by the Elbe, Mulde, and Saale rivers. Until 1918, Anhalt was ruled by one of the most ancient houses of Germany, issued from a son of Albert the Bear (12th cent.), it was divided, at most times, into several principalities held by various branches of the family. Reunited into a single duchy in 1863, it joined the German Empire in 1871, became a republic in 1918, and joined the Weimar Republic. Celebrated members of the house of Anhalt were Leopold I, prince of Anhalt-Dessau, and Sophie of Anhalt-Zerbst, who was empress of Russia as Catherine II.

Anhui (än'hwä') or **An-hui** (än-hwē), province (1968 est. pop. 35,000,000), c. 55,000 sq mi (142,450 sq km), E central China. HO FEI is the capital. Anhwei may be divided into two climatic areas. The northern half, within the N China plain and watered by the Huai and its tributaries (flooding is a common problem), is cold in winter and dry throughout the year. It has a single harvest annually, the chief crops being wheat, kaoliang, corn, soybeans, and cotton. The southern half, through which the Yangtze River flows, is mountainous and has a relatively moist, warm climate. It is a major rice-producing region, two thirds of the cultivated area is double-cropped. Wheat, sweet potatoes, cotton, barley, and tobacco are also grown, and tea is produced in the south east. Fish culture is important. Coal and iron are abundant throughout the province. Three of China's 34 leading industrial centers are in Anhwei. Ho-fei, the capital, which has textile mills and new iron and steel works, HUAI NAN, a large coal-mining center, with important chemical manufactures, and Ma-an-shan, a major industrial complex with huge steel works. Railroad building has not had high priority because of the excellent waterways—the Yangtze is open to ocean vessels in the summer, the Huai and its affluents are navigable by junk, and an intricate canal system connects the two rivers. Some single line tracks have been built to link the industrial centers with Ho-fei, and there are rail connections with other provinces, generally radiating from Ho-fei, the

railroad connecting Nanking and Shanghai crosses the province. Road building has been accomplished at the local level, linking marketing and industrial centers. Anhwei Univ. is in Ho-fei.

anhydride (änhī'drīd, -drīd) [Gr. =without water], chemical compound formed by removing water, H_2O , from another compound, the anhydride can also react with water to form the original compound. An acid anhydride reacts with water to form an acid, e.g., sulfur trioxide, SO_3 , reacts with water to form sulfuric acid, H_2SO_4 . A basic anhydride reacts with water to form a base, e.g., calcium oxide, CaO , reacts with water to form calcium hydroxide, $Ca(OH)_2$. Anhydrides of organic acids have many uses. They react with alcohols to form esters, e.g., acetic anhydride, $(CH_3CO)_2O$, reacts with ethanol, C_2H_5OH , to form ethyl acetate, $CH_3COOC_2H_5$, a useful solvent. They also react with ammonia and primary or secondary amines to form amides. Other important acid anhydrides include maleic anhydride and phthalic anhydride.

anhydrous ammonia, liquefied ammonia that contains 82% nitrogen and is used as an agricultural fertilizer. It is stored under pressure and must be added to the soil at a depth of several inches in order that the ammonia may be absorbed by the soil. See FERTILIZER.

ani (ä'nē), bird. See CUCKOO.

Aniakchak (änēäk'chäk), volcano, 4,420 ft (1,347 m) high, in the Aleutian Range, SW Alaska. Its crater is c. 6 mi (9.7 km) in diameter. Aniakchak was thought to be extinct until it erupted on May 1, 1931.

Aniam (än'äm), Manassite. 1 Chron. 7:19.

Aniene (anyä'nä), Lat. Anio, river, 61 mi (98 km) long, rising in Latium, central Italy, and flowing generally southwest to empty into the Tiber River near Rome. Two aqueducts have carried water from the Aniene to Rome since ancient times, and now the river also supplies several hydroelectric plants. Below Tivoli, where it forms a celebrated waterfall, it is also called the Teverone.

aniline (än'älīn), $C_6H_5NH_2$, colorless, oily, basic liquid organic compound, chemically, a primary aromatic amine whose molecule is formed by replacing one hydrogen atom of a benzene molecule with an AMINO GROUP. Aniline boils at $184^\circ C$ and melts at $-6^\circ C$. It is of great importance in the dye industry, being used as the starting substance in the manufacture of many dyes—e.g., indigo—and as an aid in the manufacture of others. For this reason many dyes have the word *aniline* in their common name, such as aniline black (one of the best black dyes known), aniline red, yellow, blue, purple, orange, green, and others. Today these synthetic dyes have largely replaced the natural ones. Aniline is prepared commercially by the reduction of nitrobenzene, a product of coal tar, or by heating chlorobenzene with ammonia in the presence of a copper catalyst. Sulfonation of aniline yields sulfanilic acid, the parent compound of the sulfa drugs. Aniline is also important in the manufacture of rubber-processing chemicals and antioxidants.

Anim (ä'nīm), town of Palestine, SW of Hebron. Joshua 15:50.

animal, any member of the animal kingdom (Kingdom Animalia) as distinguished from the plant kingdom (Kingdom Plantae). Demarcation between animals and plants is usually based on a fundamental difference in their method of obtaining food. Plants characteristically manufacture their food from inorganic substances (usually by photosynthesis). Animals, on the other hand, must secure food already organized into organic substances. In addition, most animals have specialized means of locomotion, possess nervous systems and sense organs, and are adapted for securing, ingesting, and digesting their food. In all but the simpler forms there is a distinct alimentary canal or digestive system. Almost all animals, unlike most plants, possess a limited scheme of growth, that is, the adults of a given species are nearly identical in their characteristic form and are similar in maximum size. It is easy to distinguish between plants and animals of the higher groups, but among the simpler and microscopic forms it is often difficult. Some single-celled organisms, such as *Euglena*, possess chlorophyll and carry on photosynthesis but have a flexible cell membrane rather than the cellulose wall characteristic of plant cells and swim actively by means of flagella. Such forms are probably descended from the common ancestors of plants and animals that existed in the early stages of evolution. They are classified by zoologists as one-celled animals and by botanists as ALGAE, or simple plants. They may also be classified in a third kingdom, the PROTISTA. Ani-

mals and plants are interdependent—green plants provide oxygen as a by-product of photosynthesis and are the ultimate source of all food for animals. Animals (as well as plants) provide carbon dioxide through respiration and the decomposition of their dead bodies (see CARBON CYCLE, NITROGEN CYCLE). In zoological classification the animal kingdom is divided into the two subkingdoms of PROTOZOA (one-celled animals) and Metazoa (many-celled animals). The Metazoa comprise numerous INVERTEBRATE phyla and the phylum CHORDATA. The distinguishing characteristics of the chordates are a NOTOCHORD (a dorsal stiffening rod) in the embryo, a dorsal, hollow SPINAL CORD, and GILL slits (sometimes present only during embryonic stages, e.g., in the frog and man). The chordates include two primitive subphyla of a few species each, in which these features are present only at certain stages of the life cycle. The fourth and major chordate subphylum is the Vertebrata (see VERTEBRATE), in which the embryonic notochord is replaced by the SPINAL COLUMN of the adult. The scientific study of animals is called ZOOLOGY, the study of their relation to their environment and of their distribution is animal ECOLOGY. For specific approaches to the study of animals and plants, see BIOLOGY.

animal husbandry, domestication of animals especially as a source of food, fuel, power, or raw materials. Maintenance of control over an animal species for several generations has often led to man's dependence upon that animal for his well-being. Domestic animals have functioned as symbols of wealth, prestige, or religious belief, or as accessories to acts of aggression and defense. The domestication of animals influenced settlement patterns, architecture, and equipment, as well as the value placed on the animals and the elaboration of rules governing property rights concerning them. They have also figured importantly in the verbal symbolism of myths and songs, and in the idiomatic vocabularies of the societies possessing them. The first domesticated animal seems to have been the sheep, which was tamed around 9000 B.C. in N. Iraq. Around 6500 B.C., domestic goats were kept in the same region, about 6000 B.C. the pig was domesticated in Iraq, about 5500 B.C. there were domesticated cattle in SW Iran, and around 3000 B.C. the horse was domesticated in Russia.

animal jelly: see GELATIN.

animated cartoon: see MOTION PICTURES.

animism, belief that within every object dwells an individual spirit or force that governs its existence. It has been said that upon this concept rests the historic structure of religion. Since primitive man did not distinguish between animate and inanimate objects or between physical and mental processes, everything in the universe was thought to have its own individuality. Men, animals, plants, stones, as well as emotions, dreams, and ideas alike, were regarded as having indwelling spirits. More generalized is the idea of mana, which originated among Melanesians of the South Seas. A kind of transcendental force, mana is thought to be the spirit that pervades all objects and things and is responsible for the good and evil in the universe. In philosophy, the term animism is applied to the doctrine that the principle of life, called the vital force, cannot be reduced to the mechanistic laws of physics and chemistry, but is separate and distinct from matter. See FETISH, TABOO, TOTEM, IDOL, SHAMAN, ANCESTOR WORSHIP, AMULET. See J. G. Frazer, *The Golden Bough* (1890, repr. 1966), E. B. Tylor, *Religion in Primitive Culture* (1871, repr. 1970).

Anio, river. See ANIENE.

anion (än'tī'ən), atom or group of atoms carrying a negative charge. The charge results because there are more electrons than protons in the anion. Anions can be formed from nonmetals by reduction (see OXIDATION AND REDUCTION) or from neutral acids (see ACIDS AND BASES) or polar compounds by ionization. Anionic species include Cl^- , SO_4^{--} , and CH_3COO^- . Highly colored intermediates in organic reactions are often radical anions (anions containing an unpaired electron). SALTS are made up of anions and CATIONS. See ION.

anise (än'ts), annual plant (*Pimpinella anisum*) of the family Umbelliferae (CARROT family), native to the Mediterranean region but long cultivated elsewhere for its aromatic and medicinal qualities. It has flat-topped clusters of small yellow or white flowers that become seedlike fruits—the aniseed of commerce, used in food flavoring. Anise oil is derived from the seeds and sometimes from the leaves; it is also obtained from the star anise, an unrelated woody plant. The oil, composed chiefly of anethole,

is used in medicinals, dentifrices, perfumes, beverages, and, in drag hunting, to scent a trail for dogs in the absence of a fox. The anise of the Bible (Mat. 23:23) is dill, a plant of the same family. Anisette is an anise-flavored liqueur. Anise is classified in the division MAGNOLIOPHYTES, class Magnoliopsida, order Umbellales, family Umbelliferae.

Anjo (änjō'), city (1970 pop. 94,307), Aichi prefecture, S. central Honshu, Japan. It is an agricultural and poultry center with cotton textile mills and food canneries. There are agricultural and forestry schools in the city.

Anjou (änzhō'), region and former province, W. France, coextensive roughly with Maine-et-Loire and parts of Indre-et-Loire, Mayenne, and Sarthe. Depts. ANGERS, the historic capital, and SAUMUR are the chief towns. A fertile lowland, Anjou is traversed by the Loire, Mayenne, Sarthe, Loir, and Maine rivers. It is chiefly an agricultural area with excellent vineyards that produce the renowned Vouvray and Saumur sparkling wines. Occupied by the Andecavi, a Gallic people, the region was conquered by Caesar. Anjou fell to the Franks in the 5th cent. and became a countship under Charlemagne in the 9th cent. By the 10th cent. it was in the hands of the first line of the counts of Anjou (see ANGEVIN dynasty), who expanded their holdings vigorously. Fulk Nerra, who founded the Angevin dynasty, acquired Saumur from the counts of BLOIS. His successor, Geoffrey Martel, won Touraine from Blois (1044) and Maine from Normandy (1051). FULK (d. 1143), the grandson of Fulk Nerra, after protracted wars with Henry I of England over the possession of Maine, married his son Geoffrey (Geoffrey Plantagenet) to Henry's daughter Matilda. Geoffrey ruled Anjou (1129-51) and conquered Normandy, of which he was crowned duke in 1144. His son, later Henry II of England, married Eleanor of Aquitaine and with her inheritance ruled most of W. France. When Henry II's grandson, Arthur I, duke of Brittany, rebelled against his uncle, John of England, he won the support of Philip II of France, to whom he paid homage (1199) for Anjou, Maine, and Touraine. After Arthur's death, Philip II seized (1204) all Anjou. In 1246, Louis IX of France gave Anjou in appanage to his brother Charles, count of Provence, who later also became king of Sicily and Naples (see CHARLES I). Charles II of Naples gave Anjou as dowry to his daughter Margaret when she married Charles of Valois, son of Philip III of France. When their son became (1328) King Philip VI of France, Anjou was again reunited to the French crown. John II of France, however, made Anjou a duchy (1360) and gave it to his son Louis (later Louis I of Naples). Louis XI of France inherited Anjou after the death (1480) of René, grandson of Louis I, and the death (1481) of Charles of Maine, René's nephew, the last of the Angevin line. Anjou was definitively annexed to France in 1487. In the 16th cent. Anjou was held as appanage at various times, the last duke was Francis of Alençon and Anjou. The region was devastated during the Wars of Religion (see under RELIGION WARS OF) (1562-98). During the French Revolution the rising of the VENDEE, the Royalist revolt against the revolution, occurred in Anjou.

Ankara (äng'kärə, Turk. ang'kara), city (1970 pop. 1,208,791), capital of the Republic of Turkey and its Ankara province, W. central Turkey, at an elevation of c. 3,000 ft (910 m). Turkey's largest city after Istanbul, Ankara is an administrative, commercial, and cultural center. Grains, vegetables, and fruit are grown nearby. Manufactures of the city include food products, farm machinery, and cement. Known in ancient times as Ancyra and later as Angora, the city was an important commercial center at least as early as Hittite times (18th cent. B.C.). In the 1st cent. A.D. it became the capital of a Roman province. It flourished under Augustus, in the ruins of a marble temple dating from his reign (31 B.C.-A.D. 14) was found the *Monumentum Ancyranum*, a set of inscribed tablets valuable as a record of Augustan history. The city was conquered by the Ottoman Turks in the mid-14th cent., and in 1402 Tamerlane defeated and captured Sultan Bayezid I there. In the late 19th cent. Ankara declined and by the early 20th cent. was a small town known only for the production of mohair. In 1920, Kemal Atatürk made the city the seat of his Turkish Nationalist government. In 1923 it replaced Istanbul as the capital of all Turkey, partly to break with tradition and partly to take advantage of its central location. The city grew rapidly from the 1920s, in the 1960s its population almost doubled. There are few historic remains. Ankara's leading modern monument is the Atatürk mausoleum, completed in 1953. The city has numerous

museums and is the seat of the Ankara, Hacettepe, and Middle East Technical universities

Anking: see AN-CH'ING, China

An Lu-shan (an lōō-shan), d 757, Chinese general of the T'ang dynasty. Of mixed Sogdian and Turkish birth, he was appointed regional commander on the northeastern frontier. In 755 he led c 200,000 troops in revolt against the T'ang central government. Emperor Hsuan Tsung fled the capital Ch'ang-an for Szechuan, and on the way he was forced by discontented soldiers to execute his concubine YANG KUEI FEI, who was blamed for demoralizing the court and was even rumored to have had a secret affair with An Lu-shan. An Lu-shan was killed by his son in 757. The rebellion lasted until 763, when foreign troops helped restore the T'ang dynasty to power.

Ann, Cape, NE Mass., N of Massachusetts Bay. It is noted for its old fishing villages, resorts, and artists' colonies, especially Gloucester and Rockport.

Anna (Anna Ivanovna) (an'na i'va'nōvna), 1693–1740, czarina of Russia (1730–40), daughter of Ivan V and niece of Peter I (Peter the Great). On the death of her distant cousin, Peter II, she was chosen czarina by the supreme privy council, which thus hoped to gain power for itself. Anna signed articles limiting her power, but she soon restored autocratic rule, with support from the lesser nobility and the imperial guards. She made minor concessions to the nobles but restored the security police and terrorized opponents. Distrusting the nobility, she excluded Russians from high positions and surrounded herself with Baltic Germans. Her favorite, Ernst Johann von Biron, had the greatest influence. Allied with Holy Roman Emperor CHARLES VI, Anna intervened in the War of the Polish Succession (1733–35), installed Augustus III as king of Poland, and attacked Turkey in 1736. Charles's separate peace with the Turks at Belgrade forced Russia to make peace in turn, at the price of all recent conquests except Azov. During Anna's reign began the great Russian push into central Asia. She was succeeded by her grandnephew, Ivan VI.

Anna [Gr., = Heb. HANNAH], 1. Aged prophetess who hailed Jesus' presentation at the Temple. Luke 2:36–38. 2. In Tobit, the mother of young Tobias.

Anna Amalia, duchess of Saxe-Weimar (ama'lyā, zak'sa-vī'mar), 1739–1807, German patron of letters and science, niece of Frederick II of Prussia and mother of CHARLES AUGUSTUS, duke of Saxe-Weimar. As regent for her son (1757–75) she fostered German culture by her patronage of such authors as Herder, Wieland, Goethe, and Schiller. She wrote the music for Goethe's *Erwin und Elmire*.

Annaba (ān-nab'a), formerly **Bône** (bōn), city (1966 pop 168,790), capital of Annaba dept., extreme NE Algeria, a port on the Mediterranean Sea. One of the country's leading ports, the city is also an important administrative, commercial, and industrial center. The large El Hadjar ironworks, built with French and Soviet financial and technical aid, constitutes the chief industry; others include chemical (superphosphate) manufacturing, food canning, cork production, and railway construction. Founded by the Carthaginians, the city became a favorite residence of the Numidian kings. Under the Romans, it was called Hippo Regius and was a center of early Christianity, the episcopal see of St. Augustine. The city was captured by the Vandals in 431. After the Arab conquest of Algeria in the 7th cent., Annaba became an important Muslim city and port. Spanish forces occupied it in the 16th cent. During the 17th and 18th cent., Annaba was a busy center for European trade. The French took the city in 1832. Landmarks include the Great Mosque and the Cathedral of St. Augustine.

Anna Comnena (kōmnē'nā), b. 1083, d. after 1148, Byzantine princess and historian, daughter of Emperor Alexius I. She plotted, during and after her father's reign, against her brother, JOHN II, in favor of her husband, Nicephorus Bryennius, whom she wished to rule as emperor. Having failed, she retired to a convent. There she wrote the *Alexiad* (finished in 1148), one of the outstanding Greek historical works of the Middle Ages. Covering the reign of Alexius I and the First Crusade, it tends to glorify her father and his family, however. Anna's familiarity with public affairs and her access to the imperial archives give her work great value. There is an English translation by Elizabeth A. Dawes (1928, repr 1967). See biography by Georgina Buckler (1929).

Anna Ivanovna: see ANNA, czarina of Russia

An Najaf (an nā'jāf), city (1965 pop 128,096), 5 central Iraq on a lake near the Euphrates River. The city is also called Mashad Ali, after the tomb (in a mosque) of Ali, son-in-law of Muhammad the

Prophet. The tomb is an object of pilgrimage by Shiite Muslims and a starting point for the pilgrimage to Mecca.

Annaka (an-na'ka), city (1970 pop 40,092), Gumma prefecture, central Honshu, Japan. It is an agricultural and tourist center, noted for its mineral springs.

Anna Leopoldovna (lyā'āpōl'davnā) or **Anna Karlovna** (kar'lavnā), 1718–46, duchess of Brunswick-Wolfenbützel, regent of Russia (1740–41), daughter of Charles Leopold, duke of Mecklenburg-Schwerin, and of Catherine, sister of Czarina Anna of Russia. She married the prince of Brunswick-Wolfenbützel, and their son, IVAN VI, succeeded (1740) Anna as czar. After the deposition of Ivan by Czarina ELIZABETH, Anna Leopoldovna and her husband were imprisoned. She died in childbirth.

Annam (anām', ā'nām), historic region (c 58,000 sq mi/150,200 sq km) and former state, in central Vietnam, SE Asia. The capital was HUE. In 1954, when Vietnam was divided on a line approximating the 17th parallel, Annam went largely to South Vietnam. The region extended nearly 800 mi (1,290 km) along the South China Sea between Tonkin (now in North Vietnam) on the north and Cochinchina (now part of South Vietnam) on the south. The ridge of the Annamese Cordillera separated N and central Annam from Laos on the west, the ridge then swung southeastward and ran along the coast of S Annam, which included the plateaus that stretched to the borders of Cambodia and Cochinchina. The narrow coastal plains of N and central Annam were interrupted by spurs of mountains that almost reached the sea, as at Porte d'Annam, a pass important in Annamese history. In addition to Hue, the principal cities in the region were DA NANG (the chief seaport), An Nhon, Quang Tri, and VINH (now in North Vietnam). The origins of the Annamese state may be traced to the peoples of the Red River valley in North Vietnam. After more than 2,000 years of contact with the Chinese, they fell under Chinese rule as the result of a Han invasion in 111 B.C. The region, to which the Chinese gave the name Annam ("Pacified South", a name resented by the people), comprised all of what later became N Annam and Tonkin. Southern Annam was occupied by the kingdom of the Chams, or Champa, from the late 2d cent. A.D. In 939 the Annamese drove out the Chinese and established their independence, which they maintained, except for one brief period of Chinese reoccupation (1407–28), until their conquest by the French in the 19th cent. Le Loi, who defeated the Chinese in 1428, established the Le dynasty. A long series of wars against the Chams ended in 1471 when the Chams were defeated and the Annamese kingdom was extended southward to the vicinity of Da Nang. The power of the Le dynasty declined, and in 1542, after several rebellions, the dynasty was defeated. By 1558 the kingdom was in effect divided between two great families: the Trinh line, which reinstalled a puppet Le emperor and ruled from Hanoi (then called Tonkin) as far south as Porte d'Annam (this area was called Tonkin by the Europeans who arrived in the 16th cent.), and the Nguyens, who ruled from Hue over the territory extending from Porte d'Annam south to the vicinity of Qui Nhon. In the 17th cent. the lords of Hue pushed further southward into the Cambodian provinces on the lower Mekong. The early 18th cent. saw their control extended into parts of Laos and, at the expense of Cambodia, to the shores of the Gulf of Siam. The ruling dynasties of Hue and Tonkin were overthrown in 1778 and 1786 respectively, and the two domains were reunited (1802) as the empire of Vietnam by Nguyen-Anh, a Hue general, who had procured French military aid by ceding (1787) to the French the port of Da Nang and the Con Son islands. Nguyen-Anh established himself as emperor, his authority was formally recognized by the Chinese in 1803. In 1807 the Vietnamese extended a protectorate over Cambodia, which led in succeeding years to frequent wars against Siam. After the death of Nguyen-Anh, his successor, attempting to withdraw into isolation, mistreated French nationals and Vietnamese Christian converts. This provided an excuse for French military operations, which began in 1858 and resulted in the seizure of southern Vietnam (Cochinchina) and the establishment of protectorates (by 1884) over northern Vietnam (Tonkin) and central Vietnam (Annam). The French, who abolished the name Vietnam, received recognition for their protectorates from the Chinese emperor. In 1887, Annam became part of the Union of Indochina. In World War II, Indochina was occupied by the Japanese, who set up the autonomous state of Vietnam, comprising Tonkin, Annam, and Cochinchina.

China, Bao Dai, the last emperor of Vietnam, was established as ruler. After the war Annamese and Tonkinese nationalists demanded independence for the new state of Vietnam, and the region was plunged into a long and bloody conflict (see VIETNAM).

Annamese Cordillera (an'namēz' kōr'dīlyā'a) or **Chaine Annamitique** (shēn anamētik'), principal mountain range of Southeast Asia, extending c 700 mi (1,130 km) from N central Laos SE to S central South Vietnam, Ngoc Linh (8,524 ft/2,598 m) in N South Vietnam is the highest peak. The range forms the divide between rivers draining into the Mekong basin and those flowing into the South China Sea. An igneous massif, the range has a steep eastern face and a gently sloping western section. The Tran Ninh Plateau in the north and the Moi plateaus in the south are extensions of the range.

Annapolis (anāp'ālīs), city (1970 pop 29,592), state capital and seat of Anne Arundel co., central Md., on the south bank of the Severn River. Annapolis is a port of entry and the business and shipping center for the fruit and vegetable farmers of S Maryland. Local industries include the packaging of seafood and the manufacture of small boats and plastics. Annapolis was settled in 1649 by Puritans fleeing Virginia. Hostility between the Puritans and the Roman Catholic governors of Maryland resulted in the battle of the Severn River in 1655, in which the Puritans successfully revolted, only to lose control after the RESTORATION in England. The settlement, originally called Providence, was later known as Anne Arundel Town, after the wife of the 2d Lord Baltimore. In 1694 it became the provincial capital of Maryland and was renamed Annapolis for Princess (later Queen) Anne of England. During the 1700s the city prospered, largely because of its tobacco exports and trade with the West Indies and Europe; it rapidly became an important social and commercial center for the colonies. In 1783–84, Annapolis served as the capital of the United States when the Congress met there. The city was the site of the Annapolis Convention (1786), which led to the FEDERAL CONSTITUTIONAL CONVENTION. Still standing is the statehouse where George Washington resigned as commander in chief of the Continental Army in 1783 and where the treaty that ended the Revolutionary War was ratified in 1784 (see PARIS, TREATY OF). Other notable landmarks are the Old Treasury (c 1695), the oldest original building in Maryland, the library (1737), St. John's College, and St. Anne's Church (1858–59) and graveyard, where the former royal governor of Annapolis Sir Robert Eden (an ancestor of Anthony Eden) is buried. Much 18th-century architecture is preserved in the city. Annapolis is also the site of the United States Naval Academy, founded in 1845.

Annapolis, river, c 75 mi (120 km) long, rising in W Nova Scotia, Canada, and flowing SW past Annapolis Royal to Annapolis Basin, an arm of the Bay of Fundy. The entrance to the basin, bordered by cliffs 500 ft (152 m) high, is known as Digby Gut. The Annapolis valley, an important agricultural area noted for its apples, was the site of Nova Scotia's first successful farming colony.

Annapolis Convention, 1786, interstate convention called by Virginia to discuss a uniform regulation of commerce. It met at Annapolis, Md. With only 5 of the 13 states—Delaware, New Jersey, New York, Pennsylvania, and Virginia—represented, there could be no full-scale discussion of the commercial problems the nation faced as a result of the weak central government under the Articles of Confederation. The main achievement of the convention was the decision to summon a new meeting for the express purpose of considering changes in the Articles of Confederation to make the union more powerful. An address was drawn up by Alexander Hamilton and was sent to all the states, asking them to send delegates to Philadelphia in May, 1787. The move was extraconstitutional, but Congress passed a resolution urging attendance. The call from Annapolis was heeded and delegates from 12 states met. From that Federal Constitutional Convention was to emerge the Constitution of the United States.

Annapolis Royal, town (1971 pop 758), W N.S., Canada, on the Annapolis River. Founded as Port Royal by the sieur de MONTS in 1605, the settlement was destroyed (1613) by English colonists under Samuel ARGALL but was rebuilt by the French. The fort changed hands between the French and the English five times from 1605 to 1710, when it capitulated to a force of New Englanders under Francis Nicholson. The name was then changed in honor of Queen Anne. Annapolis Royal was the capital of Nova Scotia from 1713 to 1749. Fort Anne Historic

National Park includes the ruins of the fort. The officers' quarters (built 1797-98) have been restored as a museum.

Annapurna (ən-nəpōr'nə), massif of the Himalayas, N central Nepal, forming a ridge 35 mi (56 km) long, including two of the highest peaks in the world. Having four snow-covered peaks, it rises to Annapurna I (26,502 ft/8,078 m) in the west and Annapurna II (26,041 ft/7,938 m) in the east. Annapurna I was first climbed in 1950 by a French expedition led by Maurice Herzog.

Ann Arbor, city (1970 pop. 99,797), seat of Washtenaw co., S Mich., on the Huron River, inc. 1851. It is a research and educational center, with a large number of government and industrial research and development firms, the huge Univ. of Michigan, and two junior colleges. Products include lasers, computers, hospital and laboratory equipment, scientific instruments, automotive parts, and precision machinery. The city is also a medical center, in addition to the university hospitals and medical school, it has a community hospital, a veterans' hospital, and a neuropsychiatric hospital. There are Indian mounds in the region.

Annas (ān'əs) [Gr. = Heb. HANANIAH], Jewish high priest who examined Jesus. Nonbiblical sources say that he was retired high priest. His son-in-law was Caiaphas. John 18:13, 24, Acts 4:6-22.

An Nasiriyah (an nāsīrī'ya), city (1965 pop. 60,405), provincial capital, SE Iraq, on the Euphrates River. It is the center of a date-growing region. Founded in 1870, the city was captured by the British in 1915. Nearby are the ruins of Ur.

Annau or **Anau** (both ənəu'), village, Central Asian USSR, in Turkmenistan, 5 mi (8 km) SE of Ashkhabad, near the Iranian border. It has a 15th-century mosque, a citadel, ancient burial mounds, and other remains. At Annau, Raphael Pumpelly discovered (1903) traces of habitation dating back to c. 3000 B.C. There are indications of ancient cultivation of grain, and beautifully designed pottery has been found. The discovery has been related to other excavations throughout central Asia. See Raphael Pumpelly, *The Prehistoric Civilization of Anau* (1908).

Anne, Saint, in tradition, mother of the Virgin and wife of St. Joachim. She is not mentioned in Scripture, but her cult is very old. In the West she has been especially popular since the Middle Ages. She is patroness of Quebec prov., and Ste Anne de Beaupre is one of the most visited of New World shrines. Brittany, also under her patronage, has the renowned shrine of Ste Anne d'Auray, with its annual pilgrimage. St. Anne is invoked by women in childbirth. In art, she is usually an elderly veiled woman and often appears teaching her daughter to read. Her name also appears as Anna. Feast: July 26.

Anne, 1665-1714, queen of England, Scotland, and Ireland (1702-7), later queen of Great Britain and Ireland (1707-14), daughter of James II and Anne Hyde, successor to William III. Reared as a Protestant and married (1683) to Prince George of Denmark (d. 1708), she was not close to her Catholic father and acquiesced in the GLORIOUS REVOLUTION (1688), which put William III and her sister, Mary II, on the throne. She was soon on bad terms with them, however, partly because they objected to her favorite, Sarah Jennings (later Sarah Churchill, duchess of MARLBOROUGH), who was to exercise great influence in Anne's private and public life. Of Anne's many children the only one to live much beyond infancy—the duke of Gloucester—died at the age of 11 in 1700. Since neither she nor William had surviving children and support for her exiled Catholic half brother rose and fell in Great Britain (see STUART, JAMES FRANCIS EDWARD, JACOBITES), the question of succession continued after the Act of SETTLEMENT (1701) and after Anne's accession. The last Stuart ruler, she was the first to rule over Great Britain, which was created when the Act of Union joined Scotland and England in 1707. Her reign, like that of William III, was one of transition to parliamentary government. Anne was, for example, the last English monarch to exercise (1707) the royal veto. Domestic and foreign affairs alike were dominated by the War of the SPANISH SUCCESSION, known in America as Queen Anne's War (see FRENCH AND INDIAN WARS). In the actual fighting on the Continent, Sarah Churchill's husband, the duke of MARLBOROUGH, won a series of spectacular victories. At home the costs of the fighting were an issue between the Tories, who were cool to the war, and the Whigs, who favored it. Party lines were slowly hardening, but party government and ministerial responsibility were not yet established, intrigues and the favor of the queen still made and unmade cabinets, though the influence

of public opinion, shaped by an increasingly powerful press, and elections was growing. Thus it was at least partly through the pressure of the Marlboroughs that Anne was induced, despite her Tory sympathies, to oust Tory ministers in favor of Whigs. The Marlboroughs were even able to force the dismissal of Robert HARLEY in 1708, though the scolding duchess had already lost much of her power to Anne's new favorite, the quiet Abigail MASHAM, kinswoman and friend of Harley. When the unpopularity of the war and the furor over the prosecution of Henry SACHEVERELL showed the power of the Tories (who won the elections of 1710) and made the move feasible, Anne recalled Harley to power, and the Marlboroughs were dismissed. Harley, created earl of Oxford, was political leader until 1714, when he was replaced by his Tory colleague and rival, Viscount Bolingbroke (see ST. JOHN, HENRY). Soon afterward the queen died, and Jacobite hopes were dashed by the succession of GEORGE I of the house of Hanover. Queen Anne was a dull, stubborn, but conscientious woman, devoted to the Church of England and within it to the High Church party. She supported the act (1711) against "occasional conformity" and the Schism Act (1714), both directed against dissenters and both repealed in 1718. She also created a trust fund, known as Queen Anne's Bounty, for poor clerical benefices. During Anne's reign such thinkers as George Berkeley and Sir Isaac Newton and such scholars and writers as Richard Bentley, Swift, Pope, Addison, Steele, and Defoe were at work, while Sir Christopher Wren and Sir John Vanbrugh were at the same time setting in stone and brick the rich elegance of the period. See biographies by M. R. Hopkinson (1934) and David Green (1970), G. M. Trevelyan, *England under Queen Anne* (3 vol., 1930-34), G. N. Clark, *The Later Stuarts* (2d ed. 1955).

Anne (Anne Elizabeth Alice Louise), 1950-, British princess, daughter of Queen Elizabeth II and Prince Philip, duke of Edinburgh. She was educated at Benenden School. An accomplished horsewoman, she represented Britain in various international show-jumping events. In 1973 she married a British army officer, Mark Phillips.

annealing (ənēl'ng), process in which glass, metals, and other materials are treated to render them less brittle and make them more workable. Annealing consists of heating the material and then cooling it very slowly and uniformly, the time and temperatures required in the process are set according to the properties desired. Annealing increases ductility and lessens the possibility of a failure in service by relieving internal strains.

Anne Boleyn, queen of England. See BOLEYN, ANNE.

Anncy (ansē'), town (1968 pop. 56,689), capital of Haute-Savoie dept., SE France, in SAVOY in the N Alps, on beautiful Lake Annecy. A popular tourist resort, it also has printing plants and factories making jewelry and wood and leather products. The center of the city, traversed by narrow canals, is picturesquely medieval. St. Francis of Sales, who was born in Annecy, was bishop from 1602 to 1622. The city has many fine churches, monasteries, and seminaries. The castle of the counts of Geneva (12th-14th cent.) dominates Annecy from a hill.

Anne de Beaujeu (də bözhō'), c. 1460-1522, regent of France, daughter of the French king Louis XI. With her husband, Pierre de Beaujeu, duc de Bourbon, she acted as regent for her brother, Charles VIII, after the death (1483) of Louis XI. Preserving the royal authority, she put down the rebellious great nobles and subdued Brittany. In 1491 she and her husband arranged the marriage of Charles VIII to ANNE OF BRITAIN, and soon afterward their influence declined.

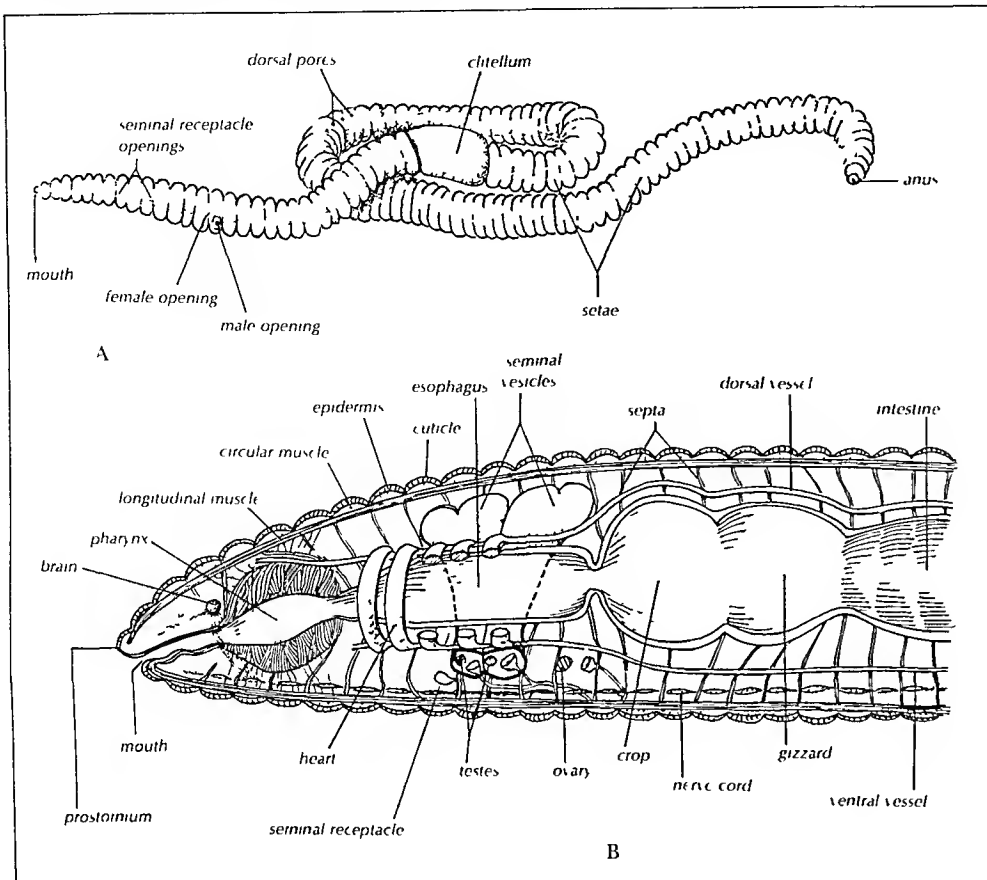
Annelida (ənēl'īdā) (Lat. *anellus* = a ring), phylum of soft-bodied, bilaterally symmetrical (see SYMMETRY, BIOLOGICAL) segmented animals, known as the segmented, or annelid, worms. The approximately 8,600 known species are grouped in three classes: the EARTHWORMS and freshwater worms (oligochaetes), the LEECHES (hirudineans), and the marine worms (polychaetes). Annelids are found throughout the world, from deep ocean bottoms to high mountain glaciers. They live in protected habitats such as mud, sand, and rock crevices, and in and among other invertebrate animals, such as sponges. Many live in tubes they secrete around themselves. The fundamental characteristic of the phylum is the division of the body into a linear series of cylindrical segments, or metameres. Each metamere consists of a section of the body wall and a compartment of the body cavity with its internal organs. The external divisions, which may be seen in the common earth-

worm, correspond to the internal divisions. The annelid body consists of a head, a trunk, made up of metameres, and an unsegmented terminal region. In the more primitive members of the phylum the metameres are identical, or very similar to one another, each containing the same structures, in more advanced forms there is a tendency toward a consolidation of some segments and a restriction of certain organs to particular segments. The body wall is covered with epidermis overlaid with a thin, pliant cuticle secreted by the epidermal cells. The body wall consists of well-developed, segmentally arranged muscles, used for crawling and swimming movements. Most annelids possess short external bristles called setae, or chaetae, composed of chitin. Chaetae are used to grip the soil, to hold the animal in a tube, or to increase the surface areas of appendages for swimming. The digestive system of annelids consists of an unsegmented gut that runs through the middle of the body from the mouth, located on the underside of the head, to the anus, which is on the terminal region. The details of the digestive tract are characteristic of each class within the phylum. The gut is separated from the body wall by the body cavity, called the COELOM. The compartments of the coelom are separated from each other by thin sheets of tissue, called septa, which are perforated by the gut and by blood vessels. Except in the leeches, the coelom is filled with an incompressible fluid that serves as a skeleton, providing the animal with rigidity and with the resistance necessary for muscular movement. If the worm is punctured, it loses its ability to move properly, since functioning of the body muscles is dependent on the maintenance of the fluid volume in the coelom. In primitive annelids each compartment of the coelom is connected to the outside by ducts for the release of sex cells, and by paired excretory organs, or nephridia. These openings are closed except when functioning, thus preventing the loss of coelomic fluid. In more advanced species both excretory and reproductive functions are sometimes served by a single type of duct, and ducts may be absent in certain segments. Characteristics of the circulatory system vary within the phylum. The blood usually contains hemoglobin, a red oxygen-carrying pigment, some annelids have a green oxygen-carrying pigment, and others have unpigmented blood. The circulatory system is usually closed, i.e., confined within well-developed blood vessels, in some leeches the circulatory system is partly open, with blood and coelomic fluid mixing directly in the sinuses of the body cavity. Blood flows toward the head through a contractile vessel above the gut and returns to the terminal region through vessels below the gut, it is distributed to each body compartment by lateral vessels. Some of the lateral vessels are contractile and serve as hearts, i.e., pumping organs for driving the blood. Some aquatic annelids have thin-walled, feathery gills, through which gases are exchanged between the blood and the environment. However, most annelids have no special organs for gas exchange, and respiration occurs directly through the body wall. The nervous system typically consists of a primitive brain, or ganglionic mass (see GANGLION), located in the head, connected by a ring of nerves to a ventral nerve cord which runs the length of the body, the cord gives rise to lateral nerves and ganglia in each segment. Sense organs of annelids generally include eyes, taste buds, tactile tentacles, and organs of equilibrium called statocysts. Reproduction is sexual or asexual. Asexual reproduction is by fragmentation, budding, or fission. Among sexually reproducing annelids hermaphrodites are common, but many species have separate sexes. Fertilized eggs of marine annelids develop into free-swimming larvae. Eggs of terrestrial forms are enclosed in cocoons and hatch as miniature versions of the adults. The ability to regenerate lost body parts is highly developed in all annelids except the leeches. Because of the soft nature of the annelid body, there are few fossils of the phylum. Fossils of tube-dwelling polychaetes have been found, but there is scarcely any fossil record for earthworms and none for leeches. The Annelida may be divided on the basis of their anatomical structure into three classes: Polychaeta (marine worms), Oligochaeta (earthworms and freshwater worms), and Hirudinea (leeches).

Class Polychaeta The vast majority of the 5,300 known species of polychaete worms are marine, a few, however, are found in fresh or brackish water. They are most abundant from the low-tide line to a depth of about 150 to 200 ft (50 m) but some occur in deeper water and many in the intertidal zone. The polychaetes, so-named because of the numerous setae (chaetae) they bear, range in length from

less than $\frac{1}{8}$ in. to more than 9 ft (2 mm to 3 m), but most are from 2 to 4 in. (5–10 cm) long. Their colors are often brilliant and some species are iridescent.

ized feeding habits. Many are adapted for feeding on organic matter deposited on the ocean floor. For example, the lugworms have a simple, thin-walled,



A The earthworm, *Lumbricus terrestris*, representative of the phylum Annelida

B Internal anatomy of an earthworm

The class is usually divided on the basis of mode of existence into two subclasses, the Errantia and the Sedentaria. Members of the Errantia, or errant polychaetes, include actively crawling or swimming forms, which may, however, also spend time in burrows or crevices, or under rocks on the seashore. The Sedentaria, or sedentary polychaetes, are adapted to living permanently in tubes or burrows, some attach themselves to rocks or piers. A familiar errant polychaete is the CLAMWORM, *Nereis*, widely used as bait. Errant polychaetes swim, crawl over the ocean bottom, or tunnel through surface sediments. Most are predators on small invertebrates, some are scavengers. In most, the first few body segments bear sensory projections called cirri, while the remaining body segments bear conspicuous leglike appendages called parapodia. The parapodia, along with undulations of the body, propel the worm in crawling and swimming; they are tipped with bundles of setae, usually made of chitin. Most errant polychaetes have well-developed heads, which bear eyes, sensory tentacles, and a specialized organ, the nuchal organ, thought to detect chemicals. The anterior end of the gut forms a protrusible structure, the proboscis, equipped with strong chitinous jaws and used in feeding. The setae of some polychaetes, e.g., the tropical fireworm, are hollow and contain calcium carbonate rather than chitin. These setae are easily broken off and contain a toxin that produces a painful reaction in humans. In the scaleworms, a series of overlapping scales form an armor on the animal's upper surface. In the SEA MOUSE this armor is completely covered by a feltwork of long slender setae projecting from the parapodia. Many sedentary polychaetes, like the LUGWORM, *Arminicola*, live in burrows in sand or mud. The majority, however, are tube builders. Tubes of different species vary greatly in their composition and structure. They may be built of sand, shell, or other particles held together with mucus, or made entirely of organic substances secreted by the worm, that harden on contact with water. The tubes may be straight, branched, spiraled or U-shaped. Most are permanently attached to a substrate and the worm seldom or never ventures outside; however, the tube worm *Cistenides* moves about the sea floor, dragging along its delicate tube of sand grains. Sedentary polychaetes have greatly modified heads for special

jawless proboscis, which is used to draw sand into the gut, where organic matter is removed. Other worms have feeding tentacles that extend from the tube opening and creep along the mud or sand, picking up organic deposits. Still others of the Sedentaria are filter feeders: the beautiful feather-duster worms have a crown of feathery, ciliated tentacles that extend from the tube opening to sweep small planktonic organisms from the water. The tentacles are quickly withdrawn if the animal is startled. The parapodia are reduced in the sedentary polychaetes, and the setae of many tube-dwelling forms are hooked, to help the worm hold itself to the wall of its tube. The structure of the digestive tract of polychaetes is variable, reflecting the diversity of feeding types. Respiration is entirely through the body wall in some polychaetes, and partially so in most. Many species have thin-walled extensions of the body surface, i.e., gills, used for gas exchange, most commonly the gills are extensions of the parapodia. The tentacles of feather-duster worms are used for respiratory exchange as well as for feeding. A polychaete may have a single pair of excretory tubes, or a pair in each segment. Sedentary polychaetes have various modifications to insure that wastes will be deposited near the mouth of the tube or burrow, where they are washed away. Most polychaetes reproduce sexually, and the sexes are separate. Sex cells develop from masses of tissue in the metamereres and leave by way of tubules or by rupture of the body wall. In most cases fertilization of the eggs by sperm occurs externally in seawater, and results in the formation of free-swimming larvae. Variations include internal fertilization, laying of egg masses that are attached to objects with mucus, and brooding of developing eggs in the worm's body. Some errant polychaetes, including the clamworm, undergo extreme changes in appearance and become active swimmers at the time of year that the sex cells mature, males and females swarm to the surface of the sea to spawn. In some of these species the portion of the body containing the sex cells breaks free and engages in swarming and spawning, leaving the asexual portion behind to regenerate its lost parts. Swarming generally occurs at night and is correlated with particular phases of the moon. Some species perform a kind of nuptial dance, swimming in circles as they spawn. In some species the worms

liberate a luminous secretion, which produces circles of light on the ocean surface as they dance. The most famous swarming polychaete is the tropical palolo worm, a name sometimes applied to all swarming polychaetes. Two groups of polychaetes that are sometimes regarded as separate classes are the Archiannelida and the Myzostomaria. The former group includes a variety of minute marine worms living in surface mud, in tide pools near the high-tide line, and in the interstitial spaces of mud and sand in some subtidal areas. All archiannelids are scavengers. They have a ciliated epidermis and only a few body segments, many resemble the larvae of other polychaetes. The Myzostomaria are a small group of marine worms parasitic on certain echinoderms (crinoids, starfish, and brittle stars). They are disk-shaped and flattened, with a series of reduced parapodia with hooked setae; they often match the color pattern of the host.

Class Oligochaeta This class includes about 3,000 species of earthworms and freshwater worms. The members of the class range in length from about $\frac{1}{2}$ in. to 10 ft (0.5 mm–3 m) but most are comparable to the polychaetes in size. Oligochaetes occur in a variety of habitats throughout the world. Most are burrowers in the soil, but the class also includes worms that inhabit wells, marshes, and swamps. Other species live under rocks on the seashore, in the leaves of tropical trees and vines, on the surface of glaciers, or on the gills of freshwater crayfish. Like the polychaetes, oligochaetes have bodies divided into segments. However, they lack parapodia and, with a few exceptions, have relatively few and in conspicuous setae. The setae are usually arranged in four bundles on each segment; those of aquatic forms are longer than those of land forms. The setae of an earthworm may be felt as a roughness if one rubs a finger along its side. Oligochaetes are less varied in their external form than the polychaetes, but are much more numerous. As many as 4,000 oligochaetes have been counted in one square meter of lake bottom, and about 9,000 in one square meter of meadow soil. In almost all oligochaetes, the head is a simple cone-shaped structure without sensory appendages. Light is detected by photoreceptor cells in the skin, usually concentrated toward the front of the animal. The mouth, located under the head, leads to a relatively simple, straight digestive tract consisting of a pharynx, an esophagus, and an intestine, terminating in an anal opening. Terrestrial oligochaetes tunnel through the ground, swallowing soil as they go. The digestive tract of such a worm is specially modified for this rough diet. Typically it has a thin-walled storage area, or crop, and a muscular gizzard for grinding the soil to remove the organic matter that is the actual food of the worm. Specialized calciferous glands remove excess calcium, magnesium, strontium, and phosphate and regulate the level of these ions in the blood. Solid wastes are egested and plastered against the burrow wall, or ejected from the mouth of the burrow; the ejected material is called castings. Earthworms, through their burrowing and digestive processes, are largely responsible for the mixing and aeration of the soil. Not all oligochaetes have soil diets, some of the small aquatic worms are active predators on other small invertebrates. The circulatory system is that typical of the annelids and has many contractile vessels, or hearts. Although a few aquatic forms have gills for respiration, most oligochaetes lack such specialized structures and use the capillaries of their body walls for respiratory exchange. Oxygen dissolved in the soil water diffuses through the moist epidermis of the worm. If earthworms are forced to the surface, as when their burrows are filled with rainwater, they suffocate as a result of desiccation. Excretion is typically carried out by a pair of tubules in each segment. All oligochaetes are hermaphroditic and nearly all cross-fertilize by copulation. Male and female reproductive organs are located in separate segments. The copulating pair exchange sperm, which are stored in the body of the recipient worm until its eggs are mature. The worm then secretes a cocoon into which it deposits the eggs and the sperm, fertilization and development of the eggs occurs in the cocoon. When the young emerge they are miniatures of the adults. The cocoon is secreted by a glandular region, the clitellum, consisting of several thickened segments. The clitellum of an earthworm is a conspicuous saddle-shaped region near its front end.

Class Hirudinea This class includes the 300 species of leeches: flattened, predacious or parasitic annelids equipped with suckers used for creeping. Leeches range in length from about $\frac{1}{2}$ in. to 8 in. (1 cm–20 cm), most are under 2 in. (5 cm) long. They are com-

monly black, brown, green, or red, and may have stripes or spots. The majority of leeches are predators on small invertebrates, most swallow their prey whole, but some suck the soft parts from their victims. Some leeches are parasites rather than predators, and suck the body fluids of their victims without killing them. The distinction is not sharp, as many predatory leeches take blood meals on occasion. Leeches are primarily freshwater annelids, but some live in the ocean and some in moist soil or vegetation. These are the only annelids with a fixed number (34) of body segments, each segment has secondary subdivisions known as annuli. A clitellum, less conspicuous than that of oligochaetes, is present, there are no parapodia. A leech has a small anterior sucker and a larger posterior one, the leech crawls by moving the anterior sucker forward, attaching it, and drawing up the posterior sucker. Most leeches can swim by rapid undulations of the body, using well-developed muscles of the body wall. The coelom differs from that of other annelids in that it is largely filled with tissue. Coelomic fluid is contained in a system of sinuses, which in some leeches functions as a circulatory system, there is a tendency in this group toward the loss of true blood vessels. The blood of some leeches is red. In others the blood lacks oxygen-carrying pigments and is therefore colorless, the oxygen dissolved directly in the blood is sufficient for respiration. Gas exchange occurs through the body surface of most leeches, although many fish-parasitizing leeches have gills. The sense organs consist of sensory cells of various types, including photoreceptor cells, scattered over the body surface. There are also from 2 to 10 eyes, consisting of clusters of photoreceptor cells and located toward the front of the body. Many leeches have a proboscis used for swallowing the prey or for sucking its fluids, others have jaws for biting. Many parasitic leeches are able to parasitize a wide variety of hosts. Most of the marine and some of the freshwater leeches are fish parasites. The medicinal leech, *Hirudo medicinalis*, is one of a group of aquatic bloodsucking leeches with jaws. Another group of jawed bloodsuckers is terrestrial, these leeches live in damp tropical vegetation and drop onto their mammalian prey. Most parasitic leeches attach to the host only while feeding, a single meal may be 5 or 10 times the weight of the leech and provide it with food for several months. The digestive tract of bloodsuckers produces an anticoagulant, hirudin, which keeps the engorged blood from clotting. A few leeches attach permanently to the host, leaving only to reproduce. Predatory leeches are active at night and hide by day. Like the oligochaetes, leeches are hermaphroditic and cross-fertilizing, although fertilization is internal. In some species the sperm are enclosed in sacs, called spermatophores, that are attached to the outside of the partner, the sperm pass through the body wall to the ovaries, where the eggs are fertilized. In other species, the sperm are not enclosed and are transferred directly into the body of the partner by copulation. A courtship display is seen among some leeches at the time of mating. The fertilized eggs are deposited in a cocoon, secreted by the clitellum, the cocoon is buried in mud or affixed to submerged objects. The young emerge as small copies of the adults.

Annensky, Innokenty Feodorovich (ĕnĕkĕn'tyĕ fyŏ'darŏvĭch ănyĕn'skĕ), 1856–1909, Russian poet. A classical scholar, he translated Euripides before he began to publish verse in 1904. His highly metrical lyrics concern death, suffering, and beauty. Annensky's scant output is collected in *Quiet Songs* (1904) and *The Cypress Chest* (1910).

Anne of Austria, 1601–66, queen of France, daughter of King Philip III of Spain. Married to the French king Louis XIII (1615), she was neglected by her husband and sought the society of the court intriguer, Mme de CHEVREUSE. Anne's indiscretion, especially her flirtation with the duke of Buckingham, injured her reputation. Her loyalty to Spain and her strong Roman Catholic background made her suspect after France's alliance (1635) with the Protestant nations in the Thirty Years War, she was accused by the French minister of state, Cardinal Richelieu, of treasonable correspondence with Spain but was pardoned (1637). Contrary to the express wish of her husband before his death she was granted (1643) by PARLEMENT full powers as regent for her son LOUIS XIV. She entrusted the government to Cardinal MAZARIN, whom she supported during the wars of the Fronde in France. After Mazarin's death (1661), her son excluded her from participation in affairs of state. Anne of Austria is a central figure of Alexandre Dumas's *Three Musketeers*.

Anne of Bohemia, 1366–94, queen consort of Richard II of England, daughter of Holy Roman Emperor Charles IV. She was married to Richard early in 1382 and quickly gained popularity in England. It was probably through her entourage that the writings of John Wyclif were introduced into Bohemia, where they gained much prominence through the teachings of John HUSS.

Anne of Brittany, 1477–1514, queen of France as consort of CHARLES VIII from 1491 to 1498 and consort of LOUIS XII from 1499 until her death. The daughter of Duke FRANCIS II of Brittany, she was heiress to his duchy. Shortly before her father's death (1488), a French army under Louis de La Tremoille successfully invaded Brittany and secured the duke's promise that Anne would marry only with the consent of the French crown. Upon becoming duchess, the young Anne's hand and her duchy were eagerly sought. To prevent France from swallowing up the duchy, a coalition including Archduke Maximilian of Austria (later Holy Roman Emperor MAXIMILIAN I), King HENRY VII of England, and King FERDINAND II of Aragon sent forces to Anne's aid. Nevertheless, Anne's situation was perilous and she appealed (1489) directly to Maximilian for protection. In 1490, Maximilian married Anne by proxy but failed to assist her with armed strength. Besieged at Rennes in 1491, Anne was forced by the French to annul her marriage and was quickly married to Charles VIII. It was agreed that if Charles died before Anne without issue, she was to marry his successor. Accordingly, in 1499, she married Louis XII, who had previously obtained a divorce from his first wife. The marriage (1514) of Claude, Anne's daughter by Louis XII, to Francis of Angoulême (later Francis I of France) led to the eventual incorporation (1532) by France of Brittany, which had previously remained theoretically separate. See biography by H. J. Sanborn (1917).

Anne of Cleves (klĕvz), 1515–57, fourth queen consort of HENRY VIII of England. The sister of William, duke of Cleves, one of the most powerful of the German Protestant princes, she was considered a desirable match for Henry by those English councilors, most notably Thomas CROMWELL, who wished to ally England with the SCHMALKALDIC LEAGUE. The marriage was agreed upon in 1539, and although Henry tried to break the contract after seeing his bride, they were married in Jan. 1540. Henry found Anne dull and unattractive, and the marriage was never consummated. This and the fact that Anne had previously contracted to marry the duke of Lorraine's son were used as grounds for divorce in July, 1540. Anne gave her consent and, by agreement, lived the rest of her life in England. See biography by M. C. Barnes (1958).

Anne of Denmark, 1574–1619, queen consort of James I of England (James VI of Scotland), daughter of Frederick II of Denmark and Norway. She married James in 1589. Brought up a Lutheran, she became a Roman Catholic some time in the 1590s and at James's English coronation (1603) refused to take Anglican communion. James appeared devoted to her at first, but her extravagance and shallowness came to annoy him, and her Catholicism was an embarrassment to him in England. They lived apart after c. 1606. See biography by E. C. Williams (1968).

annexation, in international law, formal act by which a state asserts its sovereignty over a territory previously outside its jurisdiction. Many kinds of territory have been subject to annexation, chief among them those inhabited by settlers of the annexing power, those which already have had the status of protectorates of the annexing state, and those conquered by the force of arms. The consent of other interested powers must be obtained in order that the annexation be generally recognized in international law. Efforts to establish the self-determination of inhabitants as the only grounds for the transfer of territory have been realized in the Charter of the United Nations, which does not recognize annexation as an instrument of national policy. The term *annexation* is also used in municipal government to describe the process by which an incorporated local government may extend its legal control over surrounding areas. Usually this type of annexation requires the consent of the other communities concerned.

An Nhon see QUI NHON, South Vietnam

Anniston, city (1970 pop. 31,533), seat of Calhoun co., NE Ala., in a mining region of the Appalachian foothills, inc. 1873. Its many varied manufactures include soil pipes, textiles, microwave ovens, factory-built homes, and vaccines. Founded (1872) as an iron-manufacturing "company town," it was opened to the public in 1883. A local landmark is the beautiful Church of St. Michael and All Angels

(Episcopal, 1887). Nearby are the huge Anniston Army Depot and U.S. Fort McClellan, headquarters of the Women's Army Corps (WAC) and of the Chemical Corps Training Command.

annual, plant that germinates from seed, blossoms, produces seed, and dies within one growing season. Annuals propagate themselves by seed only, unlike many biennials and perennials. They are thus especially suited to environments that have a short growing season. Cultivated annuals are usually considered to be of three general types: tender, half-hardy, and hardy. Tender and half-hardy annuals do not mature and blossom in one ordinary temperate growing season unless they are started early under glass and are set outdoors as young plants. Hardy annuals are usually sown where they are expected to bloom. Quite often they reseed themselves year after year. Blooming is prolonged by cutting the flowers before the seeds can form. Typical annual flowers are cosmos, larkspur, petunia, and zinnia; annual vegetables include corn, tomatoes, and wheat. See H. G. W. Fogg, *Dictionary of Annual Plants* (new ed. 1972).

annual rings, the growth layers of WOOD that are produced each year in the stems and roots of trees and shrubs. In climates with well-marked alternation of seasons (either cold and warm or wet and dry) the wood cells that are produced when water is easily available and growth is rapid (in the spring or wet season) are usually noticeably larger and have thinner walls than those produced later in the season when the supply of water has diminished and growth is slower. There is thus a sharp contrast between the small, thick-walled late-season wood cells produced one year, and the large, thin-walled cells of the spring wood of the following year. Where the climate is uniform and growth continuous, as in wet, tropical forests, there is little or no visible contrast between the annual rings, although differences exist. When rings are conspicuous, they may be counted to give a reasonably accurate approximation of the age of the tree. They are also reflective (by their range of thickness) of the climatic and environmental factors that influence growth rates. The science of dendrochronology is based upon the phenomenon of variability in the thickness of annual rings.

annuity: see INSURANCE

annulment of marriage: see NULLITY OF MARRIAGE

Annunciation of the Virgin: see MARY

Annunzio, Gabriele D': see D'ANNUNZIO, GABRIELE

anoa (ănŏ'ă) see BUFFALO

anode, ELECTRODE through which current enters an electric device. In ELECTROLYSIS, it is the positive electrode in the electrolytic cell.

anointing of the sick, SACRAMENT of the Orthodox Eastern Church and the Roman Catholic Church, formerly known as extreme unction. In it a sick or dying person is anointed on eyes, ears, nostrils, lips, hands, feet, and sometimes, in the case of men, the loins, by a priest while he recites absolutions for sins committed. The Roman Catholic Church teaches that through the sacrament the sick and dying receive remission of sins, health of soul, and, if God wills, health of body. The sacrament may be shortened, and it may be given conditionally, as when there is doubt as to whether the recipient is living or as to whether he is baptized. Anointing of the sick is given only to persons seriously ill and in danger of death from internal causes, hence, it is not given before operations or in battle before attack. Anointing of the sick, the last confession, and the VIATICUM are the last rites of the church. The chief biblical text for anointing of the sick is James 5:14,15. In the Eastern churches it is normally given by three priests, and it may be given to the healthy to prevent sickness, it is not so widely used in the Eastern churches as in the West.

Anoka (ănŏ'ka), city (1970 pop. 13,489), seat of Anoka co., E Minn., on the Mississippi at the confluence of the Rum, inc. 1878. Originally a trading post and lumber town, it grew as a farm trade center. Ammunition and metal products are among its manufactures. A state mental hospital is there.

anole: see CHAMELEON

anomalistic year (ănŏm'ălis'tik), time required for the earth to go from the perihelion point once around the sun and back to the perihelion point. It is 365 days, 6 hr, 13 min, 53.0 sec of MEAN SOLAR TIME. The anomalistic year is longer than the SIDEREAL YEAR and the TROPICAL YEAR because of the eastward motion of the line of apsides (see APSIS), which is caused by the slow rotation of the earth's orbit as a whole.

Anopheles: see MOSQUITO

anorthite (ănôr'thīt) see FELDSPAR

Anouilh, Jean (zhāN anwē'ya), 1910–, French dramatist. Anouilh's many popular plays range from tragedy to sophisticated comedy. His first play, *L'hermine*, was published in 1932. During the Nazi regime he wrote plays about resistance to oppression in terms of subjects from classical mythology. *Antigone* (1944, tr. 1946) is the most celebrated of these. Several of his later plays have contemporary and historical settings. Anouilh's works frequently contrast the worlds of romantic dreams and harsh reality. His later plays include *The Waltz of the Toreadors* (1952, tr. 1957), *Poor Bits* (1958, tr. 1964), *The Lark* (1953, tr. 1955), *Becket* (1959, tr. 1960), *The Rehearsal* (1963), and *Dear Antoine* (1969, tr. 1971). See studies by L. C. Pronko (1961), John Harvey (1964), E. O. Marsh (1968), Marguerite Archer (1971), and A. Lenski (1973).

Anquetil-Duperron, Abraham Hyacinthe (abram'yāsāNt' anKātēl' dupērōN'), 1731–1805, French Orientalist. He gave up studying for the priesthood to pursue his deep interest in Eastern languages. In India (1755–61) he learned Persian, Sanskrit, Zend, Avestan, and Pahlavi. After studying with the PARSIS, he was forced to return to France as a result of the British conquests in India. He took with him 180 manuscripts, which he gave to the Royal Library. His three-volume translation of the *Zend-Avesta* (1771) introduced Zoroastrian texts to Europe. Anquetil-Duperron also translated the *Upanishads* into Latin (1804) and wrote several works on India.

Ansbach (ans'bakh), city (1970 pop. 30,603), capital of Middle Franconia, Bavaria, S. West Germany, on the Rezat River. Its manufactures include machine tools, electrical products, and chemicals. The city developed around an 8th-century Benedictine abbey. It became the residence of the Franconian branch of the Hohenzollern family in 1331. Ansbach passed to Prussia in 1791 and to Bavaria in 1806. Noteworthy buildings include the 12th-century Romanesque Church of St. Gumbertus, which was redone in baroque style in the 18th cent., and an 18th-century castle.

Anschluss (an'shlōös), German term designating the incorporation of Austria into Germany. Prohibited by the 1919 peace treaty of St. Germain in order to prevent a resurgence of a strong Germany, the Anschluss was favored by German nationalists, and by Austrians dissatisfied with their country's diminished status after World War I. Under the threat of military force, Adolf Hitler occupied Austria on March 11, 1938, and incorporated it into Germany as the province of Ostmark. In 1943, the Moscow Declaration of the United States, Great Britain, and the Soviet Union annulled the Anschluss, recognizing Austria's right to independence, an independent government was not set up until the end of World War II.

Anselm, Saint (ān'sēlm), 1033?–1109, Italian prelate, archbishop of Canterbury, Doctor of the Church (1720), b. Aosta, Piedmont. After a carefree youth of travel and schooling in Burgundy he became a disciple and companion of LANFRANC, the famed theologian and prior of the monastery at BEC, which Anselm soon joined (1060). Anselm became prior (1063) and abbot (1078) and brought widespread fame to the school there. Monastic holdings in England threw him into English public life, and he won the esteem of William the Conqueror. He was a frequent visitor to Lanfranc at Canterbury, and when the latter died, Anselm succeeded him as archbishop (1093). He disputed the right of WILLIAM II to invest him, reserving this for Pope URBAN II, whom William refused to recognize. Anselm momentarily overcame the king's intransigence and took the pallium from Urban's legate. Anselm's further reform-minded efforts to free the church from secular control met stiff resistance. When he went to Rome for support, William banished him and confiscated the diocesan properties. At the Council of Bari (1098) Anselm ably defended the *Filioque* of the CREED in the East-West controversy on the procession of the Holy Spirit. The new king HENRY I, recalled Anselm, who proved valuable in arranging Henry's marriage to Matilda of Scotland and in gaining the support of the barons for the king in his dispute with Robert of Normandy. Conflict over lay INVESTITURE again broke out, however, and Anselm refused to consecrate bishops and abbots nominated by the king. He was again banished while appealing in Rome. Anselm eventually won (1107) Henry's agreement to surrender the right of investiture in exchange for homages from church revenues—a compromise that in effect established papal supremacy in the English church. Many consider this Anselm's most important

achievement. His writings mark him as the founder of SCHOLASTICISM. A strict Augustinian, operating from the formula *fides quaerens intellectum* (faith seeking understanding), he believed in an essential harmony between revelation and reason. He was the first to incorporate successfully the rationalism of Aristotelian dialectics into theology. Although he wrote no great summa, his precision together with his mystical insight give permanent value to such works as *Cur Deus Homo?* (1094–98), on the ATONEMENT. He constructed rational proofs for God's existence in *Monologium* (c. 1070), and in the sequel *Proslogium* he advanced his famous ontological proof, which deduces God's existence from man's notion of a perfect being in whom nothing is lacking. In *De Fide Trinitatis* he defended universals against the nominalist ROSCELIN. He taught the Immaculate Conception of Mary in *De Conceptu Virginali* and is said to have instituted that feast in England. Feast April 21. See Eadmer's *Life of St. Anselm*, Archbishop of Canterbury (tr. by R. W. Southern, 1962), biographies by R. W. Church (1884), A. C. Welch (1901), and Joseph Clayton (1933), studies by R. W. Southern (1963), Charles Hartshorne (1965), and D. P. Henry (1967).

Ansermet, Ernest (ěrněst' anSěrmě'), 1883–1969, Swiss conductor. For several years he was a high-school mathematics teacher. He began his conducting career in Germany and toured with Diaghilev's Ballets Russes from 1915 to 1923. In 1918 he founded the Orchestre de la Suisse Romande in Geneva and remained its director until 1967. Ansermet was noted for his interpretations of modern French and Russian music and made many concert tours. He also composed several short pieces.

An-shan or Anshan (both an-shan), city (1970 est. pop. 1,500,000), central Liaoning prov., China, on a branch of the South Manchurian RR. Its huge integrated iron and steel complex is the largest in China and one of the ten largest in the world. It comprises iron and coal mines and numerous blast furnaces, open hearths, and finishing facilities. Many varieties of steel and steel products (including rails and cables) are produced. Other manufactures in An-shan include chemicals, tractors, machinery, alarm clocks, and cement. An-shan was developed as a metallurgical center largely by the Japanese, who occupied the region during World War II. The Soviet Union dismantled much of the steel mill between 1944 and 1946, but by 1956 the facilities had been rebuilt. The city has a mineral-spray sanitarium for the treatment of arthritis and joint diseases.

An-shun or Anshun (both an-shōn), town, W. central Kweichow prov., SW China. A flourishing town during the opium traffic days, it is known for its green tea. Other industries include sugar refining and machine building. Coal deposits are there.

Ansky, Shloime (shlōi'mə an'skē) or **Solomon Seinwil Rapoport**, 1863–1920, Russian author who wrote in Yiddish. His last name is also spelled Anski. He extensively researched regional Jewish folklore and incorporated folk elements into his realistic stories of peasant life and Hasidism. His most famous work is *Tavishn Tsvet Veln, oder der Dibuk* (1916, tr. *The Dybbuk*, 1926), a story of demonic possession, which he later adapted into a play. It was turned into an opera by Lodovico Rocca (1934) and again by David and Alex Tankin (1949). A modernized version of the play, adapted by Paddy Chayefsky, appeared in New York City in 1960.

Ansley, Clarke Fisher, 1869–1939, American teacher and editor, b. Swedona, near Springfield, Ill., grad. Univ. of Nebraska, 1890. After teaching English at Nebraska, he was professor of English at the State Univ. of Iowa (1899–1917) and dean of its College of Fine Arts (1911–15). Having turned to editing, he conceived the idea of a one-volume general encyclopedia, compact enough and simply enough written to serve as a guide to the "young Abraham Lincoln." This work was started in 1928 as *The Columbia Encyclopedia* with Ansley as its editor in chief. The first edition (1935) and the first supplement (1938) were completed under his direction.

Anson, Adrian Constantine, 1851–1922, American baseball player-manager, known usually as "Cap" Anson, b. Marshalltown, Iowa. For most of his career he played with the Chicago club of the National League and was four times league batting champion. As manager (1879–97), he led the team to five pennants. In 1939 he was elected to the National Baseball Hall of Fame, his lifetime batting average was .339.

Anson, George Anson, Baron, 1697–1762, British admiral. In his famous voyage (1740–44) around the world, Anson, in spite of shipwrecks and scurvy, inflicted great damage on Spanish shipping and re-

turned to England with a rich prize. He was raised to the peerage after his popular naval victory (1747) off Cape Finisterre. Appointed then as first lord of the admiralty, he assisted William Pitt, Lord Chatham, in reorganizing naval administration. See *A Voyage round the World* (comp. by Richard Walter, rev. ed. 1911), biographies by M. V. Anson (1912) and S. W. C. Pack (1960), L. A. Wilcox, *Anson's Voyage* (1970).

Anson, Sir William Reynell, 1843–1914, English jurist. He was a founder of the school of law at Oxford Univ. From 1899 to his death he sat in Parliament as a member for Oxford. His *Principles of the English Law of Contract* (1879) and *The Law and Custom of the Constitution* (2 vol., 1886–92) are frequently consulted standard works. See memoir ed. by H. H. Henson (1920).

Ansonia, city (1970 pop. 21,160), New Haven co., SW Conn., on the Naugatuck River, inc. as a city 1893. Its manufactures include brass and copper products, iron castings, foundry products, plastics, and electronic devices. Settled in 1651 as part of Derby, Ansonia was founded (1844) as an industrial community by Anson G. Phelps, a metals merchant and philanthropist. Ansonia's historical landmarks include the birthplace of David Humphreys, who accepted Gen. Charles CORNWALLIS's sword in surrender after the YORKTOWN CAMPAIGN (1781), and "Pork Hollow," where Revolutionary patriots hid food stores from British raiders.

Anstey, Christopher, 1724–1805, English poet and satirist. He is known chiefly for *The New Bath Guide* (1766), a series of poetical episodes humorously depicting contemporary life at Bath. This work was widely read in its time and may have influenced Tobias Smollet's *Humphrey Clinker*.

Anstey, F., pseud. of **Thomas Anstey Guthrie**, 1856–1934, English author. He relinquished his law practice to write humorous fiction. His best and most successful works are marked by an atmosphere of fantasy and include *Vice Versa* (1882), *The Tinted Venus* (1885), and *The Brass Bottle* (1900). Besides translating several comedies of Moliere, he wrote the play *The Man from Blankley's*, successfully produced in 1901. See his autobiography, *A Long Retrospect* (1936).

ant, any of the 2,500 INSECT species constituting the family Formicidae of the order Hymenoptera, to which the bee and the wasp also belong. Like most members of the order, ants have a "wasp waist," that is, the front part of the abdomen forms a narrow stalk, called the waist, or pedicel, that attaches to the thorax. The wings, when present, are also typical of the order, the small hind pair of wings is attached to the rear edge of the front pair. The head has two bent antennae, used both as organs of touch and as chemosensory organs. In most species there are two compound eyes. The jaws are of the biting type and in some species are used for defense. Some ants have stings, and some can spray poison from the end of the abdomen. Most ants are black, brown, red, or yellow. METAMORPHOSIS is complete. A soft, legless, white larva hatches from the egg, in most species it is completely helpless and must be fed and carried by adults. In some species pupation occurs within a cocoon. Ants are cosmopolitan in distribution. All species show some degree of social organization, many species nest in a system of tunnels, or galleries, in the soil, often under a dome, or hill, of excavated earth, sand, or debris. Mound-building ants may construct hills up to 5 ft (1.5 m) high. Other species nest in cavities in dead wood, in living plant tissue, or in papery nests attached to twigs or rocks, some invade buildings or ships. Colonies range in size from a few dozen to half a million or more individuals. Typically they include three castes: winged, fertile females, or queens; wingless, infertile females, or workers; and winged males. Those ordinarily seen are workers. In some colonies ants of the worker type may become soldiers, or members of other specialized castes. Whenever a generation of queens and males matures it leaves on a mating flight, shortly afterward the males die, and each fecundated queen returns to earth to establish a new colony. The queen then bites off or scrapes off her wings, excavates a chamber, and proceeds to lay eggs for the rest of her life (up to 15 years), fertilizing most of them with stored sperm. Females develop from fertilized and males from unfertilized eggs. The females become queens or workers, depending on the type of nutrition they receive. The first generation larvae are fed by the queen with her saliva, all develop into workers, which enlarge the nest and care for the queen and the later generations. It is thought that the produc-

tion of males by the queen and the rearing of new queens by the workers may be controlled by hormonal secretions of all the members of the colony. There are many variations on the basic pattern of new colony formation. In some species the queen cannot establish a colony herself and is adopted by workers of another colony. Slave-making ants raid the nests of other ant species and carry off larvae or pupae to serve as workers, in a few slave-making species the adults cannot feed themselves. Different species differ widely in their diets and may be carnivorous, herbivorous, or omnivorous. Members of some species eat honeydew from plants infested with APHIDS and certain other insects, others, called dairying ants, feed and protect the aphids and "milk" them by stroking. Harvester ants eat and store seeds, these sometimes sprout around the nest, leading to the erroneous belief that these ants cultivate their food. However, cultivation is practiced by certain ants that feed on fungi grown in the nest. Some of these, called leaf-cutter, or parasol, ants, carry large pieces of leaf to the nest, where the macerated leaf tissue is used as a growth medium for the fungus. Most leaf cutters are tropical, but the Texas leaf-cutting ant is a serious crop pest in North America. The army ants of the New World tropics and the driver ants of tropical Africa are carnivorous, nomadic species with no permanent nests. They travel like armies in long columns, overrunning and devouring animals that cannot flee their path, the African species even consume large mammals. House pests among the North American ants include the yellowish Pharaoh ant, the little black ant, the odorous house ant, the Argentine ant of warm climates, and the black carpenter ant. Carpenter ants tunnel in wood, but do not feed on it. The TERMITES are often mislabeled "white ant," but belongs to a different insect order. Ants as a group are beneficial to humans. Their tunneling mixes and aerates the soil, in some places replacing the activity of earthworms. Many species feed on small insects that are serious pests of crops. Ants are classified in the phylum ARTHROPODA, class Insecta, order Hymenoptera, family Formicidae. See publications of the U.S. Dept. of Agriculture, P. P. and M. W. Larson, *All about Ants* (1965), L. H. Newman, *Ants from Close Up* (1967), C. L. Hogue, *The Armies of the Ant* (1972).

ANTA* see AMERICAN NATIONAL THEATER AND ACADEMY

Antabuse (án'tabyōōs), trade name for the drug tetraethylthiuram disulfide, used in the treatment of ALCOHOLISM. Also called sulfinam, Antabuse is non-toxic, but it alters the metabolism of alcohol in the body, making it impossible for one who is taking the drug to drink without experiencing severe discomfort. When alcohol is present the drug increases the concentration of acetaldehyde in the body, causing symptoms resembling those of a bad hangover. The individual feels hot, the face becomes flushed, the neck and head throb, and nausea, vomiting, and headache may follow. Small quantities of alcohol, such as from food sauces and cough medicines, and even inhaled traces from shaving lotions and varnishes, may induce the same symptoms. The drug Temposil, or citrated calcium carbamide, has the same function as Antabuse, but is weaker and safer. The therapeutic use of Antabuse was discovered in the 1930s when workers exposed to tetraethylthiuram disulfide, a chemical used in the rubber industry, became ill after drinking alcoholic beverages.

antacid, any one of several basic substances that counteract stomach acidity (see STOMACH). Antacids are used by physicians to treat peptic ulcers and hyperchlorhydria, i.e., the excessive production of hydrochloric acid by the parietal cells lining the stomach. Commonly used antacid preparations, most sold without prescription, contain sodium bicarbonate, magnesium hydroxide, or aluminum hydroxide. Some preparations contain substances such as magnesium trisilicate that reduce the formation of gas.

Antaeus (ántē'ās), in Greek mythology, giant, son of Poseidon. He became stronger whenever he touched the earth, his mother, Gaea. He killed everyone with whom he wrestled until Hercules overcame him by lifting him in the air.

Antakya: see ANTIOCH, Turkey

Antalcidas, Peace of: see CORINTHIAN WAR

Antalya (ántäl'yä), city (1970 pop. 95,185), capital of Antalya prov., SW Turkey, a seaport on the Mediterranean Sea. Its manufactures include textiles and ships. Nearby are deposits of chrome and manganese. Founded in the 2d cent. B.C. by Attalus II, king of Pergamum, the city was known as Attaleia or At-

talia, and later as Adalia. It is mentioned in Acts 14:25 as the port from which Paul and Barnabas sailed to Antioch. It passed under the control of the Seljuk Turks in the 13th cent. and in the 15th cent. was annexed by the Ottoman Empire. Situated on a steep cliff, Antalya is a picturesque city surrounded by an old wall. The city is a popular resort. Nearby are numerous ancient ruins.

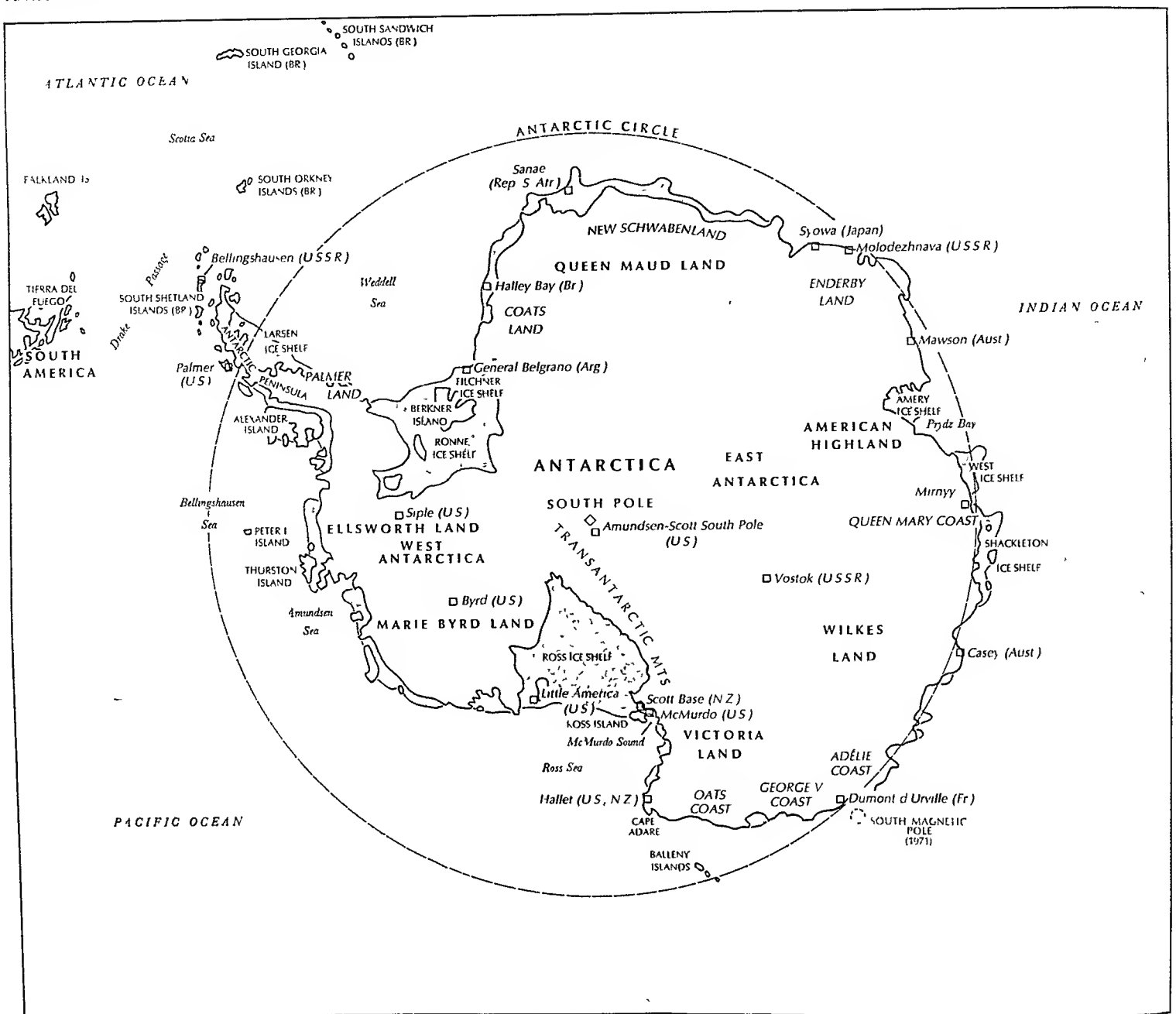
Antananarivo: see TANANARIVE, Malagasy Republic

Antara (ántär'ä), fl. 600, Arabian warrior and poet, celebrated in his own day as a hero because he rose from slave birth to be a tribal chief. His poetry is represented by one poem in the MUALLAQAT. His greatness gave rise to many legends over the centuries, and he became the hero of the popular Arabic epic *Sirat Antar*. In it he represents the ideal of a Bedouin chief, rich, generous, brave, and kind. His name also appears as Antar.

Antarctica (ánt'ärk'tikä), the 5th largest continent, c.5,500,000 sq mi (14,245,000 sq km), asymmetrically centered on the South Pole and almost entirely within the Antarctic Circle. It consists of two major regions: W Antarctica (c.2,500,000 sq mi/6,475,000 sq km), a mountainous archipelago that includes the Antarctic Peninsula, and E Antarctica (c.3,000,000 sq mi/7,770,000 sq km), geologically a continental shield. They are joined into a single continental mass by an ice cap thousands of feet thick. The seaward margins of the ice cap are steeply sloping, masses of ice break off and float away as icebergs, leaving ice cliffs. Where the outward creep of the ice is channeled into ice streams (zones of more rapid flowage), great floating ice tongues project into the sea, where mountains retard outward movement, the flow is channeled into great valley glaciers. The two major coastal indentations are the Ross Sea, facing the Pacific Ocean, and the Weddell Sea, facing the Atlantic Ocean. At the head of each sea are great ice shelves, the Ross and the McMurdo ice shelves in the Ross Sea and the Ronne and the Filchner ice shelves in the Weddell Sea. Partly aground but mostly afloat, these nearly level ice shelves are from 600 to 4,000 ft (180-1,220 m) thick. They move steadily toward the sea and are fed by valley glaciers, ice streams, and surface snow accumulations. Smaller ice shelves are found all along the coast. Except for mountain ranges, much of E Antarctica's rock surface is near sea level, however, the continent's domed, snow-covered glacial surface rises to about 13,000 ft (4,000 m). In W Antarctica there is great variation in the subglacial relief, suggesting mountainous islands or submerged ranges separated by deep sounds beneath the ice cover. Less than 5% of Antarctica is free of ice, these areas include mountain peaks, small coastal areas, and islands. The Transantarctic Mts. (c.3,500-14,300 ft/1,100-4,400 m high), which extend from the east side of the Filchner Ice Shelf to the western portal of the Ross Sea, form the inner margin of E Antarctica. Primarily formed by block faulting (see MOUNTAINS), the lower slopes have a complex structure of late Precambrian and early Paleozoic metamorphic rocks. These are overlaid by essentially horizontal sedimentary rock, mainly of continental or near-shore origin and ranging in age from the Devonian period to the early Jurassic, which are similar to rocks found in Australia, S. Africa, and E. South America, coal-bearing Permian strata are also found there. Distinctive plant, insect, fish, and animal fossils in the Triassic and Jurassic strata strongly indicate that the continents of the Southern Hemisphere are parts of a hypothetical supercontinent, Gondwanaland, which broke up in the late Mesozoic era. The continents have since drifted to their present positions. The ice-drowned, mountainous archipelago of W Antarctica is related to the Andes Mts. of South America and is structurally connected to them by way of the Antarctic Peninsula and the Scotia Arc (South Georgia and the South Orkney and South Sandwich islands). The complex structure consists of highly folded metasedimentary strata from Paleozoic to Pliocene epochs. There has been much volcanism down to the present. Mountains of the Antarctic Peninsula rise to c.11,000 ft (3,350 m), the mountains of Marie Byrd Land have comparable heights. The Ellsworth Mts., at the head of Ronne Ice Shelf, are the highest in Antarctica, Vinson Massif (16,860 ft/5,140 m) is the continent's highest peak. A variety of mineral deposits have been discovered in Antarctica, but the extent of the deposits is largely unknown and their relative inaccessibility makes their utility doubtful. Antarctica is surrounded by the world's stormiest seas. A belt of pack ice surrounds the continent, only a few areas are ice-free at the end of most summers. The physical boundary most widely accepted today for the antarctic region

is the Antarctic Convergence, a zone c.25 mi (40 km) wide encircling the earth roughly between the 50th and 60th parallels of latitude. Within this zone the colder and denser north-flowing antarctic surface waters sink beneath warmer and saltier subantarctic waters, the difference in temperature and chemical content of the water on the two sides of the zone is reflected in noticeable differences in air temperature and in marine life. Antarctic climate is characterized by low temperature, high wind velocities, and frequent blizzards. Rapidly changing weather is typical of coastal locations, where temperatures for the warmest month average around freezing. Winter minimums drop as low as -40°F (-40°C). High altitude and continuous darkness in winter combine to make the interior of Antarctica the coldest place on earth. Summer temperatures are unlikely to be warmer than 0°F (-18°C), winter mean temperatures are -70°F (-57°C) and lower. The lowest temperature ever recorded on earth was -126.9°F (-88.3°C) at Vostok, a Russian station. Precipitation is in the form of snow, the annual water equivalent in the interior is c.2 in. (5 cm) and c.10 in. (25 cm) in coastal areas. In the dry, dust-free air one can see for miles in clear weather, distances are deceptive, and mirages are common. Refraction of light on blowing snow or low clouds causes "whiteouts" in which the sky blends with the snow-covered surface, eliminating the horizon, no condition is more feared by aviators. There is no native human population in Antarctica, nor are there any large land animals. Few species are adapted to the antarctic environment, but individuals of these few species are numberless. Life that depends completely on the land is limited to microscopic life in summer melt-water ponds, tiny wingless insects living in patches of moss and lichens, and two types of flowering plants (both in the Antarctic Peninsula). Birds and seals that spend part of their time on land (e.g., emperor and Adélie penguins and the brown skua—the most southerly bird and a notorious predator—and Weddell, crabeater, and Ross seals) are dependent on the surrounding sea for food. Antarctic waters are rich in plankton, which serves as food for krill—small shrimplike crustaceans that are the principal food of baleen whales, crabeater seals, Adélie penguins, and several kinds of fish. Fur and elephant seals, which spend the summers on islands north of lat. 65°S were the basis for 19th-century commercial activity in Antarctica. In the 20th cent., commercial interest shifted to baleen whales. Fur seals, thought to be extinct, have only a few small rookeries but they are recovering from the slaughter of the 19th cent., as are the elephant seals. Whaling has been declining since the peak year of 1930-31 when the Norwegians dominated the industry, since 1967 only the Japanese and the Russians have continued whaling. International efforts to regulate whaling to preserve the stock have been ineffective, and the baleen whales that spend the summer in a zone up to 300 mi (480 km) north of the pack ice are now in danger of extinction.

History of Exploration Although there was for centuries a tradition that another land lay south of the known world, attempts to find it were defeated by the ice. Antarctica's frigid nature was revealed by the second voyage (1772-75) of the English explorer Capt. James Cook. He did not see the continent as he circumnavigated the world, but he was the first to cross the Antarctic Circle. British and U.S. seal hunters followed him to South Georgia, an island in the S. Atlantic. In 1819 the British mariner William Smith discovered the South Shetland Islands. Returning in 1820, he and James Bransfield of the British navy explored and roughly mapped the Shetlands and part of the shore of the Antarctic Peninsula. Searching for rookeries, sealers explored the coastal and offshore regions of the Antarctic Peninsula. Most notable were the British captains James Weddell, George Powell, and Robert Fildes and the Americans Nathaniel B. Palmer, Benjamin Pendleton, Robert Johnson, and John Davis. Davis made the first landing on the antarctic continent (Feb. 7, 1821) at Hughes Bay on the Antarctic Peninsula. First to spend the winter in Antarctica, on King George Island in 1821, were 11 men from the wrecked British vessel *Lord Melville*. After 1822 fur sealing declined, but in 1829-30 Palmer and Pendleton led a sealing and exploring expedition that included Dr. James Eights, the first U.S. scientist to visit Antarctica. John Biscoe, a British navigator circumnavigated Antarctica from 1830 to 1832, sighting Enderby Land in 1831 and exploring the western side of the Antarctic Peninsula in 1832. John Balleny and Peter Kemp were other British sealers who made discoveries in E. Antarctica in the 1830s. Four naval



exploring expeditions visited Antarctica in the first half of the 19th cent. Capt T. T. Bellingshausen was the leader of a Russian expedition that circumnavigated Antarctica (1819-21). He apparently was the first to see (1820) the part of the continent that is now called Queen Maud Land. In W. Antarctica he discovered (1820) Peter I Island and Alexander Island. Admiral J. S. C. Dumont d'Urville led a French expedition to the Pacific Ocean that made two visits to Antarctica. He explored in the area of the Antarctic Peninsula in 1838 and in 1840 discovered Clarie Coast and Adélie Coast in E. Antarctica. In 1840, Lt. Charles Wilkes, leader of the U.S. Exploring Expedition to the Pacific (1838-42), sailed along the coast of E. Antarctica for 1,500 mi (2,400 km), sighting land at nine points. British Capt. James C. Ross commanded two vessels on an expedition (1841-43) that discovered Victoria Land in E. Antarctica, the Ross Sea, and the Ross Ice Shelf and explored and mapped the western approaches of the Weddell Sea. In the 1890s, after a half-century of neglect, interest in Antarctica was revived. Norwegian and Scottish whaling firms sent ships (1892-93) to investigate the possibilities of whaling around the Antarctic Peninsula and a Norwegian vessel examined the Ross Sea area, where a landing was made (1895) on Cape Adare. C. A. Larsen began whaling at South Georgia island in 1904-5, and the seas of the Scotia Arc became the center of Antarctic whaling until after 1926. The 1890s also marked the beginning of a period of extensive Antarctic exploration, during which 16 exploring expeditions from nine countries visited the continent. For the first time, many of them were financed by private individuals and

sponsored by scientific societies. It was a period of innovation and hardship in an extremely harsh, little-known environment. The Belgian expedition under Lt. Adrien de Gerlache was beset in the pack ice in March, 1898, and the ship drifted west across the Bellingshausen Sea for a year before it was released. A British expedition led by C. E. Borchgrevink was the first to establish a base for wintering on the continent (Cape Adare, 1899) and the first to make sledge journeys. Different parts of the Antarctic Peninsula and the islands of the Scotia Arc were explored by de Gerlache (1897-98), a Swedish expedition under Dr. Otto Nordenskjöld (1901-4), the Scottish National Antarctic Expedition led by W. S. Bruce (1902-4), and two French expeditions led by Dr. Jean B. Charcot (1903-5 and 1908-10). Nordenskjöld spent two winters in Antarctica before being rescued after his ship was crushed by ice. Exploration in the Ross Sea area during this period was characterized by long inland journeys. Four British expeditions had bases on Ross Island at McMurdo Sound. British Capt. R. F. Scott headed two expeditions (1901-4 and 1910-13), E. H. Shackleton led another expedition (1907-9), and A. E. Mackintosh headed the Ross Sea Party of Shackleton's unsuccessful Trans-Antarctic Expedition (1914-17). Roald Amundsen, a Norwegian, set up his base at the Bay of Whales, an indentation in the front of the Ross Ice Shelf, and a Japanese expedition (1911-12) was ship-based. The British expeditions carried out extensive exploration and scientific investigation of Victoria Land. Shackleton and scientific investigation of the South Pole (Jan. 1, 1909), but it was Amundsen who reached the Pole first, on Dec. 14,

1911. Scott reached it on Jan. 17, 1912, but he and four companions perished on the return trip. The Weddell Sea border of E. Antarctica was seen first by Bruce (1904), and it was later explored by the German expedition of Dr. Wilhelm Filchner, discoverer of the Filchner Ice Shelf, whose ship was beset and drifted in the Weddell Sea through the winter of 1912 before being released. Shackleton reached the Weddell Sea in Jan. 1915. He had planned to sledge to McMurdo Sound, via the South Pole, but his ship was beset and crushed in the ice, and his party lived on ice floes until they finally reached Elephant Island in boats. From there Shackleton made his epic voyage of c. 800 mi (1,290 km) to South Georgia in an open boat. Two other expeditions explored E. Antarctica during the early 20th cent.—Dr. Erich von Drygalski's well-equipped German expedition (1901-3) was cut short on the Wilhelm II Coast when the ship was beset, and Douglas Mawson, leader of the Australasian Expedition (1911-14) established bases at Commonwealth Bay on the George V Coast and on the Queen Mary Coast. Five major sledge journeys were made from Commonwealth Bay, two men perished and Mawson barely survived. In the period following World War I, scientific and technological advances were applied to further Antarctic exploration. The first airplane flight in Antarctica (Nov. 26, 1928) was by Sir Hubert Wilkins, an Australian who later flew down the eastern side of the Antarctic Peninsula. However, it was U.S. explorer Richard E. Byrd who most successfully coordinated radios, tractors, airplanes, and aerial cameras for the purposes of exploration. On his first expedition Byrd established his base, Little America,

near the site of Amundsen's old base at the Bay of Whales. From Little America he made the first flight over the South Pole on Nov. 29, 1929. On this expedition Marie Byrd Land was discovered and explored from the air. On his second expedition (1933-35) Byrd successfully integrated flights with long sledge and tractor journeys in a more complete exploration of Marie Byrd Land. In 1929-30 three other expeditions were also using aircraft for short flights over the coast. Sir Hubert Wilkins in 1929-30 operated in the Bellingshausen Sea. A Norwegian captain, Hjalmar Riiser-Larsen, explored (1929-30) the coast of E Antarctica from Enderby Land to Coats Land, the area was later claimed by Norway as Queen Maud Land. In Nov., 1935, U.S. explorer Lincoln Ellsworth made the first transantarctic flight, from Dundee Island at the tip of the Antarctic Peninsula to the Bay of Whales, landing four times en route. The British Graham Land Expedition explored the Antarctic Peninsula by sea, air, and dog team from 1935 to 1937, using a different base each winter. Germany made a calculatedly spectacular effort at aerial surveying when two aircraft flying from a catapult ship photographed approximately 135,000 sq mi (350,000 sq km) of Queen Maud Land. The Norwegians had done considerable exploration and mapping during the first two decades of antarctic whaling in the Scotia Arc. In 1925-26 they introduced pelagic whaling with factory ships that could operate in the open sea. Between 1927 and 1937, Lars Christensen led an extensive program of aerial exploration and mapping of the coast of E Antarctica from the Weddell Sea to the Shackleton Ice Shelf. Also allied to whaling were the investigations in physical oceanography, marine biology, and coastal mapping carried out by the Discovery Committee of the British Colonial Office from 1925 to 1939. Their major achievement was the discovery of the Antarctic Convergence. The 1930s were a period of international rivalry in Antarctica, and the map was cut into wedge-like territorial claims that often overlapped. Although the U.S. government did not make a claim nor recognize those of other nations, it supported antarctic exploration. The U.S. Antarctic Service Expedition (1939-41), directed by Byrd, introduced the concept of continuously occupied bases, one of which was set up at the Bay of Whales and another on Stonington Island W of the Antarctic Peninsula. The onset of World War II forced the evacuation of the bases, but before the war ended Great Britain, in order to offset claims by Chile and Argentina, had established permanent bases on the Antarctic Peninsula and off-lying islands. Interest in Antarctica intensified after the war, and several governments established permanent agencies to direct antarctic affairs. Great Britain, Argentina, and Chile continued the system of scientific bases in the Antarctic Peninsula and Scotia Arc. Australia established bases on Heard and Macquarie islands, and France founded one on the Adélie Coast. From 1945 to 1957 the U.S. navy conducted Operation Highjump, the largest expedition ever sent to Antarctica. It involved c. 5,000 men, 13 ships including 2 icebreakers, 6 seaplanes, 6 airplanes, 2 small amphibian planes, and 3 helicopters. About 60% of the coastline was photographed, of which about 25% was reported as sighted for the first time. Much of the interior bordering the Ross Ice Shelf was also photographed. The navy's Operation Windmill (1947-48), a part of the larger operation, consisted of two icebreakers equipped with helicopters; it was sent to get ground control for Highjump photography on the coast of Wilkes Land. After World War II, most expeditions were again government-financed. The Ronne Antarctic Research Expedition (1947-48), led by Finn Ronne, was the last privately sponsored U.S. expedition. Using the old U.S. Antarctic Service Expedition Base on Stonington Island, Ronne closed the unexplored gap at the head of the Weddell Sea. Some work was done as a joint effort with the British party that also had a base on the island. A portent of the international cooperation soon to follow, the Norwegian-British-Swedish Antarctic Expedition was organized by the respective governments and scientific societies for exploration and scientific investigation in Queen Maud Land. Although geophysical exploration of the Ross Ice Shelf had been carried out by the Second Byrd Expedition, the Norwegian-British-Swedish Expedition was the first to use geophysical methods inland on a very extensive scale. The International Geophysical Year (IGY), from July 1, 1957, to Dec. 31, 1958, was planned to correspond with a period of maximum sunspot activity. Organized as a cooperative venture by a special committee of the International Council of Scientific Unions, the IGY involved scientists from 56 nations at ap-

proximately 2,000 stations on five meridian belts from pole to pole. In a cooperative program, planned and coordinated to avoid duplication and achieve maximum results, 12 nations maintained 65 stations and operational facilities in Antarctica. World data centers were established to collect and organize information and make it available to all scientists. The more difficult logistical problems of establishing inland bases were undertaken by the United States and the USSR. The American effort, beginning in 1955-56, was carried out by Naval Task Force 43 (Operation Deep Freeze). A major base of operations was built on Ross Island, and an airfield was established on the ice. Five other U.S. stations were established, including one at the South Pole that was entirely supplied by air. The Russians concentrated on E Antarctica, building Mirnyy, a station on the Queen Mary Coast, and two relay stations and three bases inland: Komsomolskaya, Vostok (at the Geomagnetic South Pole), and Sovetskaya. There were 14 British stations, 8 Argentine stations, and 6 Chilean stations. France reoccupied the station opened in 1950 on the Adélie Coast and set up another inland near the Magnetic South Pole. Australia, Belgium, Japan, Norway, South Africa, and New Zealand also participated and occupied either insular or coastal sites. From 1951 to 1958, Dr. Vivian Fuchs led the British Commonwealth Trans-Antarctic Expedition's traverse with tractors from the Weddell Sea to McMurdo Sound via the South Pole, conducting a seismic and magnetic profile en route. Although mapping was not part of the IGY program, long-distance flights by U.S. planes covered c. 2,000,000 sq mi (5,180,000 sq km) in 1955-56, half of which had never been seen before. These and later support flights, the tractor journeys to build bases, and geophysical traverses by tracked vehicles during the IGY left little of the continent that had not been seen. So outstanding were the results that before the IGY ended it was proposed to continue and broaden the program after 1958. The International Council of Scientific Unions in 1957 established SCAR (Scientific Committee on Antarctic Research) to plan and coordinate the programs that would be carried out in a manner similar to the IGY. Of the 12 nations involved in the IGY, some have dropped their programs, others have suspended and then renewed operations, those that have been continually involved have reduced the size of their programs. Some stations have been closed, new ones have been opened, and old ones have had to be replaced by buildings designed for permanence and comfort. At McMurdo the United States has built a scientific village where people may be housed in summer and winter. The village is heated and lighted by a small atomic power plant that uses waste heat to distill sea water. From McMurdo other U.S. bases are supported by air. Since the IGY the National Science Foundation (NSF) has financed the U.S. program. Logistical support is in the hands of the U.S. navy, and mapping is done by the U.S. Geological Survey. Since 1962, when the NSF introduced a research ship, work on various branches of oceanography in the 5 Pacific and 5 Atlantic has been done. In 1968-69 the NSF added a wooden trawler-type vessel especially designed for marine biological investigations in the area of the Antarctic Peninsula. The success of the IGY effort led to the signing (1959) of the Antarctic Treaty by representatives of the 12 nations that had been involved in the IGY. The treaty applied to the area south of lat. 60°S, exclusive of the high seas, and it provided for cooperation and freedom of movement for scientific investigation as well as for the exchange of observers and scientific data. It prohibited military operations, nuclear explosions, and the disposal of radioactive wastes. Previous territorial claims were not prejudiced, nor was any activity during the life of the treaty to be construed as supporting territorial claims. By 1971 six consultative conferences had been held, resulting in amendments relative to cooperation in scientific research, conservation of living resources, contamination of the environment, development of telecommunications, and preservation of historic areas and buildings. In the early 1970s fossil finds and geological studies gave further support to the theory of continental drift. These studies concluded that Antarctica has been frozen for at least 20 million years (not 7 million years as previously thought) and that a tropical environment existed there 250 million years ago. See H. R. Mill, *The Siege of the South Pole* (1905), J. G. Hayes, *The Conquest of the South Pole* (1932), E. W. H. Christie, *The Antarctic Problem* (1951), P. I. Mitterling, *America in the Antarctic to 1840* (1959), Frank Debenham, *Antarctica, the Story of a Continent* (1959), L. P. Kirwan, *A History of Po-*

lar Exploration (1960), Walter Sullivan, *Quest for a Continent* (1957) and *Assault on the Unknown* (1961), A. G. Price, *The Winning of Australian Antarctica* (1962), P. E. Victor, *Man and the Conquest of the Poles* (1963), Raymond Priestley et al., ed., *Antarctic Research* (1964), Trevor Hatherton, ed., *Antarctica* (1965), R. S. Lewis, *A Continent for Science* (1965), L. B. Quatermain, *South to the Pole* (1967), H. G. R. King, *The Antarctic* (1969), L. O. Quam, ed., *Research in the Antarctic* (1971), K. J. Berstrand, *Americans in Antarctica, 1775-1948* (1971), R. S. Lewis and P. M. Smith, eds., *Frozen Future* (1973).

Antarctic Circle, imaginary circle on the surface of the earth at 66½°S lat., i.e., 23½°N of the South Pole. It marks the southernmost point at which the sun can be seen at the summer SOLSTICE (about June 22) and the northernmost point of the southern polar regions at which the MIDNIGHT SUN is visible.

Antarctic Peninsula, glaciated mountain region of W ANTARCTICA, extending c. 1,200 mi (1,930 km) N toward South America, in the south, volcanic peaks rise to c. 11,000 ft (3,350 m). It is surrounded by numerous islands, including the South Shetlands and the Palmer Archipelago. The tip of the peninsula, 670 mi (1,078 km) from Cape Horn, is Antarctica's farthest point from the South Pole. The continent's only flowering plants are found on the peninsula. The northwest coast of the peninsula was mapped by the British navigator James Bransfield in Jan., 1820, and was explored by sealers in 1820-21. First considered to be part of the continent, the peninsula was later (1928) thought to be a group of islands; the John Rymill expedition (1934-37) proved its peninsularity. It was originally named Palmer Peninsula by Americans for Nathaniel Palmer, a U.S. captain who explored the area in Nov., 1820. In 1832, Britain claimed it and called it Graham Land and Trinity Peninsula. Argentina claimed it in 1940 as San Martin Land and Chile in 1942 as O'Higgins Land. In 1964, by international agreement, the entire feature was called the Antarctic Peninsula, Graham Land, Trinity Peninsula, and Palmer Land are used as local names.

Antares (āntār'ēz), brightest star in the constellation SCORPIUS, Bayer designation Alpha Scorpii, 1970 position R.A. 16h27m, Dec. -26°22'. A red supergiant of SPECTRAL CLASS M1, Antares has an apparent MAGNITUDE of about 0.9, making it one of the 20 brightest stars in the sky. Its name is from the Greek meaning "rival of Mars," referring both to its color and to its brightness. Antares is a binary star and a semi-regular variable, with magnitude ranging from 0.86 to 1.02. Its distance from the earth is about 500 light-years.

ant bear: see AARDVARK

anteater, name applied to various animals that feed on ants, termites, and other insects, but more properly restricted to a completely toothless group of the order EDENTATA. There are three genera, all found in tropical Central and South America. The great anteater, or ant bear (*Myrmecophaga*), has an elongated, almost cylindrical head and snout, a long sticky tongue, a coarse-haired body about 4 ft (1.2 m) long, and a long, broad tail. The large, sharp claws on the forefeet are weapons of defense and are used to open the hard earth mounds of termites and ants, which are then picked up on the saliva-coated tongue. The tongue extends to a length of about 2 ft (60 cm). The collared, or lesser, anteater (*Tamandua*), less than half the size of the great anteater, is a short-haired yellowish and black arboreal creature. The arboreal two-toed anteater (*Cyclops*) is the size of a squirrel and has a prehensile tail and silky yellow fur. Other animals called anteater are members of other groups. The banded anteater of Australia is a marsupial, the spiny anteater, also of Australia, is related to the PLATYPUS. For the scaly anteater, see PANGOLIN. True anteaters are classified in the phylum CHORDATA, subphylum Vertebrata, class Mammalia, order Edentata, family Myrmecophagidae.

Antelami, Benedetto (bānādēt'tō antālā'mē), c. 1150-c. 1225, Italian sculptor. Considered the most important sculptor of the late Romanesque period in N Italy, Antelami was an aesthetic forebear of Nicola and Giovanni PISANO. His relief carvings emphasize rhythmic design by means of drapery details on elongate figures and tight compositions. The faces of his figures are profoundly expressive. Antelami's style, as in his doors for the baptistry at Parma (begun 1196), suggests that he was trained in S France. It is clear that his late work was influenced by French Gothic style.

antelope, name applied to a large number of hoofed, ruminant mammals of the CATTLE family

(Bovidae), which also includes the sheep and goats. The North American PRONGHORN is sometimes called an antelope, but belongs to a separate, related family (Antilocapridae). True antelopes are found only in Africa and Asia. They range in size from pygmy antelopes, 12 in (30 cm) high at the shoulder, to the giant ELAND, with a shoulder height of over 6 ft (180 cm). Most types stand 3 to 4 ft (90-120 cm) high. The horns of antelopes, unlike the antlers of deer, are unbranched, consist of a chitinous shell with a bony core, and are not shed. Africa is the home of most antelopes. The spiral-horned antelopes are the BUSHBUCKS, (including the nyala and the sitatunga), KUDU, eland, and BONGO. These oxlike animals have patterns of light and dark stripes on the body, and most have them on the face as well. The DUKERS are a group of small, straight-horned antelopes of forest and thick brush country. MARSH ANTELOPES are deerlike animals of marshes and reedbeds, they include the waterbuck, kob, puka, lechwe, reedbuck, and rhebok. The GNU (or wildebeest) and the closely related HARTEBEEST and DAMALISK are horselike antelopes of the grasslands. The name ORYX is applied to smaller horselike animals of the desert and scrublands, including the gemsbok and the beisa, the ADDAX is a related desert antelope. The sable antelope and the closely related roan antelope have enormous, backward-curved, scimitar-shaped horns. GAZELLE is the name for a number of small, delicate antelopes with spreading horns, inhabiting deserts and grassy plains. The largest of these is the pale brown IMPALA, the kind of antelope best known from motion pictures. The gazelle tribe also includes the gerenuk, dibatag, springbok, and BLACKBUCK, as well as the so-called true gazelles (genus *Gazella*). The blackbuck, found in India, was the first antelope to be described by zoologists, and has the generic name *Antelope*. The delicate pygmy antelopes include the royal antelope, beira, klipspringer, onibi, grysbok, steinbok, dik-dik, and suni. Males have tiny, straight horns. The nilgai and the four-horned antelope are found in SE Asia. More closely related to the goats than to any of the above-named animals, but often called antelopes, are the saiga of central Asia and the chiru of Tibet. Antelopes are classified in the phylum CHORDATA, subphylum Vertebrata, class Mammalia, order Artiodactyla, family Bovidae.

antelope brush, low, deciduous shrub (*Purshia tridentata*) of the family Rosaceae (ROSE family), widely distributed in the W United States where it is a characteristic constituent of the vegetation on arid slopes and desert ranges. One of the most important Western browse plants, it provides abundant forage throughout the year for both cattle and deer. Antelope brush is classified in the division MAGNOLIOPHYTA, class Magnoliopsida, order Rosales, family Rosaceae.

antenna (āntē'nā), in electronics, system of wires or other conductors used to transmit or receive radio or other electromagnetic waves (see RADIO), popularly called an aerial. The idea of using an antenna was developed by Guglielmo Marconi (c 1897). In a transmitting antenna, the signal from an electronic circuit causes electrons in the antenna to oscillate, these moving electric charges generate electromagnetic radiation, which is transmitted through space. Distribution of the waves depends on the design of the antenna, the transmitting antennas of radio stations are designed to emit waves in all directions, while those used for RADAR focus the waves in a single direction. In a receiving antenna electromagnetic waves cause the electrons to oscillate, inducing a signal that can be detected by an electronic circuit. The antenna has a characteristic frequency that depends on the relationship between its physical dimensions and the wavelength of the signal, a wire of a given length is inherently tuned to radio waves whose wavelengths are simple fractions of the length of the wire. In general, a longer antenna is used to transmit or receive signals of longer wavelength. Theoretically, the same antenna can be used both for sending and for receiving signals, but in practice, transmitting antennas are designed differently from receiving antennas, since they must be able to handle higher power loads. Any straight vertical conductor may serve as an antenna and will transmit to or receive from all directions. A horizontal antenna radiates or intercepts energy principally at right angles to itself, the use of horizontal antennas enables transmitters to concentrate or beam their signals into desired areas and enables receivers to select one of several signals having the same frequency but arriving from different directions. Developments in radio circuitry and antenna design have culminated the need, in most locations, for an

external antenna for AM radio reception, however, external antennas are usually needed for FM radio and television reception. Special antennas are employed in transmitting and receiving radar and microwaves and in satellite communications. The radio telescopes used in astronomy are specially designed receiving antennas.

Antenor (āntē'nōr), fl last half of 6th cent B C, Greek sculptor who executed the bronze statues of the tyrannicides Harmodius and Aristogiton. In 480 B C, Xerxes carried these statues away from Athens, but they were discovered later at Susa by Alexander and sent back. A marble figure of a woman, signed on the base by Antenor, was found in the ruins of the Acropolis at Athens. See also CRITIUS.

Antenor, in Greek mythology, wise elder of Troy who urged that Helen be returned to Menelaus. The Greeks spared him and his family when they sacked Troy. A later myth portrays Antenor as a traitorous spy who opened the door of the wooden horse. Agenor was his son.

Antequera (āntāk'āra), city (1970 pop 40,908), Malaga prov, S Spain, in Andalusia. At the foot of the Sierra de los Torcales, it is the center of a fertile agricultural region. The Cueva de Menga, a large prehistoric burial chamber, possibly Celtic, was discovered in the vicinity in 1842. Similar finds were made in 1903 and 1904.

Antequera y Castro, José de (hōsā' dā āntāk'āra ē ka'strō), 1690-1731, Peruvian lawyer, leader of a revolt in Paraguay. A prosecutor of the audiencia of Charcas, he was sent to Asuncion to probe charges against the governor of Paraguay, Diego de los Reyes. Antequera sided with the opposition, became governor himself, and upheld the celebrated doctrine that "the authority of the people is superior to that of the king." He led the uprising of the COMUNEROS in a war against the authority of the viceroy and was finally captured and beheaded in 1731. This first struggle for freedom was the forerunner of the Spanish American revolts against Spain.

Anteros: see EROS.

Antheil, George (ān'tīl), 1900-59, American composer, b Trenton, NJ. He went to Europe in 1920 and became known for his iconoclastic approach to music. In 1927 a performance of his *Ballet mécanique*, scored for player piano, car horns, airplane propellers, and the like, caused a great stir among critics and concertgoers in New York City. Much of his early work, such as the opera *Transatlantic* (1930), reveals the influence of jazz. Antheil's later compositions include more traditional symphonies and sonatas.

antheion: see HALO.

anthem [ultimately from ANTIPHON], short nonliturgical choral composition used in Protestant services, usually accompanied and having an English text. The term is used in a broader sense for "national anthems" and for the Latin motets still used occasionally in Anglican services. A full anthem is entirely choral, while a verse anthem includes parts for solo singers. The anthem arose in the Anglican Church, as the English counterpart of the Latin motet, through the work of Christopher Tye (c 1500-1573), Thomas TALIS, and William BYRD (1543-1623). Early anthems were often in the style of Latin motets, sometimes being merely an English text set to well-known motets. In the late 17th cent composers such as Henry Purcell and John Blow, under Italian influences, wrote verse anthems with several movements, as in cantatas. George F Handel's anthems, in the tradition of the full anthem, are, like those of Purcell and Blow, too elaborate for ordinary church use. Since the 19th cent extracts from oratorios, masses, passions, etc., are commonly used as anthems, but these pieces are not anthems in the original sense of the term. See R T Daniel, *The Anthem in New England before 1800* (1966), M B Foster, *Anthems and Anthem Composers* (1901, repr 1970).

anthemion (ānthē'mēan), commonly called a palmette, a radiating, fan-shaped ornament or motif suggestive of a palm leaf or of honeysuckle and found in Egyptian, Assyrian, and Aegean art. It was widely used by the Greeks and Romans on their buildings and on many kinds of decorative objects.

Anthemius of Tralles (ānthē'mēas, trāl'ēz), fl 6th cent, Greek architect, engineer, and mathematician. By order of Emperor Justinian and with the aid of Isidorus of Miletus, he built (532-37) the Church of HAGIA SOPHIA in Constantinople.

anther, pollen-bearing structure of the stamen of a flower, usually borne on a slender stalk called the filament. Each anther generally consists of two pollen sacs, which open when the pollen is mature. The

method of opening, or dehiscence, is uniform in any single species of plant.

anthology, collection of selected literary pieces of varied authorship. The name derives from the Greek word *anthologia*, which means "gathered flowers," and it was first given to the GREEK ANTHOLOGY. Whereas in the past an anthology usually contained short, select poems or epigrams, in modern times an anthology has come to include all forms of literary composition.

Anthony, Saint (ān'tanē, ān'thanē), 251?-c 350, Egyptian hermit, called St Anthony of Egypt and St Anthony the Abbot. At the age of 20 he gave away his large inheritance and became a hermit. At 35 he went into seclusion and at that time he experienced, says tradition, every temptation the devil could devise, but he repelled them. A colony of hermits grew up about him, and after 20 years he emerged to rule them in a community, the monks being in solitude except for worship and meals. After a few years he went away to the desert near Thebes, where he lived most of the rest of his long life. St Anthony was the father of Christian MONASTICISM, his community became a model, particularly in the East, but he did not write the rule ascribed to him. His type of community is seen in the West among the Carthusians. He is a patron of herdsmen. St ATHANASIUS wrote his life. The temptation of St Anthony has inspired works of literature, particularly a novel by Flaubert, and became a popular theme early in the history of Western art. Feast Jan 17.

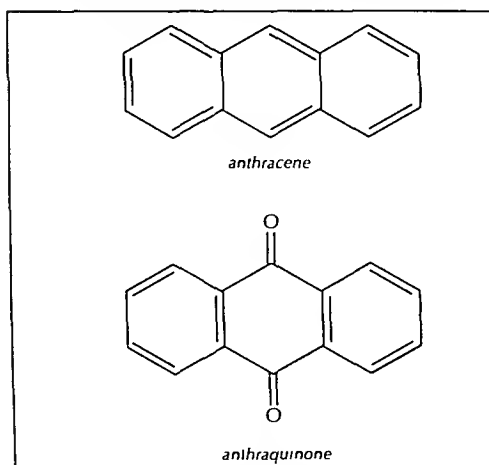
Anthony, Marc: see ANTONY.

Anthony, Susan Brownell, 1820-1906, American reformer and leader of the woman-suffrage movement, b Adams, Mass., daughter of Daniel Anthony, Quaker abolitionist. From the age of 17, when she was a teacher in rural New York state, she agitated for equal pay for women teachers, for coeducation, and for college training for girls. When the Sons of Temperance refused to admit women into their movement, she organized the first woman's temperance association, the Daughters of Temperance. At a temperance meeting in 1851 she met Elizabeth Cady Stanton, and from that time until Stanton's death in 1902 they were associated as the leaders of the woman's movement in the United States and were bound by a warm personal friendship. Susan B Anthony lectured (1851-60) on woman's rights and on abolition, and, with Stanton, secured the first laws in the New York state legislature guaranteeing to women rights over their children and control of property and wages. In 1863 she was a coorganizer of the Women's Loyal League to support Lincoln's government, especially his emancipation policy. After the Civil War she opposed granting suffrage to freedmen without also giving it to women, and many woman-suffrage sympathizers broke with her on this issue. She and Stanton organized (1869) the National Woman Suffrage Association. In 1890 this group united with the American Woman Suffrage Association to form the National American Woman Suffrage Association, of which Anthony was president from 1892 to 1900. In 1872 she led a group of women to the polls in Rochester, N Y, to test the right of women to the franchise under the terms of the Fourteenth Amendment. Her arrest, trial, and sentence to a fine (which she refused to pay) were a cause celebre, other women followed her example until the case was decided against them by the US Supreme Court. From 1869 she traveled and lectured throughout the United States and Europe, seeing the feminist movement gradually advance to respectability and political importance. The secret of her power, aside from her superior intellect and strong personality, was her unswerving singleness of purpose. With Elizabeth Cady Stanton and Matilda Joselyn Gage, she compiled Volumes I to III of the *History of Woman Suffrage* (1881-86), using a personal legacy to buy most of the first edition and present the volumes to colleges and universities in the United States and Europe. The *History* was completed by Ida Husted Harper (Vols IV-VI, 1900-1922, Susan B Anthony contributed to Vol IV). See *The Life and Work of Susan B Anthony*, ed by Ida Husted (3 vol., 1908, repr 1969), *biographies* by K S Anthony (1954) and R C Dorr (1928, repr 1970).

Anthony of Padua, Saint, 1195-1231, Portuguese Franciscan, Doctor of the Church, b Lisbon. He was renowned for his eloquence. According to tradition, in a vision he received the child Jesus in his arms and is usually thus represented in art. He was known as a preacher and for his holy life and was canonized the year after he died in Padua. Anthony has a reputation as a miracle worker and is popularly invoked by Roman Catholics to find lost articles. Feast June 13. See biography by Mary Purcell (1960).

anthophyllite (ăn'thəfil'it) see AMPHIBOLE

anthracene (ăn'thrāsēn), $C_{14}H_{10}$, solid organic compound derived from coal tar. It melts at 218°C and boils at 354°C . When pure it is colorless and has a violet fluorescence, it darkens when exposed to sunlight. Anthracene is insoluble in water but is



quite soluble in carbon disulfide and somewhat soluble in ethanol, methanol, benzene, chloroform, and other organic solvents. It is readily oxidized to form anthraquinone, the parent compound of the ALIZARIN series of dyes. The molecular structure of anthracene consists of three benzenelike rings joined side by side, it is thus an AROMATIC COMPOUND. It is the first member of the anthracene series, a group of aromatic hydrocarbons that are structurally related to it and have the general formula C_nH_{2n-10} .

anthracite (ăn'thrāsīt') see COAL

anthrax (ăn'thrāks), acute infectious disease of animals that can be secondarily transmitted to humans. It is caused by a bacillus (*Bacillus anthracis*) that primarily affects sheep, horses, hogs, cattle, and goats and is almost always fatal in animals. Transmission to humans normally occurs through contact, but can also occur by breathing air laden with the spores of the bacilli. The disease is almost entirely occupational, i.e., restricted to individuals who handle hides of animals (e.g., farmers, butchers, and veterinarians) or sort wool. In the cutaneous form of the disease, which is not usually fatal to humans, pustules occur on the hands, face, and neck, pulmonary anthrax causes lesions in the lungs and brain. Pure cultures of the anthrax bacillus were obtained in 1876 by Robert Koch, who demonstrated the relationship of the microbe to the disease, confirmation of the bacillus as the cause of anthrax was provided by Louis Pasteur, who also developed a method of vaccinating sheep and cattle against the disease. Anthrax is now relatively uncommon in the United States because of widespread vaccination of animals and disinfection of animal products such as hides and wool.

anthropology, classification and analysis of humans and their society, descriptively, historically, and physically. Its unique contribution to studying the bonds of human social relations has been the distinctive concept of CULTURE. It has also differed from other sciences concerned with human social behavior (especially sociology) in its emphasis on data from nonliterate peoples and archaeological exploration. Emerging as an independent science in the late 18th and early 19th cent., anthropology was associated from the beginning with various other emergent sciences, notably biology, geology, linguistics, psychology, and archaeology. Its development is also linked with the philosophical speculations of the Enlightenment about the origins of human society and the sources of myth. A unifying science, anthropology has not lost its connections with any of these branches, but has incorporated all or part of them and often employs their techniques. It is divided primarily into physical anthropology and cultural anthropology. Physical anthropology focuses basically on the problems of human evolution, including human paleontology and the study of RACE and of body build or constitution (somatology). It uses the methods of ANTHROPOMETRY, as well as those of genetics, physiology, and ecology. Cultural anthropology includes ARCHAEOLOGY, which studies the material remains of prehistoric and extinct cultures, ETHNOGRAPHY, the descriptive study of living cultures, ETHNOLOGY, which utilizes the data furnished by ethnography, the recording of living

cultures, and archaeology, to analyze and compare the various cultures of humanity, social anthropology, which evolves broader generalizations based partly on the findings of the other social sciences, and LINGUISTICS, the science of language. Applied anthropology is the practical application of anthropological techniques to areas such as industrial relations and minority-group problems. In Europe the term anthropology usually refers to physical anthropology alone. See A. L. Kroeber, *Anthropology* (1948, repr. in 2 vol., 1963), Clyde Kluckhohn, *Mirror for Man* (1949, repr. 1963), M. J. Herskovits, *Cultural Anthropology* (1955, repr. 1963), Margaret Mead and R. L. Bunzel, ed., *The Golden Age of American Anthropology* (1960), B. C. Loring, *The Stages of Human Evolution* (1967), J. O. Brew, ed., *One Hundred Years of Anthropology* (1968), G. M. Foster, *Applied Anthropology* (1969), A. H. Smith and J. L. Fisher, ed., *Anthropology* (1970), Marvin Harris, *The Rise of Anthropological Theory* (1968) and *Culture, Man, and Nature* (1971).

anthropometry (ăn'thrəpōm'etrē), technique of measuring the human body in terms of dimensions, proportions, and ratios such as those provided by the CEPHALIC INDEX. Once the standard approach to racial classification and comparing humans to other primates, the technique is now used for deciding the range of clothing sizes to be manufactured, and determining the nutritional status of people. See Ashley Montagu, *A Handbook of Anthropometry* (1960), Robert McCammon, *Human Growth and Development* (1970).

anthropomorphism (ăn'thrəpōmōr'fīzəm) [Gr. = having human form], in religion, conception of divinity as being in human form or having human characteristics. Anthropomorphism also applies to the ascription of human forms or characteristics to the divine spirits of things such as the winds and the rivers, events such as war and death, and abstractions such as love, beauty, strife, and hate. As used by students of religion and anthropology the term is applied to certain systems of religious belief, usually polytheistic. Although some degree of anthropomorphism is characteristic of nearly all polytheistic religions, it is perhaps most widely associated with the Homeric gods and later Greek religion. Anthropomorphic thought is said to have developed from three primary sources: ANIMISM, legend, and the need for visual presentation of the gods.

antiballistic missile: see GUIDED MISSILE

Antibes (āntēb'), resort town (1968 pop. 48,013), in Alpes-Maritimes dept., SE France, on the RIVIERA. It is a seaport and the center of a great flower-growing region, a school of horticulture is there. Nearby is the fashionable resort Cap d'Antibes. The town was founded as a Greek colony in the 4th cent. B.C. A fortified port, it still has the 16th-century Fort Carré. Also of interest is a Grimaldi château (14th and 16th cent.) housing a museum that includes numerous works of Picasso. Roman ruins are to the south.

antibiotic, any of a variety of substances, usually obtained from microorganisms, that inhibit the growth of or destroy certain other microorganisms. Although for centuries preparations derived from living matter were applied to wounds to destroy infection, the fact that a microorganism is capable of destroying one of another species was not established until the latter half of the 19th cent. when Pasteur noted the antagonistic effect of other bacteria on the anthrax organism and pointed out that this action might be put to therapeutic use. Meanwhile the German chemist Paul Ehrlich developed the idea of selective toxicity that certain chemicals that would be toxic to some organisms, e.g., infectious bacteria, would be harmless to other organisms, e.g., humans. In 1928, Sir Alexander Fleming, a Scottish biologist, observed that *Penicillium notatum*, a common mold, had destroyed staphylococcus bacteria in culture, and in 1939 the American microbiologist Rene Dubos demonstrated that a soil bacterium was capable of decomposing the starch-like capsule of the pneumococcus bacterium, without which the pneumococcus is harmless and does not cause pneumonia. Dubos then found in the soil a microbe, *Bacillus brevis*, from which he obtained a product, tyrothricin, that was highly toxic to a wide range of bacteria. Tyrothricin, a mixture of the two peptides GRAMICIDIN and tyrocidine, was also found to be toxic to red blood and reproductive cells in humans but could be used to good effect when applied as ointments on body surfaces. PENICILLIN was finally isolated in 1939, and in 1944 Selman Waksman and Albert Schatz, American microbiologists, isolated STREPTOMYCIN and a number of other antibiotics from *Streptomyces griseus*. The

mass production of antibiotics began during World War II with streptomycin and penicillin. Now most antibiotics are produced by staged fermentations in which strains of microorganisms producing high yields are grown under optimum conditions in nutrient media in fermentation tanks holding several thousand gallons. The mold is strained out of the fermentation broth, and then the antibiotic is removed from the broth by filtration, precipitation, and other separation methods. In some cases new antibiotics are laboratory synthesized, while many antibiotics are produced by chemically modifying natural substances, many such derivatives are more effective than the natural substances against infecting organisms or are better absorbed by the body, e.g., some semisynthetic penicillins are effective against bacteria resistant to the parent substance. The great number of diverse antibiotics currently available can be classified in different ways, e.g., by their chemical structure, their microbial origin, or their mode of action. They are also frequently designated by their effective range. TETRACYCLINES, the most widely used broad spectrum antibiotics, are effective against both Gram-positive and Gram-negative bacteria, as well as against rickettsias and psittacosis-causing organisms (see GRAM'S STAIN). The medium spectrum antibiotics BACITRACIN, the ERYTHROMYCINS, penicillin, and the CEPHALOSPORINS are effective primarily against Gram-positive bacteria, although the streptomycin group is effective against some Gram-negative and Gram-positive bacteria. Polymixins are narrow spectrum antibiotics effective against only a few species of bacteria. Antibiotics are either injected, given orally, or applied to the skin in ointment form. Many, while potent anti-infective agents, also cause toxic side effects. Some, like penicillin, are highly allergenic and can cause skin rashes, shock, and other manifestations of allergic sensitivity. Others, such as the tetracyclines, cause major changes in the intestinal bacterial population and can result in superinfection by fungi and other microorganisms. CHLORAMPHENICOL, which is now restricted in use, produces severe blood diseases, and use of streptomycin can result in ear and kidney damage. Many antibiotics are less effective than formerly because antibiotic-resistant strains of microorganisms have emerged (see DRUG RESISTANCE). Antibiotics have found wide nonmedical use. Some are used in animal husbandry, along with vitamin B₁₂, to enhance the weight gain of livestock. However, some authorities believe the addition of antibiotics to animal feeds is dangerous because continuous low exposure to the antibiotic can sensitize humans to the drug and make them unable to take the substance later in the treatment of infection. In addition low levels of antibiotics in animal feed encourage the emergence of antibiotic-resistant strains of microorganisms. Drug resistance has been shown to be carried by a genetic particle transmissible from one strain of microorganism to another, and the presence of low levels of antibiotics can actually cause an increase in the number of such particles in the bacterial population and increase the probability that such particles will be transferred to pathogenic, or disease-causing, strains. Antibiotics have also been used to treat plant diseases such as bacteria-caused infections in tomatoes, potatoes, peppers, and fruit trees. The substances are also used in experimental research. Other antibiotics discussed in this volume are ACTINOMYCIN, AMPHOTERICIN B, AMPICILLIN, LINCOMYCIN, NEOMYCIN, RIFAMPIN, and VANCOMYCIN. See H. M. Bottcher, *Wonder Drugs* (1964), Tadeusz Korzybski, *Antibiotics* (2 vol., 1967), L. P. Garrod et al., *Antibiotics and Chemotherapy* (3d ed. 1971).

antibody, specific protein produced by lymphocyte cells in response to the presence in the body of a foreign agent. Foreign substances, or antigens, may be bacteria, bacterial toxins, viruses, or other cells or proteins. The body is capable of making thousands of different antibodies, each specific to a different antigen. Each specific antibody is made by one particular lymphocyte cell and its clone, or descendant cells (see IMMUNITY).

Antichrist (ăn'tikristī), in Christian belief, a person who will represent on earth the powers of evil by opposing Christ, glorifying himself, and causing many to leave the faith. He will be destroyed by Christ at the time of the Second Coming. 1 John 2:18-22, 4:3, 2 John 7, and Rev. 13. Similar ideas are expressed in Judaism (e.g., Ezek. 38:1-39:29), and in Zoroastrianism. Christians have often identified enemies of their faith with the Antichrist, e.g., with early Christians it was Nero, with some Protestants the pope.

anticline: see FOLD

anticoagulant (ăn'tēkōāg'yālānt), any of several substances that inhibit blood clot formation (see BLOOD CLOTTING). Some anticoagulants, such as the coumarin derivatives bishydroxycoumarin (Dicumarol) and warfarin (Coumadin) inhibit synthesis of prothrombin, a clot-forming substance, and other clotting factors. The coumarin derivatives compete with vitamin K, which is a necessary substance in prothrombin formation (see VITAMIN). They are only effective after the body's existing supply of prothrombin is depleted. Another anticoagulant, heparin, is a POLYSACCHARIDE found naturally in many cells. It acts in several ways by preventing prothrombin formation, by preventing formation of fibrin, another clotting substance, and by decreasing the availability of a third clotting factor, thrombin. Heparin is obtained by extracting it from animal tissues. Anticoagulants are used to treat blood clots, which appear especially frequently in veins of the legs and pelvis in bedridden patients. Therapy helps to reduce the risk of clots reaching the lung, heart, or other organs. Heparin causes an instantaneous increase in blood-clotting time, and its effect lasts several hours.

Anti-Comintern Pact: see COMINTERN and AXIS

Anti-Corn-Law League, organization formed in 1839 to work for the repeal of the English CORN LAWS. It was an affiliation of groups in various cities and districts with headquarters at Manchester and was an outgrowth of the smaller Manchester Anti-Corn-Law Association. Richard COBDEN and John BRIGHT were its leading figures. The league won over Sir Robert Peel to its views, and the corn laws were repealed in 1846.

Anticosti (ăntikōs'tē), low, flat island (1971 pop. 419), 135 mi (217 km) long and 10 to 30 mi (16-48 km) wide, E Que., Canada, at the head of the Gulf of St. Lawrence. The island was discovered by Cartier in 1534. Louis XIV granted it to Jolliet as a reward for his discovery of the Mississippi. Jolliet's heirs held it until 1763, when it was annexed to Newfoundland (then a separate colony). It was returned to Canada in 1774 and has been privately owned since 1895. Lumbering for pulpwood is the chief occupation on the island.

anticyclone, region of high atmospheric pressure; anticyclones are commonly referred to as "highs." The pressure gradient, or change between the core of the anticyclone and its surroundings, combined with the CORIOLIS EFFECT, causes air to circulate about the core in a counterclockwise direction in the Northern Hemisphere and a clockwise direction in the Southern Hemisphere. Near the surface of the earth the frictional drag of the surface on the moving air causes it to spiral outward gradually toward lower pressures while still maintaining the rotational direction. This outward movement of air is fed by descending currents near the center of the anticyclone that are warmed by compression as they encounter higher pressures at lower altitudes. The warming, in turn, greatly reduces the relative humidity, so that anticyclones, or "highs," are generally characterized by few clouds and low humidity. Such weather characteristics may extend over an area from a few hundred to a few thousand miles wide. Many low-level anticyclones are swept generally eastward by the prevailing west-to-east flow of the upper atmosphere, usually traversing some 500 to 1,000 mi (800-1,600 km) per day. Other anticyclones are permanent or seasonal features of particular geographic regions. The term *anticyclone* is derived from the fact that the associated rotational direction and general weather characteristics of an anticyclone are opposite to those of a CYCLONE.

antidiabetic drug, any of several drugs that control blood sugar level in the treatment of DIABETES. See INSULIN, ORINASE, PHENFORMIN.

antidiuretic hormone (ăn'tēdī'ōrēt'ik), polypeptide hormone secreted by the posterior PITUITARY GLAND. Its principal action is to regulate the amount of water excreted by the kidneys. Antidiuretic hormone (ADH), known also as vasopressin, causes the kidneys to resorb water directly from the renal tubules, thus concentrating the salts and waste products in the liquid, which will eventually become urine. ADH secretion by the pituitary is regulated by neural connections from the hypothalamus, which is believed to monitor either the volume of blood passing through it or the concentration of water in the blood. Dehydration or body stress will raise ADH secretion and water will be retained. Alcohol inhibits ADH secretion. Failure of the pituitary to produce ADH results in diabetes insipidus. In pharmacological doses ADH acts as a vasoconstrictor. The structure and chemical synthesis of ADH was

announced (1953) by nobel laureate Vincent Du Vigneaud and others.

Antietam campaign (ăntē'tām), Sept., 1862, of the Civil War. After the second battle of BULL RUN, Gen. Robert E. LEE crossed the Potomac to invade Maryland and Pennsylvania. At Frederick, Md., he divided (Sept. 10) his army, sending Stonewall Jackson to capture the large Union garrison at Harpers Ferry and thus clear his communications through the Shenandoah valley. With the remainder, Lee marched NW toward Hagerstown. Gen. George B. MCCLELLAN learned of this division of forces and moved to attack. In the battle on South Mt. (the Blue Ridge N. of the Potomac, 12 mi/19 km W. of Frederick) on Sept. 14, 1862, McClellan defeated Lee's rear guard and took the passes of that range. Lee then fell back to Sharpsburg (c. 9 mi/14.5 km W. of South Mt.), where his position lay behind Antietam Creek. On Sept. 15 the Harpers Ferry garrison capitulated to Jackson, who, with part of his command, joined Lee before McClellan attacked. The battle of Antietam (or Sharpsburg) opened on the morning of Sept. 17. Early assaults on Lee's left were bloody but indecisive, and McClellan failed to press the slight Union advantage with his available reserves. In the afternoon Burnside's corps crossed the Antietam over the bridge on Lee's right and drove the Confederates back, but A. P. Hill's division arrived from Harpers Ferry and repulsed the attack. The battle was not renewed. On Sept. 18-19, Lee recrossed the Potomac into Virginia unhindered. The fighting at Antietam was so fierce that Sept. 17, 1862, is said to have been the bloodiest single day of the war with some 23,000 dead and wounded, evenly divided between the sides. It was a Union victory only in the sense that Lee's invasion was stopped. McClellan has been blamed for not pursuing Lee with his superior forces. The scene of the battle of Antietam has been set aside as a national battlefield site (est. 1890). See K. P. Williams, *Lincoln Finds a General* (Vol. II, 1950), J. Murfin, *The Gleam of Bayonets* (1965).

Antietam National Battlefield Site. see ANTIETAM CAMPAIGN

Antietam National Cemetery see NATIONAL PARKS AND MONUMENTS (table)

Anti-Federalists, in American history, opponents of the adoption of the Federal Constitution. Leading Anti-Federalists included George Mason, Elbridge Gerry, Patrick Henry, and George Clinton. Later, many of the Anti-Federalists opposed the policies of the FEDERALIST PARTY and of Alexander HAMILTON. See M. Borden, ed., *The Antifederalist Papers* (1965), C. M. Kenyon, ed., *The Antifederalists* (1966).

antifreeze, substance added to a solvent to lower its freezing point. The solution formed is called an antifreeze mixture. Antifreeze is typically added to water in the cooling system of an internal combustion engine so that it may be cooled below the freezing point of pure water (32°F or 0°C) without freezing. Any substance that dissolves will cause freezing-point depression (see COLLAGATIVE PROPERTIES), a desirable antifreeze also should not corrode metal parts, attack rubber, become viscous at low temperatures, or evaporate readily at the ordinary engine operating temperature. It should be chemically stable, a good conductor of heat, and a poor conductor of electricity. Ethylene GLYCOL is the most widely used automotive cooling-system antifreeze, although methanol, ethanol, isopropyl alcohol, and propylene glycol are also used. Substances that inhibit corrosion are usually added, antifoaming agents are sometimes added as well. In automotive windshield-washer fluids, an alcohol (e.g., methanol) is usually added to keep the mixture from freezing; it also acts as a solvent to help clean the glass. The brine used in some commercial refrigeration systems is an antifreeze mixture; it is typically a water solution of calcium chloride or propylene glycol.

antifriction metal, ALLOY used in plain BEARINGS. Antifriction metals such as BABBITT METAL and white metal are made of tin, lead, antimony, zinc, and copper in various combinations and proportions.

antigen see IMMUNITY

Antigone (ăntig'ōnē), in Greek legend, daughter of Oedipus. She followed her father in his banishment and disgrace. When her brothers Eteocles and Polyneices killed each other in the war of the SEVEN AGAINST THEBES, Creon, King of Thebes, forbade the burial of the rebel Polyneices. Antigone disobeyed his command and performed the funeral service. In Sophocles' *Antigone* she hangs herself in the tomb where Creon ordered her buried alive. In another

version of the story, she is rescued by Creon's son and sent to live among shepherds.

Antigonish (ăn'tigōn'ish'), town (1971 pop. 5,489), N. central N.S., Canada, on an inlet of St. Georges Bay. The town was founded in 1784 by disbanded British soldiers and later settled by Highland Scots. It is known for the Antigonish Movement, a cooperative movement promoted in the 1920s and 30s by St. Francis Xavier Univ.

Antigonus I (Antigonus Cyclops) (ăntig'ōnās sī'klōps), 382?-301 B.C., general of ALEXANDER THE GREAT and ruler in Asia. He was made (333 B.C.) governor of Phrygia, and after the death of Alexander he was advanced by the friendship of ANTIPATER, who with PTOLEMY I and Craterus, supported Antigonus in 321 against PERDICCAS and EUMENES. In the wars of the DIADOCHI, Antigonus was the leading figure because he seems to have had the best chance to re-create Alexander's empire. He had control of Asia Minor, Syria, and Mesopotamia at the time (316) when Eumenes was murdered. His great power, however, ultimately caused LYSIMACHUS, SELEUCUS I, and Ptolemy I to unite against him. Antigonus' son, Demetrius Poliorcetes (later DEMETRIUS I of Macedon), was an able agent in the bid to build the empire by invading Greece. Antigonus defeated (306) Ptolemy, but both Antigonus and Ptolemy were conquered at the battle at Ipsus (301). Antigonus was killed.

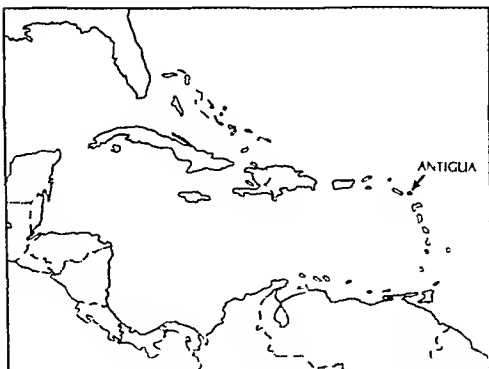
Antigonus II (Antigonus Gonatas) (gōnā'tās), c. 320-239 B.C., king of Macedon, son of Demetrius I. He took the title king on his father's death (283) but made good his claim only by defeating the Gauls in Thrace and by taking Macedon in 276. His rule was very troubled, PYRRHUS attacked him, and so did Ptolemy II. A confederation of Greek cities headed by Athens waged (c. 266-c. 262 B.C.) the so-called Chremonidean War against him. Antigonus won the war, captured Athens, and restored the Macedonian state. However, the Achaean League, under Aratus, gained power c. 251. Nevertheless Antigonus maintained himself and for a brief period united Greece. He was himself a scholar and a patron of philosophy and poetry. Upon his death he was succeeded by his son, DEMETRIUS II.

Antigonus III (Antigonus Doson) (dō'sōn,-sōn), d. 221 B.C., king of Macedon. On the death of Demetrius II he became regent for Demetrius' son Philip (Philip V). He married the widow of Demetrius, and in 227 he proclaimed himself king. The attacks of CLEOMENES III on the ACHAEAN LEAGUE caused its leader, Aratus, to request help from Antigonus, who led his troops south in 224. In 222, Antigonus crushed Cleomenes at Sellasia in Laconia and took Corinth as his reward. Meanwhile he had reconstituted the Hellenic League, and when he died he left power in Greece as well as Macedon to Philip.

Antigua (ăntē'gwā, Span. antē'gwa) or **Antigua Guatemala** (gwatāma'la, Span. gwatāma'la) [Span. = Old Guatemala], town (1964 pop. 21,984), S. central Guatemala. Founded in 1542 by survivors from nearby Ciudad Vieja, which had been destroyed by flood and earthquake, Antigua became the capital of Spanish Guatemala. In the 17th cent. it flourished as one of the richest capitals of the New World, rivaling Lima and Mexico City, by the 18th cent. its population had increased to c. 100,000. Its university was a center of the arts and learning, and its churches, convents, monasteries, public buildings, and residences were characterized by massive luxury. Antigua, dominated by the volcanoes Agua (12,310 ft/3,752 m high), Acatenango (12,982 ft/3,957 m high), and Fuego (12,854 ft/3,918 m high), was continually subject to disaster from volcanic eruptions, flood, and earthquake. In 1773 two earthquakes leveled the city. The Spanish captain general ordered (1776) the removal of the capital to a plain supposedly free from earthquakes and there founded GUATEMALA city. Antigua is now a major tourist center with many fine Spanish colonial buildings. It is also the commercial center of a rich coffee-growing region.

Antigua (ăntē'ga, -gwā), island (1971 pop. 70,000), 108 sq mi (280 sq km), British West Indies, in the Leeward Islands. SAINT JOHN'S is the capital. With its dependencies of Barbuda and Redonda, Antigua is an associated state of Great Britain and enjoys full internal self-government, with the British responsible for foreign affairs and defense. Hilly, with a much indented coast, Antigua has farms that grow mainly sugarcane and cotton. Tourism is a major industry; the island provides many hunting and fishing resorts. Discovered by Columbus in 1493, Antigua was named for a Spanish church in Seville. Unsuccessful Spanish and French settlements on the island were followed by a fruitful British effort in

1632, when sugarcane was introduced from St. Kitts. After a brief French occupation in 1666, Antigua passed permanently to Britain. The abolition of slav-



ery in 1834 hurt the sugar industry, in the early 19th cent. cotton was introduced. The United States has a military base on the island.

Antigua, Guatemala see ANTIGUA

anti-hero, principal character of a modern literary or dramatic work who lacks the attributes of the traditional protagonist or hero. The anti-hero's lack of courage, honesty, or grace, his weaknesses and confusion, often reflect modern man's ambivalence toward traditional moral and social virtues. Literary characters that can be considered anti-heroes are Leopold Bloom in James Joyce's novel *Ulysses* (1922), Willy Loman in Arthur Miller's play *Death of a Salesman* (1949), the bombardier Yossarian in Joseph Heller's novel *Catch-22* (1961), and the protagonists of many of Philip Roth's and Kurt Vonnegut's novels.

antihistamine (ăn'tih's'tāmēn), any one of a group of compounds having various chemical structures and characterized by the ability to antagonize the effects of HISTAMINE. Their principal use in medicine is in the control of allergies such as hay fever and hives. The antihistamines are also useful as sedatives and for the prevention of motion sickness.

Anti-Lebanon, ancient *Anti-Libanus*, Arabic *Jabal al Sharq*, mountain range between Syria and Lebanon, rising to Mt. Hermon, 9,232 ft (2,814 m) high. Once noted for its forests of oak, pine, cypress, and juniper, the range is now largely barren and stony. Its name also appears as Anti-Liban.

Antilles see WEST INDIES

Antiochus (ăntil'ōkəs), in Greek mythology, young hero of the Trojan War, a favorite of Achilles. While protecting his father, Nestor, he was killed by Memnon. He was buried with Achilles and Patroclus.

Anti-Masonic party, American political organization that rose after the disappearance in W. New York state in 1826 of William Morgan. A former Mason, Morgan had written a book purporting to reveal Masonic secrets. The Masons were said, without proof, to have murdered him, and in reaction local organizations arose to refuse support to Masons for public office. In New York state Thurlow Weed and William H. SEWARD attempted unsuccessfully to use the movement, which appealed strongly to the poorer classes, to overthrow Martin VAN BUREN and the ALBANY REGENCY. Anti-Masonry spread from New York to neighboring states and influenced many local and state elections. At Baltimore, in 1831, the Anti-Masons held the first national nominating convention of any party and issued the first written party platform—innovations followed by the older parties. The vote for their presidential candidate, William WIRT, mostly hurt Henry Clay. Usually the Anti-Masons in national politics acted with the NATIONAL REPUBLICAN PARTY in opposition to Jacksonian democracy, and in 1834 they helped to form the WHIG PARTY. See W. B. HESSLETINE, *The Rise and Fall of Third Parties* (1948), Lorman Ratner, *Antimasonry* (1969).

antimatter see ANTIPARTICLE

antimetabolite see METABOLITE

antimony (ăn'timō'nē) [from Lat. *antimonium*], semimetallic chemical element, symbol Sb [from Lat. *stibium*, = a mark], at no. 51, at wt. 121.75, m.p. 630.5°C, b.p. 1440°C, sp. gr. (metallic form) 6.69 at 20°C, valence 0, +3, -3, or +5. Antimony exists in two allotropic forms (see ALLOTROPY), the more common is silvery blue-white and has a rhombohedral crystalline structure. It is a poor conductor of heat and electricity and is brittle and easily powdered. It is primarily used in alloys and chemical compounds. It is a member of group Va of the PERIODIC TABLE. Antimony rarely occurs free in nature,

but its ores are widely distributed. The principal ore is STIBNITE, a sulfur compound known since early times; there are extensive deposits in China. Antimony is often found in other ores as well, e.g., silver, copper, and lead. The pure element antimony is produced from the ore by roasting it to form the oxide, then reducing the oxide with carbon or iron, often a flux of sodium sulfate or sodium carbonate is used to prevent loss of molten antimony by evaporation. Antimony does not react with air or water at room temperature; it does react with fluorine, chlorine, or bromine, and is soluble in hot nitric or sulfuric acid; at higher temperatures, antimony will ignite and burn in air. It unites with hydrogen to form stibine, a poisonous gas. In combination with metals antimony forms alloys that are hard and brittle and have low melting points. The alloys of antimony include BRITANNIA METAL, TYPE METAL, BABBITT METAL, and sometimes PEWTER; these alloys expand on cooling, thereby retaining fine details of a mold. Alloys and compounds of antimony are used in bearings, storage batteries, safety matches, and as a red pigment in paint. Although antimony and many of its compounds are toxic, TARTAR EMETIC (potassium antimonyl tartrate) is used as a medicine. Small concentrations of antimony can be detected by a method similar to the MARSH TEST for arsenic. Antimony is mixed with soot and other substances to make kohl, used for centuries by women in some countries as an eye cosmetic. A method for the extraction of antimony from stibnite was first described c. 1600 by Basilus Valentinus. Although known to the ancients, the element was first adequately described by Nicolas Lemery in 1707.

antinomianism (ăntinō'mēanizəm) [Gr. = against the law], the belief that Christians are not bound by the moral law, particularly that of the Old Testament. The idea was strong among the Gnostics, especially MARCION. Certain heretical sects in the Middle Ages practiced sexual license as an expression of Christian freedom. In the Protestant Reformation theoretical antinomian views were maintained by the Anabaptists and Johann Agricola, and in the 17th cent. Anne Hutchinson was persecuted for supposed antinomianism. Rom. 6 is the usual refutation for antinomianism.

Antinous (ăntin'ōs), c. 110-130, favorite of Emperor Hadrian, b. Bithynia. He was with the emperor constantly until on a journey in Egypt he was drowned in the Nile—some say in saving Hadrian's life. His beauty was legendary, and Hadrian mourned him greatly, had him deified, founded the city of Antinopolis in Egypt in his honor, and seems to have renamed the youth's birthplace Antinopolis. A cult was inaugurated in his honor, coins were struck with Antinous' head on them, and many busts and statues were made.

Antioch (ăn'tiōk), ancient town of Phrygia, near the Pisidian border. The site is north of the present-day Antalya, Turkey. It was founded by Seleucus I and became a center of Hellenistic influence. It was visited by St. Paul (Acts 13:14, 14:21, 2 Tim. 3:11).

Antioch (ăn'tiōk') or **Antakya** (antak'ya), city (1970 pop. 66,400), capital of Hatay prov., S. Turkey, on the Orontes (Asi) River, near the Mediterranean Sea, at the foot of Mt. Silpius. It is the trade center for a farm region where grains, cotton, grapes, olives, and vegetables are grown. The city's few manufactures include processed foods, textiles, and leather goods. Antioch was founded c. 300 B.C. by Seleucus I, king of ancient Syria, and named for his father Antiochus, a Macedonian general. Situated at the crossing of north-south and east-west trade routes, the city soon became a rich commercial center. Antioch was occupied by Pompey in 64 B.C. and quickly became an important Roman military, commercial, and cultural center. The Romans built great temples, a forum, a theater, baths, aqueducts, and other public buildings. The two main streets, at right angles to each other, were lined with marble colonnades and adorned with temples, palaces, and statues. Antioch was an early center of Christianity; Peter and Paul preached there. It was in Antioch that the followers of Jesus were first called Christians after having severed themselves from the synagogue about 20 years after Jesus' death (Acts 11:26, 13:1). Antioch is one of the three original patriarchates (see PATRIARCH). Aurelian, who recovered the city from Shapur I of Persia, erected (3d cent.) more magnificent buildings and churches. The city was a great center of Christian learning and played a significant role in the theological controversies of the early Christian church (see CHRISTIANITY). St. John Chrysostom estimated its population (4th cent.) at 200,000, excluding children and slaves. In 526 the city suffered a severe earthquake and in 540 it was captured by Per-

sia. In 637, Antioch was conquered by the Arabs. Nicephorus II reconquered it (969) for the Byzantine Empire, but in 1085 it fell, through treason, to the Seljuk Turks. The army of the First Crusade (see CRUSADES) captured Antioch in 1098, after a half-year siege. Bohemond I was made prince of Antioch. His principality, which extended from Iskenderun (Alexandretta) southward beyond Latakia, was one of the most powerful of the Crusaders' states. In 1268 the Mamelukes captured and sacked the city; it was further damaged by Tamerlane in 1401. In 1516, Antioch, by then an unimportant city, was taken by the Ottoman Empire. The city was held (1832-40) by Muhammad Ali of Egypt, and in 1872 it was badly disrupted by an earthquake. After World War I, Antioch was incorporated into the French Syria League of Nations mandate. In 1939 it was restored to Turkey as part of the sanjak of ALEXANDRETTA. Modern Antioch occupies only a fraction of the area of the ancient city, most of which is buried under alluvial deposits. Numerous important archaeological finds have been made in and near Antioch. They include the Great Chalice of Antioch (see CHALICE), held by some to be the Holy Grail, and, at Daphne, Antioch's ancient suburban resort, splendid mosaics (1st-6th cent. A.D.), which are mostly copies of lost paintings. The city has an archaeological museum.

Antioch, city (1970 pop. 28,060), Contra Costa co., W. Calif., on the San Joaquin River near the mouth of the Sacramento, inc. 1872. It is a processing and shipping center for the agricultural products of the fertile islands in the delta area between the rivers.

Antioch College, at Yellow Springs, Ohio, coeducational, chartered 1852, opened 1853. Horace Mann, Antioch's first president, envisioned a program stressing the development not only of the intellect but of the whole personality, especially the individual's social conscience and competence. The cooperative work-study program, adopted (1921) during the presidency of Arthur E. Morgan, has been developed in an attempt to achieve this goal. The college years are divided between off-campus work and on-campus study, both full-time. This system usually requires five years. Students are given a voice in community government, college policy formulation, and other administrative affairs. Also, Antioch maintains its own foreign study program. In conjunction with the Universities of Guanajuato (Mexico), Besançon (France), and Tübingen (Germany), Antioch Centers for University Education have been established. Antioch students in different programs, however, attend other foreign schools. On campus the Fels Research Institute for studies in human development, the Charles F. Kettering Research Laboratory for studies in biological science, and other experimental and research centers employ scientists, students, and teachers unaffiliated to the college.

Antiochia Margiana see MERV

Antiochus I (Antiochus Soter) (ăntil'ōkəs sō'tər), b. c. 324 B.C., d. c. 262 or 261 B.C., king of Syria (280-261? B.C.), son of SELEUCUS I. He did not, like his father, seek to expand in Europe. The Seleucid holdings were greatly reduced, particularly by the Egyptians under Ptolemy II. Antiochus was famous as a founder of cities.

Antiochus II (Antiochus Theos) (thē'ōs), d. 247 B.C., king of Syria (261?-247 B.C.), son and successor of Antiochus I. In warfare with Ptolemy II he had sporadic successes, but his marriage to Ptolemy's daughter Berenice sealed the peace, and most of the Syrian possessions his father had lost were restored to Antiochus. On the death of Antiochus, his son by an earlier marriage, SELEUCUS II, and Berenice in behalf of her infant son struggled for the throne, a long war with Ptolemy III ensued.

Antiochus III (Antiochus the Great), d. 187 B.C., king of Syria (223-187 B.C.), son of Seleucus II and younger brother of Seleucus III, whom he succeeded. At his accession the Seleucid empire was in decline. Although Antiochus did not succeed in totally restoring the greatness of the Seleucid dynasty, he did much to revive its glory. He led an expedition (212-205 B.C.) to the eastern provinces and went as far as India. Although he was defeated earlier by the Egyptians at Raphia (modern Rafā), he and Philip V of Macedon undertook (202 B.C.) to wrest Egyptian territories from the boy king, Ptolemy V. Antiochus did not properly appreciate the growing power of Rome. While Philip V was engaged by the Roman armies, Antiochus recovered S. Syria and Asia Minor. In 199 he won a decisive victory over the Egyptians, Palestine then reverted to Syria, having been under Egyptian rule for almost a century. In 196 he seized the Thracian Chersonese and thus alarmed the Greeks. They as well as the Egyptians sought the aid

of the Romans Antiochus, who disregarded the advice of Hannibal in 193, waited and then challenged Rome by accepting the invitation of the Aetolian League to interfere in Greece in 192. The Romans crushed him (191) at Thermopylae and again at Magnesia (190). He also lost a number of naval engagements, and in 188 he was forced to give up all his territory W of the Taurus. Thus the Seleucid empire became a purely inland Asiatic state, and dreams of reviving Alexander's empire died.

Antiochus IV (Antiochus Epiphanes) (ἐπιφανής), d. 163 B.C., king of Syria (175 B.C.–163 B.C.), son of Antiochus III and successor of his brother Seleucus IV. His nephew (later Demetrius I) was held as a hostage in Rome, although still claiming the throne. Antiochus is best known for his attempt to Hellenize Judaea and extirpate Judaism—a policy that instigated the rebellion of the MACCABEES. Antiochus invaded Egypt, which was torn by strife between Ptolemy VI and his brother (later Ptolemy VII), and would probably have conquered that region if the Romans had not intervened in his siege of Alexandria (168). Antiochus was briefly succeeded by his son, Antiochus V, a boy king who was overthrown by Demetrius I.

Antiope (ἀντιόπη), in Greek mythology 1 Theban princess, daughter of Nycteus. She was seduced by Zeus and bore him twin sons, Zethus and Amphion. Fleeing to Sicyon to escape the wrath of her father, she was forced to abandon her infants on Mt. Cithaeron, where they were raised by shepherds. After Nycteus committed suicide, Antiope was pursued and captured by her uncle Lycus, then king of Thebes, and his wife Dirce, who treated her with great cruelty. Later the sons of Antiope revenged their mother; they dethroned Lycus and punished Dirce by tying her to the horns of a bull. They then erected a wall around Thebes with stones which moved of their own will to the music of Amphion's lyre. Zethus married the nymph Thebe, and after she died he married AEDON. Amphion married Niobe. 2 A queen of the Amazons, sister of Hippolyte. According to one legend she was abducted by Theseus and became the mother of Hippolytus.

antiparticle, ELEMENTARY PARTICLE corresponding to an ordinary particle such as the PROTON, NEUTRON, or ELECTRON, but having the opposite electrical charge and magnetic moment. Antiparticles are also known as charge-conjugate particles. Every elementary particle has a corresponding antiparticle, the antiparticle of an antiparticle is an ordinary particle. In a few cases, such as the PHOTON and the neutral PION, the particle is its own antiparticle, but most antiparticles are distinct from their ordinary counterparts. When a particle and its antiparticle collide, both are annihilated and other particles such as photons or pions are produced. In some cases this represents the total conversion of mass into energy. For example, the collision between an electron and its antiparticle, a positron, results in the conversion of their combined masses into the energy of two or three photons. A proton-antiproton annihilation usually results in several pions. The reverse process, pair production, is the simultaneous creation of a particle and its antiparticle from the combination of the same products that result from their mutual annihilation. The existence of antiparticles was predicted in 1928 by P. A. M. Dirac's relativistic QUANTUM THEORY of the electron. According to the theory both positive and negative values are possible for the total relativistic energy of a free electron. A vacuum is assumed to consist of a sea of electrons that fill all available negative energy levels. These electrons are not detectable by ordinary experiments. However, the absorption of energy by one of the electrons could excite it out of the negative-energy sea to a positive energy level, where it could be observed. The process would result in the appearance of a "hole" in the sea of negative-energy electrons, and the hole would have all the physical properties of a positively charged electron (positron). Thus, the absence of an electron in a negative energy state could be observed as a positron. In 1932, Carl D. Anderson, while studying COSMIC RAYS, discovered the predicted positron, the first known antiparticle. About 23 years passed before the discovery of the next antiparticles—the antiproton was discovered by Chamberlain and Segrè in 1955, and the antineutron was discovered the following year—but the existence of antiparticles for all known particles was by then firmly established in theory. The existence of antiparticles makes possible the creation of antimatter, composed of atoms made up of antiprotons and antineutrons in a nucleus surrounded by positrons. A very simple type of "atom" incorporating antiparticles is positronium, a brief pairing of a positron

and an electron that may occur before their annihilation. A few simple nuclei of antimatter have been created in the laboratory, such as the antideuteron (see DEUTERIUM), but any antimatter in our part of the universe is necessarily very short-lived because of the overwhelming preponderance of ordinary matter by which the antimatter is quickly annihilated. Nevertheless, there is no reason in theory why atoms or even entire galaxies of antimatter could not have evolved in a part of the universe far removed from our own. There would be no way to tell from the photons of light and other radiation reaching us from such a galaxy whether the source of the energy was composed of ordinary matter or antimatter, since the same physical laws governing the production of energy apply equally to matter and antimatter and the photon is its own antiparticle.

Antipas (ἀντίπαῦς) 1 See HEROD. 2 Martyr at Pergamum, traditionally its first bishop. Rev. 2:13.

Antipater (ἀντίπατρος), d. 319 B.C., Macedonian general. He was one of the ablest and most trusted lieutenants of PHILIP II and was a friend and supporter of ALEXANDER THE GREAT. When Alexander went on his Asiatic campaign, Antipater was left as regent (334–323 B.C.) in Macedon. He resisted the attempt of Olympias to gain the regency and governed ably except that his policy of supporting tyrants and oligarchs made him unpopular in Greece. After the death of Alexander he put down a rebellion of many of the Greek cities in the Lamian War and punished Athens. By imposing a more oligarchic form of government on Athens, he drove Demosthenes to commit suicide. Antipater was a leading opponent of the regent, Perdiccas, and after Perdiccas was defeated in 321 by Ptolemy I, Antigonus I, and Craterus, it was Antipater who held the kingdom together. After his death it fell violently apart in the wars of the DIADOCHI.

Antipater, in the Bible. See HEROD.

Antipatris (ἀντίπατρίς), city of Roman Palestine, founded by Herod the Great and named after his father. It was c. 10 mi (16.1 km) NE of Joppa, on the north-south road. Paul was taken there on the way to Caesarea. Acts 23:31.

Antiphrilos (ἀντίφριλος), fl. 4th cent. B.C., Greek painter, of Alexandrian origin. He invented a grotesque called gryllos, a creature part man, part animal or bird. It is known that he painted portraits of Philip of Macedon and Alexander the Great, though none of his many works have survived.

Antiphon (ἀντίφῶν, -fōn), c. 479–411 B.C., Athenian orator. He rarely spoke in public but wrote defenses for others to speak. Of his 15 extant orations 3 were for use in court, the rest for the instruction of his pupils. A few fragments of other speeches survive, but some may be the work of Antiphon the Sophist, who also lived in Athens in the 5th cent. B.C. Antiphon did much to advance Attic prose writing. His position in politics was with the conservative aristocrats, and he was instrumental in setting up the Four Hundred in 411 B.C. When they fell, Antiphon was among the first to be executed before ALCEBIADES returned.

antiphon (än'tifōn), in liturgical music, generally a short text sung before and after a psalm or canticle. The main use is in group singing of the Divine Office in a monastery. However, introit, offertory, and Communion of the Mass were originally antiphons that later were used independently. Certain festival chants, sung preparatory to the Mass itself, are called antiphons. There are also the four antiphons of the Blessed Virgin Mary, which are in the nature of office hymns and are sung by alternating choirs (i.e., antiphonally), each one belonging to a certain portion of the year. The best known of these is *Salve Regina*, of whose text there are many polyphonic settings. Modern antiphons are set to composed music rather than PLAINSONG. These are independent choral works for which the English term ANTHEM was derived from antiphon.

Antipodes (äntip'ädēz), rocky uninhabited islands, 24 sq mi (62 sq km), South Pacific, c. 450 mi (720 km) SE of New Zealand, to which they belong. The Antipodes were discovered by British seamen in 1800 and are so named because they are diametrically opposite Greenwich, England.

antipodes [Gr., =having feet opposite], people or places diametrically opposite on the globe. Thus antipodes must be separated by half the circumference of the earth (180°), and one must be as far north as the other is south of the equator, midnight at one is noonday at the other. For example, New Amsterdam and St. Paul, small islands nearly midway between S. Africa and Australia, are more nearly

antipodal to Washington, D.C., than is any other land.

antipope [Lat., =against the pope], person elected pope whose election was later declared uncanonical and in opposition to a canonically chosen legitimate pontiff. Important antipopes were NOVATIAN, Clement III (see GUIBERT OF RAVENNA), Nicholas V (see RAINALDUCCI, PIETRO), Clement VII (see ROBERT OF GENEVA), Benedict III (see LUNA, PEDRO DE), John XXIII (or by a different count, John XXII, see COSSA, BALDASSARRE), and Felix V (see AMADEUS VIII), who was the last antipope.

antique. The term is used collectively to designate classical Greek and Roman works of art, particularly sculptures, as an adjective to indicate an object, a period, or a style of ancient or early times, and as a noun, for objects of art, furniture, rugs, pottery, metalwork, costumes, jewelry, and household goods of early production. The demand and prices paid for antiques have led to the widespread making of reproductions and reconstructions, some with spurious marks of age. See ANTIQUE COLLECTING for a description of the characteristics of various styles, see DIRECTOIRE, EMPIRE, LOUIS PERIOD, and RÉGENCE styles.

antique collecting. The term *antique* initially referred only to the pre-classical and classical cultures of the ancient world. It is now applied to old artifacts of all cultures that have historic, aesthetic, and usually monetary value. In 1952 the Florence agreement, sponsored by the United Nations Educational, Scientific, and Cultural Organization, was drawn up to "facilitate the free flow of educational, scientific, and cultural materials." In 1966 the United States tariff regulations were altered to permit duty-free importation of antiques, defined as objects being more than 100 years old at the time of entry. More than 50 countries now have similar regulations. Antique collecting has a venerable history dating from the preservation of valued religious objects in antiquity. By the 16th cent. English and European private collections of rarities flourished. But it was the 18th cent. with its development of the art and science of archaeology that produced the impetus for public and private collecting in earnest. In the United States, collectors, seriously active since the 18th cent., first concentrated on old books, manuscripts, the possessions and mementoes of famous people, and classical antiquities. State historical societies encouraged the growing interest in colonial history and its artifacts. In the late 1850s an association was founded to restore and preserve MOUNT VERNON, the first of the country's many house museums. Finely crafted household articles such as pewterware and furniture claimed collectors' attention with the opening of the Centennial Exposition of 1876 in Philadelphia, in which reconstructed colonial rooms were exhibited. During the next century many sorts of objects in addition to paintings, books, and furniture excited the collector's lust. Specialty collections grew in such items as quilts, bedspreads, jewelry, glass, coins, postage stamps, china, porcelain, silver and other metalcraft, needlework (including needlepoint, embroidery samplers, lace, and hooked rugs), bottles, stoneware, pill boxes, scrimshaw (expertly carved teeth and bones of sperm whale and walrus tusks of the 18th cent.), snuffboxes, fans, watches, clocks, periodicals, badges, Daguerreotypes, postcards, photographs, toys, posters, military and political souvenirs, objects reminiscent of many forms of public transport (including railroad and ship bells, whistles, lamps, and models), buttons, and many varieties of folk art and memorabilia symbolic of the recent past. Frequently the only value a popular object can claim is that of scarcity. Certain objects (e.g., comic books and fruit-crate labels), more properly called curios, have become collector's items by virtue of nostalgic association or content rather than intrinsic value. Antique dealers, whose number had increased to nearly 20,000 in the United States by 1965, also acquire for sale objects that are characteristic of a particular stylistic current (e.g., ART NOUVEAU and ART DECO) that is experiencing a revival of interest. The sources of many valuable antiques include attics, cellars, barns, and other storage rooms. The objects are sold or traded at auctions, antique fairs, rummage sales, flea markets, and garage sales, all increasing in attendance yearly. The great pleasures of antique collecting are counted as bargain finding, the discovery, after a long search, of a much-desired item, the showing off of a special treasure to others, and, above all, the discovery that an object one has acquired is rarer and of greater worth than one had suspected. The elegant Parke-Bernet auction house in New York City offered in 1974 a week of free appraisals to the public, stimu-

lating 3,500 people to bring possible heirlooms out of their trunks and attics. The estimated ratio of trash to treasure during this week was four to one. With the tremendous growth of interest in antiques, a critical expertise in historical styles and construction methods has developed of necessity for the care and identification of precious objects. Dealers publish extensive directories to provide a basis for consistent appraisal, the fantastic bargain, as a result, has become rarer and rarer. At the same time, museums and private institutions have built up outstanding antique collections. Among the finest of these in the United States are to be seen at the Metropolitan Museum of Art, the Museum of American Folk Art, New York City, the Museum of Fine Arts, Boston, the Yale University Art Gallery, New Haven, Conn., the Philadelphia Museum of Art, the Winterthur (Delaware) Museum, and the restoration of Williamsburg, Va. See L. G. G. Ramsay, ed., *The Complete Encyclopedia of Antiques* (rev. ed. 1967), Mary Durant, *The American Heritage Guide to Antiques* (1970), M. D. Schwartz and Betsy Wade, *The New York Times Book of Antiques* (1972).

Antirent War, in U.S. history, tenant uprising in New York state. When Stephen Van Rensselaer, owner of Rensselaerswyck, died in 1839, his heirs attempted to collect unpaid rents. Tenants on the estate resisted and an angry mob forcibly turned back a sheriff's posse that tried to evict them. Resistance to landlord authority quickly spread to landed estates throughout the Hudson valley, tenants disguised as Indians harassed landlord agents and sheriffs. When a deputy sheriff of Delaware co., N.Y., was killed (1845), Gov. Silas Wright declared a state of insurrection and called out the state militia. Armed resistance ended and the antirenters turned to politics. They helped elect a Whig, John Young, as governor of New York, the legislature passed ameliorative measures, and the 1846 state constitution outlawed future long-term leases. The Antirent War hastened the breaking up of the large landed estates as worried landlords began selling their holdings. See E. P. Cheyney, *The Anti-Rent Agitation in the State of New York, 1839-46* (1887), Henry Christman, *Tin Horns and Calico* (1945, repr. 1961), D. M. Ellis, *Landlords and Farmers in the Hudson-Mohawk Region, 1790-1850* (1946, repr. 1967).

Anti-Saloon League, U.S. organization working for prohibition of the sale of alcoholic liquors. Founded in 1893 as the Ohio Anti-Saloon League at Oberlin, Ohio, by representatives of temperance societies and evangelical Protestant churches, it came to wield great political influence. Vigorously led by James Cannon, Jr., a Methodist bishop, the League played an important role in securing the passage of the Eighteenth Amendment. Its influence waned, however, especially after the repeal (1933) of prohibition. In 1950 it merged with the National Temperance League. See P. H. Odegard, *Pressure Politics: Story of the Anti-Saloon League* (1928, repr. 1966), biography of Bishop Cannon by Virginius Dabney (1949).

anti-Semitism, form of prejudice against the Jews, ranging from antipathy to violent hatred. Before the 19th cent., anti-Semitism was largely religious, based on dislike for the Jews who had allegedly crucified Jesus Christ, and was expressed in the later Middle Ages by sporadic persecutions and expulsions—notably the expulsion from Spain under Ferdinand and Isabella—in severe economic and personal restriction (see GHETTO), and in fantastic legends, such as those of ritual murder by Jews of Christian children. However, since the Jews were generally restricted to the pursuit of occupations that were unpopular or taboo, such as moneylending, hence the sentiment was also economic in nature. After the emancipation of the Jews, brought about by the Enlightenment of the 18th cent. and by the French Revolution, religious and economic resentments were gradually replaced by feelings of racial prejudice stemming from the notion of the Jews as a distinct race. This development was due not only to the rising nationalism of the 19th cent. but also to the conscious preservation, especially among Orthodox Jews, of cultural and religious barriers that isolated the Jewish minorities from other citizens. Jewish reaction to the phenomenon of anti-Semitism found political expression in ZIONISM. The unpopularity of the Jews, on whom all evils could be blamed with impunity, was exploited by demagogues, such as Edouard DRUMONT in France, to stir the masses against an existing government, and by reactionary governments, as in Russia, to find an outlet for popular discontent. The millions of Russian and Polish Jews who, after the assassination (1881) of Alexander II, fled the POGROMS and found refuge in oth-

er countries contributed to the popular feeling that Jews were aliens and intruders. In addition, a spurious document, the "Protocols of the Wise Men of Zion," purporting to outline a Jewish plan for world domination, emerged in Russia early in the 20th cent. and was subsequently circulated throughout the world. After the Russian Revolution of 1917, the Jews were accused of plotting to dominate the world by their international financial power or by a Bolshevik revolution. Pseudoscientific racial theories of so-called Aryan superiority directed against the Jews emerged in the 19th cent. with the writings of Joseph Arthur GOBINEAU and Houston Stewart CHAMBERLAIN and found their climax in those of Alfred Rosenberg. These theories were incorporated in the official doctrine of German NATIONAL SOCIALISM by Adolf Hitler. Hitler's persecution of the Jews during World War II was unparalleled in history. It is estimated that between 5 and 6 million European Jews were exterminated between 1939 and 1945 (see CONCENTRATION CAMP). The end of persecution did not mean the end of anti-Semitism, as the sporadic attacks on synagogues in many countries since the end of World War II indicate. In the Soviet Union and the countries of Eastern Europe, where anti-Semitism is officially outlawed, it has reappeared in new forms. From the late 1940s until Joseph Stalin's death in 1953, anti-Semitic persecution took the form of deportations, jailings, and the suppression of Jewish publications and cultural institutions. Although anti-Semitism in these countries receded during the 1950s, it reappeared in the 60s and 70s, when synagogues were periodically closed, particularly in the upsurge of anti-Semitism that followed the Arab-Israeli War of 1967. In the 1970s, citizens of the Soviet Union, but particularly Jews, found it increasingly difficult to emigrate to Western countries. In the United States, although anti-Semitism has not been an instrument of national policy, it exists nevertheless, Jews are regularly excluded from membership in certain private clubs, from some schools, and from the rental of certain housing. The problem of anti-Semitism has been analyzed by numerous psychologists and social scientists, most of whom view it as an irrational form of behavior based on the need for a scapegoat to justify aggression or relieve guilt. See Jean Paul Sartre, *Anti-Semite and Jew* (tr. 1948, repr. 1960), E. J. Long, *Two Thousand Years: A History of Anti-Semitism* (1953), Leon Poliakov, *The History of Anti-Semitism* (1965, repr. 1974), Rose Feitelson and George Salomon, *The Many Faces of Anti-Semitism* (1967), Leonard Dinnerstein, *Anti-Semitism in the United States* (1971), Arnold Forster and B. R. Epstein, *The New Anti-Semitism* (1974).

antiseptic, agent that kills or inhibits the growth of microorganisms on the external surfaces of the body. Antiseptics should generally be distinguished from drugs such as antibiotics that destroy microorganisms internally, and from disinfectants, which destroy microorganisms found on nonliving objects. Germicides include only those antiseptics that kill microorganisms. Some common antiseptics are alcohol, iodine, hydrogen peroxide, and boric acid. There is great variation in the ability of antiseptics to destroy microorganisms and in their effect on living tissue. For example, mercuric chloride is a powerful antiseptic, but it irritates delicate tissue. In contrast, silver nitrate kills fewer germs but can be used on the delicate tissues of the eyes and throat. There is also a great difference in the time required for different antiseptics to work. Iodine, one of the fastest-working antiseptics, kills bacteria within 30 sec. Other antiseptics have slower, more residual action. Since so much variability exists, systems have been devised for measuring the action of an antiseptic against certain standards. The bacteriostatic action of an antiseptic compared to that of phenol (under the same conditions and against the same microorganism) is known as its phenol coefficient. Joseph Lister was the first to employ the antiseptic phenol, or carbolic acid, in surgery, following the discovery by Louis Pasteur that microorganisms are the cause of infections. Modern surgical techniques for avoiding infection are founded on asepsis, the absence of pathogenic organisms. Sterilization is the chief means of achieving asepsis.

antislavery movement: see SLAVERY, ABOLITIONISTS. **Antisthenes** (āntis'thēnēz), b. 444? B.C., d. after 371 B.C., Greek philosopher, founder of the CYNICS. Most of his paradoxical views stemmed from his early Sophist orientation, even though he became one of Socrates' most ardent followers. He believed that man's happiness lay in cultivating virtue for its own sake. To attain virtue, man must reduce his dependence on the external world to a minimum, disregard social convention, shun pleasure, and live in

poverty. Antisthenes, like Xenophanes, repudiated polytheism, substituting one god, whom he described as unlike anything known to man. His view that each individual is unique had implications for ethics and for a theory of knowledge.

Anti-Taurus: see TAURUS.

antithesis (āntith'īsīs), a figure of speech involving a seeming contradiction of ideas, words, clauses, or sentences, within a balanced grammatical structure. Parallelism of expression serves to emphasize opposition of ideas. The familiar phrase "Man proposes, God disposes" is an example of antithesis, as is John Dryden's description in "The Hind and the Panther": "Too black for heaven, and yet too white for hell."

antitoxin, any of a group of antibodies formed in the body as a response to the introduction of poisonous products, or TOXINS. By introducing small amounts of a specific toxin into the healthy body, it is possible to stimulate the production of antitoxin so that the body's defenses are already established against invasion by the bacteria or other organisms that produce the toxin. See IMMUNITY.

Antitrust Act: see CLAYTON ANTITRUST ACT, SHERMAN ANTITRUST ACT.

Antium: see ANZIO, Italy.

antler: see HORN.

Antofagasta (āntōfāgā'stā), city (1970 pop. 126,252), capital of Antofagasta prov., N. Chile, a port on the Pacific Ocean. Antofagasta was founded by Chileans in 1870 to exploit nitrates in the Desert of Atacama, then under Bolivian administration. Its occupation by Chilean troops in 1879 sparked the War of the Pacific (see PACIFIC WAR OF THE), and after the war the city and province were ceded to Chile. Antofagasta has depended primarily on nitrates and copper exports, and its economy has often been affected by sharp fluctuations in world demands. The city is an international commercial center and a major industrial hub with large foundries and ore refineries. Backed by desert hills, Antofagasta enjoys a fine climate but has little rainfall. Water is piped in from the San Pedro River, 280 mi (451 km) away.

Antoine, André (āndrā' āntwān'), 1858-1943. French theatrical director, manager, critic. In opposition to the teachings of the Paris Conservatory, he formed his own company, the THÉÂTRE LIBRE, in 1887. There he presented, by means of private subscriptions, the foremost works of the naturalistic school. Financial failure forced him to relinquish the theater in 1894. In 1897 he founded the Théâtre Antoine where he continued the tradition of his Théâtre Libre for 10 years. From 1906 to 1914 he was director of the Odeon in Paris, and after World War I he became a drama critic and the dean of French theatrical writers.

Antoine, Pere (pēr āntwān'), 1748-1829, Spanish priest in New Orleans, a Capuchin friar. His family name was Mareno, and the Spanish name given to him by the church was Antonio de Sedella. Through many years of service at St. Louis Cathedral under Spanish, briefly French, and then U.S. rule, he won great love and respect from his French congregation, who had previously regarded his harshness with distaste. He was almost constantly at war with the authorities. The Spanish colonial rulers once sent him back as a prisoner to Spain, and U.S. officials were later highly incensed at his secret dealings with the Spanish. The legend that he was empowered to introduce the Inquisition to Louisiana but refrained from doing so is apparently based on fact.

Antonelli, Giacomo (jā'kōmō āntōnēl'ē), 1806-76. Italian cardinal and statesman of the Roman Catholic Church, adviser to Pope PIUS IX. He received the red hat of the cardinalate in 1847, presided over the council drafting the constitution for the Papal States, and became the premier of the pope's first constitutional cabinet. After returning (1850) from exile in Gaeta, Pius IX made him secretary of state. His vigorous diplomacy was directed against Italian national unification.

Antonello da Messina (āntōnēl'ō dā mās-sē'nā), c. 1430-1479, Italian painter, b. Messina. Antonello appears to have had early contact with Flemish art. In his deft handling of the oil medium—his rendering of transparent surfaces and minute landscape details—a strong Northern influence can be seen. About 1475 he went to Venice. There he painted the *San Cassiano Altarpiece*, of which only fragments now exist (Vienna). His style affected the art of Bellini and other Venetians. He was also an excellent portrait painter, examples of his portraiture are in the Metropolitan Museum, the Philadelphia Museum, the Louvre, and in Berlin. Other paintings by him are *Ecce Homo* (Metropolitan Mus.), *Madonna*

and *Child* (National Gall. of Art, Washington, D.C.), *Pieta* (Venice), *Crucifixion* (Antwerp) See Stefano Bottari's study (1956)

Antonescu, Ion (yōn antōnēs'kōō), 1882-1946, Rumanian marshal and dictator. He served in World War I and later became chief of staff, but he fell into disfavor with King Carol II because of his pro-Nazi attitude and his suspected intrigues with the IRON GUARD. In World War II, on Sept. 4-5, 1940, Carol, threatened with revolution and German intervention, appointed Antonescu premier with dictatorial powers. On Sept. 6, Antonescu forced the king to abdicate in favor of Carol's son, MICHAEL. In Nov., 1940, Rumania joined the Axis Powers, and Antonescu gave Adolf Hitler virtual control over Rumanian economy and foreign policy, tolerated violent pogroms against the Jews, and declared (June 22, 1941) a "holy war" on the Soviet Union. With two Soviet armies deep in Rumania, King Michael in Aug., 1944, had Antonescu and his cabinet arrested in a dramatic coup. Antonescu was tried (1946) for war crimes, sentenced, and executed.

Antonines (ān'tōnīnz), collective name of certain Roman emperors of the 2d cent., usually listed as ANTONINUS PIUS, his adopted sons, MARCUS AURELIUS and VERUS, and COMMODOUS.

Antoninus, Saint (āntōnī'nas), 1389-1459, Italian churchman, b. Antoninus Pierozzi. He was a Dominican and became archbishop of Florence. He ruled well and was renowned for his charitable work in the city. His *Summa moralis* is a pioneering work in moral theology, of interest for its treatment of commercial ethics and the morality of banking. It is a valuable record of the effect the new economic changes were having on everyday life. Feast May 10. See Bede Jarrett, *St. Antonino and Medieval Economics* (1914).

Antoninus, Wall of, ancient Roman wall extending across N Britain from the Firth of Forth to the Firth of Clyde. It was built by the Roman governor Lullius Urbicus in the reign of Emperor Antoninus Pius—probably in A.D. 140-42. Intended as a defense against the peoples to the north, it was built out of turf, with a ditch on the north and 19 forts along its southern side. The wall was 37 mi (60 km) long. It was abandoned c. 185. See Sir George Macdonald, *The Roman Wall in Scotland* (2d ed., 1934).

Antoninus Pius (Titus Aurelius Fulvus Boionius Arrius Antoninus) (pī'as), A.D. 86-A.D. 161, Roman emperor (138-161). After a term as consul (120) he went as proconsul to Asia, where he governed with distinction. He was adopted by the emperor Hadrian and, on succeeding him, administered the empire with marked ability and integrity. Italy was embellished with fine buildings, and the provinces were eased of much of their financial burden. During his reign the Wall of Antoninus was built in Britain. His wife was Faustina, aunt of his successor, MARCUS AURELIUS.

Antonioni, Michelangelo (mekālan'jālō antōnyō'nē), 1912-, Italian film director and scriptwriter, b. Ferrara, Italy. In the 1940s he made documentaries that contributed to the development of Italian Neo-Realism. His later films deal with the alienation and loveless eroticism of modern life, with plot and dialogue often subordinate to visual and aural images. His films include *Le Amiche* (1955), *L'Avventura* (1959), *La Notte* (1960), *L'Eclisse* (1961), *The Red Desert* (1964), *Blow-Up* (1966), and *Zabriskie Point* (1969). See study by Ian Cameron and Robin Wood (rev. ed. 1971).

Antony or Marc Antony, Lat. *Marcus Antonius*, c. 83 B.C.-30 B.C., Roman politician and soldier. He was of a distinguished family, his mother was a relative of Julius CAESAR. Antony was notorious from his youth for riotous living, but even his enemies admitted his courage. Between 58 B.C. and 56 B.C. he campaigned in Syria with Aulus Gabinius and then in Gaul with Caesar, who made a protégé of him. In 52 B.C. he became quaestor and in 49 B.C. tribune. When the situation between POMPEY and Caesar became critical, Antony and Quintus CASSIUS LONGINUS, another tribune, vetoed the bill to deprive Caesar of his army and fled to him. Caesar crossed the Rubicon, and the civil war began. At the battle of Pharsala, Caesar took the right wing, and Antony gave distinguished service as the leader of the left. After Caesar's assassination (44 B.C.), Antony, then consul, aroused the mob against the conspirators and drove them from the city. When Octavian (later AUGUSTUS), Caesar's adopted son and heir, arrived in Rome, Antony joined forces with him, but they soon fell out. Antony went to take Cisalpine Gaul as his assigned proconsular province, but Decimus BRUTUS would not give it up, and Antony besieged

him (43 B.C.) at Mutina (modern Modena). The senate, urged by CICERO, who had excoriated Antony in the *Philippics*, sent the consuls Aulus HIRTIUS and Caius Vibius Pansa to attack Antony. The consuls fell in battle, but Antony retired into Transalpine Gaul. Octavian now decided for peace and arranged with Antony and Marcus Aemilius LEPIDUS the Second Triumvirate, with Antony receiving Asia as his command. In the proscription following this treaty Antony had Cicero killed. Antony and Octavian crushed the republicans at Philippi, and the triumvirate ruled the empire for five years. In 42 B.C. Antony met CLEOPATRA, and their love affair began. While Antony was in Egypt, his wife, Fulvia, became so alienated from Octavian that civil war broke out in Italy. At about the time Antony arrived in Italy, Fulvia died (40 B.C.) and peace was restored between Octavian and Antony, who married Octavian's sister Octavia, she became, thereafter, Antony's devoted partisan and the strongest force for peace between the two. In 36 B.C., Antony undertook an invasion of Parthia. The war was costly and useless, and Antony succeeded only in adding some of Armenia to the Roman possessions. In 37 B.C., Antony settled in Alexandria as the acknowledged lover of Cleopatra. He gave himself up to pleasure, caring neither for the growing ill will in Rome nor for the increasing impatience of Octavian. In 32 B.C. the senate deprived Antony of his powers, thus making civil war inevitable. In 31 B.C., Antony and his fleet met Marcus Vipsanius Agrippa with Octavian's fleet off Actium, and Antony found his large, cumbersome galleys were no match for the swift small craft that Octavian had built. In the middle of the battle Cleopatra retired with her boats, and Antony followed her. His navy surrendered to Octavian. The situation of the two lovers was desperate. Returning to Alexandria, they set about fortifying Egypt against Octavian's arrival. When at length Octavian did come (30 B.C.), Antony committed suicide, under the impression, it is said, that Cleopatra had died already. She killed herself soon afterward. Of the many dramas on the tragedy the best known by far is Shakespeare's *Antony and Cleopatra*. The name also appears as Marc Anthony. See A. E. Weigall, *The Life and Times of Cleopatra* (1968).

Anthothijah (āntōthī'jā), descendant of Benjamin 1 Chron. 8:24.

Antothite (ān'tōthīt) see ANATHOTH.

Antrim (ān'trīm), county (1971 pop. 352,549), 1,098 sq mi (2,844 sq km), NE Northern Ireland. BELFAST is the county town. The eastern and seaward area of the county is a picturesque region of mountains and glens, to the west, where Antrim borders on Lough Neagh, lie the fertile valleys of the Bann and the Lagan rivers. On the northern coast is the extraordinary basaltic formation known as the GIANT'S CAUSEWAY. The region is chiefly agricultural (oats, flax, potatoes). Fishing and cattle breeding are also important occupations, and there is a significant tourist trade. Belfast is a major British port and the chief industrial center of Northern Ireland. Antrim, BALLYMENA, and CARRICKFERGUS have textile industries, other urban centers include Larne and Lisburn.

Antsirane: see DIEGO SUAREZ, Malagasy Republic.

ANTU (ān'tōō) see PESTICIDE.

Antung (ān'tōōng), former province (c. 24,000 sq mi/62,160 sq km), NE China. The capital was T'ung-hua (Tunghwa). It was bordered on the SE by the Yalu River, which separated it from Korea, and by the Bay of Korea. A part of Manchuria, it was included in Manchukuo and was created a province in 1945. In 1954, Antung became part of Liaoning prov.

Antung: see TAN-TUNG, China.

Antwerp (ān'twūrp), Flemish *Antwerpen*, Fr. *Anvers*, province (1970 pop. 1,533,249), 1,104 sq mi (2,859 sq km), N Belgium, bordering on the Netherlands in the north. ANTWERP (the provincial capital) and MECHELEN are the chief cities. The province is largely a flat, cultivated plain, drained by the Scheldt River and its tributaries and served by the Albert Canal. It is mostly Flemish-speaking and was part of the duchy of BRABANT.

Antwerp, Flemish Antwerpen, Fr. *Anvers*, city (1970 pop. 224,543), capital of Antwerp prov., N Belgium, on the Scheldt River. It is one of the busiest ports in Europe, a commercial, industrial, and financial center, and a rail junction. The city is linked with industrial E Belgium (especially Liege) by the ALBERT CANAL and also has a large transit trade to and from West Germany (especially the Ruhr district). Manufactures of Antwerp and its surrounding region include refined petroleum, petrochemicals, dyes, photographic supplies, motor vehicles, leather goods, and

processed food. In addition, the city is a major international center of the diamond trade and industry, has large shipyards, and is the seat of the world's first stock exchange (founded 1460). Antwerp was a small trading center by the early 8th cent. It was destroyed by the Normans in 836, but by the 11th cent. it was a fairly important port. The city was chartered in 1291. Antwerp was held (13th to mid-14th cent.) by Brabant and then became an early seat of the counts of Flanders. In the 15th cent. it rose to prominence as Bruges and Ghent declined. In 1446 the English Merchant Adventurers and other traders gave the port great impetus by moving their operations from Bruges to Antwerp. By the middle of the 16th cent. Antwerp was Europe's chief commercial and financial center. The diamond industry, established in the 15th cent., had expanded considerably after the arrival (early 16th cent.) of Jewish craftsmen expelled from Portugal. The city's prosperity suffered greatly in 1576 when it was sacked and about 6,000 of its inhabitants killed by Spanish troops (the "Spanish fury") and again in 1584-85 when the city was captured by the Spanish under Alessandro de Farnese after a 14-month siege. Under the Peace of Westphalia (1648), the Scheldt was closed to navigation (as a means of favoring Amsterdam), and Antwerp declined rapidly. The city revived with the opening of the Scheldt by the French in 1795 and with the expansion of its port facilities by Napoleon I. The incorporation (1815) of Belgium in the Netherlands again hindered Antwerp's economic development, a situation that was continued by the Dutch-Belgian treaty of separation (1839), which gave the Netherlands the right to collect tolls on Scheldt shipping. The expansion of Antwerp as a major modern port dates only from 1863, when, by a cash payment, Belgium ended Dutch restrictions on traffic on the Scheldt. Antwerp was seriously damaged in World War I when it was captured (Oct., 1914) by the Germans after a 12-day siege. In World War II, it was again taken (May, 1940) by the Germans, who bombarded it heavily after it had been recaptured (Sept., 1944) by the Allies. The artistic fame of Antwerp dates from the rule (15th cent.) of Philip the Good of Burgundy, who founded an academy of painting there. The painters Quentin Massys and P. P. Rubens resided in the city, and Sir Anthony Van Dyke was born there. Many of their works are in the museums and churches of Antwerp. Christophe Plantin made (16th cent.) the city a center of printing, his house is now a museum. Among Antwerp's many splendid structures are the large Gothic Cathedral of Notre Dame (14th-16th cent.), with a spire c. 400 ft (122 m) high, the churches of St. James (containing the tomb of Rubens) and of St. Paul (both 16th cent.), the Renaissance-style city hall (mid-16th cent.), Rubens's house (now a museum), and old guildhalls lining the Groote Markt [market place]. Antwerp is the site of a famous zoological garden and a noted school of music.

Anu (ā'nōō), ancient sky god of Sumerian origin, worshiped in Babylonian religion. The son of Apsu (the underworld ocean) and Tiamat (primeval chaos), Anu was king of the great triad of gods, which included the earth god Enlil and the water god Ea.

An Uaimh, Republic of Ireland see NAVAN.

Anub (ā'nəb), Judahite 1 Chron. 4:8.

Anubis (ənoō'bīs), Egyptian god of the dead. He presided over the embalming of the dead, and is represented as a dog-headed or jackal-headed man.

Anuradhapura (ənoō'radəpōō'ra) or **Anarajapura** (əna'raja-), town (1968 est. pop. 30,000), capital of the North Central prov., Sri Lanka (Ceylon), on the Aruvi River. Rice plantations and vegetable gardens surround the town, which is famous chiefly for its vast Buddhist ruins and as a pilgrimage center. Founded in 437 B.C., it was the capital of a Sinhalese kingdom and a Buddhist center until the 8th cent. A.D., when, after a Tamil invasion, it was abandoned in favor of Pollonnaruwa. Ruins include several colossal stupas (some larger than the pyramids of Egypt), a temple hewn from rock, and the Brazen Palace (so called from its metal roof). A sacred bo tree at Anuradhapura was grown from a slip of the tree at Bodhi Gaya, India, under which Buddha reputedly attained enlightenment.

Anvers see ANTWERP, Belgium.

Anville, Jean Baptiste Bourguignon d' (zhān bātēs' bōōrgēnyōn' dānvēl'), 1697-1782, French geographer and cartographer. His maps of ancient geography, characterized by careful, accurate work and based largely on original research, are especially valuable. He left unknown areas of continents blank.

and noted doubtful information as such, compared to the lavish maps of his predecessors, his maps looked empty. Anville became cartographer to the king, who purchased his maps, atlases, and other geographical material (the largest collection in France). Anville himself made more than 200 maps.

anxiety, anticipatory tension or vague dread persisting in the absence of a specific threat. In contrast to fear, which is a realistic reaction to actual danger, in anxiety the true source of distress is concealed from the individual. Anxiety is characterized physiologically by increased pulse rate, heightened breathing and blood pressure, palpitations, perspiration, muscular tension, dryness of the mouth, and sometimes an increased need to urinate or defecate. Freud first believed that anxiety was the result of repressed, pent-up sexual energy but later viewed it as a danger signal, alerting the ego to excessive stimulation and causing repression. It has been defined as the tension resulting from a sense of failure or disapproval in interpersonal relations, and as an apprehensive reaction to unresolved conflicts or experiences that threaten the personality. DEFENSE MECHANISMS are personality responses to anxiety resulting from frustration and conflict.

An-yang or **Anyang** (both an-yāng), city (1970 est. pop. 225,000), N Honan prov., China, on the Peking-Canton RR, in a cotton-growing area. It has textile mills, coal mines, and a medium-sized iron and steel complex. An-yang was once a capital of the Shang dynasty and one of the earliest centers of Chinese civilization. Excavations, begun there in 1928, have revealed a rich Bronze Age culture.

Anza, Juan Bautista de (hwan boutēs'tā dā ān'sa), 1735-88, Spanish explorer and official in the Southwest and the far West, founder of San Francisco, b. Mexico. Accompanied by Father F. T. H. Garcés and a small expedition, he opened (1774) an overland road from Sonora through present-day Arizona to California, reaching San Gabriel and Monterey. Viceroy A. M. Bucareli, alarmed by the threatened encroachments of the Russians and the British on the Pacific coast, sent (1775) Anza on a new expedition to establish a colony. In 1776 he chose the site of San Francisco, where a presidio was founded by one of his lieutenants and a mission was founded by Father Francisco Palou under the direction of Father Junipero Serra. Later, as governor of New Mexico (1777-88), Anza built up Spanish frontier defenses and established order. Journals of men on his California journey are in Anza's *California Expeditions* (ed. by H. E. Bolton, 5 vol., 1930, repr. 1966). For his diaries and a study of his administration, see A. B. Thomas, *Forgotten Frontiers* (1932, repr. 1969). See F. Thurman, *The Cahuillas and White Men of San Carlos and Coyote Canyon* (1970).

Anzengruber, Ludwig (lōōt'vīkh an'tsəngroō'bar), 1839-89, Austrian writer. An actor and a clerk in the imperial police, Anzengruber had little success as a writer until the production (1870) of his anticlerical play *Der Pfarrer von Kirchfeld* [the parish priest of Kirchfeld]. It was the first of a series of folk plays and was followed by *Der Meineidbauer* (1871, tr. *The Farmer Forsworn*, 1913-15) and *Die Kreuzschreiber* (1872, tr. *The Crossmakers*, 1958). *Das vierte Gebot* (1878, tr. *The Fourth Commandment*, 1912) is an early example of NATURALISM. Anzengruber also wrote short stories and two novels.

Anzhero-Sudzhensk (anzhē'ra-sōō'jēnsk), city (1970 pop. 106,000), SW Siberian USSR, on the Trans-Siberian RR. One of the oldest and largest coal-mining centers of the Kuznetsk Basin, the city was developed as a source of coal for the railroad. Mining equipment, chemicals, and pharmaceuticals are manufactured there.

Anzio (ān'tsyō), Lat. Antium, town (1971 pop. 23,092), in Latium, central Italy, on the Tyrrhenian Sea. It is a seaside resort with a fishing industry. A Volscian town, it was captured by Rome in 341 B.C. and became a favorite resort of the Romans. Nero and Caligula were born there, among the ruins of Nero's villa two famous statues, the Apollo Belvedere and the *Girl of Anzio*, were found. Anzio declined in the Middle Ages, but it revived c. 1700 and became a residence of the popes. During World War II, Allied troops landed (Jan., 1944) at Anzio and nearby Nettuno to draw German forces from Cassino, thus effecting a breakthrough (May, 1944) to Rome.

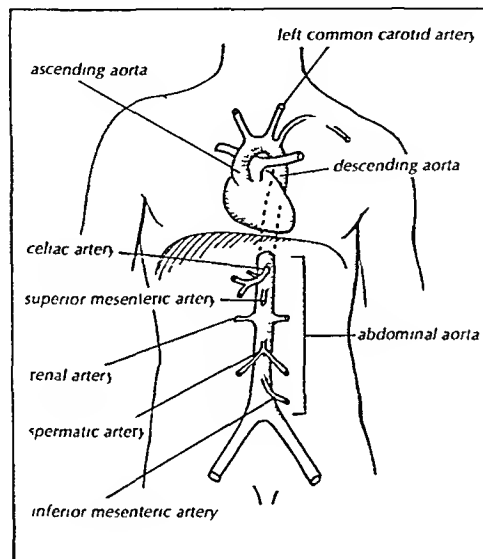
Anzus Treaty, defense agreement signed in 1951, by Australia, New Zealand, and the United States. The name Anzus is derived from the initials of the three signatory nations. As a result of the reestablishment of peace between Japan and the United States in 1951, Australia and New Zealand asked for a treaty

making it clear that an attack on any of the three signatory countries would be considered an attack upon all. It is also known as the Pacific Security Treaty.

Aomori (āōmō'rē), city (1970 pop. 240,041), capital of Aomori prefecture, extreme N Honshu, Japan, on Aomori Bay. First opened to foreign trade in 1906, Aomori is now the chief port of N Honshu. Rice, textiles, and tobacco are among its exports, many of which are shipped to Hokkaido. A modern city, it was rebuilt after a disastrous fire in 1910 and again after severe air raids in 1945. Aomori prefecture (1970 pop. 1,427,430, 3,719 sq mi (9,632 sq km), has rich timber lands and famous apple orchards. Aomori, Hachinohe, and Hirosake are the major cities.

aorist: see TENSE

aorta (āōr'ta), primary artery of the CIRCULATORY SYSTEM in mammals, delivering oxygenated blood to all other arteries except those of the lungs. The human aorta, c. 1 in (2.54 cm) in diameter, originates at the left ventricle of the HEART. After supplying the coronary arteries that nourish the heart itself, the aorta



Aorta

extends slightly toward the neck to feed branches serving the head and arms. It then arches down toward the waist, directing blood into the arterial system of the chest. Entering the abdomen through the aortic hiatus, an opening in the diaphragm, the aorta next supplies the stomach, kidneys, intestines, gonads, and other organs through extensive arterial networks. It finally divides into the two iliac arteries carrying blood to the legs. The elasticity of the aorta wall permits it to pulse in rhythm with the heartbeat, thus helping to propel blood through the body.

Aosta, Emmanuel Philibert of Savoy, duke of (āō'sta, -sta), 1869-1931, Italian general, son of King Amadeus of Spain and cousin of Victor Emmanuel III of Italy. In World War I he held the Piave front after the Italian defeat at Caporetto and later occupied Friuli. He became a marshal in 1926. His son Amadeus (1898-1942), who succeeded to his title, was viceroy of Ethiopia (1937-41). He surrendered to the British during World War II after a valiant defense.

Aosta (āō'stā), city (1971 pop. 36,961), capital of Valle d'Aosta and of Aosta prov., NW Italy, near the junction of the Great and Little St. Bernard roads. Aosta is an industrial and tourist center. Manufactures include iron and steel, aluminum, and chemicals. Emperor Augustus there founded (c. 25 B.C.) a colony called Augusta Praetoria, on the site of an older settlement. In the 11th cent. Aosta was given as a fief to Count Humbert I, the founder of the Savoy dynasty, the cadet line of the house bore the title of duke of Aosta. Roman remains in Aosta include walls and gates, a majestic triumphal arch honoring Augustus, a theater, and an amphitheater. There is also a fine cathedral (12th-19th cent.).

Aosta, Valle d' (vāldāō'stā), region (1971 pop. 111,239, 1,260 sq mi (3,263 sq km), NW Italy, bordering on France in the west and on Switzerland in the north. AOSTA is the capital of the region and of its only province. A high Alpine country, the Valle d'Aosta includes the Italian slopes of Mont Blanc, the Matterhorn, and Monte Rosa, its highest peak is the Gran Paradiso. The population, much of which is French-speaking, is concentrated in the pictur-

esque valleys of the Dora Baltea River and its tributaries. The Great and the Little SAINT BERNARD roads join in the upper Aosta valley. Farming is the main occupation, cereals and grapes are grown, and dairy cattle are raised. Iron and steel and textiles are the leading manufactures, and there are major hydroelectric facilities. The region has several fashionable resorts, notably Champoluc, Courmayeur, and Cervinia-Breuil. A long vehicular tunnel through Mont Blanc, connecting France and Italy, was opened in 1965, highways feeding it were built in Valle d'Aosta, thus markedly improving the region's transportation network. Rome conquered the region from the Salassi people c. 25 B.C. It later was held by the Goths, the Lombards, and the dukes of Burgundy. After passing (11th cent.) to the counts of Savoy, the Valle d'Aosta shared the history of PIEMONTE. Under the Italian constitution of 1947 it was made a region with considerable autonomy, particularly in administrative and cultural affairs. The feudal system long prevailed in the region, and more than 70 castles are still standing.

Apache Indians, North American Indians of the Southwest composed of six culturally related groups. They speak a language that has various dialects and belongs to the ATHABASCAN branch of the Nadene linguistic stock (see AMERICAN INDIAN LANGUAGES), and their ancestors entered the area about 1100. The NAVAHO INDIANS, who also speak an Athabaskan language, were once part of the Western Apache, other groups E of the Rio Grande along the mountains were the Jicarilla, the Lipan, and the Mescalero groups. In W New Mexico and Arizona were the Western Apache, including the Chiricahua and the Coyotero. The Kiowa Apache in the early southward migration attached themselves to the Kiowa, whose history they have since shared. Subsistence in historic times consisted of wild game, cactus fruits, seeds of wild shrubs and grass, livestock, grains plundered from settlements, and a small amount of horticulture. The social organization involved matrilineal residence, a rigorous mother-in-law avoidance pattern, and working for the wife's relatives. The Apache are known principally for their fierce fighting qualities. They successfully resisted the advance of Spanish colonization, but the acquisition of horses and new weapons, taken from the Spanish, led to increased intertribal warfare. The Eastern Apache were driven from their traditional plains area when (after 1720) they suffered defeat at the hands of the advancing COMANCHE INDIANS. Relations between the Apache and the settlers gradually worsened with the passing of Spanish rule in Mexico. By mid-19th cent. when the United States acquired the region from Mexico, Apache lands were in the path of the American westward movement. The futile but strong resistance that lasted until the beginning of the 20th cent. brought national fame to several of the Apache leaders—COCHISE, GERONIMO, MANGAS COLORADAS, and VICITRIO. Remnants of the Apaches now live in reservations in Arizona, where they number some 11,500. See G. C. Baldwin, *The Warrior Apaches* (1965), D. I. Thrapp, *The Conquest of Apache* (1967), Keith Basso and Morris Opler, ed., *Apachean Culture and Ethnology* (1971), J. U. Terrell, *Apache Chronicle* (1972).

Apalachee Indians, extinct tribe of North American Indians once centered about Apalachee Bay, NW Florida, belonging to the Muskogean branch of the Hokan-Siouan linguistic stock (see AMERICAN INDIAN LANGUAGES). Prosperous agriculturalists, they fought off the raids of the Creek Indians until early in the 18th cent. Combined Indian and British forces then conquered them, wiping out their villages along with Spanish missions and garrisons. More than 1,000 Apalachee were sold into slavery.

Apalachicola, river: see CHATTAHOOCHEE, river

APA-Phoenix: see ASSOCIATION OF PRODUCING ARTISTS—PHOENIX

Aparri (apar'rē), city (1969 est. pop. 45,700), Cagayan prov., on Luzon, the Philippines. Situated on the mouth of the Cagayan River on the Babuyan Channel, it is the port for the rich Cagayan valley, the Philippines's leading tobacco-producing area.

apartheid (apar'thit) [Afrik. = apartness], system of racial segregation peculiar to the Republic of South Africa. Racial segregation and the supremacy of whites had been traditionally accepted in South Africa prior to 1948, but in the general election of that year, Daniel F. MALAN included the policy of apartheid in the Afrikaner Nationalist party platform, bringing his party to power for the first time. While most whites have continued to acquiesce in the policy, there has been bitter and sometimes bloody strife over the degree and stringency of its imple-

mentation The purpose of apartheid is separation of the races not only of whites from nonwhites, but also of nonwhites from each other, and, among the Africans (known as Bantu), of one group from another In addition to the Africans, who constitute about 70% of the total population, those regarded as nonwhite include the Coloured (mulatto) and Asiatic (mainly of Indian ancestry) populations Initial emphasis was on restoring the separation of races within the urban areas A large segment of the Asiatic and Coloured populations was forced to relocate out of so-called white areas African townships that had been overtaken by (white) urban sprawl were demolished and their occupants removed to new townships well beyond city limits Between the passage of the Group Areas Acts of 1950 and 1968, about 500,000 Africans were moved from the cities to rural reservations Under the prime ministership of Hendrik VERWOERD, apartheid developed into a policy known as "separate development," whereby each of the nine Bantu groups was to become a nation with its own homeland, or Bantustan An area totaling about 14% of the country's land was set aside for these homelands, the remainder, including the major mineral areas and the cities, being reserved for the whites The basic tenet of the separate development policy is that within the confines of his designated homeland the black African shall have quite extensive rights and freedoms, the corollary being that outside it his position is akin to that of an alien His movement to and between other parts of the country is strictly regulated, the location of his residence or employment (if permitted to work) is restricted, and he is not allowed to vote or own land Thus African urban workers, including those who are third- or fourth-generation city dwellers, are seen as transients, their real homes being the rural reservations from which they or their forefathers migrated Only those holding the necessary labor permits, which are granted according to the current requirements of the labor market, are allowed to reside within urban areas Such permits do not automatically include the spouse or family of a permit holder, a fact that has contributed greatly to the breakup of family life among the Africans Most African urban dwellers must live in the townships on a city's perimeter (an exception is made for domestic servants, who are permitted to live within city limits on the premises of their employers) All Africans living outside the Bantustans are subject to strict curfew regulations and passbook requirements, especially in the cities, if unable to produce these when challenged, they are subject to arrest In 1962 the South African government established the first of the Bantustans, the Transkei, as the homeland of the Xhosa tribe, and granted it limited self-government in 1963 Since then none of the other tribal groups has succeeded in gaining even this degree of self-government The reserves are, in general, made up of broken tracts of poor quality land, riddled with erosion and incapable of supporting their large designated populations Opportunities for employment are few, as there is little or no industry in these areas Urban wage-earners attempt to contribute to the support of their families in the reserves, but the level of African wages is so low as to make this barely feasible In 1972, African wages in manufacturing were one fifth or one sixth of those of whites, and in other fields, such as mining, the ratio of discrepancy in cash wages was 20 or more to 1 Despite public demonstrations against apartheid, UN resolutions, and opposition from international religious societies, the policy has been applied with increased rigor, extending to rigid enforcement in the churches and universities In 1961, South Africa withdrew from the British Commonwealth rather than yield to pressure over its racial policies, and in the same year the three South African denominations of the Dutch Reformed Church left the World Council of Churches rather than abandon their advocacy of apartheid Although the policy of apartheid was continued under Prime Minister John VORSTER, there are signs of change After South Africa was barred from the Olympic Games in 1964 and 1968, there were some alterations in the government's policy, so that by the early 1970s international sports events held in South Africa were being viewed and participated in by both blacks and whites In 1972, a series of antiapartheid protests occurred in both nonwhite and white universities Probably the most forceful pressures, both internal and external, eroding the barriers of apartheid are economic African wages are gradually increasing as awareness grows of the market potential of a more highly paid African labor force There is a chronic shortage of skilled labor, so, over the

protests of the white trade unions, an increasing number of more highly rated jobs are being opened up to Africans (for whom trade union membership is illegal) In addition, there are the pressures, political and economic, being exerted by the independent countries of black Africa Nevertheless there are many who feel that apartheid will only be toppled by force—by political upheaval from within or by violent assault from without See A L Sachs, *South Africa The Violence of Apartheid* (1969), Jim Hoagland, *South Africa Civilizations in Conflict* (1972), United Nations Educational, Scientific, and Cultural Organization, *Apartheid Its Effects on Education, Science, Culture, and Information* (2d rev ed 1972)

apartment house, building having three or more dwelling units Numerous early examples of this form of dwelling have been found in remains of Roman and medieval cities and the 17th-century Pueblo Indian villages of North America Its most important development came with the Industrial Revolution After 1850 crowded slums began to develop in the cities of Europe and the United States Few good, low-cost multiple dwellings were built before World War I, but great progress was made in the development of more luxurious apartment buildings, particularly in Paris and Vienna In the 1880s fireproof steel-frame construction, the improvement of the elevator, and the introduction of electric lighting made possible the rapid evolution of the apartment building In 1901 New York City put into effect a tenement-house law, its purpose was to protect occupants against fire hazards and unsanitary and unsafe conditions Between 1919 and 1934 there appeared in Europe many commendable low-cost housing developments Important examples are the project by Gropius at the Siemensstadt in Berlin, J J P Oud's group at the Hook in Holland, and H P Berlage's apartments in Amsterdam There has been government-subsidized public housing in the United States since 1937 A phenomenal increase in the building of apartments has taken place since 1921 in all the larger cities, reaching its peak in New York City, where apartments largely replaced private houses The cooperative apartment is a building in which the tenants belong to a corporation that owns the building In the condominium each apartment unit is owned separately and owner-tenants generally form an association to provide for apartment maintenance The apartment hotel combines the accommodations of an apartment, including cooking space, with the services characteristic of a hotel Apartment houses have now spread to the suburbs of the larger cities, where they often include gardens, tennis courts, and children's playgrounds Numerous apartment houses are constructed as living complexes for retired persons A radical experiment in multiple dwellings called Habitat was designed for the Montreal Expo 67 by Moshe SAFDIE Concrete units were stacked like boxes but in a random-appearing fashion to create a visually exciting housing complex See F R S Yorke and Frederick Gibberd, *Masterworks of International Apartment Building Design* (1959), Samuel Paul, *Apartment Their Design and Development* (1967)

apastron (əpās'trən) see APSIS

apatite (āp'atīl), mineral, a calcium phosphate containing chlorine, fluorine, or both It is transparent to opaque in shades of green, brown, yellow, white, red, and purple The yellow-green variety, called asparagus stone, and the blue-green manganapatite are used to a limited extent in jewelry Large deposits of apatite are mined for use in making phosphatic fertilizers Apatite is a minor constituent in many types of rock Commercial deposits are mined in Florida, Tennessee, and Montana, and in N Africa and the USSR

Apaturia (āpachōō'rēā, -tyōō'rēā), in Greek religion, annual festival celebrated by the Ionians and the Athenians It was held in October or November, in the season when various phratries (clans) met to induct new members, register children born since the previous festival, and pay homage to the gods

ape, any primate of the family Pongidae (also called Simiidae), closely related to the human family (Hominiidae) The small apes, the GIBBON and the siamang, and the smallest of the great apes, the ORANGUTAN, are found in SE Asia The other great apes, the GORILLA and the CHIMPANZEE, are found in Africa The term *ape* was formerly applied to certain tailless monkeys as well, and the Pongidae were distinguished as the anthropoid, or manlike, apes *Ape* and *anthropoid ape* are now used synonymously, although the common names of certain monkeys

still contain the word *ape*, for example, the N African macaque is called the Barbary ape True apes vary in size from the 3-ft (90-cm), 15-lb (6.8-kg) gibbon to the 6-ft (1.8-m), 500-lb (227-kg) gorilla All apes are forest dwellers and spend at least some of the time in the trees They are able, like monkeys, to run along branches on all fours, unlike monkeys, they are also able to move about by brachiation, or arm-over-arm swinging Gibbons (including siamangs) and orangutans are particularly adept at this type of locomotion and spend most of the time in trees Gorillas are the most terrestrial of the apes, and chimpanzees also spend much of the time on the ground The skeleton of an ape is quite similar to that of a human in the structure of the chest and shoulders Apes have broad, flat chests and arms capable of reaching up and backward from the shoulder, this construction is associated with brachiation The pelvis, on the other hand, is more like that of a monkey, designed for walking on all fours Most apes are able to walk on two feet, but only for short distances The ground-living gorillas and chimpanzees normally walk on the hind feet and knuckles of the hands, with the fingers of the hands curled under The arms of an ape are longer than the legs The hands are similar to human hands, but with fingers and thumb of more equal length, the feet are hand-like grasping structures Apes have neither tails nor the cheek pouches found in Old World monkeys, gibbons are the only apes that have the buttock callosities found in Old World monkeys The face of an ape is quite flat, like that of many monkeys and of humans The vision is highly developed, with a stereoscopic color image The brain is similar in structure to the human brain, although smaller, and is capable of fairly advanced reasoning Apes are classified in the phylum CHORDATA, subphylum Vertebrata, class Mammalia, order Primates, family Pongidae See Vernon Reynolds, *The Apes* (1967), R M Yerkes and A W Yerkes, *The Great Apes* (1929, repr 1970), G H Bourne, *The Ape People* (1971)

Apeldoorn (a'pəldōrn), city (1971 pop 126,266), Gelderland prov., central Netherlands Its varied manufactures include paper and paint The city is a transportation center and attracts many tourists Nearby is Het Loo, a royal palace and the residence of former Queen Wilhelmina from the time of her abdication in 1948 until her death in 1962

Apelles (əpēl'ēz), fl 330 B.C., Greek painter, the most celebrated in antiquity but now known only through descriptions of his works He is supposed to have studied under Ephorus of Ephesus and under Pamphilus of Amphipolis at Sicily He was court painter to Philip II of Macedon and to Alexander the Great His portraits of Alexander included one in the Temple of Diana at Ephesus that showed Alexander wielding the thunderbolts of Zeus Apelles excelled in painting horses, and according to Pliny the portrait of Antigonos Cyclops on horseback was his masterpiece Most famous, perhaps, was the painting of Aphrodite rising from the sea A painting made by Botticelli from Lucian's description of Apelles' *Calumny* is in the Uffizi Apelles is said to have been the first to recognize the talents of PROTOGENES

Apelles, Christian at Rome Rom 16 10

Apennines (āp'ənīnz), Ital *Appennino*, mountain system, running the entire length of the Italian peninsula It extends south c 840 mi (1,350 km) from the Cadibona Pass in Liguria, NW Italy, where the Apennines join with the Ligurian Alps, to the Strait of Messina, the mountains of Sicily are a southwest continuation of the system The Apennines are widest (c 80 mi/130 km) in the central section, which also contains the highest peaks, Mt Corno (9,560 ft/2,914 m high) and Mt Amaro (9,170 ft/2,795 m high) However, in general the peaks are much lower The central and southern Apennines have mineral springs, crater lakes, fumaroles, and volcanoes (two, Vesuvius and Etna, are still active) The southern section also experiences many earthquakes Of the many rivers rising in the Apennines, the few important ones (Arno, Tiber, and Volturno) all flow W into the Tyrrhenian Sea The N and central Apennines are rich in a great variety of minerals There are many hydroelectric plants in the mountains The once heavily forested slopes of the system have been greatly reduced by man through the centuries, attempts at conservation and reforestation have been made The greatest population concentrations are found in the valleys and the fertile basins Extensive pasturelands are used for sheep and goat grazing The Apennines are pierced by many railroad tunnels and highway passes, and by the Apennian, Cassian, Flaminian, and Salarian ways (see ROMAN ROADS)

Apharsachites (əfər'sākīts) or **Apharsathchites** (əfər'sāthkīts), Assyrian colonists settled in Samaria Ezra 4 9, 5 6, 6 6 The Apharsites apparently were another group of colonists Ezra 4 9

aphasia (əfá'zhə), language disturbance caused by a lesion of the brain, making an individual partially or totally impaired in his ability to speak, write, or comprehend the meaning of spoken or written words It is distinguished from functional disorders such as stammering or stuttering, and from impaired speech due to physical defects in the organs used for speaking Treatment consists of reeducation, the oral and lip-reading methods employed in the education of deaf and mute children have been found to be of assistance in therapy

Aphek (ā'fēk) 1 Canaanite royal town, the modern Ras el-Ain or Rosh Hayim (Israel) Herod called it Antipatris It is mentioned in Egyptian documents dating from the 19th cent B C Joshua 12 18 See APHEKAH 2 Canaanite city in Asher. Joshua 13 4, 19 30 Aphik Judges 1 31 3 Place where Ahab defeated Benhadad 1 Kings 20 26–30, 2 Kings 13 17 4, 5 Two places where the Philistines encamped, perhaps the same as 1 1 Sam 4 1, 29 1

Aphekah (āfē'kə), unidentified place, probably the same as APHEK 4 Joshua 15 53

aphelion (āfē'lēən, āp'hē'-), point farthest from the sun in the orbit of a body about the sun See APSIS

Aphiah (āfī'ə), ancestor of King Saul 1 Sam 9 1

aphid or **plant louse**, tiny, usually green, soft-bodied, pear-shaped insect, injurious to vegetation It is also called greenfly and blight Aphids are mostly under 1/4 in (6 mm) long Some are wingless, others have two pairs of transparent or colored wings, the front pair longer than the hind pair In typical aphids (family Aphididae), two tubes called cornicles project from the rear of the abdomen and exude protective substances Aphids feed by inserting their beaks into stems, leaves, or roots, and sucking the plant juices Usually they gather in large colonies Their life cycle is complex and varies in different species In a typical life cycle, several generations of wingless females, which reproduce asexually (see PARTHENOGENESIS) and bear live offspring, are followed by a generation of winged females, which bears a sexually reproducing, egg-laying generation of males and females Mating usually occurs in fall and the eggs are laid in crevices of the twigs of the host plant, the first generation of wingless females hatches in spring Different host plants and different parts of the plant may be used at different stages of the life cycle Many kinds of aphid secrete a sweet substance called honeydew, prized as food by ants, flies, and bees This substance consists of partially digested, highly concentrated plant sap and other wastes, and is excreted from the anus, often in copious amounts Certain aphid species have a symbiotic relationship with various species of ants that resembles the relationship of domestic cattle to humans, hence the name "ant cows" for aphids The ants tend the aphids, transporting them to their food plants at the appropriate stages of the aphids' life cycle and sheltering the aphid eggs in their nests during the winter The aphids, in turn, provide honeydew for the ants Some aphids (e.g., the woolly apple aphid) secrete long strands of waxy material from wax glands, forming a conspicuous woolly coating for their colonies Gall-making aphids live in GALLS, or swellings of plant tissue, formed by the plant as a reaction to substances secreted by the insects, galls of different aphid species are easily identified (e.g., the cockscomb gall of elm leaves) One group of aphids lives only on conifers (e.g., the eastern spruce gall aphid) The PHYLLOXERA, notorious for its damage to vineyards, is closely related to the aphids The damage done by aphids is due to a number of causes, including loss of sap, clogging of leaf surfaces with honeydew, and growth of molds and fungi on the honeydew Leaf curl, a common symptom of aphid infestation, occurs when a colony attacks the underside of a leaf, causing its desiccation The downward curl provides protection for the colony, but the leaf becomes useless to the plant Some species also transmit viral diseases of plants Many larger insects feed on aphids, including ladybird beetles and lacewings Fungus infection and damp weather also help limit the number of aphids Among the aphids causing serious damage to food crops are the grain, cabbage, cornroot, apple, woolly apple, and hickory aphids and the alder and beech tree blights Aphids are classified in several families of the phylum ARTHROPODA, class Insecta, order Homoptera

Aphik (āfīk) see APHEK 2

aphorism (āf'arīz'am), short, pithy statement of an evident truth concerned with life or nature, distinguished from the axiom because its truth is not capable of scientific demonstration HIPPOCRATES was the first to use the term for his *Aphorisms*, briefly stated medical principles Note his famous opening sentence "Life is short, art is long, opportunity fleeting, experimenting dangerous, reasoning difficult"

aphotic zone: see OCEAN

Aphrah (āf'ra), in the punning passage of Micah 1 10, apparently the name of a town The name meant "dust" in Hebrew or sounded like a word meaning "dust," hence probably the use of the name

Aphrodite (āf'rādī'tē), in Greek religion, goddess of love and of beauty Although Homer designated her the child of Zeus and Dione, Hesiod's account of her birth, in which she emerges from the foam of the sea, is more popular She supposedly rose where Uranus' genitals had fallen after he had been mutilated by Cronus Although Zeus gave Aphrodite in marriage to Hephaestus, she bestowed her affections on many others She loved Ares, by whom she bore not only Harmonia but, in some myths, Eros and Anteros She was the mother of Hermaphroditus by Hermes and of Priapus by Dionysus Zeus caused her to love the shepherd Anchises, by whom she bore Aeneas Adonis, in whose legend Aphrodite appears as a goddess of fertility, also won her favors It was to Aphrodite that Paris awarded the apple of discord, which caused the dispute leading ultimately to the Trojan War Worshipped throughout Greece, the goddess differed in representation according to her various attributes As Aphrodite Urania, she was a celestial goddess, the embodiment of pure or spiritual love, as Aphrodite Pandemos, she was a goddess of marriage and family life, the essence of earthly or sensual love She was also worshipped as a war goddess, as at Sparta, and as a sea goddess and patroness of sailors Aphrodite had important cults at Cythera on Crete, at Paphos and Amathas on Cyprus, at Corinth, and at Mt Eryx in Sicily Probably of Eastern origin, she was similar in many of her attributes to the Oriental goddesses Ashtar and Ishtar The Romans identified Aphrodite with VENUS

Aphses (āf'sēz), head of a priestly course 1 Chron 24 15

Apia (apē'a), town (1971 est pop 30,600), capital of WESTERN SAMOA, on the northern coast of UPOLU island The economic, social, and political center of Western Samoa, Apia is the nation's only port and city Through its harbor bananas, copra, and cocoa are exported, and cotton goods, motor vehicles, meats, and sugar are imported At the western end of the harbor is Mulinu'u, the old ceremonial capital of a Samoan kingdom Robert Louis STEVENSON is buried on a hill overlooking the city, his former home, Vailima, served as the residence of the New Zealand high commissioner

Apianus, Petrus (pē'tras āpē'nās), Latinized from **Peter Bienewitz** or **Bennewitz** (pā'tar bē'nāvits, bē'nāvits), 1495–1552, German cosmographer and mathematician He was professor of mathematics at Ingolstadt and was noted for his knowledge of astronomy and his general learning Best known among his writings is the *Cosmographia* (1524), which has some of the earliest maps of America

Apicius, Marcus Gabius (apīsh'ās), 1st cent., Roman gourmet He squandered most of his large fortune on feasts and then, anticipating a need to economize, committed suicide The cookbook called *Apicius* probably dates from a century later

Apis (āpīs), in Egyptian religion, sacred bull of Memphis, said to be the incarnation of Osiris or of Ptah His worship spread throughout the Mediterranean world and was particularly important during the time of the Roman Empire See also SERAPIS

Apo, Mount (ā'pō), active volcano, 9,690 ft (2,953 m) high, on S Mindanao island, the Philippines It is the highest peak of the islands Mt Apo has a snow-capped appearance but is actually covered with white sulfur Mt Apo National Park (281 sq mi/728 sq km, est 1936) is there

apocalypse (əpōk'ālīps) [Gr, =uncovering], type of ancient Hebrew and Christian literature dealing with the end of the world The writing, mostly in the form of visions, is characterized by rich imagery and obscure symbols In the New Testament the book of REVELATION is often called the Apocalypse In the Old Testament apocalyptic elements appear extensively in Isaiah, Ezekiel, Daniel, Joel, and Zechariah The book called 4 ESDRAS is one of the chief Jewish apocalypses, other PSEUDEPIGRAPHAS are also apoca-

lyptic Modern books of this sort are seen among the works of Emmanuel SWEDENBORG See also FOUR HORSEMEN OF THE APOCALYPSE

apocrine gland: see SWEAT

Apocrypha (əpōk'rīfə) [Gr, =hidden things], appendix to the Authorized (or King James) Version of the Old Testament containing the following books and parts of books First and Second ESDRAS, TOBIT, JUDITH, ESTHER 10 4–16 24, WISDOM, ECCLESIASTICUS, BARUCH, Dan 3 24–90 (see DANIEL and THREE HOLY CHILDREN), Dan 13 (see SUSANNA 1), Dan 14 (see BEL AND THE DRAGON), the Prayer of Manasses (see MANASSEH 2), First and Second MACCABEES The Western canon includes all these except First and Second Esdras and the Prayer of Manasses, which are often given in an appendix to editions of the Vulgate (where the First and Second Esdras of the Apocrypha are called Third and Fourth Esdras) Protestants follow Jewish tradition in treating these books as uncanonical (see OLD TESTAMENT) For Jewish and Christian works resembling biblical books but not included in the Western or the Hebrew canon—sometimes called apocryphal—see PSEUDEPIGRAPHAS See Manuel Komroff, ed., *The Apocrypha* (1936, repr 1972), E J Goodspeed, *The Story of the Apocrypha* (1939, repr 1962), B M Metzger, *An Introduction to the Apocrypha* (1957), L H Brockington, *A Critical Introduction to the Apocrypha* (1961)

Apodaca, Juan Ruiz de (hwan rōōēth' dā āpōthā'-kā), 1754–1835, Spanish viceroy and military leader He was sent to London by the Central Junta of Seville to gain English support against Napoleon After service as governor of Cuba (1812–15), Apodaca, as viceroy of New Spain (1816–21), devoted himself to repressing revolutionary movements The royalist cause was at first successful, but with the defection of the royalist commander ITURBIDE it failed Feeling that Apodaca was not making sufficient effort to put down the revolution, a group in Mexico City, headed by the Masons, forced him to surrender his authority He returned (1821) to Spain where he held various offices He had the title visconde de Venadito

apogee (āp'ājē), point farthest from the earth in the orbit of a body about the earth See APSIS

Apollinaire, Guillaume (gēyōm' apōlēnār'), 1880–1918, French poet He was christened Wilhelm Apollinaris de Kostrowitzky Apollinaire was a leader in the restless period of technical innovation and experimentation in the arts during the early 20th cent Influenced by the symbolist poets of the previous generation, he developed a casual, lyrical poetic style characterized by a blend of modern and traditional images and verse techniques His best-known lyrical poems are collected in *Alcools* (1913) and *Calligrammes* (1918) A friend of many avant-garde artists, including Picasso and Braque, Apollinaire is credited with introducing CUBISM with his book *Les Peintres cubistes* (1913, tr *The Cubist Painters*, 1949) *Les Mamelles de Tiresias* (1918), his only play, was one of the earliest examples of SURREALISM See biographies by Francis Steegmuller (1963, repr 1971) and Margaret Davies (1964), studies by Scott Bates (1967) and L C Breunig (1969)

Apollinarianism (apōlīnār'ēnīzəm), heretical doctrine taught by Apollinaris or Apollinarius (c 315–c 390), bishop of Laodicea, near Antioch A celebrated scholar and teacher, author of scriptural commentary, philosophy, and controversial treatises, he propounded the theory that Christ possessed the LOGOS in place of a human mind, and hence, while perfectly divine, he was not fully human Apollinarianism was popular in spite of its repeated condemnation, particularly by the First Council of Constantinople It anticipated MONOPHYTISM

Apollinaris Sidonius (Caius Sollius Apollinaris Sidonius) (apōlīnār'is sīdō'nēās, sīdō'-), fl 455–75, Latin writer, b Lyons He had a minor role in imperial politics and was bishop of Clermont Although his panegyric poetry is of little consequence, his letters are an interesting historical source Canonized by the Roman Catholic Church, he is called St Sidonius

Apollo (apōl'ō), in Greek religion, one of the most important Olympian gods, concerned especially with prophecy, medicine, music and poetry, archery, and various bucolic arts, particularly the care of flocks and herds He was a moral god, frequently associated with the higher developments of civilization, such as law, philosophy, and the arts As patron of music and poetry he was often connected with the Muses Apollo may have been first worshipped by primitive shepherds as a god of pastures and flocks, but it was as a god of light, Phoebus or Phoebus

Apollo, that he was most widely known. After the 5th cent B.C. he was frequently identified with Helios, the sun god. Although Apollo was the father of Aristaeus, Asclepius, and, in some legends, Orpheus, his amorous affairs were not particularly successful. Daphne turned into a laurel rather than submit to him, and Marpessa refused him in favor of a mortal. The cult of Apollo was Panhellenic, and the prophecies of his oracles bore great authority. His chief oracular shrine was at Delphi, which he was said to have seized, while still an infant, by killing its guardian, the serpent Python. This event was celebrated every eight years in the festival of the *Stepheria*, in which a youth impersonating Apollo set fire to a hut (called the palace of Python) and then went into exile to Tempe, where he was purified of his deed. At Delphi, Apollo was primarily a god of purification. He had other notable shrines at Branchidae, Claros, Patara, and on the island of Delos, where, it was said, he and his twin sister, Artemis, were born to Leto and Zeus. In Roman religion, in which he was also known as Apollo, he was worshipped in various forms, most significantly as a god of healing and of prophecy. In art he was portrayed as the perfection of youth and beauty. The most celebrated statue of him is the *Apollo Belvedere*, a marble statue in the Belvedere of the Vatican, Rome; it is a Roman copy, dating from the early empire, of a Greek original in bronze. The right forearm and the left hand were restored by a pupil of Michelangelo. The statue represents the god as a vigorous and triumphant youth, naked except for the chlamys draped over his extended left arm.

Apollo Belvedere: see APOLLO, in Greek religion

Apollodorus (apōl'ōdōr'as), fl. 430–400 B.C., Athenian painter, called the Shadower, said to have introduced the use of light and shade to model form. Among his few known works are *Ajax Struck by Lightning* and *Priest in the Act of Devotion*, both were at Pergamum in the time of Pliny the Elder, none has survived.

Apollodorus (of Athens), fl. 2d cent. B.C., Greek grammarian and historian. He wrote many works on grammar, history, and mythology. His best-known books, only fragments of which survive, are *On the Gods*, a prose treatise, and *Chronicle*, a verse work treating Greek history from the fall of Troy. He may also have written the *Library*, a valuable work on Greek mythology that may be an abridgment of *On the Gods*.

Apollodorus of Damascus, Roman architect and engineer, fl. late 1st to early 2nd cent. A.D., b. Syria. Apollodorus was responsible for nearly all buildings designed under Trajan, for whom he was official architect. Known for his use of symmetry and axial organization, Apollodorus produced his greatest achievement in the Forum of Trajan (see FORUM) and Trajan's Column (see ROMAN ART), in which he expressed simple grandeur and preserved a marked Hellenic spirit. His treatise *Engines of War* survives.

Apollonia (āpālō'nēā) [Gr., = of Apollo], name of several ancient Greek towns. The most important was a port in Illyria on the Adriatic. It was founded by Corinthians and was later a Greek and a Roman intellectual center. Julius Caesar used it as a base. Octavian (later AUGUSTUS) received news of Julius Caesar's death while stationed at Apollonia. Among the other towns of this name, there was one in Thrace on the Aegean (a town famous for a large statue of Apollo), one in N. Sicily, and another in Chalcedice (Khalkidhiki), which was visited by Paul on his way to Salonicia (Acts 17:1).

Apollonius (āp'ālō'nēās) 1 Governor of Coele-Syria and Phoenicia for Seleucus IV. He oppressed the Jews and was killed by Judas Maccabaeus. 1 Mac 3:10–24, 2 Mac 4:4, 5:24. 2 Governor of Coele-Syria under Alexander Balas. 1 Mac 10:69.

Apollonius of Perga, fl. 247–205 B.C., Greek mathematician of the Alexandrian school. He produced a treatise on conic sections that included, as well as his own work, much of the work of his predecessors, among whom was Euclid. Apollonius introduced the terms *parabola*, *hyperbola*, and *ellipse*. In his works Greek mathematics reached its culmination.

Apollonius of Tralles: see FARNESE BULL

Apollonius Rhodius (rō'dēās), fl. 3d cent. B.C., epic poet of Alexandria and Rhodes. He became librarian at Alexandria. His extant work, the *Argonautica*, is a Homeric imitation in four books on the story of the Argonaut heroes. He and CALLIMACHUS carried on a famous literary quarrel.

Apollo (apōl'ōs), Alexandrian Jew who became a Christian missionary. Acts 18:24–19:1, 1 Cor 11:2, 3:4–6, 4:6.

Apollo space program: see SPACE EXPLORATION

Apollyon (apōl'yan), Greek name of the destroying angel. Rev 9:11. See SATAN, HELL.

apology [from Gr., = defense], literary work that defends, justifies, or clarifies an author's ideas or point of view. Unlike the ordinary use of the word, the literary use neither implies that wrong has been done nor expresses regret. The most famous ancient example, Plato's *Apology* (3d cent. B.C.), presents Socrates' defense of himself at his trial before the Athenian government. Sir Philip Sidney's *Apologie for Poetrie* and *Defense of Poesie* (both 1580), which examine the art of poetry and its condition in England, apparently were written to justify the poets' craft after it had been attacked by critics. A third famous example, Cardinal Newman's spiritual autobiography *Apologia pro Vita sua* (1864), was written to clarify the Cardinal's views after they had been misrepresented in an essay by Charles Kingsley.

apoplexy or stroke, destruction of brain tissue as a result of intracerebral hemorrhage, THROMBOSIS (clotting), or embolism (obstruction in a blood vessel caused by clotted blood or other foreign matter circulating in the blood stream). Cerebral hemorrhage or thrombosis usually occurs in elderly persons with constricted arteries (see ARTERIOSCLEROSIS) although either may also be caused by inflammatory or toxic damage to the cerebral blood vessels. Cerebral embolism may occur at any age, even in children. Symptoms of stroke develop suddenly. In cases of severe brain damage there may be deep coma, paralysis of one side of the body, and loss of speech, followed by death or by permanent neurological disturbances after recovery. If the brain damage sustained has been slight, there is usually complete recovery. When the stroke has been caused by thrombosis or by an EMBOLUS, anticoagulants are helpful in certain cases, sometimes surgical removal of the clot is possible.

apostle (apōs'al) [Gr., = envoy], one of the prime missionaries of Christianity. The apostles of the first rank are saints PETER, ANDREW, JAMES (the Greater), JOHN, THOMAS, JAMES (the Less), JUDE (or Thaddaeus), PHILIP, BARTHOLOMEW, MATTHEW, SIMON, and MATTHIAS (replacing JUDAS ISCARIOT). Traditionally the list of the Twelve Disciples includes Judas and not Matthias, and the list of the Twelve Apostles includes Matthias and not Judas. St. PAUL is always classed as an apostle, and so sometimes are a few others, such as St. BARNABAS. The principal missionary to any country is often called its apostle, e.g., St. Patrick is the apostle of Ireland, and St. Augustine of Canterbury the apostle of England. For the Apostles' Creed, see CREED, for the *Teaching of the Apostles*, see DIDACHE, for the earliest account of their activities, see ACTS OF THE APOSTLES. See E. J. Goodspeed, *The Twelve: The Story of Christ's Apostles* (1957, repr. 1962).

Apostle Islands, group of more than 20 wooded islands, in Lake Superior, off N. Wis. Madeline, 13 mi (21 km) long, is the largest island and has the group's only settlement, La Pointe. Noted for their wave-eroded cliffs and abundant wildlife, the islands are visited by tourists and hunters. The islands, along with an 11 mi (18 km) strip of the adjacent shoreline, make up Apostle Islands National Lakeshore (see NATIONAL PARKS AND MONUMENTS, table).

Apostolic Constitutions: see CONSTITUTIONS, APOSTOLIC

apostolic delegate: see LEGATE

apostolic succession, in Christian theology, the doctrine asserting that the chosen successors of the apostles enjoyed through God's grace the same authority, power, and responsibility as was conferred upon the apostles by Christ. Therefore present-day bishops, as the successors of previous bishops, going back to the apostles, have this power by virtue of this unbroken chain. For the Orthodox, Roman Catholic, and Anglican churches, this link with the apostles is what guarantees for them their authority in matters of faith, morals, and the valid administration of sacraments. Essential to maintaining the apostolic succession is the right consecration of bishops. Apostolic succession is to be distinguished from the Petrine supremacy (see PAPACY). Protestants (other than Anglicans) see the authority given to the apostles as unique, proper to them alone, and hence reject any doctrine of a succession of their power. The Protestant view of ecclesiastical authority differs accordingly. See ORDERS HOLY, CHURCH.

apostrophe: see PUNCTUATION, ABBREVIATION

apostrophe, figure of speech in which an absent person, a personified inanimate being, or an abstraction is addressed as though present. The term is derived from a Greek word meaning "a turning

away," and this sense is maintained when a narrative or dramatic thread is broken in order to digress by speaking directly to someone not there, e.g., "Envy, be silent and attend!"—Alexander Pope, "On a Certain Lady at Court."

apothecaries weight: see ENGLISH UNITS OF MEASUREMENT

apotheosis (apōth'ēō'sis), the act of raising a person who has died to the rank of a god. Historically, it was most important during the later Roman Empire. In an emperor's lifetime his genius was worshipped, but after he died he was often solemnly enrolled as one of the gods to be publicly adored. Apotheosis is closely related to ANCESTOR WORSHIP.

Appaim (āp'āim), Jerahmeelite. 1 Chron 2:30, 31.

Appalachia, region. See APPALACHIAN MOUNTAINS.

Appalachian Mountains (āpālā'chān, -chēān, -lāch'-), mountain system of E. North America, extending in a broad belt c. 1,600 mi (2,570 km) SW from the St. Lawrence valley in Quebec prov., Canada, to the Gulf coastal plain in Alabama. Main sections in the system are the White Mts., Green Mts., Taconic Mts., Catskill Mts., Allegheny Mts., Black Mts., Great Smoky Mts., the Blue Ridge, and the Cumberland Plateau. The Appalachian Mts., much-eroded remnants of a great mountain mass formed by folding (see MOUNTAINS), consist largely of sedimentary rocks. In general the eastern portions are more rugged than the western, which are mainly of horizontal rock structure. Mt. Mitchell (6,684 ft/2,037 m) in the Black Mts. is the highest peak. The Great Appalachian Valley is a chain of lowlands extending along most of the system's length, its main segments are the St. Lawrence Lowland, Lake Champlain Lowland, Lebanon Valley, Cumberland Valley, Shenandoah Valley, the Valley of Virginia, and the Valley of East Tennessee. The Great Valley has long been an important north-south highway and is one of the most fertile areas in the E. United States. The Appalachians themselves are rich in mineral resources, including coal, iron, petroleum, and natural gas. The scenic ranges also abound in resorts and recreation areas, Shenandoah and Great Smoky Mts. national parks are in the region, and the APPALACHIAN TRAIL winds 2,050 mi (3,299 km) along the Appalachian crest from Mt. Katahdin, Maine, to Springer Mt., Georgia. Crossed by few passes, the Appalachians, especially their central portion, were a barrier to early westward expansion and played an important role in U.S. history, major east-west routes followed river valleys and gaps (see CUMBERLAND GAP). See N. M. Fenneman, *Physiography of the Eastern United States* (1938), R. H. Brown, *Historical Geography of the United States* (1948), I. R. Ford, ed., *The Southern Appalachian Region* (1962), Eliot Porter, *Appalachian Wilderness* (1970), H. M. Caudill, *Night Comes to the Cumberlands* (1963) and *My Land is Dying* (1971).

Appalachian Trail, world's longest continuous hiking path, 2,050 mi (3,299 km) long, passing through 14 states, E. United States. Conceived in 1921 by Benton Mackaye, forester and regional planner, and completed in 1937, the trail extends along the ridges of the Appalachian Mts. from Mt. Katahdin, Maine, to Springer Mt., Ga. It passes through eight national forests and two national parks, but the greatest part of its length is on private property. Hiking and trail clubs maintain shelters and campsites along the path. The trail was designated a national scenic trail in 1968 (see NATIONAL PARKS AND MONUMENTS, table).

Appaloosa horse, breed of LIGHT HORSE developed in the United States by the Nez Perce Indians of Idaho from a horse that originated in Asia and was popular in Europe during the Middle Ages. Lewis and Clark found the breed in the possession of the Nez Perce in 1805. The Appaloosa is characterized by a spotted pattern of markings, it most commonly has solid-colored foreparts and small, dark, round or oval spots over the loin and hips. Famed for its intelligence, speed, stamina, and endurance, it is an outstanding stock and show horse of great popularity. It stands just over 14 hands (56 in./140 cm) and weighs about 1,100 lb (500 kg).

apparent magnitude: see MAGNITUDE

apparent solar time: see SOLAR TIME

apparition, spiritualistic manifestation of a person or object in which a form not actually present is seen with such intensity that belief in its reality is created. The ancient and widespread belief in apparitions and ghosts (specters of dead persons) is based on the idea that the spirit of a man, or of any object, is endowed with volition and motion of its own. Apparitions, especially particular shapes attached to certain legends or superstitions, are often

considered as premonitions or warnings. They may appear in any form and may manifest themselves to any or all the senses. The most evil apparitions are said to be those of persons who have died violent or unnatural deaths, those with guilty secrets, and those who were improperly buried. However, not all apparitions are believed to be dangerous, many, especially those associated with a particular religion, are thought to be signs of divine intervention. Summoning apparitions by means of incantations, crystal gazing, polished stones, hypnotic suggestion, and various other ways is one of the oldest practices of DIVINATION. See SPIRITISM. See also Andrew MacKenzie, *A Gallery of Ghosts* (1973).

appeal, in law, hearing by a superior court to consider correcting or reversing the judgment of an inferior court, because of errors allegedly committed by the inferior court. The party appealing the decision is known as the appellant, the party who has won the case in the lower court as the appellee. The term is also sometimes used to describe the review by a court of the action of a government board or administrative officer. Appellate procedure is set by statute. There are two types of errors, of fact and of law. An error of fact is drawing a false inference from evidence presented at the trial. An error of law is an erroneous determination of the legal rules governing PROCEDURE, EVIDENCE, or the matters at issue between the parties. Ordinarily, only errors of law may be reviewed in appeal. In an appeal from an action tried in EQUITY, however, the appellate court passes on the entire record, both as to facts and law. Should the appeals court conclude that no error was committed, it will affirm the decision of the lower court. If it finds that there was error, it may direct a retrial or grant a JUDGMENT or DECREE in favor of the party who lost in the lower court. The determinations of appeals courts are usually printed, often with an opinion indicating the basis for the court's decisions. Such opinions are of great utility in guiding the inferior courts and are often cited as precedents in future cases.

Appel, Karel (kă'ral ap'al), 1921–, Dutch painter. A member of CoBrA, the European group allied with ABSTRACT EXPRESSIONISM, Appel reacted against the austerity of earlier Dutch abstraction. Characterized by informal brush work, bright, bold color, and a slashing line, Appel's paintings often possess a childlike quality. Examples of his work are in the Boymans-Van Beuningen Museum, Rotterdam.

appendix, small, worm-shaped blind tube, about 3 in (7.6 cm) long and ¼ in to 1 in (6.4–2.54 cm) thick, projecting from the cecum (large intestine) on the right side of the lower abdominal cavity. The structure, also called the vermiform appendix, has no function in man and is considered a vestigial remnant of some previous organ or structure, having a digestive function, that became unnecessary to man in his evolutionary progress (see DIGESTIVE SYSTEM). Infection of accumulated and hardened waste matter in the appendix may give rise to appendicitis, the symptoms of which are severe pain in the abdomen, nausea, vomiting, fever, abdominal tenderness, and muscle spasm. A blood count usually shows a rise in the number of white corpuscles. Appendicitis may occur at any age, although it is more prevalent in persons under 40 years of age. The danger in appendicitis is that the appendix can rupture, either spontaneously or because the patient has in judiciously been given laxatives or an enema, and that the infection can spread to the peritoneum (see PERITONITIS). Surgery is indicated in appendicitis, preceded and followed by antibiotic therapy.

Appenzell (ä'pentsël), canton, NE Switzerland. A rural and sparsely populated region, it is mainly a meadowland dotted with small farms. Appenzell retains many ancient customs and has been famous for centuries as a textile and embroidery center. It was ruled after the 11th cent. by the abbots of St. Gall, against whom it revolted in 1403. In 1411, Appenzell allied itself with the Swiss Confederation, which had helped defeat the abbots. It became a Swiss canton in 1513, and in 1597 it was split into two independent half cantons: Ausser-Rhoden or Outer Rhodes (1970 pop. 49,023), 94 sq mi (243 sq km), with its capital at HERISAU, accepted the Reformation; Inner-Rhoden or Inner Rhodes (1970 pop. 13,124), 67 sq mi (174 sq km), with its capital at the town of Appenzell (1970 pop. 5,217), remained Catholic.

Appert, Nicolas (nêkôlâ' äpär'), also known as François Appert (frä'nswä'), 1750–1841, French originator of a method of CANNING. In 1795 the French government offered a prize of 12,000 francs for a method of preserving food, especially for use

by the army and navy. Appert, already an experienced chef, began to experiment in his workshop at Massy, near Paris, and in 1810 was awarded the prize for his method. The method, based on the idea that heat destroys or neutralizes the ferments that cause food spoilage, involved cooking foods in corked jars. Appert published several editions of his results (*The Art of Preserving*, tr. 1920) and with his prize money opened the first commercial cannery in the world.

Apphia (äf'ëä), Christian woman associated with Philemon. Philemon 2.

Appia, Adolphe (adôlf' äp'pyä), 1862–1928, Swiss theorist of modern stage lighting and decor. In interpreting Wagner's ideas in scenic designs for his operas, Appia rejected painted scenery for the three-dimensional set, he felt that shade was as necessary as light to link the actor to his setting in time and space. His use of light, through intensity, color, and mobility, to set the atmosphere and mood of a play created a new perspective in SCENE DESIGN AND STAGE LIGHTING. See his *Work of Living Art and Man Is the Measure of All Things*, in a single volume, ed. by Barnard Hewitt (tr. 1960), study by W. R. Volbach (1968).

Appian (äp'ëän), fl. 2d cent., Roman historian. He was a Greek, born in Alexandria. His history of the Roman conquests from the founding of Rome to the reign of Trajan is strongly biased in favor of Roman imperialism, but it reproduces many documents and sources that otherwise would have been lost. Of the 24 books, written in Greek, only Books VI–VII and Books XI–XVII have been fully preserved.

Appiani, Andrea (andrë'a äp-pyän'ë), 1754–1817, Italian neoclassical painter and Italian court painter of Napoleon I, active in Lombardy. His frescoes include work in churches and palaces of Milan. In his portraits his style anticipated the romantic approach. Portraits of Napoleon (1796, Bellagio) and Canova are among his oils.

Appian Way (äp'ëän), Lat. *Via Appia*, most famous of the ROMAN ROADS, built (312 B.C.) under Appius Claudius Caecus. It connected Rome with Capua and was later extended to Beneventum (now Benevento), Tarentum (Taranto), and Brundisium (Brindisi). It was the chief highway to Greece and the East. Its total length was more than 350 mi (563 km). The substantial construction of cemented stone blocks has preserved it to the present. Branch roads led to Neapolis (Naples), Barium (Bari), and other ports. On the first stretch of road out of Rome are interesting tombs and the Church of St. Sebastian with its catacombs. In 1784, Pope Pius VI built the new Appian Way from Rome to Albano, parallel with the old.

Appii forum (äp'ëi) [Lat. = Appius' market], important stop on the Appian Way, c. 40 mi (64 km) E of Rome. It was at the head of a canal through the Pontine Marshes. When Paul arrived here on his way to Rome, he was met by Christians from the city (Acts 28:15). The modern Italian successor is Foro Appio.

Appius Claudius: see CLAUDIUS, Roman gens.

apple, any tree (and its fruit) of the genus *Malus* of the family Rosaceae (ROSE family). Apples were formerly considered species of the pear genus *Pyrus*, with which they share the characteristic pome fruit. The common apple (*M. sylvestris*) is the best known and is commercially the most important temperate fruit. Apparently native to the Caucasus mts. of W Asia, it has been under cultivation since prehistoric times. According to ancient tradition the forbidden fruit of the Garden of Eden was the apple (Gen. 3). In religious painting, the apple represents the fruit of the tree of knowledge of good and evil, as do occasionally the pear and the quince. It was sacred to Aphrodite in classical mythology. The apple is now widely grown in thousands of varieties, e.g., the Golden Delicious, Winesap, Jonathan, and McIntosh. The tree is hardy in cold climates, and the firm fruit is easy to handle and store. Most apples are consumed fresh, but some are canned or used for juice. Apple juice (sweet cider) is partly fermented to produce hard cider and fully fermented to make vinegar. Wastes from fermenting processes are a major source of PECTIN. APPLEJACK is a liquor made from hard cider. Western Europe, especially France, is the chief apple-producing region, in North America, also with an enormous total output, Washington is the leading apple-growing state, but very many areas grow crops at least for local consumption. The tree is subject to several insect and fungus pests, for which the orchards are sprayed. The hardwood is used for cabinetmaking and fuel. The crab apples are wild North American and Asiatic species

of *Malus* now cultivated as ornamentals for their fragrant white to deep pink blossoms—e.g., the American sweet, or garland, crab apple (*M. coronaria*), the prairie crab apple (*M. ioensis*), and the Siberian crabapple (*M. baccata*). The small, hard, sour crabapple fruits are used for preserves, pickles, and jelly, in growth and culture these trees are similar to the common apple. Apples are classified in the division MAGNOLIOPHYTES, class Magnoliopsida, order Rosales, family Rosaceae.

Applegarth, Robert, 1834–1924, English trade union leader, a carpenter by trade. A charter member of the Amalgamated Society of Carpenters and Joiners, he became in 1862 its general secretary. Under his leadership the society, with other unions, pressed the fight for legalization of unions and for protection of their funds. The fight was successfully concluded in 1871. See biography by A. W. Humphrey (1913), John Bowditch and Clement Ramsland, *Voices of the Industrial Revolution* (1961).

Applegate, Jesse, 1811–88, American pioneer in Oregon, b. Kentucky. With his family he moved (1821) to Missouri, and there in 1843 he joined the "great emigration" of more than 900 people over the Oregon Trail—a trek pictured in his *Day with the Cow Column* in 1843 (ed. by Joseph Schafer, 1934, pub. with *Recollections of My Boyhood* by Applegate's nephew). A leader on the westward journey, he was elected (1845) a member of the legislative committee of the provisional government that ruled Oregon until it became (1849) a U.S. territory. Later he helped organize the new government and, as surveyor general, did much exploring and opened a wagon route to California.

applejack, brandy made by distilling hard cider or fermented apple pomace. Another method of making applejack, now rarely used, is to let fermented cider freeze and then to remove the ice. It was one of the most popular drinks among the early settlers of North America and remained so for a long time in rural areas.

apple maggot, larva of a FRUIT FLY, *Rhagoletis pomonella*.

apple of discord: see PARIS, in Greek mythology.

Applesseed, Johnny: see CHAPMAN, JOHN.

Appleton, Daniel, 1785–1849, American publisher, b. Haverhill, Mass. The owner of a general store in Boston, he moved to New York in 1826, where he established one of the largest publishing houses in the country. The firm was continued by his sons under the name D. Appleton & Company. It eventually was renamed Appleton-Century-Crofts, Inc.

Appleton, Sir Edward Victor, 1892–1965, English physicist, grad. St. John's College, Cambridge. After returning from active service in World War I he became assistant demonstrator in experimental physics at the Cavendish Laboratory in 1920. He was professor of physics at the Univ. of London (1924–36) and professor of natural philosophy at Cambridge Univ. (1936–39). From 1939 to 1949 he was secretary of the Dept. of Scientific and Industrial Research. Knighted in 1941, he received the 1947 Nobel Prize in Physics for his contributions to the knowledge of the ionosphere, which led to the development of radar. See study by R. W. Clark (1971).

Appleton, city (1970 pop. 57,143), seat of Outagamie co., E. Wis., on the Fox River near its exit from the northern end of Lake Winnebago, in a dairying and stockraising region, inc. 1857. Waterfalls provide power for the city's industries, which produce paper, wood, metal, concrete, knitted goods, and dairy products. Appleton had the nation's first hydroelectric plant (1882) and the state's first electric streetcar (1886). The city is the seat of Lawrence Univ. Harry Houdini was born there.

apple worm: see CODLING MOTH.

appliqué, see EMBROIDERY, NEEDLEWORK.

Appomattox (äpämät'äks), town (1970 pop. 1,400), seat of Appomattox co., central Va., inc. 1925. Confederate general Robert E. Lee surrendered to Union general Ulysses S. Grant at nearby Appomattox Courthouse on April 9, 1865. After Gen. Philip Sheridan's victory over the Confederates at Five Forks on April 1, Lee abandoned Petersburg and Richmond and retreated westward, planning to unite with the army of Gen. Joseph Johnston near Danville, Va. Grant pursued, pressing Lee's flank and rear, while Sheridan cut off further retreat at Appomattox Courthouse. Severed from supplies and surrounded by Union forces, Lee surrendered the remnants of the Army of Northern Virginia to Grant at the McLean House on April 9. The surrender marked the virtual end of the war, as the remaining Confederate armies, on hearing of Lee's act, followed suit. The

site of the surrender has been made a national historical park (see NATIONAL PARKS AND MONUMENTS, table)

Apponaug, RI see WARWICK

apprenticeship, system of learning a craft or trade from one who is engaged in it and of paying for the instruction by a given number of years of work. The practice was known in ancient Babylon, Egypt, Greece, and Rome, as well as in modern Europe and to some extent in the United States. Typically, in medieval Europe, a master craftsman agreed to instruct a young man, to give him shelter, food, and clothing, and to care for him during illness. The apprentice would bind himself to work for the master for a given time. After that specified time he would become a journeyman, working for a master for wages, or he might set up as a master himself. The medieval guilds supervised the relation of master and apprentice and decided the number of apprentices in a given guild. The Industrial Revolution, with its introduction of machinery, put an end to most of these guilds, but apprenticeship continues in highly skilled trades, at times competing with technical schools. The terms of apprenticeship are regulated by many trade unions, as well as by law. The apprenticeship programs in Europe today differ from those in Great Britain and the United States by providing training in areas other than the skilled crafts. In Great Britain apprenticeship programs sometimes include outside schooling at company expense. In the United States, Wisconsin in the early 1900s established a system of apprenticeships, it proved so successful that the U.S. Congress adopted a similar system in 1937. After a lapse in the 1950s, Congress passed (1962) the Manpower Development and Training Act to encourage apprenticeship programs. See Andrew Beveridge, *Apprenticeship Now* (1963), N. F. Duffy, ed., *Essays on Apprenticeship* (1967).

appropriation, in constitutional law, allotment by a legislature of money for a particular purpose. In the United States, for example, the Constitution provides that no money may be drawn from the Treasury except under appropriations made by law and that no appropriations shall be made for more than two years. In the United States a general appropriation bill is passed at the beginning of each session of Congress. In England, at the end of sessions of Parliament. See also BUDGET.

APRA (a'pra), or the *Alianza Popular Revolucionaria Americana*, also called the *Partido Aprista*, reformist political party in Peru. Founded (1924) by Victor Raul Haya de la Torre while in exile, the party's Peruvian activities were led by Jose Carlos Mariategui until Haya de la Torre's return to Peru in 1931. The party's program advocates social reform, particularly the emancipation of the Indian, the betterment of agrarian conditions, and the socialization of some industries. Originally committed to revolutionary change, the party gradually assumed a less radical stance, so that by the late 1960s it was a moderately reformist group, rather than a revolutionary organization. Characterized as rabble rousers and implicated in acts of political terror, the Apristas were outlawed from 1931 to 1945. During the early part of that period the Apristas engaged in continual gun battles with the military, thus creating an enduring enmity between the two groups. In 1945 the party was legalized, and it joined in a coalition government under Jose Luis Bustamante. In 1948, following an abortive revolt of dissident Apristas in the port city of Callao and with the country on the verge of civil war, a military junta headed by General Manuel Odría took power, and the party was again outlawed. Gradually becoming less radical, the APRA party was again legalized (1956) when Manuel Prado, a conservative, was elected president with its support. In the 1962 presidential election, Haya de la Torre won a slight plurality, but the military, remembering its earlier feuds with the party and still distrustful of it, immediately seized the government. Civilian rule was restored in the next year, and the Apristas were allowed to function freely. However, the military coup of 1968 led to the outlawing of all political activity, including that of the Apristas. Since the coup, Aprista groups are allowed to meet as social clubs, but they are not permitted to engage in any political organizing. The party continues to enjoy widespread popularity throughout Peru.

Apra Harbor (a'pra) or **Port Apra**, port on the west coast of the island of GUAM, W Pacific, in the MARIANAS ISLANDS. The only good harbor on the island, it is a port of entry closed to foreign vessels except by permit. There is a large U.S. naval base used for maintenance of the Seventh Fleet and Polaris submarines.

Apraksin, Feodor Matveyevich (fyó'dər mätvyä'vich aprak'syín), 1671-1728, Russian admiral. He helped Peter I (Peter the Great) create the Russian navy and won several naval battles in Peter's wars against Sweden. He was made a count in 1709.

apricot [Arabic from Lat., =early ripe], tree, *Prunus armeniaca*, and its fruit, of the plum genus of the family Rosaceae (ROSE family), native to temperate Asia and long cultivated in Armenia. The fruit is used raw, canned, preserved, and dried. California is the chief place of cultivation in the United States, although by selecting suitable varieties the apricot can be grown in most regions where the peach is hardy. Apricots are used in the making of a cordial and also for apricot brandy. Apricots are classified in the division MAGNOLIOPHYTA, class Magnoliopsida, order Rosales, family Rosaceae.

Apries (ä'prē-ē), king of ancient Egypt (588-569 B.C.), of the XXVI dynasty, successor of Psamtik II. Apries sought to recover Syria and Palestine. He attacked Tyre and Sidon but failed (586 B.C.) to relieve the siege of Jerusalem by NEBUCHADNEZZAR. A revolt in Egypt caused him to seek assistance from AMASIS II, who assassinated him and seized the throne. Apries is called Pharaoh-hophra in the Bible (Jer 44:30).

April see MONTH

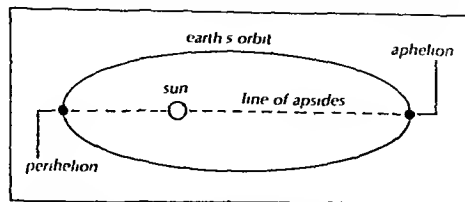
April Fool's Day or **All Fool's Day**, holiday of uncertain origin, consecrated to practical joking and celebrated on the first of April. Prior to the adoption of the Gregorian calendar in 1564, the date was observed as New Year's Day by cultures as varied as the Roman and the Hindu. The holiday is considered to be related to the festival of the vernal equinox, which occurs on March 21. The English gave April Fool's Day its first widespread celebration during the 18th cent.

apse, the termination at the sanctuary end of a church, generally semicircular in plan but sometimes square or polygonal. The apse appeared early in Roman temples and basilicas; it was originally a semicircular recess with a half dome as ceiling and contained the monumental statue of the deity. The motif was adopted in the early Christian churches, in these the apse occupied the eastern end of the building where the altar, the bishop's throne, and the seats of the clergy were placed. A fine example of this early form is in the cathedral of Torcello near Venice. Because of its location and function in the church services, the apse became the architectural climax of the church interior and was richly ornamented. In the early churches, the half-dome ceiling was incrustured with handsome mosaics, the walls were veneered with fine marbles, and the altar and pulpits were also richly decorated. As the apse steadily increased in liturgical and architectural emphasis, chapels were added to it. In English Gothic architecture the apse was in most cases a square termination, and in Italy its form remained a simple semicircle, as the chapels were in another part of the church. In France the entire choir—composed of apse, ambulatory, and radiating chapels (the whole termed a *chevet*)—attained, in the 12th and 13th cent., its great splendor.

Apscheron (əpshēr'ŋ), peninsula, c 40 mi (60 km) long, extending into the Caspian Sea, E Azerbaijan, SW USSR. It is a dry, hilly area at the eastern end of the Greater Caucasus mts and is underlain by rich oil-bearing rock strata. The oil industry developed there in the 1870s, although the presence of oil was known long before. The peninsula, with its Baku oil fields, was once the USSR's chief oil-producing region but now accounts for a small portion of Soviet production. Natural gas wells, salt lakes, mineral springs, and mud volcanoes are also found on Apscheron. BAKU is the region's chief city, and the peninsula falls within the boundaries of Greater Baku.

apsides (äp'sidēz) see APSIS

apsis (pl apsides), point in the ORBIT of a body where the body is neither approaching nor receding from another body about which it revolves. Any el-



Apsis points, or apsides, in the earth's orbit. At perihelion the earth is closest to the sun and at aphelion it is farthest from the sun.

liptical orbit has two apsides. At the perigee the moon or other satellite is as close as it ever gets to the earth, and it begins to move away, at the apogee it is as far away as it gets, and it begins to move closer. Similarly, in the orbit of the earth or another planet around the sun, the perihelion is the point of closest approach and the aphelion is the point of farthest recession. In the orbit of the stars in a BINARY STAR system, the periastron is the point of closest approach and the apastron the point of farthest recession. A line connecting the two apsidal points of an elliptical orbit (e.g., the aphelion and perihelion) is called the line of apsides; it is the major axis of the ellipse. This line may precess because of gravitational influences of other bodies or relativistic effects.

apteryx (äp'tariks) see KIWI

Apuleius, Lucius (ä'pyölē'əs), fl. 2d cent., Latin writer, b. Hippo (now 80ne, Algeria). His romance *The Golden Ass* or *Metamorphoses* is the only Latin novel to survive in entirety. It tells the story of Lucius of Corinth, who is transformed into an ass by a Thessalian woman and undergoes a series of strange and exciting adventures before he is restored to human form. *The Golden Ass* has been tremendously popular, influencing strongly the history of the novel, e.g., the works of Boccaccio, Cervantes, Fielding, and Smollett. Other works by Apuleius include *The Apology* or *On Magic*, his defense in a suit brought by his wife's family for gaining her affections by magic, *Florida*, an anthology from his own works, and *On the God of Socrates*, *On the Philosophy of Plato*, and *On the World*, philosophical treatises. See study by H. E. Butler and A. S. Owen (1914).

Apulia (əpyō'lēə), Ital. *Puglia*, region (1971 pop. 3,562,377), 7,469 sq mi (19,345 sq km), S Italy, bordering on the Adriatic Sea in the east and the Strait of Otranto and Gulf of Taranto in the south. Its southern portion, a peninsula, forms the heel of the Italian "boot." BARI is the capital of the region, which is divided into Bari, Brindisi, Foggia, Lecce, and Taranto provs. (named for their capitals). Apulia is mostly a plain, its low coast, however, is broken by the mountainous Gargano Peninsula in the north, and there are mountains in the north central part of the region. Farming is the chief occupation, but industry is expanding. Farm products include olives, grapes, cereals, almonds, figs, tobacco, and livestock (sheep, pigs, cattle, and goats). Manufactures include refined petroleum, chemicals, plastics, fertilizer, and wine. There are saltworks in the north and bauxite mines in the south. Fishing is pursued in the Adriatic and in the Gulf of Taranto. The scarcity of water has long been an acute problem in Apulia, and it is necessary to carry drinking water by aqueduct across the Apennines from the Sele River in Campania. In ancient times only the northern part of the region was called Apulia; the southern peninsula was known as Calabria, a name later used to designate the toe of the Italian boot. The region was settled by several Italic peoples and by Greek colonists before it was conquered (4th cent. B.C.) by Rome. After the fall of Rome, Apulia was held successively by the Goths, the Lombards, and the Byzantines. In the 11th cent. it was conquered by the Normans, ROBERT GUISCARD set up the duchy of Apulia in 1059. After the Norman conquest of Sicily (late 11th cent.), Palermo replaced MELFI (just west of present-day Apulia) as the center of Norman power, and Apulia became a mere province, first of the kingdom of Sicily, then of the kingdom of Naples. From the late 12th to early 13th cent. Apulia was a favorite residence of the Hohenstaufen emperors, notably Frederick II. The coast later was occupied at times by the Turks and by the Venetians. In 1861 the region joined Italy. The feudal system long prevailed in the rural areas of Apulia, social and agrarian reforms proceeded slowly from the 19th cent. and accelerated in the mid-20th cent. The characteristic Apulian architecture of the 11th-13th cent. reflects Greek, Arabic, Norman, and Pisan influences. There are universities at Bari and Lecce.

Apure (əpō'rā), river, c 500 mi (800 km) long, rising in the Andes, N Colombia, and flowing E across W central Venezuela to the Orinoco River. It drains much of the western portion of the Orinoco basin and is navigable by river steamers for c 400 mi (640 km) during the rainy season. There is extensive livestock ranching along the Apure. The Portuguesa River is the chief tributary.

Apurimac (əpōrē'mak), river, c 550 mi (885 km) long, rising in the Andes, S Peru. It flows generally northwest in a narrow valley to join the Urubamba River and form the Ucayali, which is one of the main headstreams of the Amazon.

Aqaba (a'kaba), town (1964 est. pop. 10,000), SW Jordan, at the head of the Gulf of Aqaba, on the border with Israel. It is the only Jordanian port with direct access to the Red Sea. Phosphates are the chief export. Aqaba is also a popular winter seaside resort. Since at least 1000 B.C., a port has existed continuously on the site to handle trade between Palestine and Syria. Aqaba stands on or near the biblical Elath (Elat). The Roman military post of Aelana later occupied the site. A great road built under Emperor Trajan linked the area with Damascus and Egypt. Occupied and fortified by the Crusaders in 1115, Aqaba was retaken by SALADIN in 1187. During the 19th cent. the town became a staging point on the pilgrim route to Mecca. T. E. Lawrence (Lawrence of Arabia) captured Aqaba for the Allies in World War I; it later became part of the Hejaz but was ceded to Trans-Jordan in 1924. The town's name is sometimes spelled Akaba.

Aqaba, Gulf of, northern arm of the Red Sea, 118 mi (190 km) long and 10 mi (16.1 km) wide, between the Sinai and Arabian peninsulas, a part of the Great Rift Valley. The gulf, which is entered through the Straits of Tiran, has played a major role in the tensions between Israel and the Arab states (Egypt, Jordan, Saudi Arabia) bordering it. Aqaba, with the Israeli port of Elat at its head, has been Israel's only direct access to E. Africa, Asia, and Australia since it was barred by Egypt from using the Suez Canal. The Gulf of Aqaba was blockaded by the Arabs from 1949 to 1956 and again in 1967, although it was declared (1958) an international waterway by the United Nations. In the wake of the 1967 Arab-Israeli war, Israel occupied strategic points along the Straits of Tiran to insure open passage of its shipping.

Aqsu see A-K'O-SU, China

aquaculture see HYDROPONICS

aqua fortis (ak'wā fōr'tīs) see NITRIC ACID

aquamarine (āk'wəmə'rēn') [Lat., = sea water], transparent BERYL with a blue or bluish-green color. Sources of the gems include Brazil, Siberia, Burma, the Malagasy Republic, and parts of the United States. Oriental aquamarine is a transparent crystalline corundum with a bluish tinge. The emerald is similar in composition, differing only in color.

aqua regia (rē'jēa) [Lat., = royal water], corrosive, fuming yellow liquid prepared by mixing one volume of concentrated nitric acid with three to four volumes of concentrated hydrochloric acid. It was so named by the alchemists because it dissolves gold and platinum, the "royal" metals, which do not dissolve in nitric or hydrochloric acid alone. Its fumes and yellow color are caused by reaction of nitric acid, HNO₃, with hydrogen chloride, HCl, to form nitrosyl chloride, NOCl, chlorine, Cl₂, and water, both chlorine and nitrosyl chloride are yellow-colored and volatile. The nitrosyl chloride further decomposes to nitric oxide, NO, and chlorine. Nitric acid is a powerful oxidizing agent (see OXIDATION AND REDUCTION), but the CHEMICAL EQUILIBRIUM for its reaction with gold, Au, only permits formation of a tiny amount of Au³⁺ ion, so the amount of gold dissolved in pure nitric acid is undetectable. The presence of chloride ion, Cl⁻, allows formation of the stable chloraurate COMPLEX ION, AuCl₄⁻. Because of the high concentration of chloride ion in aqua regia, the Au³⁺ is reacted almost as soon as it is formed, keeping its concentration low, this allows oxidation of more Au to Au³⁺, and the gold is dissolved. The gold may also react directly with the free chlorine in aqua regia, since chlorine is a powerful oxidizing agent.

aquarelle (āk'wārēl') see WATERCOLOR PAINTING

Aquarids see METEOR SHOWER

aquarium, name for any supervised exhibit of aquatic animals and plants. Aquariums are known to have been constructed in ancient Rome, Egypt, and the Orient. Goldfish have been bred in China for several hundred years and are still the most commonly kept fish in home aquariums, although tropical toy fish, such as guppies, have become increasingly popular. Large public aquariums have been made possible by the development of glass exhibit tanks, capable of holding over 100,000 gal (378,500 liters) of water. The first aquarium known to have been constructed with glass is in Regent's Park, London (1853). The maintenance of an aquarium of any size requires the careful regulation of water flow, temperature, light, food, and oxygen, removal of injurious debris, and attention to the special requirements of the individual species kept. Green aquatic plants are often used in aquariums since, through the process of photosynthesis, they utilize waste carbon dioxide from the animals' respiration and in turn provide oxygen. An aquarium in which the dis-

solved gases are kept at the proper concentrations by the physiological activities of the plants and animals is called a balanced aquarium. Certain mollusks, such as snails and mussels, are useful as scavengers, as are some species of fish. Large freshwater and saltwater aquariums are often maintained for research and breeding purposes by universities, marine stations, and wildlife commissions, e.g., those in Naples, Italy, Monaco, Plymouth, England, La Jolla, Calif., and Woods Hole, Mass. There are also many aquariums throughout the world for public exhibition. Among those in the United States are the Fish and Wildlife Service Aquariums at Washington, D.C., and Woods Hole, Mass., the John G. Shedd Aquarium at Chicago, Marine Studios, Inc., at Marineland, Fla., the New York Aquarium at Brooklyn, Scripps Institute of Oceanography at La Jolla, Calif., the Steinhart Aquarium at San Francisco, and the Waikiki Aquarium at Honolulu. See H. R. Axelrod, *Tropical Fish as a Hobby* (rev. ed. 1972), Arne Schiøtz, *A Guide to Aquarium Fishes and Plants* (tr. 1972).

Aquarius (āk'wār'ēəs) [Lat., = water carrier], large CONSTELLATION located on the ECLIPTIC (the sun's apparent path through the heavens) between Capricornus and Pisces; it is one of the constellations of the ZODIAC. Aquarius is sometimes represented as a man pouring water from a jar. Although it contains no stars of first or second magnitude, it does contain a recurrent nova observed in 1907 and again in 1962. Aquarius reaches its highest point in the evening sky in October.

aquatint (a'kwā'tīnt'), ETCHING technique. The plate is covered with a porous ground, or resist, through which acid bites many tiny pockmarks in the metal. The tones produced resemble those of a wash drawing. The technique is said to have been invented in the 1760s by J. B. Le Prince (1734-84). It is often used in combination with other types of etching. Goya's series of mixed aquatint etchings, *Los Caprichos*, *Desastres de la Guerra*, *Tauromaquia*, and *Proverbios*, are considered the supreme examples of this technique. See B. F. Morrow, *The Art of Aquatint* (1935), J. R. Abbey, *Life in England in Aquatint and Lithography, 1770-1860* (1953).

Aquaviva, Claudio (klou'dyō akwāvē'va), 1543-1615, Italian Jesuit. He was (1581-1615) fifth general of the Society of Jesus and composed the *Ratio*, the basis of Jesuit education.

aqueduct (āk'wədūkt) [Lat., = conveyor of water], channel or trough built to convey water, chiefly for providing a densely populated region with a supply of fresh water. The flow in aqueducts is ordinarily by means of gravity, although pumps are often used. Some aqueducts consist of tunnels cut through rock, while others are conduits made of some sturdy material. For example, the conduit may consist of steel pipe, concrete, wooden staves, sheet-metal flume, or any of these in combination, the flow being controlled by slide gate and needle valves. Aqueducts enable many cities in the United States to obtain water from a considerable distance. Los Angeles, for example, draws much of its water from the Owens River by means of an aqueduct more than 230 mi (370 km) long. Most of the supply for New York City is conducted through the Catskill Aqueduct and the CROTON AQUEDUCT. The topography of the land influences the design of the aqueduct, usually part of the structure is above ground and part below. Where feasible, an aqueduct may generate hydroelectric power as a byproduct of its operation. Typical of such use is the aqueduct system for Springfield, Mass., which generates power at the foot of Cobble Mt. in addition to supplying the city with water. Aqueducts were employed from early times, probably first in Mesopotamia. Their construction reached a peak of skill in Roman times in those around Rome and in Gaul, Spain, and other parts of the empire. Portions of some of the original Roman aqueducts are still standing.

Aquidneck, R.I. see RHODE ISLAND, island

aquifer (āk'wīfər) see ARTESIAN WELL

Aquila (āk'wīlə, ākwīl'ə), Christian of Jewish origin from Pontus who lived at Rome. He and his wife, Prisca or Priscilla, were friendly to Paul. Acts 18:2,18,26, Rom 16:3, 1 Cor 16:19.

Aquila [Lat., = the eagle], equatorial CONSTELLATION located N. of Sagittarius and Capricornus, lying partly in the Milky Way. It is sometimes depicted as an eagle. It contains the bright star ALTAIR (Alpha Aquilae) and the pulsating variable star Eta Aquilae. The brightest nova ever seen occurred in Aquila in 1918. Other novas were observed in Aquila in 389 and 1899, two were observed there in 1936. Aquila reaches its highest point in the evening sky in late August.

Aquila Ponticus (pōn'tīkəs), 2d cent., Jewish translator of the Old Testament from Hebrew into Greek. The characteristic feature of Aquila's version was its extremely literal rendering of the Hebrew. It was much used by Jews, even in the synagogues. No complete specimen exists. Aquila is said to have been a convert from Christianity and a disciple of Akiba ben Joseph.

Aquilegia: see COLUMBINE

Aquileia (akwēlē'ya), town (1971 pop. 1,938), in Friuli-Venezia Giulia, NE Italy, near the Adriatic Sea. Founded in 181 B.C. by the Romans, it was a stronghold against the barbarians and a trade center. Later, the town was destroyed several times by invaders, notably by Attila (A.D. 452). In the 6th cent. Aquileia became the see of a patriarch. Fleeing the Lombards in 568, the patriarch took refuge in Grado, the island port of Aquileia, and remained there while Aquileia elected its own patriarch. The pope recognized (7th cent.) both patriarchates, in 1445 that of Grado was transferred to Venice. From the 11th cent. Aquileia flourished under the temporal rule of its patriarchs, who acquired Friuli, Carniola, and Istria. Decline began in the 14th cent., and in 1420 Venice occupied Aquileia and Friuli. Aquileia was under Austrian rule from 1509 to 1918, when it passed to Italy. The patriarchate was abolished in 1751. Of particular note in the town is the Romanesque basilica (11th cent., partly restored in the 14th cent.), with an interesting and well-preserved mosaic floor and with frescoes of the 12th and 13th cent. There are also Roman ruins and an archaeological museum. Grado, now joined to the mainland by a bridge, is a popular beach resort as well as a port.

Aquinas, Saint Thomas see THOMAS AQUINAS, SAINT

Aquitaine (āk'wītān, akētēn'), Lat. *Aquitania*, former duchy and kingdom in SW France. Julius Caesar conquered the Aquitani, an Iberian people of SW Gaul, in 56 B.C. The province that he created occupied the territory between the Garonne River and the Pyrenees, under Roman rule it was extended northward and eastward almost as far as the Loire River. It had been thoroughly Romanized when it was occupied (5th cent.) by the VISIGOTHS, and the persistence of Latin culture made it a rich but indigestible addition to the Frankish realm after the defeat (507) of the Visigoths by the Frankish ruler Clovis I. In the chaotic strife among Clovis's successors, much of Aquitaine escaped Frankish control. After the separation of GASCONY from Aquitaine (7th cent.), the area N. of the Garonne was considered Aquitaine proper. From 670, Aquitaine was ruled by semi-independent native dukes, but an Arab invasion (718) forced the Aquitanian duke Eudes to seek the protection of the Frankish ruler Charles Martel, who defeated (732) the Arabs. In 781, CHARLEMAGNE, who subdued the native nobles, made Aquitaine into a kingdom for his son Louis (later emperor of the West LOUIS I). After the death (838) of Louis's son Pepin I, Louis added Aquitaine to the West Frankish kingdom of Neustria (France) and granted it to his youngest son Charles the Bald (CHARLES II, emperor of the West). A group of Aquitanian nobles made Pepin's young son, Pepin II, king, and a struggle for control ensued between Charles and the Aquitanians (840-52, 862-65). Charles was the eventual victor. During this period Aquitaine was subject to attacks by both Normans and Muslims. The repeated invasions, combined with the civil wars, weakened Carolingian control over Aquitaine, despite Charles the Bald's victory over Pepin II. Charles's successors were forced to recognize the hereditary rights of a number of independent noble families, and during the 10th cent. royal influence virtually disappeared. After 973 the counts of Poitou bore the title of duke of Aquitaine, their control beyond Poitou, however, was not realized for many years. In the 11th cent. the dukes of Aquitaine expanded at the expense of their weaker neighbors, establishing themselves over all Aquitaine and Gascony. The new duchy of Aquitaine was one of the most powerful states in western Europe. The marriage (1137) of ELEANOR OF AQUITAINE to the French king Louis VII joined Aquitaine to France. Eleanor's subsequent marriage to Henry II, duke of Normandy, who became king of England in 1154, initiated a long struggle between France and England for possession of Aquitaine. Henry and his successors held Aquitaine in vassalage from the kings of France. Over the years, however, France regained various parts of Aquitaine from England, and in the HUNDRED YEARS WAR France recovered all of Aquitaine. After its recovery, Aquitaine was constituted as the French province of Guienne, a name that had been used interchangeably with Aquitaine for many years.

Ar (ar), city of Moab, probably one of the important centers E of the Dead Sea. The Greeks called it Areopolis, and later it was called Rabbath Moab. Num 21:15,28, Deut 2:9,18,29, Isa 15:1. It is the namesake city of Num 22:36, Deut 2:36, and Joshua 13:9.

Ar, chemical symbol of the element ARGON.

Ara (ā'ra), Asherite. 1 Chron 7:38.

Arab (ā'rāb), hill town of S Palestine, near Hebron. Joshua 15:52.

Arabah or **Araba** (both ā'rāba, ā'rāba), depression, on the Israel-Jordan border, extending c 100 mi (160 km) from the Dead Sea S to the Gulf of Aqaba, part of the Great Rift Valley complex. Limestone, salt, and potash are mined near the Dead Sea. In the Old Testament, Arabah is variously called a wilderness, a plain, and a desert.

arabesque (ārabēsk') [Fr, = Arabian], in art, term applied to any complex, linear decoration based on flowing lines. In Moorish art it was often exploited to cover entire surfaces. The arabesque in modern usage derives from a Renaissance design which was Greco-Roman in inspiration.

Arabia, peninsula (1970 est. pop. 17,000,000), c 1,000,000 sq mi (2,590,000 sq km), SW Asia, called Arabistan in Persian. It is bordered on the W by the Gulf of Aqaba and the Red Sea, on the S by the Gulf of Aden and the Arabian Sea, on the E by the Gulf of Oman and the Persian Gulf, and on the N by Iraq and Jordan. Politically, Arabia consists of Saudi Arabia (the largest and most populous state), Yemen, Southern Yemen (People's Democratic Republic of Yemen), Oman, the United Arab Emirates, Qatar, Bahrain, Kuwait, and several neutral zones. Arabia is mainly a great plateau of ancient crystalline rock, covered with limestone and sandstone. It rises steeply from the narrow Red Sea coastal plain, achieving its greatest height (c 12,000 ft/3,700 m) in SW Arabia, and slopes gently E to the Persian Gulf, the Oman Mts, SE Arabia, rise to c 10,000 ft (3,000 m). The coastal mountains catch what little moisture is carried by the dry winds that cross Arabia, making the interior so arid (4 in/10 cm annual precipitation) that there is not a single perennial stream and large areas lack water. The basin-shaped interior consists of alternating steppe and desert landscape, the Nafud desert in the north is connected with the great Rub al Khali in the south (one of the world's largest sand deserts) by the Dahna, a narrow sand corridor. There is extensive and varied agriculture (coffee, grains, fruits) only in SW Arabia, particularly Yemen [Arabia Felix, = fortunate Arabia], where high coastal mountains intercept the moist southwest monsoon winds during the summer. The northeast coast of Oman has a climate similar to that of Yemen, but in most of Arabia rainfall is cyclonic and occurs only in winter. The coastal lands, however, are much more humid than the interior, fog and dew are common. Except for the inland cities of Riyadh and Hail, in Saudi Arabia, most of Arabia's large urban centers are on or near the coast. Principal cities are Jidda, Mecca, and Medina (Saudi Arabia), Sana (Yemen), Aden and Mukalla (Southern Yemen), Abu Dhabi (United Arab Emirates), Muscat (Oman), Al Manamah (Bahrain), and Kuwait city (Kuwait). Because of their dependence on isolated sources of water, about four fifths of the Arabian population is sedentary, concentrated around oases, notably in the Nejd (central Arabia) and the Hejaz (along the northeast coast of the Red Sea). Agriculture is the main occupation, with dates, grains, and fruits the chief crops. Pastoral nomads raise goats and sheep. Until the mid-20th cent., when oil was discovered in E Arabia, the peninsula's main exports were hides, wool, coffee, spices, and the famed, highly bred Arabian horses. With the exception of Aden, Arabia did not have a good port until after World War II, when modern port facilities were constructed, especially along the Persian Gulf. Arabia has an estimated one third of the earth's petroleum reserves, Kuwait and Saudi Arabia are among the world's leading producers. Europe is the principal customer of Arabian petroleum, consuming more than 50% of the output, the Far East (especially Japan), the United States, and Canada are also large consumers. Until the early 1970s, firms from the United States, Britain, and, to a lesser extent, Japan had a monopoly on drilling concessions. However, the Arabian nations now have much greater control over oil exploration and production and receive far higher payments. Modern technology and the huge wealth generated by oil resources have profoundly altered traditional life in Arabia. Flourishing private enterprise, new transportation links rapidly growing cities, and rising education and living standards now characterize much of the peninsula. Archaeological evidence points to very

early trade between Yemen and the NE African coast. From time to time ancient peoples of Arabian origin invaded and settled the inviting regions of the E Mediterranean basin, possibly they included the HYKSOS, conquerors of Egypt (18th cent. B.C.), and the Israelites who seized Palestine. However, little is definitely known of Arabian history in the period preceding the oldest inscriptions discovered—those dating from c 1000 B.C. In ancient times much of SW Arabia was divided among the domains of Ma'in, SHEBA, and Himyarite. Political unity in Sheba seems to have been hastened by Darius's conquest of N Arabia. No ancient power ever attempted the complete conquest of Arabia, because of the formidable obstacles of crossing the deserts. Rome invaded (24 B.C.) N Arabia but soon withdrew, although for a long period it held N Hejaz. Ethiopia, during its great expansion under the Aksumite kings (see AKSUM), twice (A.D. 300-378 and 525-70) held Yemen and the HADHRAMAUT. In 570, the Sassanids of Persia drove out the Ethiopians and established a short-lived hegemony over the peninsula. Arabia was briefly unified after the founding of ISLAM by MUHAMMAD, the prophet of Mecca, in the 7th cent. His dynamic faith, furthered by his successors, reconciled the warring Arab tribes and soon sent them out on a career of conquest. They subjugated N Africa and SW Asia and gained control of Spain and S France until they were stopped in the west by the Frankish ruler CHARLES MARTEL in 732 and in the east by the Byzantine Empire c 750. However, the tremendous territorial expansion of Islam deprived the religion of its exclusively Arabic character, and the need for a more convenient administrative center led to the transfer of the seat of the CALIPHATE from Medina to Damascus. Arabia was again left without political cohesion, and independent emirates arose in Yemen, Oman, and elsewhere. In the 10th cent. a semblance of unity was imposed by the KARMATHIANS, a Muslim sect, but in the 11th cent. anarchic conditions again prevailed. After the discovery of the route to India around the Cape of Good Hope in 1498, European powers were attracted to Arabia as a site for trading bases. The Portuguese seized Oman in 1508 but were driven out in 1659 by the Ottoman Empire, which attempted, but never with complete success, to control all Arabia. Great Britain established a physical presence in Arabia in 1799 by occupying Perim Island in the Bab el Mandeb, and in 1839 the Ottoman Empire lost Aden to the British. In 1853, Britain and the E Arabian sheikhs signed the Perpetual Maritime Truce by which the Arabs agreed not to harass British shipping in the Arabian Sea and recognized Britain as the dominant foreign power in the Persian Gulf. The truce confirmed the temporary truces of 1820 and 1835, the sheikhdoms were thus called the Trucial States. Arab nationalist opposition to the Ottoman Turks was aroused in the mid-19th cent. by a rekindling of the WAHABI, a reform movement within Islam, it waned toward the end of the century. Just before World War I, IBN SAUD revived the Wahabi, and during the war he signed a military pact with Britain against the Turks. His strongest rival, HUSAYN IBN ALI of the influential Hashemite family, led a successful revolt against the Turks in the Hejaz and set up an independent state there. After the war, however, the Saud family prevailed in a violent struggle against Husayn and other Arab families and founded (1925) Saudi Arabia, which absorbed the state in the Hejaz. Between the World Wars, Britain was the dominant foreign power in Arabia, holding protectorates over the Arab sheikhdoms. The post-World War II era witnessed a gradual decline of Britain's presence, culminating in the withdrawal of British military forces E of Suez in the late 1960s. Both the United States and the USSR sought to fill the vacuum created by Britain's withdrawal from the oil-rich, strategically important peninsula, but in the early 1970s the Arab nations were asserting their independence with growing success. The countries were only peripherally involved in the Arab-Israeli Wars. See D. G. Hogarth, *Arabia* (1922), T. E. Lawrence, *Revolt in the Desert* (1927), C. M. Doughty, *Travels in Arabia Deserta* (new ed. 1936, repr. 1968), Richard H. Sanger, *The Arabian Peninsula* (1954, repr. 1970), Philip K. Hitti, *History of the Arabs* (10th ed. 1970), William B. Fisher, *The Middle East: A Physical, Social and Regional Geography* (6th ed. 1970).

Arabian art and architecture: see ISLAMIC ART AND ARCHITECTURE.

Arabian Desert or **Eastern Desert**, c 86,000 sq mi (222,740 sq km), E Egypt, bordered by the Nile valley in the west and the Red Sea and the Gulf of Suez in the east. It extends along most of Egypt's eastern

border and merges into the Nubian Desert in the south. The Arabian Desert is sparsely populated, most of its inhabitants are based around wells and springs. Since ancient times Egypt has used the porphyry, granite, and sandstone found in the desert mountains as building materials. Oil is produced in the north. The name Arabian Desert is also commonly applied to the desert of the Arabian Peninsula.

Arabian Gulf: see PERSIAN GULF.

Arabian horse, breed of LIGHT HORSE developed in Mesopotamia and N Africa, and probably the first true domesticated breed. Prized since earliest times for its superior beauty, spirit, speed, grace of movement, stamina, and intelligence, the Arabian has served as parental stock for such light-weight horses as the AMERICAN SADDLE HORSE, QUARTER HORSE, STANDARD BRED HORSE, and the THOROUGHBRED. Inter-crossings of these and other light and DRAFT HORSE breeds with Arabians is still common. The Arabian's most characteristic color is bay with white markings, grays, chestnuts, and browns are also common. It averages 14 to 15 hands (56-60 in./140-150 cm) high and weighs about 1,000 lb (450 kg).

Arabian music, the music of all the Islamic peoples in Arabia, N Africa, and Persia. Little is known of Arabian music before the Hegira (A.D. 622), but afterwards under the Omayyad caliphs (661-750) a consolidation of Persian and Syrian elements with the native musical style took place in Arabia. Ibn Misjah (d. c. 715) devised a system of modal theory that lasted throughout the golden age under the first Abbasid caliphs (750-847). In the 9th cent. at Baghdad many treatises on music theory and history were written by such men as the philosopher Al-Kindi (9th cent.) and the illustrious Al-Farabi (c. 870-c. 950), who wrote the most important treatise on music up to his time. In the 11th cent. under the last Abbasid caliphs a strong Turkistan influence was brought into Arabian music by the Seljuks, and a gradual decay began in the Arabian art. With the destruction of Baghdad in 1258 came the end of specifically Arabian musical culture, and only a few late examples of this music are extant. The style was preserved in Egypt and Syria because the Arabic language was spoken there, but it had lost its vitality, and even this vestige died when the Ottoman Turks overran Egypt in 1517. The chief characteristics of Arabian music are modal homophony, florid ornamentation, and modal rhythm. The melodic modal system of Ibn Misjah contained, in its final form, eight modes. This system lasted until the 11th cent., when the modes were increased to 12, which were called *maqamat* by the 13th cent. Until this time the Arabian gamut had consisted of 12 tones roughly equal to the chromatic scale of Western music. But in the 13th cent. five more tones were added, each a quarter tone below each diatonic whole tone, i.e., below d, e, g, a, b. A new tuning of the gamut was adopted in the 16th cent., and not only the tones but also the nature of the *maqamat* were changed. Instead of scales within which melodies were composed, they became melodic formulas to be used in composition, a system much like the ragas of HINDU MUSIC. Ornamentation in Arabian music consisted of shakes and trills, grace notes, appoggiaturas, and the *tarkib*, which was the simultaneous striking of certain notes with their fourth, fifth, or octave. The rhythmic modes were primarily the vocal meters of poetry until the development of instrumental music in the 10th cent. In vocal music often a short melody is repeated for each stanza or verse, each repetition being elaborately ornamented. The principal form of Arabian music is the *nauba*, a "suite" of vocal pieces with instrumental preludes, probably originated at the Abbasid court. The principal Arabian instruments, other than those borrowed from older Semitic cultures, were the short-necked lute called *ud*, from which the European lute derived its form and name, and the long-necked lute called *tanbur*. The introduction of the lute into Europe by the Moors in Spain is a certainty, the extent to which Arabian music has exerted greater influence on the West is still a matter of controversy. See H. G. Farmer, *A History of Arabian Music to the 13th Century* (1929) and *Historical Facts for the Arabian Musical Influence* (1930).

Arabian Nights: see THOUSAND AND ONE NIGHTS.

Arabian Sea, ancient *Mare Erythraeum*, northwest part of the Indian Ocean, lying between Arabia and India. The Gulf of Aden, extended by the Red Sea, and the Gulf of Oman, extended by the Persian Gulf, are its principal arms. The submarine Carlsberg ridge, SE of Socotra Island, is the sea's southern boundary. The Indus River is the largest stream flowing into the sea. The Arabian Sea has long been an

important trade route between India and the West, its chief ports are Aden, People's Republic of Yemen, Karachi, Pakistan, and Bombay, India

Arabic languages, members of the South Semitic group of the Semitic subdivision of the Hamito-Semitic family of languages (see HAMITO-SEMITIC LANGUAGES). The Arabic languages comprise North Arabic (or simply Arabic), which represents the Southwest branch of the South Semitic tongues, and South Arabic (or Himyaritic), which belongs to the Southeast branch of the South Semitic group. South Arabic differs sufficiently from North Arabic to be considered a separate language. North Arabic, or Arabic, was confined largely to the Arabian peninsula until the 7th cent. A.D. Thereafter the spread of Islam took the Arabic language into the Fertile Crescent and across North Africa. Today Arabic is spoken throughout the Arabian peninsula and also in Iraq, Syria, Jordan, Lebanon, Israel, Morocco, Tunisia, Algeria, Libya, Egypt, Sudan, Mauritania, Chad, and Malta. The official language of 17 countries in Africa and Asia and co-official in two other states (Israel and Malta), it is the mother tongue of approximately 100 million people in these two continents. In addition, Arabic reaches the peoples of all countries professing the Muslim religion, for it is the sacred language of Islam and its holy book, the Koran. Thus, Arabic can be considered the most important living Semitic tongue. A great literature has been written in Arabic as well. The Arabic of the Koran and of subsequent Arabic literature is called classical or literary Arabic. It is uniform and standardized. Classical Arabic is still employed today as the written language, but it is restricted to formal usage as a spoken tongue. It differs considerably from its descendant, the modern colloquial Arabic that is the medium of general conversation. Modern colloquial Arabic has three principal groups of dialects: Eastern, Western, and Southern, but the language is becoming standardized owing to the influence of the mass media. Grammatically, Arabic has that distinctive feature of Semitic languages, the tri-consonantal root consisting of three consonants separated by two vowels. The basic meaning of the root is furnished by the consonants and is altered by changes in, or omission of, the vowels and by the addition of various affixes. Gender is found in the Arabic verb, as well as in the noun, pronoun, and adjective. The modern Arabic dialects have considerably simplified classical Arabic, as by discarding the declension of the noun and other inflections. Arabic has its own alphabet, which is composed of 28 consonants. Most of the characters have four different forms, one for beginning a word, another for ending a word, still another for a medial position, and a fourth for a letter used by itself. Vowels are shown by symbols above or below the consonants, but they are optional and are often not written. The direction of writing is from right to left. The Arabic alphabet evolved from the Nabataean script, which is a descendant of the Aramaic writing (see ARAMAIC). There are two major styles of the Arabic script, the angular Kufic (well-suited for decorative uses) and the cursive Nashkī. Arabic writing is also the basis of a number of scripts used by non-Arab peoples following the Muslim religion and has been adapted for the Persian, Pushtu, Urdu, Malay, Hausa, and Swahili languages, among others. South Arabic in ancient times was the language of people living in the southern Arabian peninsula. It had several known dialects and is closely related to the ETHIOPIAN of Ethiopia. Ancient South Arabic had its own South Semitic alphabet, the origin of which is still not clear, although it is generally thought to have had the same source as the North Semitic writing. Surviving inscriptions in ancient South Arabic date from the 8th cent. B.C. or earlier. The coming of Islam in the 7th cent. A.D. brought with it North Arabic, which displaced the ancient South Arabic. Modern South Arabic, which has several dialects, is spoken by about 50,000 people in the southern Arabian peninsula. Its ancestor is probably ancient South Arabic, although not all linguists agree. For grammars see G. W. Thatcher (4th ed. 1942), F. J. Ziadeh and B. W. Winder (1957), and C. P. Caspari (3d ed. 1967), A. G. Cheyne, *The Arabic Language, Its Role in History* (1969).

Arabic literature. Numerous peoples have shared in forming the great body of Arabic literature, they include Turks, Persians, Syrians, Egyptians, Indians, Africans, Jews, and Asians, in addition to the Arabs themselves. The first significant Arabic literature was produced during the medieval golden age of lyric poetry, from the 4th to the 7th cent. The poems are strongly personal qasida, or odes, often very short,

some longer than 100 lines. They treat the life of the tribe and themes of love, fighting, courage, and the chase. The poet speaks directly, not romantically, of nature and the power of God. The qasida survive only through collections, chiefly the MUALLAQAT, HAMASA, MUFADDAIYAT, and KITAB AL-AGHANI. The most esteemed of the poets are AMRU AL-KAIS, ANTARA, and ZUHAIR. The Prophet Muhammad was not interested in poetry, so Arabic poetry fell into a decline from which it recovered only in far different form. The KORAN supplanted poetry by becoming the chief object of study of the Muslim world. Poetry regained some prestige under the Umayyads, when al-Akhtal (c. 640–c. 710) and al-Farazdaq (c. 640–732) wrote their lyric works. The next great period of Arabic literature was a result of the rise of the new Arabic-Persian culture of Baghdad under the Abbasids in the 8th and 9th cent. Philosophy, mathematics, law, Koranic interpretation and criticism, history, and science were cultivated, and to this period is owed the collections of early Arabic poetry. During the 7th and part of the 8th cent., Arabic poetry had become entirely artificial, refined, and nearly totally inaccessible to the average reader without a scholarly background. At the end of the 8th cent. in Baghdad a group of young poets arose who established a new court poetry. Two of these were ABU AL-ATAHIYA and ABU NUWAS. Typical of the time is the precise, formal, yet exaggerated work of Mutanabbi (murdered in 965). Among the most popular of Arabic poets, he is considered one of the greatest masters of poetic technique. The poet HARRIRI (11th cent.) sought to combine "refinement with dignity of style, and brilliancies with jewels of eloquence." ABU AL-ALA MAARRI (d. 1057) was an outstanding Syrian poet of great originality. The greatest mystic poet of the age was Omar Ibn al-Faridh (1181–1235). The influence of India and Persia is seen in Arabic prose romance, which had become the principal literary form. The greatest collection is the THOUSAND AND ONE NIGHTS. The major writers of historical and geographical works in Arabic include BUKHARI, AL-TABARI, MASUDI, IBN KHALDUN, Ibn al-Athir (d. 1234), and IBN BATUTA. The foremost Arab philosopher was AL-GAZEL AVICENNA, the great physician, wrote on medicine. In the field of belles lettres, essays and epistles of great wit and erudition known as risalas were composed on subjects as diverse as science, mysticism, and politics. Chief practitioners of the genre include Ibn al-Muqaffa (d. 757), the unsurpassed al-Jahiz (d. c. 869), and Ibn Qutayba (d. 889). The Western center of Arabian culture was Spain, especially Cordoba under the Umayyads. The Spanish Arabs produced fine poets and scholars, but they are dwarfed by the great philosophers—AVEMPACE, AVERROES, and IBN TUFAYL. Their works became known in Europe chiefly through the Latin translations of Jewish scholars. Since 1200 in Spain and 1300 in the East, there has been little Arabic literature of wide interest. After 1870, with the growth of Western influence on the East, a vernacular literature arose in Syria and in Egypt, which aimed to rouse Arabic national consciousness in literature either by a return to classical models or by an imitation of Western forms. While there has been a reaction to Western models in modern Arabic literature, the novel and the drama, forms never before used, have developed. Notable 20th-century writers in Arabic include the novelist Najib Maftuz, the playwrights Ahmad Shawqi and Tawfiq al-Hakim, the poets Hafiz Ibrahim, Badr Shakir as-Sayyab, and Nazik al-Malaikah, and the short-story writer Mahmud Tiyum. See H. A. Gibb, *Arabic Literature, an Introduction* (2d ed. 1963), A. J. Arberry, *Modern Arabic Poetry* (1950, repr. 1967), R. A. Nicholson, *A Literary History of the Arabs* (2d ed. 1969), J. A. Haywood, *Modern Arabic Literature, 1800–1970* (1972).

Arab-Israeli Wars, conflicts in 1948–49, 1956, 1967, and 1973–74 between Israel and the Arab states. Tensions between Israel and the Arabs have been complicated and heightened by the political, strategic, and economic interests in the area of the great powers. Although Israel's independence on May 14, 1948, triggered the first full-scale war, armed conflicts between Jews and Arabs had been frequent since Great Britain received the League of Nations mandate for PALESTINE in 1920. From 1945 to 1948 Zionists waged guerrilla war against British troops and against Palestinian Arabs supported by the ARAB LEAGUE, and they had made substantial gains by 1948. The 1948–49 War reflected the opposition of the Arab states to the formation of the Jewish state of Israel in what they considered to be Arab territory. As independence was declared, Arab forces from Egypt, Syria, Transjordan (later Jordan), Lebanon, and Iraq invaded Israel. The Egyptians gained

some territory in the south and the Jordanians took Jerusalem's Old City, but other Arab forces were soon halted. In June the United Nations succeeded in establishing a four-week truce. This was followed in July by significant Israeli advances before another truce. Fighting erupted again in August and continued sporadically until the end of 1948. An Israeli advance in Jan., 1949, isolated Egyptian forces and led to a cease-fire (Jan. 7, 1949). Protracted peace talks resulted in armistice agreements between Israel and Egypt, Syria, and Jordan by July, but no formal peace. In addition, about 400,000 Palestinian Arabs had fled from Israel and were settled in refugee camps near Israel's border, their status became a volatile factor in Arab-Israeli relations. From 1949 to 1956 the armed truce between Israel and the Arabs, enforced in part by the UN forces, was punctuated by raids and reprisals. Among the world powers, the United States, Great Britain, and France sided with Israel, while the Soviet Union supported Arab demands. Tensions mounted during 1956 as Israel became convinced that the Arabs were preparing for war. The nationalization of the Suez Canal by Egypt's Gamal Abdal NASSER in July, 1956, resulted in the further alienation of Great Britain and France, which made new agreements with Israel. On Oct. 29, 1956, Israeli forces, directed by Moshe DAYAN, launched a combined air and ground assault into Egypt's Sinai peninsula. Early Israeli successes were reinforced by an Anglo-French invasion along the canal. Although the action against Egypt was severely condemned by the nations of the world, the cease-fire of November 6, which was promoted by the United Nations with US and Soviet support, came only after Israel had captured several key objectives, including the Gaza strip and Sharm el Sheikh, which commanded the approaches to the Gulf of Aqaba. Israel withdrew from these positions in 1957, turning them over to the UN emergency force after access to the Gulf of Aqaba, without which Israel was cut off from the Indian Ocean, had been guaranteed. After a period of relative calm, border incidents between Israel and Syria, Egypt, and Jordan increased during the early 1960's, with Palestinian guerrilla groups actively supported by Syria. In May, 1967, President Nasser, his prestige much eroded through his inaction in the face of Israeli raids, requested the withdrawal of UN forces from Egyptian territory, mobilized units in the Sinai, and closed the Gulf of Aqaba to Israel. Israel (which had no UN forces stationed on its territory) responded by mobilizing, and escalation of threats and provocations continued until June 5, 1967, when Israel launched a massive air assault that crippled Arab air capability. With air superiority protecting its ground forces, Israel controlled the Sinai peninsula within three days and then concentrated on the Jordanian frontier, capturing Jerusalem's Old City (subsequently annexed), and on the Syrian border, gaining a hold on the strategic Golan Heights. The war, which ended on June 10, is known as the Six-Day War. The Suez Canal was closed by the war, and Israel declared that it would not give up Jerusalem and that it would hold the remaining captured territories until significant progress had been made in Arab-Israeli relations. The end of active fighting was followed by frequent artillery duels along the frontiers and by clashes between Israelis and Palestinian guerrillas. During 1973 the Arab states, believing that their complaints against Israel were going unheeded (despite the mounting use by the Arabs of threats to cut off oil supplies in an attempt to soften the U.S. pro-Israel stance), quietly prepared for war, led by Egypt's President Anwar SADAT. On Oct. 6, 1973, on the Jewish holiday Yom Kippur, a two-pronged assault on Israel was launched. Egyptian forces struck eastward across the Suez Canal and pushed the Israelis back, while the Syrians advanced from the north. Iraqi forces joined the war and, in addition, Syria received some support from Jordan, Libya, and the smaller Arab states. The attacks caught Israel off guard, and it was several days before the country was fully mobilized. Israel then forced the Syrians and Egyptians back and, in the last hours of the war, established a salient on the west bank of the Suez Canal, but these advances were only achieved with a high cost in men and equipment. Through US and Soviet diplomatic pressures and the efforts of the United Nations, a tenuous cease-fire was implemented by October 25. Israel and Egypt signed a cease-fire agreement in November, but Israeli-Syrian fighting continued until a cease-fire was negotiated in 1974. Largely as a result of the diplomatic efforts of U.S. Secretary of State Henry KISSINGER, Israel was prevailed upon to withdraw from the west bank of the canal and to

withdraw a further several miles on the east bank (which it had previously controlled) behind a UN-supervised cease-fire zone. On the Syrian front too, territorial gains made in the war were given up. These setbacks, which were attributed largely to Israel's unpreparedness, led to a crisis of leadership that resulted in the retirement in 1974 of Prime Minister Golda MEIR and removal of Dayan as chief of the army. The Arab states had strengthened their political position and gained in military confidence, for the first time they had successfully combined economics with politics, using a petroleum embargo to influence world opinion. After the war Egyptian and Syrian diplomatic relations with the United States, broken since the 1967 war, were resumed, and clearance of the Suez Canal began. The 1973-74 War brought about a major shift of power in the Middle East, but it still failed to resolve the basic problems confronting the area. See Roderick MacLeish, *The Sun Stood Still* (1967), S. L. A. Marshall et al., ed., *Swift Sword* (1967), F. J. Khouri, *The Arab-Israeli Dilemma* (1968), W. Z. Laqueur, *The Road to Jerusalem* (1968), Ibrahim Abu-Lughod, ed., *The Arab-Israeli Confrontation of June 1967: An Arab Perspective* (1970), Dan Kurzman, *Genesis 1948: The First Arab-Israeli War* (1970), S. L. A. Marshall, *Sinai Victory* (rev. ed. 1971), Edgar O'Ballance, *The Sinai Campaign of 1956* (1960) and *The Third Arab-Israeli War* (1972), D. A. Schmidt, *Armageddon in the Middle East* (1974).

Arabistan: see ARABIA

Arab League, popular name for the League of Arab States, formed in 1945, in an attempt to give political expression to the Arab nations. The original charter members were Egypt, Syria, Lebanon, Trans-Jordan (later Jordan), Iraq, Saudi Arabia, and Yemen. A representative of Palestinian Arabs, although he did not sign the charter because he represented no recognized government, was given full status and a vote in the Arab League. Members later joining the league included Algeria, Bahrain, Kuwait, Libya, Morocco, Oman, Qatar, the Sudan, Tunisia, the Union of Arab Emirates, and the Yemen Arab Republic. The league is organized into a council, special committees, and a permanent secretariat, the secretariat has headquarters in Cairo. The constitution of the league provided for coordination among the signatory nations on education, finance, law, trade, and foreign policy, and it forbade the use of force to settle disputes among members. In 1945 the league supported Syria and Lebanon in their disputes with France and also demanded an independent Libya. The league early announced opposition to the formation of a Jewish state in Palestine and demanded that Palestine as a whole be made independent, with the majority of its population Arab. When the state of ISRAEL was created in 1948 the league countries jointly attacked it, but Israel resisted successfully. The league continued to maintain a boycott of Israel and of companies trading with Israel. Throughout the history of the league, closer political unity has been hampered by a division between pro-Western member countries and neutralist or pro-Soviet ones. On occasion, the league unites, e.g., in 1950 members signed a joint defense treaty, and in 1961 they supported Tunisia in a conflict with France. Typically, however, it is divided. The summit conferences of 1964-65 failed to establish a joint Arab command, and the league has been highly criticized by Arab leaders for failing to redress grievances arising from the Arab-Israeli War of 1967. Among the most important activities of the Arab League have been its attempts to coordinate Arab economic life, efforts toward this aim include the Arab Telecommunications Union (1953), the organization of the Arab Postal Union (1954), and the Arab Development Bank (1959, later known as the Arab Financial Organization). The Arab Common Market was established in 1965 and is open to all Arab League members, by 1973, Iraq, Jordan, Syria, and Egypt had joined. The common market agreement provides for the eventual abolition of custom duties on natural resources and agricultural products, free movement of capital and labor between member countries, and coordination of economic development.

Arabs, name originally applied to the Semitic peoples of the Arabian Peninsula. It now refers to those persons whose primary language is Arabic. They constitute most of the population of Algeria, Bahrain, Egypt, Iraq, Jordan, Kuwait, Lebanon, Libya, Morocco, Oman, Qatar, Saudi Arabia, Sudan, Syria, Tunisia, the United Arab Emirates, the People's Democratic Republic of Yemen, and Yemen. Arab communities are also found elsewhere in the world.

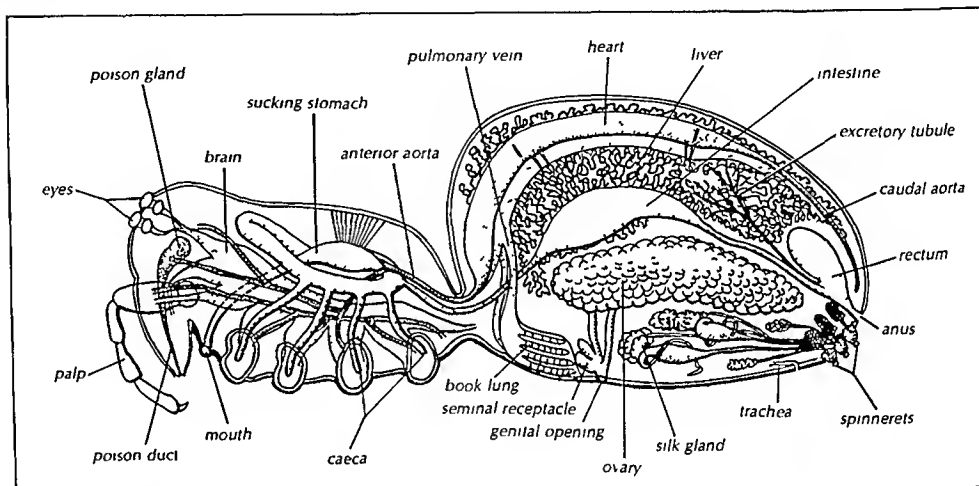
The term does not usually include Arabic-speaking Jews (found chiefly in North Africa and formerly also in Yemen and Iraq), Kurds, Berbers, Copts, and Druses, but it does include Arabic-speaking Christians (chiefly found in Syria, Lebanon, Israel, and Jordan). Socially, the Arabs are divided into two groups: the settled Arab (*fellahin*=villagers, or *hadar*=townspeople) and the nomadic *BEDOUIN*. The derivation of the term Arab is unclear, and the meaning of the word has changed several times through history. Some Arab scholars have equated Joktan (Gen. 10:25) with the ancient Arab patriarch Qahtan whose tribe is thought to have originated in S Arabia. The Assyrian inscriptions (9th cent. B.C.) referred to nomadic peoples inhabiting the far north of the Arabian peninsula, the sedentary population in the south of the peninsula was not called Arab. In classical times the term was extended to the whole of the Arabian peninsula and to all the desert areas of the Middle East, and in the Middle Ages the Arabs came to be called *SARACENS*. It was the Muslims from Arabia, nomads and settled people alike, whose invasions in the 6th and 7th cent. widely diffused both the Arabic language and ISLAM. They founded a vast empire, which at its height stretched from the Atlantic Ocean on the west, across North

state of Israel, created out of former Arab territory, hostility between them has resulted in four Arab-Israeli wars. See J. B. Glubb, *A Short History of the Arab Peoples* (1969), P. K. Hitti, *History of the Arabs* (10th ed. 1970), Majid Khadduri, *Political Trends in the Arab World* (1972), Menahem Mansoor, *Political and Diplomatic History of the Arab World, 1900-67* (7 vol., 1972), Z. N. Zeine, *The Emergence of Arab Nationalism* (3d ed. 1973), W. F. Abboushi, *The Angry Arabs* (1974).

Aracaju (a'ra-kazhō'), city (1970 pop. 183,333), capital of Sergipe state, E central Brazil, a port on the Sergipe River near the Atlantic Ocean. Mainly a commercial center, the city has cotton-spinning and weaving industries. Aracaju was founded in 1855, when it replaced São Cristovão as state capital.

Arachne (arāk'nē), in Greek mythology, woman of Lydia who challenged Athena to a trial of skill in weaving. Angered at such presumption, the goddess destroyed Arachne's work, whereupon the woman hanged herself. Athena then turned her into a spider.

arachnid (arāk'nīd), mainly terrestrial arthropod of the class Arachnida, including the SPIDER, SCORPION, MITE and tick, DADDY LONGLEGS, and a few minor groups. The body is divided into a cephalothorax



Internal anatomy of a spider, representative of the class Arachnida

Africa and the Middle East, to central Asia on the east. The Arabs became the rulers of many different peoples, and gradually a great Arab civilization was built up. Although many of its cultural leaders were not ethnically Arabs (some were not even Muslims, but Christians and Jews), the civilization reflected Arab values, tastes, and traditions. Education flourished in the Islamic lands, and literature, philosophy, medicine, mathematics, and science were particularly developed by the Arabs. At the same time in all the provinces of the huge empire, except in Persia, Arabic became the chief spoken language. The waves of Arab conquest across the East and into Europe widened the scope of their civilization and contributed greatly to world development. In Europe they were particularly important in Sicily, which they held from the 9th to the late 11th cent., and the civilization of the MOORS in Spain was part of the great Arabic pattern. Christian scholars in those two lands gained much from Islamic knowledge, and scholasticism and the beginnings of modern Western science were derived in part from the Arabs. The emergence of the Seljuk Turks in the 11th cent. and of the Ottoman Turks in the 13th cent. ended the specifically Arab dominance in Islam, though Muslim culture still remained on the old Arab foundations. In the 20th cent., Arab leaders have attempted to form an Arab nation, which would unite the whole Arabic-speaking world from Morocco on the west, across the Middle East, to the borders of Iran and Turkey. Since 1945 most of the Arab nations have combined to form the ARAB LEAGUE, its purpose being to consider matters of common interest, such as policy regarding Israel and colonialism. With 18 member states in the Arab League by the early 1970s (over 120 million people), attempts to forge a unity among the Arabs have continued. Perhaps the most significant economic factor for the Arabs has been the discovery and development of the petroleum industry, two thirds of the world's oil reserves are thought to be in the Middle East. Since World War II a continual problem for the Arab states has been their relations with the Jewish

with six pairs of appendages, and an abdomen. The first two pairs of appendages are used to kill and crush prey (most arachnids being carnivorous), the remaining four pairs are walking legs. Arachnids have simple eyes and no antennae but are equipped with sensory bristles. Some respire with air tubes, but most possess primitive respiratory organs called BOOK LUNGS. Arachnids are classified in the phylum ARTHROPODA, class Arachnida.

Arad (ārād) 1 Benjaminite 1 Chron. 8:15, 2 Royal town in the Negev, the modern Tell Arad (Israel), 5 of Hebron. Joshua 12:14, Judges 1:16. The "king Arad" of Num. 21:1 and 33:40 is a mistranslation for "king of Arad." It is the only tell (mound) in the Negev and indicates the existence of a fortified town in the Bronze Age.

Arad (arad'), city (1969 est. pop. 115,000), W Rumania, in the Banat, on the Mureșul River, near the Hungarian border. It is an important railroad junction and a leading regional commercial and industrial center. Distilling, sawmilling, and the manufacture of textiles, machine tools, locomotives, electrical goods, and leather products are the chief industries. Long (c. 1551-1685) under Turkish rule, Arad passed in 1685 to the Austrians and in 1849 to the Hungarians, who made it the headquarters of their insurrection against the Hapsburg Empire. In 1920, Arad became part of Rumania. The city's educational and cultural institutions include a theological seminary, a teacher training school, a state theatre, a philharmonic orchestra, and a museum containing exhibits on the Hungarian revolution of 1848-49. The 18th-century citadel was built by Empress Maria Theresa. Arad has sizable Hungarian, Serbian, and German minorities.

Aradus (ārādas), islet and town of ancient Phoenicia, the modern Arwad, N of Tripoli off the Syrian coast. It was the most northerly of the important Phoenician centers. In the Old Testament it is Arvad (Gen. 10:18, 1 Chron. 1:16, Ezek. 27:8, 11, 1 Mac. 15:23).

Arafat, Yasir (yasēr' ar'afat), 1929-, leader of the Palestine Liberation Organization (PLO), the coordi-

nating body for anti-Israeli Arab commando groups, and head of Al Fatah, the largest group in the PLO. He was born in Jerusalem. After smuggling arms to Arab forces during the 1948 Arab-Israeli war, Arafat entered Cairo University, where he became chairman of the Palestine Student Federation. He served in the Egyptian Army during the Suez campaign (1956) and the following year moved to Kuwait, where he trained Palestinian commandos and edited *Our Palestine*, an anti-Zionist magazine. Sometime during that period, he joined the Al Fatah commando group, and in 1965, Arafat returned to Egypt to head Al Assifa, the military arm of Al Fatah. He went on to become leader of Al Fatah, and when the group gained control of the PLO (1969), Arafat was named the larger body's chairman. At the 1974 Arab summit conference the Arab leaders unanimously endorsed Arafat as the "sole legitimate" spokesman for the Palestinians.

Arafat (ārāfāt') or **Arafa** (arafa'), granite hill, Saudi Arabia, near Mecca. The hill was an ancient pagan sanctuary and is shrouded in many legends. It is now a site for prayers during the annual pilgrimage to Mecca. Atop the hill is a minaret, reached by broad stone steps. On the 60th step is a platform with a pulpit from which the *khuṭba* (pilgrimage address) is delivered on the Day of Arafa. The hill is also called Jabal ar Rahm [Arabic, =mountain of mercy].

Arafura Sea (arāfūrā'), shallow part of the Pacific Ocean, between the Timor and Coral seas, separating Australia from New Guinea. It contains several islands of Indonesia. The Torres Strait to the east is a treacherous passage. See CARPENTARIA, GULF OF.

Aragats, Mount (ārāgāt's, Rus. arāgāt's') or **Mount Alagez** (alāgyōs'), extinct volcano, 13,435 ft (4,095 m) high, N Armenia, S European USSR, in the Lesser Caucasus. It is the highest peak in Armenia.

Arago, Dominique François (dōmēnēk' fraŋswā' arāgō'), 1786-1853, French physicist and astronomer. He is noted for his discoveries in magnetism and optics as well as for his astronomical observations. Arago was an ardent supporter of the wave theory of light. In 1811 he invented the polariscope and later developed a polarimeter. His collected works (1854-62) include his well-known *Astronomie populaire* (4 vol.).

Aragon, Louis (lūwē arāgōn'), 1897-, French writer. Aragon is considered one of the founders of SURREALISM in literature and a major spokesman for Communism in the West. After a trip to the USSR in 1931, Aragon abandoned surrealism for Marxism. He was a leader of the Resistance during World War II, and he edited the radical Paris daily *Ce Soir* and later the Communist weekly *Les Lettres françaises*. Aragon's early works include the volume of poems *Feu de joie* (1920) and the surrealist novel *Le Paysan de Paris* (1926, tr. *Nightwalker*, 1970). His cycle of social novels concerning political responsibility are translated as *The Bells of Basel* (1934, tr. 1941), *Residential Quarter* (1936, tr. 1938), *The Century Was Young* (1941, tr. 1941), and *Aurelien* (1945, tr. 1947). *Les Communistes*, the first of his five-volume cycle of realistic novels, appeared in 1949. His later works include a novel about Napoleon, *Holy Week* (1958, tr. 1961), a history of the USSR from 1917 to 1960, *Histoire parallèle* (1962, tr. 1964), the novel *La Mise à mort* (1965), and a two-volume memoir of Matisse (1972). His major works of poetry include *Le Creve-cœur* (1941), war poems, the series of love poems to his wife, the novelist TRIOLET, *Les Yeux d'Elsa* (1954), *Elsa* (1959), and *Le Fou d'Elsa* (1963), and *Les Chambres* (1969). See *Louis Aragon, Poet of the French Resistance* (ed. by Hannah Josephson and Malcolm Cowley, 1945), study by L. F. Becker (1971).

Aragón (ārāgōn, Span. arāgōn'), region (1971 pop. 1,152,708), 18,382 sq mi (47,609 sq km), and former kingdom, NE Spain, bordered on the N by France. Comprising the provinces of Huesca, Teruel, and Zaragoza (Saragossa), Aragón includes the southern slopes of the Pyrenees, where the mountains reach their greatest height, a central plain drained by the Ebro River, and the western fringe of the central plateau of Spain. Much of the region is sparsely populated and desertlike. Irrigation works, started by the Moors, were resumed in the 16th cent., the two lateral canals of the Ebro are the most important. In the oases and irrigated areas cereals, grapes, olives, and sugar beets are grown. Sheep are raised throughout Aragón, and cattle in the Pyrenees. There are iron, sulfur, and lignite deposits, but sugar refining is the only important industry. The Aragonese, mostly poor and deeply religious, have remained secluded in their small towns, jealously preserving the ancient traditions of a region inhabited since prehistoric times. The city of ZARAGOZA was founded by the

Roman emperor Augustus. Visigoths conquered the area in the late 5th cent. and Muslims in the early 8th cent. Carolingians pushed out the Muslims (c. 850), and Aragon came under the rule of Navarre. At the death (1035) of Sancho III of Navarre, his western territories were organized as the kingdom of Aragon for his illegitimate son, Ramiro I. He and his successors, notably Alfonso I, extended their dominions southward at the expense of the Moorish emirate of Zaragoza, and in the 12th cent. Zaragoza replaced Huesca as the capital. In 1076, Aragon annexed Navarre, and in 1137 it became united, through personal union, with CATALUNYA. Both regions preserved their own cortes, laws, languages, and customs and evolved along separate lines, their deep historical, social, and cultural differences at times caused great friction. With the expansion of the house of Aragon (see separate article), the name Aragon came to signify a confederation of its Spanish possessions (Aragon, Catalonia, MAJORCA, and VALENCIA) and several French fiefs. In the bitter struggles (12th-15th cent.) between kings and nobles, the nobles gained more and more privileges until Peter IV defeated them in 1348. The justiciar, a type of magistrate created in the 12th cent., acted as a sort of intermediary between king and nobles, after 1348 he lost most of his political power but gained more juridical importance. Aragon played only a minor role in the expansionist policy of its kings in the Mediterranean. United with Castile after 1479 through the marriage of Ferdinand V (Ferdinand the Catholic) with Isabella, Aragon preserved its cortes and its city privileges. These, however, were gradually limited by the centralizing policies of the Spanish monarchy, and in 1716 Philip V abolished most of the remaining political privileges to punish the Aragonese for siding with Archduke Charles (later Emperor Charles VI) in the War of the Spanish Succession. The passionate attachment of the Aragonese to their liberties was illustrated by the episode of Antonio Perez under Philip II and by the heroic defense of Zaragoza in the PENINSULAR WAR. In 1833 the administrative unit of Aragón was divided into the three present provinces.

Aragón, house of, family that ruled in Aragon, Catalonia, Majorca, Sicily, Naples, Sardinia, Athens, and other territories in the Middle Ages. It was descended from RAMIRO I of Aragón (1035-63), natural son of SANCHE III of Navarre. Under Ramiro's successors—SANCHE I, PETER I, and ALFONSO I—Navarre was temporarily (1076-1134) united with Aragon. During that period considerable territory was wrested from the Moors. Ramiro II (1134-37) was succeeded by his daughter, Petronilla, and her husband, RAYMOND BERENGAR IV, count of Barcelona. Aragon and CATALUNYA (see also BARCELONA) remained united under their descendants—ALFONSO II, PETER II, JAMES I, PETER III, ALFONSO III, JAMES II, ALFONSO IV, PETER IV, JOHN I, and MARTIN, after a brief interregnum (1410-12) they passed to Martin's nephew, FERDINAND I, and from him to ALFONSO V, JOHN II, and FERDINAND II, who after his marriage with Isabella of Castile became joint king of Castile as Ferdinand V or Ferdinand the Catholic. His grandson, Charles I (later Holy Roman Emperor CHARLES V) succeeded him and merged the houses of Aragon and Castile with that of Hapsburg. Through its merger of 1137 with the house of Barcelona, the house of Aragon had acquired various fiefs in S. France, notably Roussillon, Provence, and Montpellier, and suzerainty over others. It lost most of these between 1213 and 1246, mainly because Peter II intervened in the ALBIGENSIAN CRUSADE and was defeated (1213) at Muret. In the same period (1229-38), however, James I won the BALEARIC ISLANDS and the region of VALENCIA from the Moors. In 1282, Peter III became king of SICILY, and in the 14th cent., after a long struggle, Alfonso IV conquered SARDINIA. The duchies of ATHENS and Neopatra were under the nominal rule of the family in the 14th cent., and in 1442 the kingdom of Naples (see NAPLES, KINGDOM OF) was conquered by Alfonso V. Only rarely were these possessions united under a single ruler, for the most part they were held by various branches of the house, often at war with each other as well as with other rulers in Spain. The kingdom of MAJORCA, with ROUSSILLON and Cerdagne, was separate from 1276 to 1343, that of Sicily, from 1296 to 1409, and that of Naples, from 1458 to 1501. Even when united under one ruler as they were under Alfonso V, the various possessions retained their distinct institutions, which continued to be important in diminished and varying degrees after the union of the crowns of Aragon and Castile. See NAVARRE. See study by J. L. Shneidman (2 vol., 1971).

Araguaia (arāgwī'ā), river, c. 1,300 mi (2,090 km) long, rising in the Serra das Araras, at the border of

Goiás and Mato Grosso states, 5 central Brazil. It flows generally northward into the Tocantins River, forming most of the border between Goiás and the states of Mato Grosso and Para. Diamonds are washed along its upper tributaries. There are numerous falls on the Araguaia. The island of Bananal (c. 200 mi/320 km long, 35 mi/56 km wide), separating the river into two arms, is one of the largest freshwater islands in the world. It is also a national park. The Araguaia region has been made accessible by new highways.

Arah (ā'ra) 1 Asherite 1 Chron 7 39 2 Family in the return from the Exile Neh 7 10

arahant or **arhat**: see BUDDHISM

Araish, Al: see LARACHE

Arak (arāk'), city (1966 pop. 71,925), Tehran prov., W central Iran. A center for agricultural trade as well as for road and rail, the city is also known for its rugs and carpets. Founded c. 1800, Arak was formerly known as Sultanabad.

Arakan (ārākān', arākān'), division (1969 est. pop. 1,847,000), 14,194 sq mi (36,762 sq km), W Burma, extending along the Bay of Bengal. It lies at the foot of the Arakan Yoma mountain range, which rises to 10,050 ft (3,063 m) at Victoria Peak. The capital is SITTWE. The Arakanese, who are of Burmese stock with strong Indian influences, are mostly engaged in intensive rice cultivation. There is also a large minority of Bengali Muslims. The region, which is geographically isolated, was the seat of a powerful kingdom (after the 15th cent.), famous for a colossal image of Buddha. At various times under Burmese rule, it finally was absorbed into Burma in 1783, it was the first Burmese territory ceded (1826) to the British after the first Anglo-Burmese war. In the 1950s there was a movement in Arakan for secession from Burma. See Maurice Collis, *The Land of the Great Image* (1959).

Arakcheyev, Aleksey Andreyevich (ālīksyā' āndrā'yevich arakchā'yēf'), 1769-1834, Russian general, adviser to Czar Alexander I. An exacting officer, he helped organize the bodyguard of Czar Paul I, who made him a count and gave him high offices. Under ALEXANDER I he was made (1808) minister of war and was one of the czar's most powerful advisers. He virtually ruled Russia during Alexander's frequent trips abroad. Although a martinet and cruel, he was an efficient administrator and made valuable military reforms. See biography by Michael Jenkins (1968).

Araks, river, USSR see ARAS

Aral Kara-Kum, desert, USSR see KARA-KUM

Aral Sea (ār'əl), Rus. *Aralskoye More*, inland sea and the world's fourth largest lake, c. 26,000 sq mi (67,300 sq km), SW Kazakhstan and NW Uzbekistan, Central Asian USSR, E of the Caspian Sea. It is c. 260 mi (420 km) long and c. 175 mi (280 km) wide. Generally very shallow, it attains a maximum depth of c. 220 ft (70 m). The Aral Sea is fed by the Syr Darya and Amu Darya rivers but has no outlet. Because of its geologically recent separation from the Caspian Sea, the Aral Sea's water is only slightly saline. The sea's western and northern shores are the edges of the arid Ustyurt Plateau, the Kyzyl-Kum desert stretches to the southeast. There are many small islands in the sea. Navigation is possible only from Muynak to Aralsk. The sparse population of the region, concentrated mainly near the mouths of the Syr Darya and Amu Darya, engages in fishing (carp, perch, and pike), there is a cannery at Aralsk. Sodium and magnesium sulfate are mined along the shore. Mentioned by the Arabs in the 10th cent., the Aral Sea was called the Khorezm Sea or Khwarazm Sea by later Arab geographers. It was reached by the Russians in the 17th cent. and was known as the Sine (Blue) Sea.

Aram (ārām) 1 Ancient people and their country, roughly identifiable with Syria. The Bible records constant contacts between Hebrews and Aram, mentioning states of Damascus, Beth-rehob, Geshur, Maachah, and Zoba. Their language was a form of Aramaic. Gen 10 22, Num 13 21, Judges 18 28, 2 Sam 8 5, 6, 10-19, 1 Kings 11 23-25, 1 Chron 19 6, Ps 60 2. Descendant of Nahor. Gen 22 21 3 Asherite 1 Chron 7 34 4 In the Gospel genealogy see RAM 1.

Aram, Eugene (ārām), 1704-59, English philologist, b. Yorkshire. A self-taught linguist, Aram was the first to identify the Celtic languages as Indo-European. In 1758, while at work on an Anglo-Celtic lexicon, he was arrested and later hanged for the murder—14 years earlier—of his friend Daniel Clark. The story of his crime inspired Thomas Hood's poem *The Dream of Eugene Aram*, and Bulwer-Lytton's novel *Eugene Aram*.

Aramaic (āramā'īk), language belonging to the Northwest Semitic subdivision of the Semitic subfamily of the Hamito-Semitic family of languages (see HAMITO-SEMITIC LANGUAGES). At some point during the second millennium B.C., the Aramaeans abandoned their desert existence and settled in Syria, bringing their language, Aramaic, with them. By the beginning of the 7th cent. B.C., Aramaic had spread throughout the Fertile Crescent as a lingua franca. Still later the Persians made Aramaic one of the official languages of their empire. After the Jews were defeated by the Babylonians in 586 B.C., they began to speak Aramaic instead of Hebrew, although they retained Hebrew as the sacred language of their religion. Although Aramaic was displaced officially in the Near East by Greek after the coming of Alexander the Great, it held its own under Greek domination and subsequent Roman rule. Aramaic was also the language of Jesus. Following the rise of Islam in the 7th cent. A.D., however, Aramaic began to yield to Arabic, by which eventually it was virtually replaced. In the course of its long history the Aramaic language broke up into a number of dialects, one of the most important of which was SYRIAC. Parts of the books of Ezra and Daniel in the Old Testament were written in an Aramaic dialect, as were major portions of the Palestinian and Babylonian Talmuds. Nabataean (the form of Aramaic current among the Nabataean Arabs), Samaritan, and Palmyrene were other significant ancient dialects of Aramaic. Modern forms of the language (including Syriac) are still spoken today, though not by more than a few hundred thousand people scattered in the Near and Middle East. Grammatically, Aramaic is very close to HEBREW. The Aramaic alphabet is a North Semitic script that is first attested in the 9th cent. B.C. After c.500 B.C. its use became widespread in the Middle East. Descended from the Aramaic alphabet are the Square Hebrew alphabet, which is the ancestor of modern Hebrew writing, the Nabataean, Palmyrene and Syriac scripts, and the Arabic alphabet among others. It is believed that the alphabetic writing systems of India and Southeast Asia also have the Aramaic script as their source. See Franz Rosenthal, ed., *An Aramaic Handbook* (4 vol., 1967).

Aramburu, Pedro Eugenio (pā'thro ãððā nyð ārāmbōō'rō), 1903-70, president of Argentina (1955-58). An army general, he participated in the overthrow of Juan PERÓN in Sept., 1955, and that November he replaced Gen. Eduardo Lonardi as provisional president. With the vice president, Admiral Isaac Rojas, he ruled by decree, suppressing strikes and revolts and vigorously driving the Peronists from business, government, and military posts. He later returned the country to constitutional democracy and scheduled free elections, in which he ruled out military figures (including himself) as presidential candidates. After Arturo Frondizi was elected president in Feb., 1958, Aramburu retired from the army. He ran unsuccessfully for president in 1963. In May, 1970 he was kidnapped by a Peronist guerrilla group and murdered, allegedly for his part in the execution of 27 Peronist leaders after an unsuccessful coup attempt in 1956.

Aram-naharaim (ā'rām-nā'hārā'īm), the same as PADAN-ARAM.

Aram-zobah (ā'rām-zō bā), the same as ZOBA.

Aran (ārān), descendant of Seir the Horite. Gen. 36:28, 1 Chron. 1:42.

Aran (ārān), island (1971 pop. 3,705), 165 sq mi (427 sq km). Buteshire, W. Scotland, in the Firth of Clyde. It is largely granitic and is wild and rocky, it rises to 2,866 ft (874 m). Its scenery and its hunting and fishing have made it a resort. Brodick is the chief town. Robert I. died on Aran in 1306-7 and launched his invasion of the mainland from there.

Arana Osorio, Carlos (kār iōs ārā'nā ōsō'ryō), 1918-, president of Guatemala (1970-74). A conservative army colonel noted for his successes during an antiguerrilla campaign (1966-68), he was elected president on a law-and-order platform. He declared (Nov., 1970) a state of siege, which remained in effect for one year, and directed a vigorous campaign that brought a decline in guerrilla-terrorist activities. He instituted a five-year development plan (1971-75) and promoted social, economic, and land reform, with an emphasis on modernizing and diversifying agriculture.

Aranda, Pedro Pablo Abarca de Bolea, conde de (pā'thro pā'biō ābār'ā thā bōlā'ā kōn'dā thā ārān'dā), 1718-98, Spanish statesman. He distinguished himself at first as a military commander, serving as director general of artillery and captain general of Valencia and later of Aragon. His aristocratic background and advocacy of enlightened

despotism made him ideally suited to play a reforming role in the administration of Charles III. In 1766 he became president of the council of Castile, a position he held until 1773 when he was dismissed because of his failure to hold the Falkland Islands for Spain. Ambassador to France (1773-87), he was one of the signatories to the Treaty of Paris (1783), which recognized the independence of the United States. Under Charles IV he served briefly as foreign minister (1792), but fell into disfavor because of disapproval of war with France following the French invasion of Spain in 1794. Exiled for a short time, he was later permitted to retire to his Aragon estate.

Aranguren, Jose Luis (hōsā iōōēs' ārāngōō'rān), 1909-, Spanish philosopher, theologian, and essayist, b. Ávila. A professor of ethics and sociology at the Univ. of Madrid, he is concerned with philosophical problems. His works include *La filosofía de Eugenio D'Ors* [the philosophy of Eugenio D'Ors] (1945), *Protestantismo y catolicismo como formas de existencia* [Protestantism and Catholicism as forms of existence] (1952), *La juventud europea y otros ensayos* [European youth and other essays] (1961) and *Human Communication* (tr. 1967).

Aran Islands, 18 sq mi (47 sq km), Co. Galway, W. Republic of Ireland, in Galway Bay. The three islands are Inishmore (the largest), Inishkeer, and Inishmaan. The islands are barren, and living is primitive, farming and fishing are important. Gaelic is the everyday language of most islanders. There are many early Christian and prehistoric remains. The islands are a tourist attraction.

Aranjuez (ārānghwāth'), town (1970 pop. 29,548), Madrid prov., central Spain, in Nev. Castile, on the Tagus River. A market town (the region is known for asparagus and strawberries, horses are bred), it was once a royal residence. The palace burned several times in the 17th cent. but was rebuilt (1727) by Philip V. The Jardin de la Isla is the finest of the several palace gardens.

Arany, János (yā'nōsh ō'rōnyā), 1817-82, Hungarian poet. Arany was considered one of the founders of modern Hungarian poetry. He was an actor, notary, editor and professor of Hungarian literature at the Nagy-Koros college. His satirical poem *The Lost Constitution* (1845) was followed by his epic *Toldi* (1846 tr. 1914), to which he added *Toldi's Eve* (1854) and *Toldi's Love* (1879). Among his other works are an epic trilogy, *King Buda's Death* (tr. 1936), *Ildiko*, and *Prince Csaba* (both unfinished), and the ballads that are perhaps his finest works. His style, simple and often reminiscent of folk song, is compelling and powerful.

Arao (ārā ō) city (1970 pop. 55,452), Kumamoto prefecture, W. Kyushu, Japan, on Ariake Bay. It is a port and is part of the Omota-Arao industrial region. Here cement, chemicals, fertilizers, and plastics are produced.

Arapaho Indians (ārāp'āhō), North American Indians whose language belongs to the Algonquian branch of the Algonquian-Wakashan linguistic stock (see AMERICAN INDIAN LANGUAGES). Their own name was Inuna-ina (our people), but they were referred to as "dog eaters" (for the obvious reason) by other Indians. Tradition places their early home in N. Minnesota in the Red River valley, but nothing is known of the date or circumstances of their separation from other Algonquian peoples. They are thought to be most closely related to the Cheyenne and to the Blackfoot. However, it is known that the Arapaho divided into two groups after they migrated to the plains. One group, the Northern Arapaho, continued to live on the North Platte River in Wyoming, while the Southern Arapaho moved south to the Arkansas River in Colorado. Traditionally the Southern Arapaho were allied with the Cheyenne against the Pawnee. The Arapaho stressed membership in age-graded societies, mainly for ceremonial purposes. Their annual sun dance was a major tribal event, and later the Arapaho adopted the GHOST DANCE religion. There are three major divisions—the Atsina or GROS VENTRE INDIANS, who were allied with the Blackfoot Indians and now live with the Assiniboin Indians on the Fort Belknap Reservation in Montana, the Southern Arapaho, now living with the Cheyenne in Oklahoma, and the Northern Arapaho, who retain all of the sacred tribal stone articles and are considered by the Indians to represent the parent group. Since 1876 they have lived on the Wind River Reservation in Wyoming with their former enemies, the Shoshone. See G. A. Dorsey and A. L. Kroeber, *Traditions of the Arapaho* (1903, repr. 1974), V. C. Trenholm, *Arapahoes, Our People* (1970).

arapaima (ār'āpī mā), tropical fish, *Arapaima gigas*, of the Amazon basin. It is perhaps the largest of the strictly freshwater fishes, reportedly reaching a length of 15 ft (4.5 m), but averaging 7 to 8 ft (2-2.4 m) in length and 200 lb (90 kg) in weight. The dorsal and anal fins of the arapaima are placed so far back that they appear to be part of the tail fin, giving a massive appearance to the posterior region. The scales are olive-green, turning increasingly reddish in the tail region and becoming crimson near the tail fin. The SWIM BLADDER, as in all members of the order Clupeiformes, is open to the pharynx, in the arapaima it is rich in blood vessels and serves as a lung. The arapaima uses its fins to hollow out a nest in clear, shallow, sandy-bottomed areas. It is a graceful swimmer despite its bulk, and it is valued as an aquarium fish as well as for food. It is classified in the phylum CHORDATA, subphylum Vertebrata, class Osteichthyes, order Clupeiformes, family Osteoglossidae.

Ararat (ār'ārāt), Turkish Ağrı Dağı, name of two mountains, Little Ararat (12,877 ft/3,925 m) and Great Ararat (16,945 ft/5,165 m), E. Turkey, near the Iranian and Soviet borders. The tradition that Mt. Ararat is the resting place of Noah's ark is based on a misreading of Gen. 8:4, which properly reads "upon the mountains of Ararat," indicating a country or region. The land or the kingdom of Ararat (fl. c. 9th-7th cent. B.C.), called in Assyrian Urartu, was situated between the river Araks and the lakes Van and Rezaizeh. It included all the land later called ARMENIA. Its language, written in cuneiform, has no relation to any known language except perhaps to the Horite (2 Kings 19:37, Isa. 37:38, Jer. 51:27).

Aras (ārās), Rus. Araks, river, c. 600 mi (970 km) long, rising in the Transcaucasus mts., NE Turkey. It flows generally east, forming parts of the Turkey-USSR and USSR-Iran borders, before entering the Azerbaijan Republic, USSR, where it joins the Kura River at Sabirabad. Much of its upper and middle courses are rapid and tumultuous, and its waters are used for irrigation. The Aras is the chief river of Soviet Armenia, and its valley contains Armenia's greatest concentration of people and industries. The Aras is the Araxes of the ancients.

Arason, Jon: see APESSON, JON.

Aratus (arā'tas), fl. 3d cent. B.C., Greek court poet, from Soli in Cilicia. He wrote an astronomical treatise, *Phaenomena*, which was quoted by Ptolemy at Athens (Acts 17:28).

Aratus, d. 213 B.C., Greek statesman and general of Sicyon, prime mover and principal leader of the Second ACHAEAN LEAGUE. His objective at first was to free the Peloponnesus from Macedonian domination, and he is credited with bringing into the confederation many of the principal cities of Greece. But he was blamed for the subsequent Macedonian domination of the Peloponnesus, for while fighting Cleomenes III of Sparta and the Aetolian League he changed his policy towards Macedonia and called in ANTIGONUS III. See F. W. Walbank, *Aratos of Sicyon* (1933).

Araucanian Indians (aroukān'ēan), South American people, occupying most of S. central Chile at the time of the Spanish conquest (1540). The Araucanians were an agricultural people living in small settlements. They are classified into three major cultural subdivisions, the Huilliche, the Picunche, and the Mapuche, the last being the largest group. The known history of the Araucanians begins with the Inca invasion (c. 1448-c. 1482) under Tupac Yupanqui, but Inca influence was never strong. Against the Spanish under Pedro de VALDIVIA the Araucanians offered resistance, notably under LAUTARO and CAUPOLICÁN, and their stout fight was immortalized in the epic by Alonso de ERCILLA Y ZÚÑIGA. They were successful in protecting S. Chile and by 1598 had destroyed almost all Spanish settlements S. of the Bio-Bio River. Their struggle continued intermittently in the 17th and 18th cent. in the uprisings of 1723, 1740, and 1766. White immigration southward brought on the war of 1880-81, which ended with Araucanian submission. Earlier, especially at the beginning of the 18th cent., Araucanians fleeing white encroachment had gone across the Andes into Argentina. Capturing wild horses, they became wanderers on the plains and absorbed the PUELCHÉ. Gen. Julio A. Roca subjugated them in his campaigns (1879-83). There are many tribes and languages, which make up a separate linguistic family. The Araucanians continue to influence Chilean life, and number over 200,000. See L. C. Faron, *Hawks of the Sun* (1964) and *The Mapuche Indians of Chile* (1968), M. I. Hilger, *Huenun Namku* (1966), E. H. Korth, *Spanish Policy in Colonial Chile* (1968).

Araunah (ārō'nā), Jebusite who sold his threshing floor to David so that an altar might be erected there. This site, on Mt. Moriah, was afterward used for the Temple. 2 Sam 24:15-25. Ornan 1 Chron 21:14-30, 2 Chron 3:1.

Arawak (a'rawak), linguistic stock of American Indians who, at the time of the Spanish Conquest, occupied the islands of the Greater Antilles, the Bahamas, and Trinidad. It is believed that the tribes came from South America. Before the arrival of the Spanish they were driven from the Lesser Antilles by the Carib. Most of the Arawak of the Antilles died out after the Spanish conquest. In South America, Arawakan-speaking Indian groups are widespread, from SW Brazil and Paraguay to Colombia and Venezuela, representing a wide range of cultures. They are found mostly in the tropical forest areas N of the Amazon. Contact with white settlement has led to culture change and depopulation among these groups.

Araxes, river, Turkey and the USSR. see ARAS.

Arba or **Arbah** (both ar'bā), eponym of Kirjath-arba, "the city of Arba," usually called HEBRON. Arba is called the father of ANAK. Gen 35:27, Joshua 14:15, 15:13, 21:11.

Arbela (arbē'lā), town of ancient Assyria. Its name is sometimes given to the battle fought at Gaugamela, some 60 mi (100 km) away, in which Alexander the Great defeated (331 B.C.) Darius III. Arbela is the modern Irbil (Iraq).

arbitrage: see FOREIGN EXCHANGE.

arbitration, industrial, method of settling disputes between employer and employees by seeking and accepting a decision by a third party. Such arbitration may be compelled by the government, as in New Zealand (since 1894), Australia (since 1904), Canada (since 1907), Italy (since 1926), and Great Britain (since World War II). In other cases, it may be by voluntary agreement, as is often the case in the United States, where the government is occasionally forced to intervene in the case of a strike affecting the public welfare (see TAFT-HARTLEY LABOR ACT) by persuading the parties concerned to accept the decision handed down by the arbitrator. Machinery for that purpose has been set up at both federal and state levels in the form of mediation and arbitration boards. The American Arbitration Association, founded in 1926, provides the services of over 20,000 skilled arbitrators to help settle labor disputes. In voluntary arbitration a formal agreement is usually made to abide by the decision. See Kurt Braun, *Labor Disputes and Their Settlement* (1955), W. H. McPherson, *Grievance Mediation Under Collective Bargaining* (1956), Frank Elkouri, *How Arbitration Works* (1960).

arbitration, international, judicial process by which international disputes, usually between states, are settled peacefully, generally through the use of a tribunal acting as a court of law. Such a tribunal may consist of an individual (e.g., an impartial monarch, the pope, the secretary general of the United Nations), a neutral country, or an organization such as the United Nations International Court of Justice. The parties to the dispute pick the arbitrating body themselves and are obligated to accept the terms of settlement. If the parties do not agree in advance to follow the decision reached by a third party, but merely agree to consider it, the process is termed conciliation (see MEDIATION). Arbitration was practiced by the Greek city-states, and in the Middle Ages high ecclesiastical authorities were called upon to settle controversies. With the development of the modern system of nation-states, however, arbitration was less frequently used until the 19th cent. when the settlement by arbitration of the famous ALABAMA CLAIMS case between the United States and Great Britain brought this practice back into general use. Great advances have been made since then, most notably in the establishment of a Permanent Court of Arbitration by the HAGUE CONFERENCES. Functions analogous to arbitration were performed by the Permanent Court of International Justice (see WORLD COURT) under the League of Nations and have now been transferred to its successor, the INTERNATIONAL COURT OF JUSTICE. Today many treaties contain clauses providing for arbitration or conciliation of disputes, the most notable of these is the Charter of the United Nations (Article 33). See J. H. Ralston, *International Arbitration from Athens to Locarno* (1929), C. M. Bishop, *International Arbitral Procedure* (1930), Kenneth S. Carlston, *The Process of International Arbitration* (1946), H. W. Briggs, *The Law of Nations* (2d ed. 1952), J. L. Brierly, *The Law of Nations* (6th ed. 1963), Arthur Cox, *Prospects for Peacekeeping* (1967).

Arblay, Madame d': see BURNEY, FANNY.

Arboga (ar'bō'ga), town (1970 pop. 11,932), Västmanland co., S Sweden, on the Arboga River, near Lake Hjälmaren. It is a transportation, industrial, and tourist center. Manufactures include metal goods and processed food. Of great importance in the Middle Ages, Arboga was the site of several parliaments, including Sweden's first (1435), and numerous church assemblies. St. Bridget was proclaimed patron saint of Sweden there in 1396. The city has a Franciscan monastery (founded 1285).

Arboleda, Julio (hōō'lyō arbōlā'tha), 1817-61, Colombian poet and politician. A powerful political force, he was for a time imprisoned and then exiled. He returned to lead a revolt (1860) against MOSQUERA, was named president, but shortly thereafter was assassinated. He is best known as the author of the unfinished poem *Gonzalo de Oyón*, an epic of the Spanish conquest.

Arbor Day, in the United States, day specifically designated for the planting of trees. It was first suggested by Julius Sterling MORTON of Nebraska in 1872. It is celebrated at different times in different states because planting seasons vary. The planting of trees by school children is a usual method of celebrating Arbor Day.

arboretum: see BOTANICAL GARDEN.

arborvitae (ar'borvī'tē) [Lat. = tree of life], aromatic evergreen tree of the genus *Thuja* of the family Cupressaceae (CYPRESS family), with scalelike leaves borne on flattened branchlets of a fanlike appearance and with very small cones. Some of the numerous cultivated varieties are dwarf forms. There are several species, two native to North America, the remainder native to Asia but sometimes cultivated in the United States. *T. occidentalis*, of E. North America, called arborvitae, white cedar, or Northern white cedar, has many garden forms and is popular for hedges. The leaves were once used as a remedy for rheumatism, and their oil as a vermifuge. *T. plicata* of W. North America, called giant arborvitae, red cedar, or Western red cedar, is much larger and of considerably more importance as lumber; it is primarily used for making shingles and shakes. The wood of both of these species is soft but quite resistant to decay, hence its popularity for fence posts. Arborvitae are classified in the division PINOPHYTES, class Pinopsida, order Coniferales.

Arbroath (arbrōth') or **Aberbrothock** (āb'ərbrā-thōck'), burgh (1971 pop. 22,585), Angus, E. central Scotland, on the North Sea at the mouth of the Brothock River. A seaport, it is known for its smoked haddock, shipbuilding, and the processing of flax and jute. There are engineering works, breweries, an iron foundry, and diverse small industries. Arbroath Abbey was founded by WILLIAM THE LION c. 1178 and contains his tomb. The Scottish estates met in the abbey in 1320 and called for independence from England. In 1975, Arbroath became part of the new Tayside region.

Arbuckle Mountains, range of low, rolling hills, rising c. 700 ft (210 m) above the prairie, S. Okla., remnant of mountains formed in the Precambrian era. Interesting geological formations have resulted from the varying erosional rates of the different rock types found in the area. Platt National Park contains many cold mineral springs. Arbuckle National Recreation Area, southwest of the park, surrounds Lake of the Arbuckles, a 2,350-acre (951-hectare) reservoir formed behind Arbuckle Dam (see NATIONAL PARKS AND MONUMENTS, table).

Arbus, Diane, 1923-71, American photographer, b. New York City. For nearly 20 years Arbus operated a successful fashion photography studio with her husband. She studied with Lisette Model and began, in the 1950s, to make the intimate record of life on the freakish margins of society for which she became renowned. Her acceptance of what she saw set her work apart and gave her access to the unapproachable transvestites, dwarves, prostitutes, nudists, and the everyday ugly. She died a suicide at 48. See *aperture* monograph, *Diane Arbus* (1972).

Arbuthnot, John (arbūth'nat, ar'bathnōt), 1667-1735, Scottish author and scientist, court physician (1705-14) to Queen Anne. He is best remembered for his five "John Bull" pamphlets (1712), political satires on the Whig war policy, which introduced the character John Bull, the typical Englishman. With his friends, Swift, Pope, and Gay, Arbuthnot was a member of the SCRIBLERUS CLUB, organized to ridicule false tastes in learning, and was the principal author of the "Memoirs of Martinus Scriblerus," first published in the quarto edition of Pope's works (1741). He was also the author of several progressive medical works. Greatly admired in his time,

Arbuthnot was called an unusual genius by Samuel Johnson, and Pope addressed to him the famous "Epistle to Dr. Arbuthnot." See edition of his works by G. A. Aitken (1892), study by L. M. Beattie (1935).

Arbutus, uninc. town (1970 pop. 22,745), Baltimore co., NE Md., a suburb of Baltimore. A state hospital is nearby.

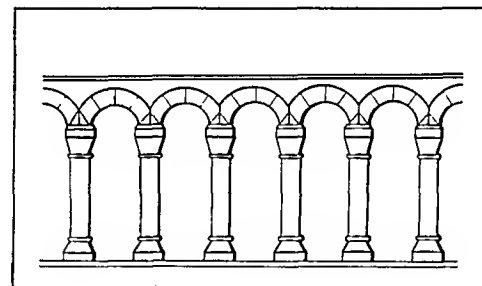
arbutus, trailing: see TRAILING ARBUTUS.

arc, in electricity, highly luminous and intensely hot discharge of electricity between two electrodes. The arc was discovered early in the 19th cent. by the English scientist Sir Humphry Davy, who so named it because of its shape. An arc is characterized by a high current, low voltage, and indefinite duration. It is usually started when two electrodes carrying an electric current are drawn apart. At the instant the electrodes are parted, strong electric forces draw electrons from one electrode to the other, initiating the arc. The discharge consists of a current composed of these electrons and charged gas particles, called ions, that form between the electrodes. The first practical electric light, the arc lamp, made use of the arc formed between two carbon rods (see LIGHTING). Today the use of the arc lamp is limited to special purposes, e.g., in searchlights and in research applications. The principle of the electric arc is employed in WELDING (as in the hydrogen arc, where hydrogen is introduced between tungsten electrodes) and also in generating heat in the electric furnace. A spark, like an arc, is a discharge of electricity between two points, but it has a high voltage and a short duration. Lightning is an example of a spark.

arc, in geometry, a curved line or any part of it, in particular, a portion of the circumference of a circle. The length s of an arc of a circle of radius r and subtending a central angle of θ radians is $s = r\theta$, if θ is measured in degrees, then the arc is given by $s = 2\pi r\theta/360^\circ$.

Arca: see ARKITE.

arcade, series of arches supported by columns or piers. An arcade may stand free, if it is attached to a wall it is called a wall arcade or a blind arcade. The earliest-known arcades were in Roman architecture, in which piers, ornamented with engaged columns carrying an entablature, formed the arch supports. However, in Diocletian's palace at Spalato there are arches supported by columns and resting directly upon their capitals, of the type which was given full development in Romanesque and Gothic architec-



Arcade

ture. In the early Christian basilica columnar arcades separated the nave and side aisles and supported the wall of the clerestory. From this beginning the rich system of bays used in Romanesque and Gothic church interiors was developed, in which lofty arcades extended the full length of the nave. Both freestanding and blind arcades were used in Romanesque facades (notably in N. Italy) and in the west fronts of English and French Gothic cathedrals, where the arches were often filled with statues of saints. Richly designed arcades surrounded the enclosed cloisters of the medieval and Renaissance monasteries; they were similarly used in the courts of houses in Italy and Spain and in the courtyards of Muhammadan mosques. The Romanesque structures of Spain, Sicily, and S. Italy made frequent use of arcades composed of interlacing arches, in which the arch rings overlap to alternate columns or piers. Continuous arcades, extending over sidewalks, are common in Italian cities, notably in Bologna.

Arcadelt, Jacob (ya'kōp ar'kadēlt), c. 1505-c. 1560, Flemish composer, b. Liege. He spent much of his time at the Papal court in Rome. After 1555 he was in Paris in the service of the duke of Guise. Arcadelt belonged to the so-called Netherlands school of composition. He wrote madrigals, French chansons, and church music, including several important books of masses.

Arcadia (arkā'dēā), region of ancient Greece, in the middle of the Peloponnesus, without a seaboard, and surrounded and dissected by mountains. The Arcadians, relatively isolated from the rest of the world, lived a proverbially simple and natural life. By far the largest city was MEGALOPOLIS, founded by Epaminondas. It had some political power, especially in the Arcadian League, but Arcadia as a whole was of little political significance. The independent mountaineers periodically fought against Spartan power, but did not cooperate well. Other cities were Mantinea, Tegea, Orchomenus, and Heraea.

Arcadia, city (1970 pop. 42,868), Los Angeles co., S Calif., a residential suburb of Los Angeles, at the foot of the San Gabriel Mts., inc. 1903. The city has electronic, aerospace, optical, and camera industries. The Santa Anita racetrack and an arboretum are in Arcadia.

Arcadius (arkā'dēās), c. 377–408, Roman emperor of the East (395–408), son and successor of Theodosius I. His brother, HONORIUS, inherited (395) the West. Henceforth the division between the Eastern and Western empires became permanent. A weak ruler, Arcadius entrusted the government successively to RUFINUS, EUTROPIUS (d. 399), and other ministers and was later greatly influenced by his Frankish wife, EU DOXIA. During his reign, Greece was invaded (395) by ALARIC I who was induced to leave in 397 by STILICHO. Arcadius put down a temporarily successful revolt (399–400) of the Gothic officials and mercenaries in Constantinople. He exiled (404) the patriarch St. JOHN CHRYSOSTOM. His son, Theodosius II, succeeded him.

Arcagnolo. see ORCAGNA

Arcaro, George Edward (Eddie Arcaro), 1916–, American jockey, b. Cincinnati, Ohio. He began riding at the age of 15, and in his 31-year career he finished first in 4,779 races, a total exceeded in the United States only by Johnny Longden and Willy Shoemaker. Arcaro was one of the two jockeys (Bill Hartack was the other) to win the Kentucky Derby five times (on Lawrin in 1938, Whirlaway in 1941, Hoop Jr. in 1945, Citation in 1948, and Hill Gail in 1952). He also has the exclusive distinction of twice having swept the Triple Crown of racing—the Kentucky Derby, the Preakness, and the Belmont Stakes. Arcaro's mounts won a record \$30,039,543 in purses. He retired from racing in 1962.

Arcas. see CALLISTO

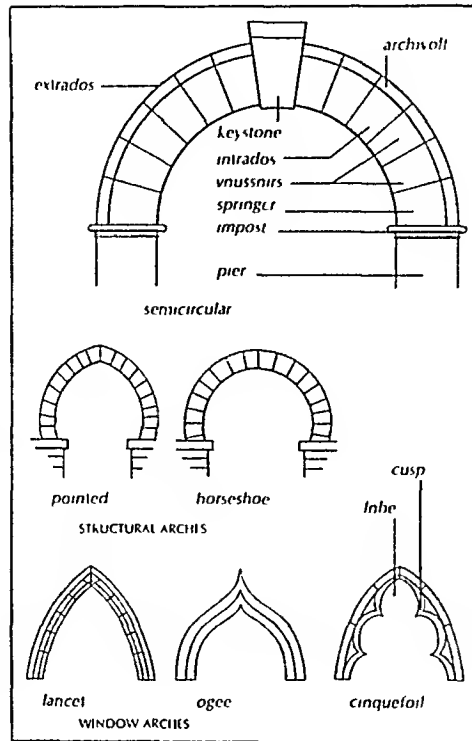
Arc de Triomphe de l'Étoile (ark də trēōn' də lātwa'), imposing triumphal arch in Paris standing on an elevation at the end of the Avenue des Champs Élysées and in the center of the Place de l'Étoile, which is formed by the intersection of 12 radiating avenues. It commemorates the victories of Napoleon I, under whose decree it was built. Construction was begun in 1806 by J. F. CHALGRIN from his own designs and was carried on after his death by L. Goust, J. N. Huyot, and G. A. Blouet successively, who brought the arch to completion in 1836. It is 164 ft (50 m) high, 148 ft (45 m) wide, and 72 ft (22 m) deep, with colossal symbolic groups flanking the arch. The principal sculpture, *La Marseillaise*, was executed by François Rude. In 1920 the body of an unknown French soldier of World War I was interred beneath the arch, and a perpetual flame was lighted.

Arcesilaus (arsēs'īlās), c. 316–c. 241 B.C., Greek philosopher of Pitane in Aeolis. He was the principal figure of the Middle Academy. Despite his position in the ACADEMY, his teachings diverged from Platonic doctrine. By emphasizing the doubt expressed by Socrates as to the possibility of gaining knowledge, he took a position comparable to that of the SKEPTICS (see SKEPTICISM). As an intellectual agnostic, he taught that knowledge and opinion could not be distinguished from each other. As to behavior in practice, Arcesilaus held that we act on ideas rather than on certain knowledge. Arcesilaus indirectly influenced Carneades and his school. Arcesilaus was, in his day, the great opponent of Stoicism. See M. M. Patrick, *The Greek Sceptics* (1929).

Arch, Joseph, 1826–1919, English labor leader, a Primitive Methodist preacher. He founded the National Agricultural Labourers Union in 1872 and became its president. In 1873, Arch visited Canada and the United States to study labor and immigration problems. He served (1885–86, 1892–1900) as one of the first labor members in Parliament and was instrumental in enfranchising agricultural workers. See his autobiography (ed. by the countess of Warwick, 1898), biography by Pamela Horn (1971).

arch, the spanning of a wall opening by means of separate units (such as bricks or stone blocks) assembled into an upward curve that maintains its

shape and stability through the mutual pressure of a load and the separate pieces. The weight of the supported load is thus converted into downward and



Arches

outward lateral pressures called thrusts, which are received by the solid piers (abutments) flanking the opening. The blocks, called voussoirs, composing the arch usually have a wedge shape but they can be rectangular with wedge-shaped joints between them. The underside of the arch is the intrados or soffit and the upper surface above the crown block (keystone) of the arch is the extrados. The point where the arch starts to curve is the foot of the arch, and the stones there are the springers. The surface above the haunch (just below the beginning of the curve) contained within a line drawn perpendicular to the springing line (from which the arch curves), and another drawn horizontal to the crown is the spandril. In modern fireproof construction the word arch is also used for the masonry that fills the space between steel beams and acts as a floor support. The arch was used by the Egyptians, Babylonians, and Greeks, chiefly for underground drains, and also by the Assyrians in the construction of vaulted and domed chambers. In Europe the oldest known arch is the Cloaca Maxima, the huge drain at Rome built by Lucius Tarquinius Priscus c. 578 B.C. The Romans developed the semicircular arch, modeled on earlier Etruscan structures, in the vaults and domes of their monumental buildings. Its use was continued in early Christian, Byzantine, and Romanesque architecture. In the 13th cent. the pointed arch (used as early as 722 B.C. in Assyrian drains) came into general use. The contact of Europeans with Saracenic architecture during the Crusades is offered among other theories for its introduction into Europe. But it is likely that the pointed arch may have been independently rediscovered in Europe in the Middle Ages as a device for solving many of the mechanical difficulties of vault construction. Its adoption was an essential element in the evolution of the Gothic system of design. With the Renaissance there was a return to the round arch, which prevailed until the 19th-century invention of steel beams for wide spans relegated the arch to a purely decorative function. Although the circular and pointed forms have predominated in the West, the Muslim nations of the East developed a variety of other arched shapes, including the ogee arch used in Persia and India, the horseshoe arch used in Spain and North Africa, and the multifoil or scalloped arch used especially in the Muslim architecture of Spain. In the 20th cent. arches often take a parabolic shape. They are usually constructed with laminated wood or reinforced concrete, materials that give greater lightness and strength to the structure. See TRIUMPHAL ARCH.

archaeology (arkēōl'ajē) [Gr., = study of beginnings], scientific study of the material remains of human cultures found in deposits dating from the beginnings of human life to the era of modern his-

tory. Archaeology provides the material evidence for establishing the history of prehistoric times and supplements documentary evidence in the study of historic periods. To locate, excavate, interpret, record, preserve, and, if necessary, restore finds, the present-day archaeologist requires skilled assistance from a wide variety of experts, including historians, anthropologists, linguists, geologists, chemists, physicists, botanists, architects, engineers, photographers, and climatologists. Materials have been collected since ancient times, notably in the classic period and during the Renaissance. Research into the life and culture of the past was initiated in the 15th cent. in Italy after the introduction of a knowledge of ancient Greece inspired the excavation of Greek sculpture. In the 18th cent. the progress of Greek and Roman archaeology was advanced by Johann Winckelmann and Ennio Visconti and by excavations at HERCULANEUM and POMPEII, in the 19th, by the acquisition of the ELGIN MARBLES. The study of ancient cultures in the Aegean region was stimulated by the excavations of Heinrich Schliemann at Troy and in Greece, and of Arthur Evans at Crete. The work of Martin Nilsson, Alan Wace, and John Pendlebury was also significant in this area, and the decipherment of the Minoan script by Michael Ventris raised new speculations about the early Aegean cultures. The foundations of Egyptology, a prolific branch of archaeology because of the antiquity of Egyptian culture and the wealth of material preserved in the dry Egyptian climate, were laid by the recovery of the Rosetta stone (see under ROSETTA) and the work of French scholars who accompanied Napoleon Bonaparte to Egypt. Investigations that have reconstructed ancient life in the Nile valley and rewritten Egyptian history were carried on in the 19th cent. by Karl Lepsius, Auguste Mariette, and Gaston Maspero, and in the 19th and 20th cent. by W. M. Flinders Petrie, James Breasted, and other scholars. Interest in the Middle East was stimulated by the work of Edward Robinson (1794–1863) on the geography of the Bible and by the decipherment of a cuneiform inscription of Darius I, which was copied (1835) by Henry Rawlinson from the Behistun rock in Iran. The finding of the Dead Sea Scrolls aroused new interest in Biblical studies. Archaeology in Mesopotamia was notably advanced in the 19th cent. by Jules Oppert, Paul Botta, and Austen Layard, in the 20th, by Charles Woolley, Henri Frankfort, and Seton Lloyd. The scientific explanation of prehistoric finds began with the conclusion advanced in 1832 by the Danish archaeologist Christian Thomsen that human industrial culture may be divided into stages of progress based on the principal materials used for weapons and implements. His three-age theory (see STONE AGE, BRONZE AGE, IRON AGE) was essentially based on prehistoric materials from Scandinavia and France. Concerted investigations began in the mid-19th cent. with the stratigraphic excavation of such remains as the LAKE DWELLING, BARROW, and KITCHEN MIDDEN. At first, the sequences of culture change uncovered in Western Europe were generalized to include all of world history, but improved techniques of field excavation and the expansion of archaeological discoveries in Africa, Asia, and the Americas challenged the universality of such rigid classifications. Technological traditions ceased to be regarded as inevitable concomitants of specific cultural stages. Later interpretations of prehistoric human life emphasize cultural responses to particular environments (see ECOLOGY). Thus the PALEOLITHIC, MESOLITHIC, and NEOLITHIC periods are evaluated in terms of food production. Developments in the methods of DATING archaeological remains resulted in many new hypotheses regarding prehistoric migrations and the diffusion of culture. The study of past times was enhanced by the investigation of the life and customs of existent aboriginal groups. Advanced indigenous cultures were ignored until John Stephens published an account of his travels (1839) in Central America, which excited the interest of archaeologists in the MAYA. In the 19th cent. fruitful studies began of the TOLTEC and of the AZTEC who followed them in Mexico and of the INCA in South America. In 1926, discovery of human cultural remains associated with extinct fauna near Folsom, N. Mex., established a depth of prehistory for the New World that is now believed to be at least 25,000 years, and perhaps over 40,000. Among the most important work done in the mid-20th cent. was that of Louis Leakey, who located the skeletal remains of humans in East Africa dating back 17 million years. Other significant excavations were conducted in the Americas and in China. Important efforts were made to promote systematic research and the scientific study of archaeological ma-

terials and to preserve them. Museums with valuable collections include the Metropolitan Museum and the American Museum of Natural History in New York City, the British Museum, the Louvre, national museums in Denmark, Norway, and Sweden, rich in remains of the Iron Age, the Vatican and Capitoline museums, Rome, collections from Pompeii and Herculaneum at Naples, and museums in Athens, Cairo, and Jerusalem. Many universities have established schools and museums of archaeology. Organizations such as the National Science Foundation, the Smithsonian Institution, and the National Geographic Society in the United States promote archaeological studies. See also MAN, PREHISTORIC and STRATIGRAPHY. See Glyn E. Daniel, *A Hundred Years of Archaeology* (1950), Grahame Clark, *Archaeology and Society* (3d ed. 1957, repr. 1968), R. J. Braidwood, *Prehistoric Man* (1961), G. E. Daniel, *The Origins and Growth of Archaeology* (1967), James Deetz, *Invitation to Archaeology* (1967), H. P. Eydoux, *History of Archaeological Discoveries* (1967), Massimo Pallottino, *The Meaning of Archaeology* (1968), Edward Bacon, *Archaeology* (1971), K. W. Marek, *Gods, Graves, and Scholars* (2d ed. 1967) and *The First American* (1971).

archaeopteryx (ar'kēōp'tērīks) [Gr. *archaeo* = primitive, *pteryx* = wing], primitive bird, two incomplete fossils of which were discovered in the 19th cent. in the late Jurassic limestone of Solnhofen, Bavaria. To date four fossil specimens have been found. Classified as a bird because of the presence of feathers and the structure of the legs and wings, it nevertheless had many characteristics now found only in reptiles or in bird embryos. It was smaller than a crow.

Archangel, see ARKHANGELSK, USSR.

archangel (ar'kājəl), chief ANGEL, differing from other angels only in importance. Three are best known, MICHAEL, GABRIEL, and RAPHAEL, they have set functions. According to Tobit 12:15 there are seven archangels, but only Raphael, companion of Tobias, is given a name.

Archelaus (ar'kēlās) see HEROD.

Archeozoic era, see PRECAMBRIAN ERA.

Archer, William, 1856–1924, English author, critic, and translator, b. Scotland. Throughout his life he worked as drama critic on several London newspapers, establishing a reputation for integrity and discernment. He influenced the direction of English and American drama through his active interest in the work of the great Norwegian playwright Henrik Ibsen. He translated Ibsen's *Pillars of Society*, and largely through his efforts the play was the first Ibsen play to be produced (1880) in London. Archer subsequently translated several other Ibsen plays, and in 1906–8 he edited Ibsen's collected plays. Archer's writings include *Masks or Faces* (1888), *America To-day* (1900), *Real Conversations* (1904), *The Old Drama and the New* (1923), and several plays, including the highly successful melodrama *The Green Goddess* (1923). His critical reviews for the *London World* were collected and published annually as *The Theatrical "World"* (1893–97). See biography by his brother, Charles Archer (1931).

Archer, The, English name for SAGITTARIUS, a CONSTELLATION.

archerfish, laterally compressed fish, genus *Toxotes*, which catches insects by spitting at and disabling them. The archerfish has a groove in the roof of its mouth that forms a long narrow tube when the tongue is placed against it, the fish propels drops of water along the tube by compressing its gill covers. Some archerfishes can shoot as far as 12 ft (3.5 m), with reasonable accuracy up to about 4 ft (1.2 m). Apparently they are able to correct the trajectory after missing a target. Shooting down insects is an auxiliary method of food-getting for the archerfish, which feeds mostly on insects floating in the water. The five archerfish species inhabit fresh and brackish coastal water in India and SE Asia. The species most often displayed in aquariums is *T. jaculator*, a silver fish with black stripes, which grows as long as 8 in. (20 cm). Archerfishes are classified in the phylum CHORDATA, subphylum Vertebrata, class Osteichthyes, order Perciformes, family Toxotidae.

archery, sport of shooting with BOW AND ARROW. An important military and hunting skill before the introduction of gunpowder, it was revived as a sport in England by Charles II. It was introduced into North America in the late 17th cent. Archery became popular in the United States after 1879, when the National Archery Association was formed. Although archery competitions were held in the 1908 and 1920 Olympic Games, it was not until 1972 that it

became a certified Olympic event. World championships are held under the auspices of the Federation Internationale de Tir à l'Arc (FITA, est. 1930). There are four main types of archery competition: target, field, flight, and crossbow shooting. The object in target shooting is to score the highest total of points with a specified number of arrows aimed at the inner circle—the "bull's-eye"—of five concentric colored circles on a padded mat—the target. The value of hits decreases from the bull's eye to the outermost circle. The world's oldest continuous archery tournament is the Ancient Scorton Arrow Contest, established (1673) by King Charles II of England. See D. W. Campbell, *Archery* (1971), E. G. Heath, *The Grey Goose Wing* (1971).

Arches National Park, 82,953 acres (33,571 hectares), E. Utah, est. as a national park 1971. Located in red-rock country and overlooking the gorge of the Colorado River, this area contains a vast and unusual array of natural rock formations. Water, frost, and wind have carved giant but graceful arches, windows, spires, and pinnacles.

archetype (ar'kitip) [Gr. *arch* = first, *typos* = mold], term whose earlier meaning, "original model," or "prototype," has been enlarged by C. G. JUNG and by several contemporary literary critics. A Jungian archetype is a thought pattern that finds worldwide parallels, either in cultures (for example, the similarity of the ritual of Holy Communion in Europe with the *tecquale* in ancient Mexico) or in individuals (a child's concept of a parent as both heroic and tyrannical, superman and ogre). Jung believed that such archetypal images and ideas reside in the unconscious level of the mind of every human being and are inherited from the ancestors of the race. They form the substance of the collective unconscious. Literary critics such as Northrop FRYE and Maud Bodkin use the term archetype interchangeably with the term MOTIF, emphasizing that the role of these elements in great works of literature is to unite readers with otherwise dispersed cultures and eras.

Archivites (ar'kēvīts), colonists sent into Samaria by the Assyrian government. They were probably natives of Erech. Ezra 4:9.

Archil (ar'kil) see ARCHITE.

archil (ar'kil, -chīl) or **orchil** (ōr-), blue, red, or purple dye extracted from several species of LICHEN, also called orchella weeds, found in various parts of the world. Commercial archil is either a powder (called cudbear), a pasty mass (called archil), or a drier paste (called persis).

Archilochus (arkil'akās), fl. c. 700 or c. 650 B.C., Greek poet, b. Paros. As an innovator in the use and construction of the personal lyric, his language was intense and often violent. Many fragments of his verse survive.

Archimedes (arkimē'dēz), 287–212 B.C., Greek mathematician, physicist, and inventor. He is famous for his work in geometry (on the circle, sphere, cylinder, and parabola), physics, mechanics, and hydrostatics. He lived most of his life in his native Syracuse, where he was on intimate terms with the royal family. Few facts of his life are known, but tradition has made at least two stories famous. In one story, he was asked by Hiero II to determine whether a crown was pure gold or was alloyed with silver. Archimedes was perplexed, until one day, observing the overflow of water in his bath, he suddenly realized that since gold is more dense (i.e., has more weight per volume) than silver, a given weight of gold represents a smaller volume than an equal weight of silver and that a given weight of gold would therefore displace less water than an equal weight of silver. Delighted at his discovery, he ran home without his clothes, shouting "Eureka," which means "I have found it." He found that Hiero's crown displaced more water than an equal weight of gold, thus showing that the crown had been alloyed with silver (or another metal less dense than gold). In the other story he is said to have told Hiero, in illustration of the principle of the lever, "Give me a place to stand, and I will move the world." He invented machines of war (Second Punic War) so ingenious that the besieging armies of Marcus Claudius Marcellus were held off from Syracuse for three years. When the city was taken, the general gave orders to spare the scientist, but Archimedes was killed. Nine of Archimedes' treatises, which demonstrate his discoveries in mathematics and in floating bodies, are extant. They are *On the Sphere and Cylinder*, *On the Measurement of the Circle*, *On the Equilibrium of Planes*, *On Conoids and Spheroids*, *On Spirals*, *On the Quadrature of the Parabola*, *Arenarius* [or sand-reckoner], *On Floating Bodies*, and *On the Method of Mechanical Theorems*. Archimedes' many contributions to

mathematics and mechanics include calculating the value of π , devising a mathematical exponential system to express extremely large numbers (he said he could numerically represent the grains of sand that would be needed to fill the universe), developing ARCHIMEDES' PRINCIPLE, and inventing ARCHIMEDES' SCREW. See studies by T. L. Heath (1953) and E. J. Dijksterhuis (1956).

Archimedes' principle, principle that states that a body immersed in a fluid is buoyed up by a force equal to the weight of the displaced fluid. The principle applies to both floating and submerged bodies and to all fluids, i.e., liquids and gases. It explains not only the buoyancy of ships and other vessels in water but also the rise of a balloon in the air and the apparent loss of weight of objects underwater. In determining whether a given body will float in a given fluid, both weight and volume must be considered, that is, the relative DENSITY, or weight per unit of volume, of the body compared to the fluid determines the buoyant force. If the body is less dense than the fluid, it will float or, in the case of a balloon, it will rise. If the body is denser than the fluid, it will sink. Relative density also determines the proportion of a floating body that will be submerged in a fluid. If the body is two thirds as dense as the fluid, then two thirds of its volume will be submerged, displacing in the process a volume of fluid whose weight is equal to the entire weight of the body. In the case of a submerged body, the apparent weight of the body is equal to its weight in air less the weight of an equal volume of fluid. The fluid most often encountered in applications of Archimedes' principle is water, and the SPECIFIC GRAVITY of a substance is a convenient measure of its relative density compared to water. In calculating the buoyant force on a body, however, one must also take into account the shape and position of the body. A steel rowboat placed on end into the water will sink because the density of steel is much greater than that of water. However, in its normal, keel-down position, the effective volume of the boat includes all the air inside it, so that its average density is then less than that of air, and as a result it will float.

Archimedes' screw, a simple mechanical device believed to have been invented by Archimedes in the 2d cent. A.D. It consists of a cylinder inside of which a continuous screw, extending the length of the cylinder, forms a spiral chamber. By placing the lower end in water and revolving the screw, water is raised to the top. The principle is applied in machines used for drainage and irrigation, and also in some types of high-speed tools. It can also be applied for handling light, loose materials such as grain, sand, and ashes.

Archipelago (arkipēl'agō) [Ital., from Gr. = chief sea], ancient name of the AEGEAN SEA, later applied to the numerous islands it contains. The word now designates any cluster of islands.

Archipenko, Alexander (arkhipēn'kō), 1887–1964, Ukrainian-American sculptor. As a youth in Paris he began to adapt cubist technique to sculpture. In 1910 he opened his own art school there and later opened schools in Berlin (1921) and New York City (1923). In 1912, Archipenko introduced sculpto-painting, an attempt to unite form and color via mixed media. However, his major contribution to 20th-century sculpture was his realization of negative form. Archipenko recognized the aesthetic value of the void—the hollowed-out shape or perforation as a complement to the bulging mass—as exemplified by his *Madonna* in marble and the bronze *Woman Combing Her Hair* (Mus. of Modern Art, New York City). Archipenko also worked in carved plastic lighted from within. His nearly abstract figures gained him international renown, among them are *Torso in Space* (Whitney Mus., New York City), *Walking Girl* (Honolulu Mus.), and *White Torso* (examples in the Chicago Arts Club and in the Fine Art Association, Phoenix, Arizona). Archipenko was also an engineer, ceramist, and teacher. See his *Archipenko: Fifty Creative Years 1908–1958* (1960), cataloged by D. H. Karshan (1969).

Archipelago de Colon, see GALÁPAGOS ISLANDS.

Archippus (arkip'as), Colossian Christian. Col. 4:17.

Archite (ar'kit) or **Archi** (ar'ki), clan that owned Ataroth between Bethel and Beth-horon, on the boundary between Ephraim and Benjamin. Joshua 16:2. HUSHAI, David's friend, was a member of the clan. 2 Sam. 15:32.

architecture, art of building in which human requirements and construction materials are related so as to furnish a practical and aesthetic solution, thus differing from the pure utility of engineering.

construction. Modern architecture, however, often approaches actual engineering in its mechanical completeness, and modern works of engineering—airplane hangars, for example—often achieve an undeniable beauty. As an art, architecture is abstract and nonrepresentational and involves the manipulation of the relationships of spaces, volumes, planes, masses, and voids. Time is also an important factor in architecture, since a building is usually comprehended in a succession of experiences rather than all at once. In most architecture there is no one vantage point from which the whole structure can be understood. The use of light and shadow, as well as surface decoration, can greatly enhance a structure. The analysis of architectural types provides an insight into past cultures and eras. The course of architecture has often been considered merely a succession of more or less arbitrary styles. In fact, behind each of the greater styles lies not a casual trend or vogue but a period of serious and urgent experimentation directed toward answering the needs of a specific way of life. Climate, methods of labor, available materials, and economy of means impose their dictates. Each of the greater styles has been given its impetus by the discovery of a new construction method and has arrived laboriously at adequate employment of it. Once developed, it survives tenaciously, giving way only when social changes or new building techniques have reduced it finally to total anachronism. That evolutionary process is exemplified by the history of modern architecture, which developed from the first uses of structural iron and steel in the mid-19th cent. Until the 20th cent. there were three great developments in architectural construction—the post-and-lintel, or trabeated, system, the ARCH system, either the cohesive type, employing plastic materials hardening into a homogeneous mass, or the thrust type, in which the loads are received and counterbalanced at definite points, and the modern steel-skeleton system. In the 20th cent. new forms of building have been devised, with the use of reinforced concrete and the development of geodesic and stressed-skin (light material, reinforced) structures. In Egyptian architecture, to which belong some of the earliest extant structures entitled to be designated as architecture (erected before 3000 B.C.), the post-and-lintel system was employed exclusively and produced the earliest stone columnar buildings in history. The architecture of W Asia from the same era employed the same system, however, arched construction was also known and used. The Chaldeans and Assyrians, dependent upon clay as their chief material, built vaulted roofs of damp mud bricks that adhered to form a solid shell. After generations of experimentation with buildings of limited variety the Greeks gave to the simple post-and-lintel system the purest, most perfect expression it was to attain (see PARTHENON, ORDERS OF ARCHITECTURE). Roman architecture, borrowing and combining the columns of Greece and the arches of Asia, erected a wide variety of monumental buildings throughout the Western world. Their momentous invention of CONCRETE enabled the imperial builders to exploit successfully the VAULT construction of W Asia and to cover vast unbroken floor spaces with great vaults and domes, as in the rebuilt Pantheon (2d cent. A.D.). The Romans and the early Christians also used the wooden truss for roofing the wide spans of their BASILICA halls. Neither Greek, Chinese, nor Japanese architecture used the vault system of construction. However, in the Asiatic division of the Roman Empire, vault development continued, Byzantine architects experimented with new principles and developed the PENDENTIVE, used brilliantly in the 6th cent. for the Church of HAGIA SOPHIA in Constantinople. The Romanesque architecture of the early Middle Ages was notable for strong, simple, massive forms and vaults executed in cut stone. In Lombard Romanesque (11th cent.) the Byzantine concentration of vault thrusts was improved by the device of ribs and of piers to support them. The idea of an organic supporting and buttressing skeleton of masonry, here appearing in embryo, became the vitalizing aim of the medieval builders. In 13th-century Gothic architecture it emerged in perfected form, as in the Amiens and Chartres cathedrals. The birth of Renaissance architecture (15th cent.) inaugurated a period of several hundred years in Western architecture during which the multiple and complex buildings of the modern world began to emerge, while at the same time no new and compelling structural conceptions appeared. The forms and ornaments of Roman antiquity were resuscitated again and again and were ordered into numberless new combinations, and structure served chiefly as a convenient tool for at-

taining these effects. The complex, highly decorated baroque style was the chief manifestation of the 17th-century architectural aesthetic. The GEORGIAN STYLE was among architecture's notable 18th-century expressions. The first half of the 19th cent. was given over to the CLASSIC REVIVAL and the GOTHIC REVIVAL. The architects of the later 19th cent. found themselves in a world being reshaped by science, industry, and speed. The needs of a new society pressed them, while steel, reinforced concrete, and electricity were among the new technical means at their disposal. The imitation of dead styles became yearly more futile, and individual architects began the conscious search for adequate new structural and artistic formulas. After more than a half-century of assimilation and experimentation, MODERN ARCHITECTURE has produced an astonishing variety of daring and original structures. See articles under countries, e.g., AMERICAN ARCHITECTURE, styles, e.g., BAROQUE, individual architects, e.g., Andrea PALLADIO, individual stylistic and structural elements, e.g., TRACERY, ORIENTATION, specific building types, e.g., PAGODA, APARTMENT HOUSE. See Talbot Hamlin, *Architecture through the Ages* (rev. ed. 1953); Nikolaus Pevsner, *An Outline of European Architecture* (16th ed. 1960); Banister Fletcher, *A History of Architecture* (17th ed. 1961); F. M. Simpson et al., *History of Architectural Development* (4 vol., rev. ed. 1954-61); H. A. Millon, *Key Monuments of the History of Architecture* (1964); A. E. Richardson and H. O. Corfianto, *The Art of Architecture* (3d ed. 1972); S. F. Kimball and G. H. Edgell, *A History of Architecture* (1946, repr. 1972); John Fleming et al., *The Penguin Dictionary of Architecture* (rev. ed. 1973).

architrave (ar'kītrāv), in architecture, principal beam and lowest member of the classical entablature, the other main members of which are the FRIEZE and the CORNICE. Its position is directly above the columns, and it extends between them, thus carrying the upper members of the order (see ORDERS OF ARCHITECTURE). The term also applies to molding around the sides and top of a door or window frame or around a wainscot or other panel.

archons (ar'kōnz, -kantz) [Gr., = leaders], in ancient Athens and other Greek cities, officers of state. Originally in Athens there were three archons: the *archon eponymos* (so called because the year was named after him), who was the chief officer of the state, the *archon basileus*, who was primarily connected with sacred rites, and the *archon polemarchos* (the polemarch, or military commander), who—theoretically, at least—had military leadership. Six more archons, the *thesmothetae* (thesmothetes), were later added; they were junior officers, generally in charge of the courts. The archons were elected, and after they had served and their records had been approved, they entered the AREOPAGUS. Solon, Hippas, and Themistocles were archons. After 487 B.C. the archons were chosen by lot, the office, which had previously been limited to the two upper classes, was opened to the third class. Thereafter the archontate declined greatly in importance. The lists of eponymous archons kept after the 7th cent. B.C. are a valuable source of history.

Arcimboldo, Giuseppe (jōzēp'pā archēmbōl'dō), 1537-93, Italian painter. Court painter to the Hapsburg kings, Arcimboldo is celebrated for his grotesque, realistically rendered symbolic portraits constructed from fruits, vegetables, animals, etc. His *Winter* (1563) is in the Vienna Kunsthistorische Museum. Arcimboldo's fanciful mannerist works were frequently imitated.

Arciniegas, Germán (hērman' arsenyā'gas), 1900-, Colombian historian and diplomat. A leading Latin American intellectual, he gained prominence as a journalist and publisher. He lived in exile in the United States (1942-60) and taught at Columbia. He was appointed Colombian ambassador to Italy in 1960 and later became ambassador to Venezuela. Among his works are *The Knight of El Dorado*, *The Tale of Don Gonzalo Jimenez de Quesada* (tr. 1942), *The State of Latin America* (tr. 1952), and *Latin America: A Cultural History* (tr. 1967). He edited *The Green Continent* (1944), an interpretation of Latin America by its leading writers.

Arcole (ar'kōlā), village (1971 pop. 4,009), Venetia, N. Italy. There, in Nov., 1796, Napoleon Bonaparte defeated the Austrians in a three-day battle.

Arcos de la Frontera (ar'kōs dā la frōntā'ra), town (1970 pop. 25,966), Cadiz prov., S. Spain, in Andalusia, on a rocky hill above the Guadalete River. A Gothic church and the palace of the duke of Arcos are at the summit. Wine and olive oil are produced. The Moors were driven out in 1250.

Arcot (ar'kōt), town (1971 pop. 30,229), Tamil Nadu state, SE India, on the Palar River. It is an agricultural

market and has a weaving industry. It became the capital of the Muslim Nawab of Carnatic in 1712. Arcot was the first important fortified town captured (1751) by Robert Clive in the British-French struggle for S. India.

Arctic Archipelago, group of more than 50 large islands, Franklin dist., Northwest Territories, N. Canada, in the Arctic Ocean. The southernmost members of the group include Baffin (the archipelago's largest island), Victoria, Banks, Prince of Wales, and Somerset islands, N. of Viscount Melville and Lancaster sounds are the Queen Elizabeth Islands, of which Ellesmere is the largest. Tundra and permanent ice cover the islands, on which oil and coal have been discovered. Frobisher Bay, on Ellesmere, is the largest settlement.

Arctic Circle, imaginary circle on the surface of the earth at 66½°N latitude, i.e., 23½° south of the North Pole. It marks the northernmost point at which the sun can be seen at the winter SOLSTICE (about Dec. 22) and the southernmost point of the northern polar regions at which the MIDNIGHT SUN is visible.

Arctic North Slope or **Arctic Slope**, Alaska. see ALASKA NORTH SLOPE.

Arctic Ocean, the smallest ocean, c. 5,400,000 sq mi (13,986,000 sq km), located entirely within the Arctic Circle and occupying the region around the North Pole. Once called the Frozen Ocean, it is covered with ice (2-14 ft/6-4 m thick) throughout the year except in fringe areas. Nearly landlocked, the Arctic Ocean is bordered by Greenland, Canada, Alaska, the USSR, and Norway. The Bering Strait connects it with the Pacific Ocean and the Greenland Sea is the chief link with the Atlantic Ocean. The principal arms of the Arctic Ocean are the Beaufort, Chukchi, East Siberian, Laptev, Kara, Barents, and Greenland seas. The floor of the Arctic Ocean is divided by three submarine ridges—Alpha Ridge, Lomonosov Ridge, and the Arctic Mid-Oceanic Ridge, other submarine ridges, such as the Faeroe-Icelandic Ridge, act to separate the Arctic Ocean from the Atlantic. Svalbard, the Franz Josef group, and Severnaya Zemlya are examples of the islands that are exposed tops of the submarine ridges. The Arctic Ocean has the widest continental shelf of all the oceans, it extends c. 750 mi (1,210 km) seaward from Siberia. From the shelf rise numerous islands, including the Arctic Archipelago, Novaya Zemlya, the New Siberian Islands, and Wrangel Island. The continental shelf encloses a deep oval basin (average depth 12,000 ft/3,658 m) that stretches between Svalbard and the Bering Strait, E. of Greenland the ring of the continental shelf is broken by the Greenland Sea. The greatest depth (17,850 ft/5,441 m) in the Arctic Ocean is found just N. of the Chukchi Sea. Since the Arctic's connection with the Pacific Ocean is narrow and very shallow, its principal exchange of water is therefore with the Atlantic Ocean through the Greenland Sea. Even there, though surface waters communicate freely and a strong subsurface current brings warm water from the Atlantic into the Arctic basin, exchange of deeper waters is barred by submarine ridges. Thus a near stagnant pool of very cold water is found at the bottom of the Arctic basin. Because several major rivers in Siberia (Lena, Yenisei, Ob) and Canada (Mackenzie) bring in much water, and because evaporation is only slight, the outflow through the Greenland Sea is important. It creates the cold East Greenland Current, which flows south along the coast of E. Greenland. A weaker current goes through Smith Sound and Baffin Bay and is known as the Labrador Current. Another weak current flows out of Bering Strait. The water that does not flow out by the Greenland Sea seems to be deflected by N. Greenland and forms the current that gives rise to a circular current in the Arctic basin itself. This circular current causes the relatively light ice of the Siberian seas, which contrasts with the heavy-pressure ice phenomenon off Greenland and Ellesmere Island (in the Arctic Archipelago). The drift of ice southward and westward has been noted and utilized by explorers. Some of the ice pack remains in the Arctic basin, and some, carried out by the East Greenland Current, melts before going far enough south to reach the regular Atlantic shipping lanes, the icebergs that harass ships are generally brought from the fjords of W. Greenland by the Labrador Current. The cold Arctic currents give the shores of NE North America and NE Asia a much colder climate than the northwest shores of Europe and North America, which are warmed by the North Atlantic Drift and the Japan Current. The Arctic currents are also less saline and lighter than these warmer currents, and therefore the Arctic water is at the surface and the Atlantic current beneath,

where they are exchanged in the Greenland Sea. It was long thought that no life could exist in the Arctic, however, despite drifting ice, ice packs, vast ice floes, and winter temperatures to -60°F (-51°C), there are hares, polar bears, seals, gulls, and guillemots as far north as 88° and plankton in all Arctic waters. The Arctic basin was almost wholly unexplored until the Amundsen-Ellsworth flight over it in 1926. Arctic research was stimulated when it was recognized that the shortest air routes between the great cities of the Northern Hemisphere cross the Arctic Ocean. Improved technology has also facilitated research, with the development of aerial photography and photogrammetry for precise mapping, radar and the fathometer for measuring ocean depths, and radio to maintain contact with the rest of the world. Detailed knowledge of drifts and ice floes, water depths, and the ocean floor has been vastly increased. Soviet polar scientists investigated (1948-49) the Lomonosov Ridge, an undersea mountain range that influences the pattern of ice drift and the circulation and exchange of water in the Arctic Ocean. American scientists in 1959 discovered the existence of a submarine plateau rising 8,100 ft (2,469 m) from the ocean floor. One fact of great potential importance is now being studied—the Arctic Ocean is warming. Recorded temperatures, glacial regressions, and the appearance of observed species of fish in larger numbers, at higher latitudes, at earlier seasons, and for long periods prove that over the decades a “climatic improvement” has taken place. Similar changes have been reported in sub-Arctic latitudes. Whether the warming is a phase in a cycle or a permanent development cannot yet be said. For an account of exploration and for bibliography, see ARCTIC REGIONS.

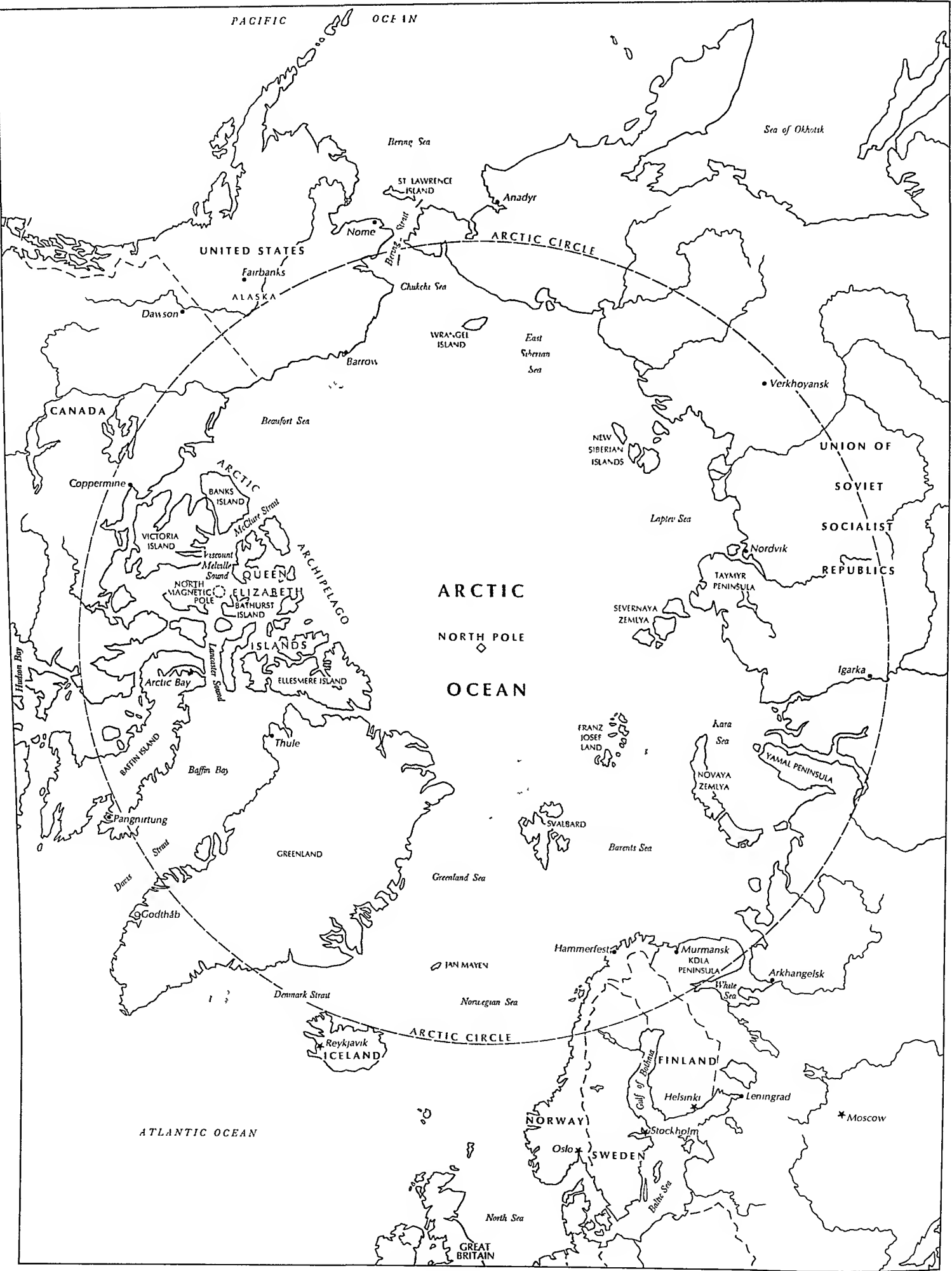
Arctic Red River, c 310 mi (500 km) long, rising in the Mackenzie Mts. of Mackenzie dist., W Northwest Territories, Canada, and flowing generally NW to the Mackenzie River. At its mouth are a post of the Royal Canadian Mounted Police and the village of Arctic Red River.

arctic regions or the Arctic, northernmost area of the earth, centered on the NORTH POLE. The arctic regions are not coextensive with the area enclosed by the ARCTIC CIRCLE (lat $66^{\circ} 31'\text{N}$) but are usually defined by the irregular and shifting 50°F (10°C) July isotherm that closely corresponds to the northern limit of tree growth and that varies both N and S of the Arctic Circle. The regions therefore include the ARCTIC OCEAN, the northern reaches of Canada, Alaska, the USSR, Norway, and the Atlantic Ocean, SVALBARD, most of Iceland, GREENLAND, and the Bering Sea. In the center of the arctic regions is a large basin occupied by the Arctic Ocean. The basin is nearly surrounded by the ancient continental shields of North America, Europe, and Asia, with the geologically more recent lowland plains, low plateaus, and mountain chains between them. Surface features vary from low coastal plains (swampy in summer, especially at the mouths of such rivers as the Mackenzie, Lena, Yenisei, and Ob) to high ice plateaus and glaciated mountains. TUNDRAS, extensive flat and poorly drained lowlands, dominate the regions. The most notable highlands are the Brooks Range of Alaska, the Innuitians of the Canadian ARCTIC ARCHIPELAGO, the Urals, and the mountains of E USSR. Greenland, the world's largest island, is a high plateau covered by a vast ice sheet except in the coastal regions. The climate of the Arctic, classified as polar, is characterized by long, cold winters and short, cool summers. Polar climate may be further subdivided into tundra climate (the warmest month of which has an average temperature below 50°F / 10°C but above 32°F / 0°C) and ice cap climate (all months average below 32°F / 0°C and there is a permanent snow cover). Precipitation, almost entirely in the form of snow, is very low, with the annual average precipitation for the regions less than 20 in (51 cm). Persistent winds whip up fallen snow to create the illusion of constant snowfall. The climate is moderated by oceanic influences, with regions abutting the Atlantic and Pacific oceans having generally warmer temperatures and heavier snowfalls than the colder and drier interior areas. However, except for along its fringe, the Arctic Ocean remains frozen throughout the year. Great seasonal changes in the length of days and nights are experienced N of the Arctic Circle, with variations that range from 24 hours of constant daylight (“midnight sun”) or darkness at the Arctic Circle to six months of daylight or darkness at the North Pole. However, because of the low angle of the sun above the horizon, insolation is minimal throughout the regions, even during the prolonged daylight period. A famous occurrence in the arctic night sky is the AURORA BOREALIS, or northern lights. Vegetation in the Arctic, lim-

ited to regions having a tundra climate, flourishes during the short spring and summer seasons. The tundra's restrictive environment for plant life increases northward, with dwarf trees giving way to grasses (mainly mosses, lichen, sedges, and some flowering plants), the ground coverage of which becomes widely scattered toward the permanent snow line. There are about 20 species of land animals in the Arctic, including the squirrel, wolf, fox, moose, caribou, reindeer, polar bear, and musk ox, and about six species of aquatic mammals such as the walrus, seal, and whale. Most of the species are year-round inhabitants of the Arctic, migrating to the southern margins as winter approaches. Although generally of large numbers, some of the species, especially the fur-bearing ones, are in danger of extinction. A variety of fish is found in arctic seas, rivers, and lakes. The Arctic's bird population increases tremendously each spring with the arrival of migratory birds (see MIGRATION OF ANIMALS). During the short warm season, a large number of insects breed in the marshlands of the tundra. In parts of the Arctic are found a variety of natural resources, but many known reserves are not exploited because of their inaccessibility. The arctic region of the USSR, the most developed of all the arctic regions, is a vast storehouse of mineral wealth, including deposits of nickel, copper, coal, gold, uranium, tungsten, and diamonds. The North American Arctic yields uranium, copper, nickel, iron, natural gas, and oil. Inaccessibility made the Arctic a relatively unknown area until the wide-scale use of airplanes and snow vehicles in the 20th cent. The arctic region of Europe (including W USSR) benefits from good overland links with southern areas and ship routes that are open throughout the year. The arctic regions of the Asian USSR and North America depend on isolated overland routes, summertime ship routes, and air transportation. Transportation of oil by pipeline from arctic Alaska was highly controversial in the early 1970s, with strong opposition from environmentalists. Because of the extreme conditions of the arctic regions, the delicate balance of nature, and the slowness of natural repairs, the protection and preservation of the Arctic has been a major goal of conservationists who fear irreparable damage to the natural environment from local temperature increases, the widespread use of machinery, the interference with wildlife migration, and oil spills. The Arctic is one of the world's most sparsely populated areas. Its inhabitants, basically of the Mongoloid race, are thought to be descendants of a people who migrated northward from central Asia after the Ice Age and subsequently spread W into Europe and E into North America. The chief groups are now the Lapps of Europe, the SAMOYEDS (Nentsy) of W USSR, the Yakuts, TUNGUS, Yukaghirs, and Chukchis of E USSR, and the ESKIMO of North America. There is a sizable Caucasian population in Siberia, and the people of Iceland are nearly all Caucasian. In Greenland, the Greenlanders, a mixture of Eskimos and northern Europeans, predominate. Because of their common background and the general lack of contact with other peoples, arctic peoples have strikingly similar physical characteristics and cultures, especially in such things as clothing, tools, techniques, and social organization. The arctic peoples, once totally nomadic, are now largely sedentary or seminomadic. Hunting, fishing, reindeer herding, and indigenous arts and crafts are the chief activities. The arctic peoples are slowly being incorporated into the society of the country in which they are located. With the Arctic's increased economic and political role in world affairs, the regions have experienced an influx of personnel charged with building and manning such things as roads, mineral extraction sites, weather stations, and military installations.

History of Exploration. The first explorers in the arctic regions were the Norsemen, the VIKINGS. Much later the search for the NORTHWEST PASSAGE and the NORTHEAST PASSAGE to reach the Orient from Europe spurred exploration to the north. This activity began in the 16th cent. and continued in the 17th, but the hardships suffered and the negative results obtained by early explorers—among them Martin FROBISHER, John DAVIS, Henry HUDSON, Willem BAFFIN, and William BARENTZ—caused interest to wane. The fur traders in Canada did not begin serious explorations across the tundras until the latter part of the 18th cent. Alexander MACKENZIE undertook extensive exploration after the beginnings made by Samuel Hearne, Philip Turnor, and others. Already in the region of NE Asia and W Alaska the Russian explorations under Vitus BERING and others and the activities of the *promyshlenniki* [fur traders] had begun to make the arctic coasts known. After 1815, British

naval officers—including John FRANKLIN, F. W. BEECHY, John ROSS, James ROSS, W. E. PARRY, P. W. DEASE, Thomas SIMPSON, George BACK, and John RAE—inspired by the efforts of John BARROW, took up the challenge of the Arctic. The disappearance of Franklin on his expedition between 1845 and 1848 gave rise to more than 40 searching parties. Although Franklin was not found, a great deal of knowledge was learned about the Arctic as a result, including the general outline of Canada's arctic coast. Otto SVERDRUP, D. B. MACMILLAN, and Vilhjalmur STEFANSSON added significant knowledge of the regions. Meanwhile, in the Eurasian Arctic, FRANZ JOSEF LAND was discovered and NOVAYA ZEMLYA explored. The Northeast Passage was finally navigated in 1879 by Nils A. E. NORDENSKIÖLD. Roald AMUNDSEN, who went through the Northwest Passage (1903-6), also went through the Northeast Passage (1918-20). Greenland was also explored. The race to be first at the North Pole was won by Robert E. PEARY in 1909. Although Fridtjof NANSEN, drifting with his vessel *Fram* in the ice (1893-96), failed to reach the North Pole, he added enormously to the knowledge of the Arctic Ocean. Air exploration of the regions began with the tragic balloon attempt of S. A. ANDRÉE in 1897. In 1926, Richard E. BYRD and Floyd Bennett flew over the North Pole, and Amundsen and Lincoln ELLSWORTH flew from Svalbard (Spitsbergen) to Alaska across the North Pole and unexplored regions N of Alaska. In 1928, George H. WILKINS flew from Alaska to Spitsbergen. The use of the “great circle” route for world air travel increased the importance of arctic regions, while new ideas of the agricultural and other possibilities of arctic and subarctic regions led to many projects for development, especially by the USSR. In 1937 and 1938 many field expeditions were sent out by British, Danish, Norwegian, Soviet, Canadian, and American groups to learn more about the Arctic. The Soviet group under Ivan Papanin set down and wintered on an ice floe near the North Pole and drifted with the current for 274 days. Valuable hydrological, meteorological, and magnetic observations were made, by the time they were taken off the floe, the group had drifted 19° of latitude and 58° of longitude. Arctic drift was further explored (1937-40) by the Soviet icebreaker *Sedov*, and the existence of Sannikov Island was proved a myth. In 1938 air photographs by Laue KOCH over N Greenland proved the much-sought Peary Channel to be only a fjord. Before World War II, the USSR had established many meteorological and radio stations in the arctic regions. Soviet activity in practical exploitation of resources also pointed the way to the development of arctic regions. Between 1940 and 1942 the Canadian vessel *St. Roch* made the first west-east journey through the Northwest Passage. In World War II, interest in transporting supplies gave rise to considerable study of arctic conditions. After the war interest in the Arctic was keen. The Canadian army in 1946 undertook a project that had as one of its objects the testing of new machines (notably the snowmobile) for use in developing arctic regions. There was also a strong impulse to develop Alaska and N Canada, but no consolidated effort, like that of the Soviets, to take the natives into partnership for a full-scale development of the regions. Since 1954 the United States and the USSR have established a number of drifting observation stations on ice floes for the purpose of intensified scientific observations. In 1955, as part of joint U.S.-Canadian defense, construction was begun on a c 3,000-mi (4,830-km) radar network (the Distant Early Warning line, commonly called the DEW line) stretching from Alaska to Baffin Island and, subsequently, across Greenland. With the continuing development of northern regions (e.g., Alaska, N Canada, and the USSR), the Arctic is assuming greater importance in the world. During the International Geophysical Year (1957-58) more than 300 arctic stations were established by the northern countries interested in the arctic regions. The Arctic Institute of North America has been prominent in sponsoring studies of the arctic regions. In 1960 the institute set up a permanent year-round station on Devon Island. Atomic-powered submarines have been used for penetrating the arctic regions. In 1958 the *Nautilus*, a U.S. navy atomic-powered submarine, became the first ship to cross the North Pole undersea. Two years later the *Skate* set out on a similar voyage and became the first to surface at the Pole. In the 1960s the Arctic became the scene of an intense search for mineral and power resources. The discovery of oil on the Alaska North Slope (1968) and on Canada's Ellesmere Island (1972) led to a great effort to find new oil fields along the edges of the continents. In the summer of 1969 the SS *Manhattan*, a specially designed oil tanker with ice



Cross-references are indicated by SMALL CAPITALS

breaker and oceanographic research vessel features, successfully sailed from Philadelphia to Alaska by way of the Northwest Passage in the first attempt to bring commercial shipping into the region. In 1971 the Arctic Ice Dynamics Joint Experiment (AIDJEX) began an international effort to study over a period of years arctic pack ice and its effect on world climate. Practically all parts of the Arctic have now been photographed and scanned (by remote sensing devices) from aircraft and satellites. From these sources accurate maps of the arctic regions have been compiled. Classic narratives of arctic exploration include Fridtjof Nansen, *Farthest North* (tr., 2 vol., 1897, repr. 1968) and *In Northern Mists* (tr. 1911), R. E. Amundsen, *The North West Passage* (tr., 2 vol., 1908), R. E. Peary, *The North Pole* (1910, repr. 1969), Vilhjalmur Stefansson, *My Life with the Eskimo* (1913) and *The Friendly Arctic* (1921). For history and geography, see L. P. Kirwan, *A History of Polar Exploration* (1960), P. D. Baird, *The Polar World* (1964), Farley Mowat, comp., *The Polar Passion: The Quest for the North Pole* (1968), Ragnar Thoren, *Picture Atlas of the Arctic* (1969), Richard Perry, *The Polar Worlds* (1973), L. H. Neatby, *Conquest of the Last Frontier* (1966) and *Discovery in Russian and Siberian Waters* (1973).

Arcturus (ārktōōr'ās), brightest star in the constellation BOOTES and 4th-brightest star in the entire sky, Bayer designation Alpha Boötis, 1970 position RA 14^h14^m3^s, Dec +19°20'. An orange giant of SPECTRAL CLASS K2 III, it has an apparent MAGNITUDE of -0.06, its diameter is about 10 times that of the sun and its luminosity about 100 times that of the sun. Arcturus is one of the nearest giant stars, at a distance of about 36 light-years, and has one of the largest PROPER MOTIONS (annual angular shift in position) of the bright stars. Its name is from the Greek meaning "guardian of the bear," and it can be found by following the extension of the curve of the handle of the Big Dipper (Large Bear).

Ard (ard) 1 Son of Benjamin Gen 46:21 2 Benjamite, perhaps the same as 1. Num 26:40 Addar 1 Chron 8:3

Ardashir I (ardāshēr') [another form of Artaxerxes], d. 240, king of Persia (226?-240). He overthrew the last Parthian king, Artabanus IV, entered Ctesiphon, and reunited Persia out of the confusion of Seleucid decline. He established the strong SASSANID or Sassanian dynasty and reconquered the old eastern territories. Ardashir established ZOROASTRIANISM as the state religion and gave much power to the priestly caste. His move against Mesopotamia, Armenia, and Cappadocia caused the Roman emperor ALEXANDER SEVERUS to campaign against him. A great battle in 232 cost both armies heavy losses. It was Alexander who had to retire, and though Alexander celebrated a triumph in Rome, Ardashir took Armenia, and Persian power was firmly established. He is sometimes called Ardashir Papakan, for his father, Papak Shapur I succeeded him.

Ardashir II, king of Persia (379-83), of the SASSANID, or Sassanian, dynasty. A provincial governor under SHAPUR II, he succeeded to the throne. He earned popularity by remitting taxes, but his rule was weak, and he was deposed in favor of his nephew, Shapur III.

Ardebil (ardēbēl'), town (1971 est. pop. 88,000), NW Iran, near the USSR border. It is a market center for a fertile agricultural region. Carpets and rugs are produced in the town. Ardebil was probably founded in the 5th cent. A.D. It became (10th cent.) the capital of Azerbaijan but was soon superseded by Tabriz. In 1220 it was destroyed by the Mongols. The town quickly regained its importance as the home of Safi ad-Din, the founder of a celebrated Sufi order. The Safavids erected a beautiful shrine there, and the town became a center of pilgrimage. Ardebil also contains the tomb of Shah Ismail. The town was occupied by the Turks in 1725 and by the Russians in 1828. Its fine library was taken to St. Petersburg by the Russians. The name is also spelled Ardabil.

Ardeche (ārdēsh'), department (1968 pop. 256,927) in VIVARAIS, S. France. Privas is the capital.

Arden, John, 1930-, English playwright, b. Barnsley, Yorkshire, educated at Cambridge and at Edinburgh College of Architecture. Although his plays often treat moral problems, Arden does not postulate absolutes, nor does he provide answers to the questions he raises. His plays combine poetry and realism and have had critical rather than commercial success. They include *Sergeant Musgrave's Dance* (1959), *The Workhouse Donkey* (1963), *Armstrong's Last Goodnight* (1967), and two autobiographical plays, *The Ballygombeen Bequest* (1972) and *The Island of the Mighty* (1972).

Arden, uninc. city (1970 pop. 82,492 including Arcade), Sacramento co., N. central Calif.

Arden, Forest of, well-wooded area, formerly very extensive, in Warwickshire, central England. It is the setting for Shakespeare's *As You Like It*.

Ardennes (ārdēn'), department (1968 pop. 309,380), NE France, in Champagne. The capital is CHARLEVILLE-MÉZIÈRES.

Ardennes, wooded plateau, from 1,600 to 2,300 ft (488-701 m) high, in SE Belgium, N. Luxembourg, and Ardennes dept., N. France, E and S of the Meuse River. The plateau is cut into wild crags and ravines by rapid rivers. Agriculture and cattle raising are the main occupations of this sparsely populated region. Peat bogs are found in shallow depressions. In Germany, the Ardennes is continued by the Eifel. The chief cities (Liege, Namur) are in the Meuse valley. A traditional battleground, the Ardennes saw heavy fighting in both World Wars, notably in the BATTLE OF THE BULGE (Dec., 1944-Jan., 1945).

Ardennes, Battle of the: see BATTLE OF THE BULGE

Ardigo, Roberto (rōbēr'tō ardēgō'), 1828-1920, Italian positivist philosopher. His early life was spent in the priesthood, from which he withdrew in dissatisfaction at the age of 43. Later he was a professor at the Univ. of Padua (1881-1909) and defended his conviction that human knowledge originated in sensation against the philosophical idealism then popular in Italy. Most of his writings were collected in *Opere filosofiche* (12 vol., 1882-1912), he also wrote *La scienza della educazione* (3d ed. 1909).

Ardmore, city (1970 pop. 20,881), seat of Carter co., S. Okla., inc. 1898. It is the commercial center of a rich oil and farm area. Its industries include oil refining, cotton and food processing, and the manufacture of tires, telephone equipment, and electronic and plastic parts. The Goddard Center for the Visual and Performing Arts, the Southern Oklahoma Area Vocational-Technical Center, and Carter Seminary for Indian children are in Ardmore. Adjacent Lake Murray State Park and the nearby Arbuckle Mts. offer recreation.

Ardon (ar'dan), Caleb's third son 1 Chron. 2:18

area, measure of the size of a surface region, usually expressed in units that are the square of linear units, e.g., square feet or square meters. In elementary geometry, formulas for the areas of the simple plane figures and the surface areas of simple solids are derived from the linear dimensions of these figures. Examples are given in the accompanying table.

Plane figures	Area*
triangle	$ab/2$
parallelogram	ab
rectangle	ab
square	s^2
circle	πr^2
Solids	Total surface area*
right circular cylinder	$2\pi r(r+a)$
right circular cone	$\pi r(r+l)$
sphere	$4\pi r^2$

* The abbreviations used are: b = base (length of any side of a plane figure), a = altitude (perpendicular distance from the farthest point of the figure to the extended base), s = side, r = radius (of the base circle in the case of the cylinder or cone), l = slant height (distance from vertex to base of a cone measured on its surface).

The areas of irregular figures, plane or solid, can be computed or closely approximated by the use of integral calculus.

Arecibo (ārasē'bō), city (1970 pop. 35,484), N. Puerto Rico, a port on the Atlantic Ocean at the mouth of the Rio Grande de Arecibo. It is the commercial and industrial center of a region producing coffee, tobacco, sugarcane, and pineapples. Arecibo was founded in 1616.

Arecibo Ionospheric Observatory (ār'isē'bō), RADIO-ASTRONOMY facility located at Arecibo, Puerto Rico. It was completed in 1963 and is operated by Cornell Univ. under contract with the U.S. National Science Foundation. The principal instrument is a fixed antenna of spherical section, 1,000 ft (305 m) in diameter, that can be pointed at a source of radio waves by moving the aberration-corrected line feeds to the antenna's focus. As a result of resurfacing of the antenna completed in 1974, observations are possible up to a frequency of 4,000 MHz. A 100-ft (30-m) satellite antenna can be used in conjunction with the large antenna for interferometer observations. In addition there is a wide range of instrumentation for measuring ionospheric

conditions. Principal research programs include pulsars, spectral-line and continuous radio emissions, very-long-baseline interferometry, radar studies of planet orbits and surfaces, and a variety of ionospheric studies.

Arel (ārē'lī), son of Gad Gen 46:16, Num 26:17

Arendal (a'rēndal), city (1970 pop. 11,769), capital of Aust-Agder co., SE Norway, a port on the Skagerrak. Manufactures include forest products and electric light bulbs. Chartered in 1723, Arendal has had one of Norway's largest merchant fleets since 1880.

Arendt, Hannah (han'ä ār'ant), 1906-, German-American political theorist, b. Hanover, Germany, 8 A. Königsberg, 1924, Ph.D. Heidelberg, 1928. She emigrated (1941) to the United States and was naturalized in 1950. Arendt was a lecturer and Guggenheim fellow, 1952-53, visiting professor at the Univ. of California at Berkeley, 1955, the first woman appointed to a full professorship at Princeton, 1959, and visiting professor of government at Columbia, 1960. From 1963 to 1967 she was professor at the Univ. of Chicago, and in 1967 she became university professor at the New School for Social Research. With the publication of *Origins of Totalitarianism* (1951) her status as a major political thinker was firmly established. In this book she examined the major forms of 20th-century totalitarianism—National Socialism (Nazism) and Communism—and attempted to trace their origins in the anti-Semitism and imperialism of the 19th cent. Her second major American publication, *The Human Condition* (1958), likewise received wide acclaim. *Eichmann in Jerusalem* (1963), her analysis of the Nazi war crimes based on observation of the trial of Adolf Eichmann, stirred considerable controversy. Arendt also served as research director of the Conference on Jewish Relations (1944-46) and executive director of Jewish Cultural Reconstruction, New York City (1949-52). Her other writings include *On Revolution* (1963), *Men in Dark Times* (1968), *On Violence* (1969), and *Crisis of the Republic* (1972).

Arensky, Anton Stepanovich (āntōn' styāpā'nāvich ārēn'skē), 1861-1906, Russian composer, pupil of Rimsky-Korsakov at the St. Petersburg Conservatory. After 1882 he taught at the Moscow Conservatory and became (1895) conductor of the Imperial Chapel Choir. He wrote operas, including *A Dream on the Volga* (Moscow, 1890), chamber and symphonic music, songs, and piano works.

Areopagite: see DIONYSIUS THE AREOPAGITE SAINT

Areopagus (ārēōp'āgus) [Gr., =hill of Ares], rocky hill, 370 ft (113 m) high, NW of the Acropolis of Athens, famous as the sacred meeting place of the prime council of Athens. This council, also called the Areopagus, represented the ancient council of elders, which usually combined judicial and legislative functions from the beginning. The Areopagus represented in the 5th and 6th cent. B.C. the stronghold of aristocracy. Jurisdiction in murder cases had probably been given to it by Draco. Solon gave it various censorial powers over the officers of the state. The change in the method of choosing the archons in 487 B.C. caused the beginning of the decline of the Areopagus. In 480 B.C. the Areopagus enabled the manning of the fleet for the battle of Salamis, and it recovered much of its influence in the war years. But c. 462 B.C. a series of attacks began and eventually the august council was reduced to the status of a court of homicide only, although it maintained its religious character. Pericles was a leader in this democratizing movement, Aeschylus was an opponent, and he brought his trilogy of dramas to a close (in *The Eumenides*) with an appeal for the preservation of the ancient traditions of the Areopagus.

Arequipa (ārākē'pā), city (1970 est. pop. 194,700), alt. c. 7,800 ft (2,380 m), capital of Arequipa dept., S. Peru, on the Chili River. One of Peru's largest cities, it is the commercial center of S. Peru and N. Bolivia. Leather goods, textiles, and foodstuffs are the chief products. Alpaca wool is graded, sorted, and shipped out through the port of MOLLEND. Founded in 1540 on the site of an Inca town, Arequipa stands on an oasis in an arid plain and grows crops for local consumption. Although the city was almost totally destroyed by an earthquake in 1868, its lovely examples of Spanish colonial architecture have been restored. The light-colored building stone, sillar, has given Arequipa the name "white city." It has a university and several other institutions of higher education.

Ares (ār'ēz), in Greek mythology, Olympian god of war. He is usually said to be the son of Zeus and Hera, but in some legends he and Eris, his twin sister, were born when Hera touched a flower. A fierce warrior, he loved battle and often took part in con-

flicts between mortals. Ares killed Halirrhothios, son of Poseidon, when the youth violated his daughter, Alcippe. For this crime Ares was judged by a tribunal of the 12 Olympians and acquitted. The hill on which the trial took place, the Areopagus, was named for him. The worship of Ares was not as important as that of Mars, with whom he was identified by the Romans.

Aresson, Areson, or Arason, Jon (all yōn a'rēsōn), 1484?-1550, Icelandic churchman. The last Roman Catholic bishop in Iceland before the Reformation, he was executed together with his sons, Ara and Bjorn, for resisting the new religious ordinances brought about by the Reformation in Denmark. Aresson established the first Icelandic printing press at Holar in 1528. His poetry, secular and sacred, has been preserved.

Aretas (ār'itās, -tās), dynastic name of the Nabataean kings of Petra. The best-known Aretas was **Aretas IV**, 9 B.C.-A.D. 49, ruler of S. Palestine, most of Trans-Jordan, N. Arabia, and Damascus. His daughter was married to Herod Antipas, who put her away in favor of Herodias. Aretas attacked (A.D. 36) Antipas and defeated him, but Rome took Antipas' part. Tiberius' death (A.D. 37) saved Aretas from the Roman army. He is mentioned in the Bible (2 Cor. 11:32).

Arethusa (ār'ithō'sā), in Greek mythology, nymph favored by Artemis and loved by the river god Alpheus. While Arethusa was bathing in his stream, Alpheus rose up and tried to abduct her, but she fled under the ocean to the isle of Ortygia. There Artemis changed her into a fountain. But Alpheus followed her, was himself changed into a river and united with her. In ancient times it was believed that the waters of the Alpheus River flowed beneath the sea from Greece and reappeared in the fountain of Arethusa in the harbor of Syracuse.

Arethusa see ORCHID

Aretino, Pietro (pyē'trō arētē'nō), 1492-1556, Italian satirist. He led a life of adventure and wrote abusive works for hire. His derisive wit was so feared that the gifts of those who sought either to buy him or buy him off made him very wealthy. He was a friend of Titian, who painted his portrait. His comedies, such as *La cortigiana* and *La talenta*, are lacking in plot and form but are singular, if exaggerated, portraits of his time. His letters, in spite of their impudent coarseness, are full of verve. Ariosto called him the "scourge of princes." See biography by James Cleugh (1966).

Aretinus, Guido see GUIDO D'AREZZO

Arezzo (arēt'sō), city (1971 pop. 87,128), capital of Arezzo prov., Tuscany, central Italy. It is an agricultural trade center and has machine and textile industries. Arezzo was an Etruscan town, later became a Roman military station and colony, and was made (11th cent.) a free commune. Siding with the Ghibellines, it was defeated (1289) at Campaldino by Florence, to which it passed definitively in 1384. In Roman times the famous red-clay Arretine vases were made there. Arezzo was a center of learning and the arts in the Middle Ages. Guido d'Arezzo, Petrarch, Aretino, and Vasari were born there. The city retains much of its medieval character. Noteworthy buildings include the Gothic cathedral (1286-1510), the Gothic Church of San Francesco (14th cent.), with frescoes of the Legend of the Holy Cross executed (1452-66) by Piero della Francesca, the Romanesque Church of Santa Maria della Pieve (1330), Bruni Palace (15th cent.), which now houses an art gallery and museum, and Vasari's mansion (decorated by Vasari in 1540).

Argall, Sir Samuel (ar'gəl), d. 1626?, English ship captain, prominent in the early settlement of Virginia. He commanded a ship sent to Jamestown in 1609 and had charge of one of the ships Baron De la Warr brought to the failing colony in 1610. He made voyages—supposedly to Bermuda, Cape Cod, and Canada—to get needed supplies for the colonies. In 1613 on a voyage up the Potomac, Argall kidnapped POCAHONTAS. He commanded the Virginia Company expedition that destroyed the rival French colonial settlement on MOUNT DESERT ISLAND in 1613, and in 1614 he led an expedition against Port Royal (now Annapolis Royal, N.S.). As deputy governor of Virginia (1617-18), he governed autocratically, and the accusations of his opponents in the colony that he was unduly harsh with the poor have been credited by most, but not all, modern historians. He was knighted in 1623 and in 1625 as an admiral commanded a fleet off the Spanish coast.

Argelander, Friedrich Wilhelm August (frē'drīkh vīl'hēlm ou'gōöst ar'gäländər), 1799-1875, German astronomer. He became director of the observatory at the Univ. of Bonn in 1837 and continued there the work of determining the positions of stars that

F. W. Bessel had begun at Königsberg. The results of his observations appear in the *Bonner Durchmusterung* (1862), which records the positions and brightness of more than 324,000 stars (up to the ninth magnitude) in the northern heavens.

Argenson, Marc Pierre de Voyer de Paulmy, comte d', 1696-1764, French statesman and patron of literature, younger brother of René Louis d'Argenson. As secretary of state for war (1743-57), he assisted Maurice de Saxe in reforming the army, especially the artillery, and founded the École militaire. He was also charged with administrative control of the city of Paris. The Champs Élysées and the Place de la Concorde were planned by him. He was a friend and patron of the philosophes, and Denis Diderot and Jean le Rond d'Alembert dedicated the *Encyclopédie* to him.

Argenson, René Louis de Voyer de Paulmy, marquis d', 1694-1757, French foreign minister (1744-47), brother of Marc Pierre d'Argenson. Well intentioned but impractical, he sought to form a federation of Italian states and to make France the disinterested arbiter of international affairs. After committing numerous blunders he was dismissed and appointed president of the Academy of Inscriptions. A friend of François Marie de Voltaire and the Encyclopedists, he spent the rest of his life in study and in literary pursuits. He left memoirs.

Argenteuil (arzhāntō'yā), city (1968 pop. 90,929), Val-d'Oise dept., N. France, on the Seine, a suburb of Paris. It has important metalworks and factories making furniture, railroad and airplane parts, and chemicals. It is also famous for its asparagus and grapes. It grew around a convent founded in the 7th cent.; there Heloise was educated and, after her misfortune, became prioress. The convent (later a monastery) was destroyed in the French Revolution, the famous relic, the Seamless Tunic, said to have been worn by Christ, was given by Charlemagne to the convent and is now enshrined in Saint-Denis Basilica (1866).

Argentina see PLACENTIA BAY

Argentina (arjēntē'nā, Span. arhāntē'nā), republic (1970 pop. 23,364,443), 1,072,157 sq. mi. (2,776,889 sq. km), S. South America. The second largest nation of South America, Argentina is composed of 22 prov-

inces, one national territory, and one federal district that is the site of BUENOS AIRES, the country's capital and largest city. Argentina is triangular in shape and stretches c. 2,300 mi. (3,700 km) from its broad northern region near the Tropic of Capricorn to S. TIERRA DEL FUEGO, an island shared with Chile. On the northeast, Argentina fronts on the Rio de la Plata (an estuary and one of the major waterways of the Western Hemisphere), which separates Argentina from S. Uruguay, its tributaries also act as international boundaries—the Uruguay River, with W. Uruguay and S. Brazil, and the Parana and Pilcomayo rivers, with Paraguay. The northwest boundary with Bolivia lies in the GRAN CHACO and the Andes mts. The western boundary with Chile follows the crest line of the Andes. The Atlantic Ocean borders Argentina on the east, there, off S. Argentina, are the FALKLAND ISLANDS, and the South Georgia, South Sandwich, and South Orkney islands, all claimed by Argentina but administered by Great Britain. Argentina also claims a sector of Antarctica. The climate of Argentina varies from subtropical in the north to cold and windswept in the south, with temperate and dry areas found throughout much of the country. Precipitation, lowest along the E. Andean slopes, increases markedly N and E across Argentina. The chief rivers of Argentina are the Parana with its tributary, the Salado, the Colorado River, and the Rio Negro. Argentina may be divided into six geographical regions—the Parana Plateau, the Gran Chaco, the Pampa (see under PAMPAS), the Monte, PATAGONIA, and the Andes mts. The Parana Plateau in the extreme northeast is an extension of the highlands of S. Brazil. It is the wettest part of Argentina and has a dense forest cover, tobacco, timber, and yerba mate are the chief products there. The spectacular IGUAZU FALLS are in a national park located at the point where Argentina, Brazil, and Paraguay meet. In N. Argentina the Gran Chaco, with the physiographically similar Mesopotamia (between the Parana and Uruguay rivers), is a predominantly flat alluvial plain with a subtropical climate. The region is seasonally flooded, and marshlands remain for long periods during the year because of poor drainage. Livestock, cotton, and quebracho are the main products. South of the Gran Chaco is the Pampa, a vast, monotonous natural grassland that extends to the Colorado River (roughly from lat. 30°S to 40°S) and is c. 400 mi. (640 km) wide from the Atlantic Ocean to the Andean foothills. The Pampa's deep, rich soil is the basic wealth of the country. The "Wet Pampa," the more humid eastern part of the region, is Argentina's principal agricultural area and produces most of the nation's exports. It is the granary of South America, with wheat, alfalfa, corn, and flax the principal crops. Cattle ranching is prevalent throughout the Pampa and especially in the southeast and north, sheep are also raised there. Dairying is important in the vicinity of Buenos Aires. The Pampa has the densest transportation network of roads and railroads in South America. Most of the principal cities of Argentina (containing a majority of the nation's population) and most of its industry are found in the region. Buenos Aires, a port city on the Rio de la Plata, is one of the largest cities of South America and the chief industrial center and transportation hub of S. South America, it is surrounded by smaller industrial cities. Elsewhere on the Pampa are LA PLATA, the capital of Buenos Aires prov. and a meat-packing and oil-refining center, ROSARIO, the second largest city of Argentina, an iron and steel and oil-refining center, and a huge grain port on the Parana River, SANTA FE, a northern commercial and industrial center and a major port at the junction of the Salado and Parana rivers, MAR DEL PLATA, a resort and fishing center on the Atlantic Ocean, and BAHIA BLANCA, the largest Argentine port directly on the Atlantic Ocean, a gateway to the S. Pampa and the oil fields of Neuquen prov. and a meat-packing, oil-refining, and wool-processing center. On the western edge of the Pampa is CORDOBA, the nation's third largest city, which reflects the transition from the "Dry Pampa" to the Monte, the desolate Andean foothills. The Monte, an arid region in the rain shadow of the Andes, has natural vegetation varying from short grasses in the east to cacti in the west. Scattered throughout the great and stretches are small but highly productive oases such as JUJUY, SALTA, TUCUMÁN, SAN JUAN, and MENDOZA, which were settled from Peru and Upper Peru (Bolivia) in the second half of the 16th cent. The oases, whose growth and importance greatly increased after they were linked by railroad to the east coast, produce wine, sugar, fruits, and corn, stock raising is also carried on there. The varied mineral deposits of this region (especially oil, lead, zinc, tin, copper, and salt) are being exploited. Mendoza and Tuc-



mán are major industrial areas engaged in food processing, oil refining, and chemical production. Occupying the southern part of Argentina is Patagonia, a vast, bleak, and windswept dissected plateau. Several large rivers flow in deep valleys eastward across Patagonia to the sea. Sheep raising (chiefly for wool) and oil and natural gas production (the area around COMODORO RIVADAVIA is the chief oil-producing region of Argentina) are the principal economic activities of Patagonia, the region also yields coal. The poor soils of Patagonia and its cool and dry climate do not favor cultivation, although irrigated agriculture is practiced in the Negro and Colorado river valleys. Patagonia is sparsely populated and largely undeveloped, with a few small river-mouth ports on the Atlantic coast such as Viedma, Rawson, Puerto Deseado, and Río Gallegos. USHUAIA, S Tierra del Fuego, on Canal Beagle, is the world's southernmost town. The Andes mts. region of Argentina, broad in the north, where it is similar to the Bolivian altiplano, and becoming narrower toward the south, extends along the length of Argentina's western border. The region, which contains some of the world's highest elevations outside of Asia—including Aconcagua (22,835 ft/6,960 m high, the highest point of South America), Bonete, Tupungato, Mercedario, and Lullailaco—acts as a barrier to the moist westerly winds, thus giving the eastern slopes of the Andes a desert condition that contrasts with the heavy snowfall on the higher elevations. There are timber and mineral resources, but they are not readily exploitable because of the region's inaccessibility. Cattle are raised on the grassy Andean foothills. There are many beautiful lakes in the region, especially where it merges with the Patagonian plateau, Lake NAHUEL HUAPI in Nahuel Huapi National Park, adjoining the Chilean lake district, is an attractive resort area. Argentina, unlike most Latin American nations, has a population that is overwhelmingly of European descent, especially of Italian and Spanish origin. The mestizo portion of Argentina's population is very small because there has been little mixture between European and Indian peoples. The Indian population, which has steadily declined since the coming of the Europeans, is still strong only in parts of the Gran Chaco and the Andean highlands. Only in NW Argentina was there an Indian population with a material culture. They were an agricultural people (recalled today by ruins N of Jujuy), but their importance was eclipsed later by the Araucanian Indians from Chile. Elsewhere there were strong and fierce Indian tribes who did much to hamper white settlement but disappeared under European warfare and pressure. Italian, Spanish (including Basque), French, German, British, Swiss, and East European immigrants came to Argentina during the 1880s, other large in-migrations of Europeans occurred in the 1930s and following World War II. The influx of Chileans into Argentina has been historically tied to boundary disputes between the two nations. The GAUCHO, or Argentine cowboy, the nomadic herdsman of the Pampas—depicted in *Martín Fierro*, the great Argentine folk epic by José Hernández—is still a legendary national symbol. By the 1970s, Argentina had a predominantly urban population with nearly three quarters of its people living in places with 2,000 or more inhabitants, nearly a third of the total population lives in and around Buenos Aires. Argentina is overwhelmingly Christian, with about 90% of the population at least nominally Roman Catholic. Spanish is the country's official language. Argentina has one of South America's lowest population growth rates (1.5%) and one of its highest literacy rates (90%). It has a fine education system that is strongly controlled at all levels by the federal government. Argentines have one of the highest per capita incomes in South America, and the wealth is fairly well distributed. However, high inflation rates in the early 1970s cut into the nation's buying power and necessitated sharp cutbacks in imports in order to bring about a more favorable balance of trade. Argentina's economy is based on agriculture, with grains and livestock (cattle and sheep) the bulwark of its wealth. As an exporter of wheat, corn, flax, oats, beef, mutton, hides, and wool, Argentina has traditionally rivaled the United States, Canada, and Australia. Its cattle herds are among the world's finest. Argentina is the world's largest source of tannin and linseed oil. The Pampa is the nation's chief agricultural area, however, since the 1930s there has been a great rise in production in other areas, especially in the oases of the Monte and the irrigated valleys of N Patagonia. Argentina is nearly self-sufficient in its agricultural needs. Although Argentina has a variety of minerals, they are of local importance and are not completely adequate to support the country's industries. Domestic

oil and gas production supplies most of the nation's energy, pipelines connect the oil and gas fields with Buenos Aires and other major refining centers. The large coal field of S Patagonia has low-grade coal. All mining operations in the country have been under federal control since 1954. Argentina has a highly developed industrial base. Developed after World War I and protected by a strong nationalistic policy, Argentine industry has made the country virtually self-sufficient in the production of consumer goods and many types of machinery. Food processing (in particular meat packing, flour milling, and canning) is the chief manufacturing industry of Argentina, leather goods and textiles are also major products. Argentina's principal imports are machinery, metals, and manufactured goods. The chief trading partners are the United States, Italy, Brazil, West Germany, and Great Britain. Argentina is governed by the 1853 constitution as modified in 1898 and subsequently amended. It has a federal system of government. The president and the vice president are elected for four-year terms by popular vote. The popularly elected bicameral national congress is composed of 69 senators (three from each province and three from the federal district), who serve four-year terms, and 243 deputies (from each province and the federal district based on proportional representation), who also serve four-year terms. The supreme court of justice, the nation's highest court, has five members. Each province has its own elected governor and legislature and its own judicial system. The chief political parties of Argentina are the Frente Justicia-Lista de Liberación (Peronista) and the Unión Cívica Radical.

History. The Europeans probably first arrived in the region in 1502 in the voyage of Amerigo Vespucci. The search for a Southwest Passage to the Orient brought Juan Díaz de Solís to the Río de la Plata in 1516. Ferdinand Magellan entered (1520) the estuary, and Sebastian CABOT ascended (1536) the Paraná and Paraguay rivers. His delight in native ornaments may be responsible for the names *Río de la Plata* [silver river] and *Argentina* [of silver]. Pedro de Mendoza in 1536 founded the first settlement of the present Buenos Aires, but Indian attacks forced abandonment of the settlement, and Asunción became the unquestioned leading city of the Río de la Plata region. Buenos Aires was refounded in 1580 by Juan de GARAY. His son-in-law, Hernando ARIAS DE SAAVEDRA (Hernandarias), secured the division of the Río de la Plata territories, and Buenos Aires achieved (1617) a sort of semi-independence under the viceroyalty of Peru. The mercantilist system, however, severely hampered the commerce of Buenos Aires, and smuggling, especially with Portuguese traders in Brazil, became an accepted profession. While the cities of present W and NW Argentina grew by supplying the mining towns of the Andes, Buenos Aires was threatened by Portuguese competition. By the 18th cent., cattle (which were introduced to the Pampas in the 1550s) roamed wild throughout the Pampas in large herds and were hunted by gauchos for their skins and fat. In 1776 the Spanish government made Buenos Aires a free port and the capital of a viceroyalty that included present Argentina, Uruguay, Paraguay, and (briefly) Bolivia. From this combination grew the idea of a Greater Argentina to include all the Río de la Plata countries, a dream that was to haunt many Argentine politicians after independence was won. A prelude to independence was the British attack on Buenos Aires, Admiral Sir Home POPEHAM and Gen. William Carr BERESFORD in 1806 took the city after the Spanish viceroy fled. An Argentine militia force under Jacques de LINIERS ended the British occupation and beat off a renewed attack under Gen. John Whitelocke in 1807. On May 25, 1810 (May 25 is the Argentine national holiday), revolutionists, acting nominally in favor of the Bourbons dethroned by Napoleon (see SPAIN), deposed the viceroy, and the government was controlled by a junta. The result was war against the royalists. The patriots under Manuel BELGRANO won (1812) a victory at Tucumán. On July 9, 1816, a congress in Tucumán proclaimed the independence of the United Provinces of La Plata. Other patriot generals were Mariano MORENO, Juan Martín de PUEYRREDÓN, and José de SAN MARTÍN. URUGUAY and PARAGUAY went their own ways despite hopes of reunion. In Argentina, a struggle ensued between those who wanted to unify the country and those who did not want to be dominated by Buenos Aires. Independence was followed by virtually permanent civil war, with countless coups d'état by regional, social, or political factions. Rule by the strong man, the caudillo, alternated with periods of democratic rule, too often beset by disorder. Anarchy was not ended by the election of Bernardino

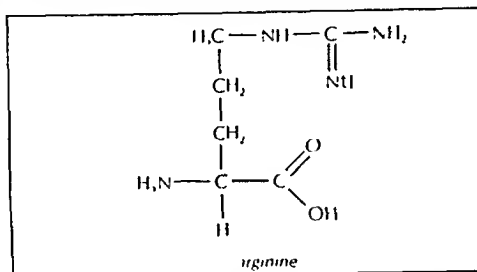
RIVADAVIA in 1826. The unitarians, who favored a centralized government dominated by Buenos Aires, were opposed to the federalists, who resented the oligarchy of Buenos Aires and were backed by autocratic caudillos with gaucho troops. The unitarians triumphed temporarily when Argentinians combined to help the Uruguayans repel Brazilian conquerors in the battle of Ituzaingó (1827), which led to the independence of Uruguay. The internal conflict was, however, soon resumed and was not even quelled when Juan Manuel de ROSAS, the most notorious caudillo, established a dictatorship that lasted until 1852. Ironically, this federalist leader, who was nominally only the governor of Buenos Aires, did more than the unitarians to unify the country. Ironically, too, this enemy of intellectuals stimulated his political opponents to write in exile some of the finest works of the Spanish American romantic period, among the writers were Domingo F. SARMIENTO, Bartolomé MITRE, José MÁRMOL, and Esteban ECHEVERRÍA. Rosas was overthrown (1852) by Justo José de URQUIZA, who called a constituent assembly at Santa Fe. A constitution was adopted (1853) based on the principles enunciated by Juan Bautista ALBERDI. Mitre, denouncing Urquiza as a caudillo, brought about the temporary secession of Buenos Aires prov. (1861) and the downfall of the Urquiza plans. Under the administrations of Mitre (1862-68), Sarmiento (1868-74), and Nicolás AVELLANEDA (1874-80), schools were built, public works started, and liberal reforms instituted. The War of the Triple Alliance (see TRIPLE ALLIANCE WAR OF THE), 1865-70, brought little advantage to Argentina. In 1880 federalism triumphed, and Gen. Julio A. ROCA became president (1880-1886). Buenos Aires remained the capital, but the federal district was set up, and Buenos Aires prov. was given La Plata as its capital. Argentina flourished during Roca's administration. The conquest of the Indians by General Roca (1878-79) had made colonization of the region in the south and the southwest possible. Already the Pampa had begun to undergo its agricultural transformation. The immigration of Europeans helped to fill the land and to make Argentina one of the world's granaries. Establishment of refrigerating plants for meat made expansion of commerce possible. The British not only became the prime consumers of Argentine products but also invested substantially in the construction of factories, public utilities, and railroads (which were nationalized in 1948). Efforts to end the power of the great landowners, however, were not genuinely successful, and the military tradition continued to play a part in politics, the army frequently combining with the conservatives and later with the growing ranks of labor to alter the government by coup d'état. The second administration of Roca (1898-1904) was marked by recovery from the crises of the intervening years, a serious boundary dispute with Chile was settled (1902), and perpetual peace between the two nations was symbolized in the CHRIST OF THE ANDES. Even before World War I, in which Argentina maintained neutrality, the wealthy nation had begun to act as spokesman for the rights and interests of Latin America as a whole, notably through Carlos CALVO, Luis M. DRAGO, and later Carlos SAAVEDRA LAMAS. Internal problems, however, remained vexing. Electoral reforms introduced by Roque SÁENZ PENA (1910-14) led to the victory of the Radical party under Hipólito IRIGOYEN (1916-22). He introduced social legislation, but when, after the presidency of Marcelo T. de ALVEAR, Irigoyen returned to power in 1928, his policies aroused much dissatisfaction even in his own party. In 1930 he was ousted by Gen. José F. Uriburu, and the conservative oligarchy—now with Fascist leanings—was again in power. The administration (1932-38) of Agustín P. JUSTO was opposed by revolutionary movements, and a coalition of liberals and conservatives won an election victory. The Radical leader Roberto M. Ortiz became president (1938), but serious illness caused him to withdraw (1942), and the conservative Ramón S. Castillo succeeded him. In 1943, Castillo was overthrown by a military coup. After two provisional presidents a "palace revolt" in 1944 brought to power a group of army colonels, chief among them Juan PERÓN. After four years of pro-Axis "neutrality" Argentina belatedly (March, 1945) entered World War II on the side of the Allies and became a member of the United Nations. A return to liberal government momentarily seemed probable, but Peron was overwhelmingly victorious in the election of Feb. 1946. Peron, an admirer of Mussolini, established a type of popular dictatorship new to Latin America, based initially on support from the army, reactionaries, nationalists, and some clerical groups. His regime was marked by curtailment of freedom

ARGININE

of speech, confiscation of liberal newspapers such as *La Prensa*, imprisonment of political opponents, and transition to a one-party state. His second wife, the popular Eva Duarte de Perón, helped him gain the support of the trade unions, thereafter the main foundation of Peron's political power. In 1949 the constitution of 1853 was replaced by a new constitution that permitted Peron to succeed himself as president, the Peronista political party was established the same year. To cure Argentina's serious economic ills, Peron inaugurated a program of industrial development—which advanced rapidly in the 1940s and early 50s, but was severely hampered by the lack of power resources and machine tools—supplemented by social welfare programs. Peron also placed the sale and export of wheat and beef under government control, thus undermining the political and economic power of the rural oligarchs. In the early 1950s, with recurring economic problems and with the death (1952) of his wife, Peron's popular support began to diminish. Agricultural production, long the chief source of revenue, dropped sharply, and the economy faltered. The Roman Catholic church, alienated by the reversal of close church-state relations, excommunicated Peron, and, finally the armed forces became disillusioned with him. In 1955, Peron was ousted by a military coup, and the interim military government of Gen. Pedro Aramburu attempted to rid the country of *justicialismo* (Peronism). In 1957, Argentina reverted to the constitution of 1853 as modified up to 1898. In 1958, Dr. Arturo FRONDISI was elected president. Faced with the economic and fiscal crisis inherited from Peron, Frondizi, with U.S. advice and the promise of financial aid, initiated a program of austerity to "stabilize" the economy and check inflation. Leftists, as well as Peronistas, who still commanded strong popular support, criticized the plan because the burden lay most heavily on the working and lower middle classes. Frondizi later fell into disfavor with the military because of his leniency toward the regime of Fidel Castro in Cuba and toward Peronistas at home, who, in the congressional elections of 1962, scored a resounding victory. Outraged by this resurgence of Peronista strength, the military arrested Frondizi. Jose Maria Guido assumed the presidency, but the military remained in power. In 1963, after months of political crisis and control by the military, presidential elections were held. The Peronista and Communist parties were banned before the election, and many persons were placed under arrest. Following the election as president of the moderate liberal Dr. Arturo ULLIA, many political prisoners were released, and relative political stability returned. The new president was faced, however, with serious economic depression and with the difficult problem of reintegrating the Peronist forces into Argentine political life. In 1964 an attempt by Peron to return from Spain and lead his followers was thwarted when Peron was turned back at Rio de Janeiro by Brazilian authorities. In elections in 1965 and 1966 the Peronists showed that they remained the strongest political force in the country, unwilling to tolerate another Peronist resurgence, a junta of military leaders, supported by business interests, seized power (1966) and placed Gen. Juan Carlos ONGANIA, a long-time right-wing opponent of Illia, in the presidency. Under Ongania, and with the strong backing of the military, the new government dissolved the legislature, banned all political parties, and exercised unofficial press censorship. Ongania also placed the national universities under government control. Widespread opposition to the rigid rule of the Ongania regime grew, and an antigovernment campaign developed. Faced with labor and student unrest, the military deposed (1970) Ongania and named Gen. Roberto M. Levingston president. Economic problems and increased terrorist activities caused Gen. Alejandro Lanusse, the leader of the coup against Ongania, to dismiss (1971) Levingston and initiate an active program for economic growth, distribution of wealth, and political stability. His direct negotiations with Juan Peron and his call for national elections and a civilian government led to the return of Peron to Argentina in 1972. After failing to achieve unity among the various Peronist groups, Peron declined the nomination from his supporters to run for president in the March, 1973, elections, which were won by Dr. Hector Campora, a Peronist candidate who subsequently resigned from office to make way for Peron's return. When new elections were held in Sept., 1973, Peron was elected president and his third wife, Isabel Martinez Peron, vice president. Peron died in July, 1974, and, as provided for in the constitution, was succeeded as president by his widow, the nation's vice pres-

ident. The government of Isabel Peron, who had only a small personal following, faced an uncertain future complicated by economic troubles, labor unrest, political violence, and deep divisions within the Peronista party. See R. J. Alexander, *An Introduction to Argentina* (1969), H. S. Ferns, *Argentina* (1969), F. P. Munson et al., *Area Handbook for Argentina* (1969), P. H. Smith, *Politics and Beef in Argentina: Patterns of Conflict and Change* (1969), Diaz Alejandro and Carlos Federico, *Essays on the Economic History of the Argentine Republic* (1970), J. A. Fernandez, *The Political Elite in Argentina* (1970), Ezequiel Martinez Estrada, *X Ray of the Pampa* (tr. 1971), J. R. Scobie, *Argentina: A City and a Nation* (2d ed. 1971), Marvin Goldwert, *Democracy, Militarism and Nationalism in Argentina, 1930-1966* (1972).

arginine (ar'janin), organic compound, one of the 22 α -AMINO ACIDS commonly found in animal proteins. Only the L-stereoisomer participates in the biosynthesis of proteins. Its basic side chain often adds a positive charge and hence a greater degree of



water-solubility to proteins in neutral solution. Although arginine can be synthesized from cellular metabolites, it is usually considered essential to the diet of children for the maintenance of normal rates of growth. Arginine is the direct metabolic precursor of UREA, the dominant nitrogenous waste product of most mammals. It was discovered in protein in 1895.

Argirocastro: see GJINOKASTER, Albania

Argo (ar'gō), in Greek mythology, ship in which JASON and the Argonauts sailed in quest of the Golden Fleece. Most legends say that Argus, son of Phrixus, was the builder, with the help of Athena. Others claim that Argus the Thespian, or Argus the son of Arestor, built the ship. The *Argo* included a beam cut from the divine tree of Dodona, which could foretell the future.

Argob (ar'gōb), region of Bashan, E of the Sea of Galilee. Deut. 34,13,14, 1 Kings 4,13. The interpretation of Argob as a person is uncertain. 2 Kings 15,25.

argol (ar'gāl) see TARTAR

Argolis (ar'gālīs), region of ancient Greece in the NE Peloponnesus. It was roughly identical with the Argive plain and was the area dominated by the city of Argos.

argon (ar'gōn) [Gr., = inert], gaseous chemical element, symbol Ar, at no. 18, at wt. 39.948, m.p. -189.2°C, b.p. -185.7°C, density 1.784 grams per liter at STP (see separate article), valence 0. Argon is a colorless, odorless, tasteless gas occurring in air (of which it constitutes 0.94% by volume) and in some volcanic gases. It is a member of group 0 of the PERIODIC TABLE, a group called the noble or INERT GASES from the mistaken former belief that none of its members could form chemical compounds, in fact, other members of the group, e.g., krypton, xenon, and radon, do form compounds. Argon is prepared by fractional distillation of liquid air. Its extreme inertness has caused it to be substituted for nitrogen in electric light bulbs. It is mixed with neon in so-called neon signs (gas discharge tubes) to produce a green-to-blue glow. It is used as a protective atmosphere in arc welding, in the refining of reactive elements, and in the growing of crystals for use in semiconductor devices. Argon was first obtained by Lord Rayleigh and Sir William Ramsay in 1894. Previously Lord Rayleigh had noticed that a liter of supposedly pure nitrogen drawn from the air weighed more than a liter prepared from a nitrogen compound. This difference in weight led him to conclude that another gas was present in the supposedly pure nitrogen. Actually several unreactive gases were present, the first samples of "argon" also contained HELIUM, NEON, KRYPTON, and XENON. Ramsay obtained pure argon later by evaporating it from liquid air.

argonaut, in zoology see PAPER NAUTILUS

Argonauts. see JASON, ARGO, GOLDEN FLEECE

Argonne (ar'gōn'), region of the Paris basin, NE France, in Champagne and Lorraine (Meuse, Marne,

and Ardennes dept.), a hilly and woody district centering around the capital, Sainte-Menehould. Thinly populated, with unimportant cultivation and only small industries, its significance has been strategic. There, in 1792, the French repulsed the Prussians. The sector was a battleground throughout World War I. In the Allied victory drive (Sept.-Nov., 1918), the Meuse-Argonne sector was carried by the Americans.

Argonne National Laboratory, nuclear research center, principal facilities located in Argonne, Ill., 27 mi (43 km) SW of downtown Chicago, other facilities located at the National Reactor Testing Station, 50 mi (80 km) W of Idaho Falls, Idaho. This atomic energy research and development establishment was founded in 1946 by the U.S. Atomic Energy Commission. Since 1966 the laboratory has operated under an agreement involving the U.S. Atomic Energy Commission, the Argonne Universities Association, and the Univ. of Chicago. The principal objectives of the laboratory are to carry out multidisciplinary basic research, much of which involves the use of radiation as a tool in the physical and life sciences, and to work on the design and development of nuclear reactors.

Argos (ar'gōs, -gās), city of ancient Greece, in NE Peloponnesus, 3 mi (4.8 km) inland from the Gulf of Argos, near the modern Nauplia. It was occupied from the early Bronze Age and is mentioned in Homer's *Iliad* as the kingdom of Diomed. Argos was the center of Argolis and in the 7th cent. B.C., under King Pheidon, dominated much of the Peloponnesus. For centuries it was one of the most powerful Greek cities, struggling with Sparta and rivaling Athens and Corinth. Much of Argos' power disappeared after Cleomenes I of Sparta took (c. 494 B.C.) the city. Pyrrhus was killed in an attack on Argos in 272. The city joined the Achaean League in 229, and in 146 it was taken by Rome, under whose rule trade flourished. The Heraeum temple, 6 mi (9.7 km) N of Argos, was the principal center for the worship of the goddess Hera. Argos produced important sculptors, including Polycleus, in the 5th cent. There is a small modern town called Argos on the site of the ancient city.

Argos, in Greek mythology see ARGUS

Arguedas, Alcides (alsē'thās argā'thās), 1879-1946, Bolivian writer and diplomat. His essays and novels, which have social and moralizing tendencies, are a reaction against the romantic idealization of the Indian. His best-known works are *Pueblo enfermo* [a sick people] (1909) and *Raza de bronce* [a race of bronze] (1919), a novel exposing the exploitation of the Indians by the landowners. Some of the Indian folktales he collected are included in the volume *Singing Mountaineers: Songs and Tales of the Quecha People* (tr. and ed. by Ruth Stephen, 1957, repr. 1971).

Arguello, Point (argwē'lō), promontory, SW Calif., extending W into the Pacific Ocean. A U.S. navy missile-launching complex is nearby.

Argun (ar'gōn'), Mandarin *O-erh-ku-na*, river, 950 mi (1,529 km) long, rising in the Great Khingan mts., Heilungkiang prov., NE China, and flowing W to the USSR border, then NE along the USSR-China frontier, where it joins the Shilka River to form the Amur. The Chinese Eastern RR, a branch of the Trans-Siberian RR, follows the upper Argun valley. Hailar, China, is the largest city on the river. Corn, grains, and sugar beets are grown in the fertile Argun valley. Silver, lead, and coal are found along the river banks.

Argus (ar'gās) or **Argos** (ar'gōs, -gās), in Greek mythology. 1 Many-eyed monster, also called Panoptes. He guarded Io after she had been changed into a heifer. 2 Builder of the ARGO. He built the ship on which Jason and the Argonauts (of which he was one) sailed in quest of the Golden Fleece.

Argyll, Archibald Campbell, 1st duke of, d. 1703, Scottish nobleman, eldest son of the 9th earl of Argyll. Having unsuccessfully sought favor with James II in order to recover the estates forfeited by his father, he supported the cause of William of Orange and formally offered William and Mary the crown of Scotland in 1689. Since his support was important to William, particularly as a basis for encouraging the submission of the clans, he was restored to his estates and made a privy counselor. He remained William's chief adviser on Scottish affairs and was made a duke (1701). Although two companies from his regiment were used to perpetrate the massacre (1692) of the MacDonalds of Glencoe, it is unlikely that he was in any way personally involved.

Argyll, Archibald Campbell, 3d duke of, 1682-1761, Scottish nobleman, brother of the 2d duke. As

lord high treasurer of Scotland (1705) and a commissioner for the union (1706), he helped negotiate the union (1707) of the kingdoms of Scotland and England. He had been created earl of Islay in 1705, and he sat as a Scottish representative peer in the united Parliament from 1707 until his death. Consistently loyal to the Hanoverian kings, he held high offices in Scotland and promoted the trade, industry, and schools of his native land. He succeeded his brother as duke in 1743.

Argyll, Archibald Campbell, 5th earl of, 1530-73, Scottish statesman. He and Lord James Stuart (later earl of Murray) became followers of John Knox in 1556 and led the troops of the Scottish Protestants, the lords of the congregation, against those of the Roman Catholic regent, Mary of Guise. Won over by Mary Queen of Scots when she arrived in Scotland (1561), he supported her until she proposed marrying Lord Darnley. He then tried to enlist the aid of Elizabeth I of England against Mary. Failing in this, he returned to Mary's party and is thought to have had some part in the murder of Darnley (1567). Argyll was in command of Mary's soldiers when they were defeated at Langside in 1568 by the soldiers under Murray, now regent, but he was reconciled with Murray the next year. Becoming a supporter of James VI, he was made lord high chancellor in 1572.

Argyll, Archibald Campbell, 8th earl and 1st marquess of, 1607-61, Scottish statesman. He became chief of the powerful Campbell clan at the death (1638) of his father, the 7th earl. A staunch Presbyterian, he was a leading opponent of Charles I's attempt to strengthen episcopacy in Scotland. Charles sought to win his support by making him a marquess (1641), but after the outbreak of the English civil war Argyll represented the COVENANTERS in negotiating (1643) the alliance with the English parliamentarians. He commanded the Covenanter army against the earl of MONTROSE and was repeatedly defeated (1644-45). In 1646, Argyll negotiated with both the defeated Charles and the English Parliament, attempting to secure a Presbyterian settlement in England. He later supported Oliver Cromwell but suffered a serious loss of influence because of the revulsion of feeling in Scotland at the king's execution (1649). Hoping that Charles II could be restored as a Presbyterian king, Argyll turned from Cromwell and crowned (1651) Charles II in Scotland. He opposed the disastrous Scottish invasion of England in that year and submitted to the English Commonwealth in 1652. He was executed for treason at the Restoration. See biography by John Willcock (1903).

Argyll, Archibald Campbell, 9th earl of, 1629?-1685, Scottish nobleman, son of the 8th earl. An ardent and active royalist and a Protestant, he opposed extreme measures against the COVENANTERS, thereby incurring the enmity of the duke of York (later James II), who in 1680 was high commissioner of Scotland. Argyll was accused of treason and sentenced to death in 1681. He escaped to Holland, was a leader of the rebellion in favor of the duke of MONMOUTH, and was captured and beheaded.

Argyll, John Campbell, 2d duke of, 1678-1743, Scottish general, son of the 1st duke, whom he succeeded in 1703. For his ardent support of the union of England and Scotland he was created (1705) earl of Greenwich. He served under the duke of Marlborough in the War of the Spanish Succession (1701-14) and rose to be commander in chief in Spain in 1711. On his return to Scotland he actively supported the succession of George I. He commanded the army that put down the Jacobite rebellion in 1715 and was made duke of Greenwich in 1719. His ambitions brought him high political offices, but he was tactless and too forthright, and his later career was uneven.

Argyllshire (ärgil'shîr) or **Argyll**, county (1971 pop. 59,909), 3,124 sq mi (8,091 sq km), W central Scotland. Inveraray is the county town. The county includes numerous islands of the Inner HEBRIDES, including the island of IONA. The coast of the mainland is jagged and deeply indented by lochs, MINTRE peninsula juts sharply into the North Channel. Wild and mountainous, the county has little arable land. Sheep grazing is the main occupation, crop raising (oats, hay, and barley) is confined to the islands and coastal strips. Fishing and distilling are also important. OBAN and Dunoon are favorite resorts. Argyllshire was settled by Celts from Ireland in the 6th cent. It became the seat of the powerful Campbell clan in the 16th cent. Under the Local Government Act of 1973, Argyllshire was divided between the new Highland and Strathclyde regions.

Argyrokastron: see GJINOKASTER, Albania

Århus (ôr'hōös), city (1970 com. pop. 237,514), capital of Århus co., central Denmark, on Århus Bay, an arm of the Kattegat. The second largest city in Denmark, it is a commercial, industrial, and shipping center. Manufactures include beer, textiles, machinery, processed food, locomotives, and tobacco products. First mentioned in the mid-10th cent., Århus is one of the oldest cities in Denmark. It developed rapidly after it became an episcopal see in the 11th cent. The city declined after the Reformation (16th cent.) but recovered its prosperity in the 18th cent. Århus is also a cultural center, with a university (opened 1928), a prominent theater, a museum group of early Danish houses, and a large library. Noteworthy buildings include the Cathedral of St. Clemens (12th cent.) and the town hall (1942), made of Norwegian marble. Until 1948 the city's name was spelled Aarhus.

aria (är'ēä), elaborate and often lengthy solo song with instrumental accompaniment. In the 16th cent. it was a melody improvised over a strophic bass line, and a distinction was made between instrumental, vocal, and dance arias. The use of the term to indicate instrumental music was continued by such composers as Froberger, Pachelbel, and J. S. Bach. The first use of the term to indicate solo song was by Giulio Caccini in 1602. Later in the 17th cent. Italian OPERA composers developed the *aria da capo*, a throughcomposed (nonsymphonic) three-part structure in which the beginning section is repeated after a contrasting middle section. Though this formal scheme was first used by Monteverdi, he did not designate it *aria da capo*. This type achieved artistic perfection in the operas of Alessandro SCARLATTI and Handel and in the works of J. S. Bach. In the 18th cent. the three main sections were divided into subsections, and there were classifications of many various types of arias. The extreme convention of using as many types as possible, but never the same type in succession, developed in the Neapolitan opera, and the subsequent formal rigidity led to a decline of the *aria da capo*. Later in the 18th cent. prominent virtuoso singers, seeking a means for technical display, caused the development of a type consisting in reality of two separate arias, the first usually dramatic and the second lyrical. Most of the arias of Mozart are of this kind. But in French operas, especially those of Christoph W. von GLUCK, there was a development leading to greater similarity of recitative and aria, which eventually culminated in the complete abandonment of arias in the late operas of Richard WAGNER, who substituted a highly melodic RECITATIVE called *Sprechgesang* [Ger., =speech-song]. The form continued to be preferred by Italian opera composers, however, and the romantic aria reached its height in the works of Giuseppe VERDI.

Ariadne (är'äd'nē), in Greek mythology, Cretan princess, daughter of Minos and Pasiphaë. Because of her love for Theseus, she gave him a clue that enabled him to kill the monstrous Minotaur. When Theseus left Crete, he took Ariadne with him, but before they reached Greece, he abandoned her at Naxos. There the god Dionysus consoled and later wedded her. She bore him several children, including Oenopion, whom Dionysus first taught the art of wine making. It was said that Zeus granted Ariadne immortality and that Dionysus set her bridal crown among the stars.

Ariana or **Aryana** (both är'äd'nä, -ä'nä), general name for the eastern provinces of the ancient Persian Empire. It was used to mean the regions S of the Oxus (modern Amu Darya) River, the regions to the north were called Transoxiana. Ariana is included in present E Iran, N and E Afghanistan, and India NE of the Indus River.

Arianism, Christian heresy founded by ARIUS in the 4th cent. It was one of the most widespread and divisive heresies in the history of Christianity. As a priest in Alexandria, Arius taught (c. 318) that God created, before all things, a Son who was the first creature, but who was neither equal nor eternal with the Father. According to Arius, Jesus Christ was a supernatural creature not quite human and not quite divine, but more like a demigod. In these ideas Arius was a disciple of Lucian, who was a disciple of the heretic PAUL OF SAMOSATA. Arius was condemned and deprived of his office. He went to Asia and propagated his doctrine among the masses through popular sermons and songs and among the powerful through the efforts of influential leaders, e.g., EUSEBIUS OF NICOMEDIA and, to a lesser extent, EUSEBIUS OF CAESAREA. The civil as well as the religious peace of the East was threatened, and Roman Emperor Constantine I convoked (325) the first ecumenical council (see NICAEA, FIRST COUNCIL OF). The

council condemned Arianism, but the Greek term *homousios* [consubstantial, of the same substance] used by the council to define the Son's relationship to the Father was not universally popular. It had been used before by the heretical Sabellius. Some, like MARCELLUS OF ANCYRA, in attacking Arianism, lapsed into SABELLIANISM. Eusebius of Nicomedia used this fear of Sabellianism to persuade Constantine to return Arius to his duties in Alexandria. ATHANASIUS, chief defender of the Nicene formula, was bishop in Alexandria, and conflict was inevitable. The Eusebians managed to secure Athanasius' exile, and when the Arian Constantius II became emperor, Catholic bishops in the East, e.g., EUSTATHIUS, were banished wholesale. The exile of Athanasius to Rome brought Pope JULIUS I into the struggle. A council wholly favorable to Athanasius, convened at Sardica (c. 343), was avoided by the Eastern bishops and ignored by Constantius. The Catholics were left dependent on Rome for support. After the West fell to Constantius, the Eusebians reversed the decisions of Sardica in several councils (Arles, 353; Milan, 355; Boziers, 356), and Pope LIBERIUS, ST. HILARY OF POITIERS, and HOSIUS were exiled. The victorious Arians, however, had now begun to quarrel among themselves. The Anomoeans [from Gr., =unlike], followers of EUNOMIUS and AETIUS, were pure Arians and held that the Son bore no resemblance to the Father. The semi-Arian court party were called Homoeans [from Gr., =similar] from their teaching that the Son was simply like the Father as defined by Scripture. A third party called Homoiousians [from Gr., =like in substance] were largely prevented from joining the orthodox (Homoousian) party through a misunderstanding of terms. The Arians debated their differences at a series of formularies at Sirmium (351-59). The final formula was an ambiguous Homoean declaration that Constantius imposed (359) upon the church in two councils, Rimini (for the West) and Seleucia (for the East). The voices of orthodoxy, however, were not silent. In the West St. Hilary of Poitiers and in the East St. BASIL THE GREAT, ST. GREGORY NAZIANZEN, and ST. GREGORY OF NYSSA continued to defend and interpret the Nicene formula. By 364 the West had a Catholic emperor in Valentinian I, and when the Catholic THEODOSIUS I became emperor of the East (379), Arianism was outlawed. The second ecumenical council was convoked to reaffirm the Nicene formula (see CONSTANTINOPLE, FIRST COUNCIL OF), and Arianism within the empire seems to have expired at once. However, ULFILAS had carried (c. 340) Homoean Arianism to the Goths living in what is now Hungary and Yugoslavia with such success that the Visigoths and other Germanic tribes became staunch Arians. Arianism was thus carried over Western Europe and into Africa. The Vandals remained Arians until their defeat by Belisarius (c. 534). Among the Lombards the efforts of Pope St. Gregory I and the Lombard queen were successful, and Arianism finally disappeared (c. 650) there. In Burgundy the Catholic Franks broke up Arianism by conquest in the 6th cent. In Spain, where the conquering Visigoths were Arians, Catholicism was not established until the end of the 6th cent. (by Recared), and Arian ideas survived for at least another century. Arianism brought many results—the ecumenical council, the Catholic Christological system, Nestorianism, and, by reaction, Monophysitism. See John Henry Newman, *The Arians of the Fourth Century* (1833, repr. 1968), H. M. Gwatkin, *Studies of Arianism* (2d ed. 1900), Adolf von Harnack, *History of Dogma* (tr. of 3d ed., 7 vol., 1898-1903).

Arias, Arnulfo (arnōōl'fō är'yās), 1901-, president of Panama (1940-41, 1949-51, Oct., 1968). A Harvard-trained physician, he dominated Panamanian politics throughout the 1930s, leading the coup that deposed President Florencio Harmodio Arosemena in 1931 and generally selecting the country's presidents. He held several cabinet and diplomatic posts. In June, 1940, he was elected president by an unprecedented majority. He jailed dissidents, disenfranchised the non-Spanish-speaking portion of the population, and espoused a totalitarian state, which led to his ouster in Oct., 1941. Reelected president in 1949, he was deposed in May, 1951, after organizing his own secret police and suspending the constitution. He ran unsuccessfully for the presidency in 1964, then won election in 1968 after putting together a strong, five-party coalition. Taking office in October, he immediately maneuvered to gain absolute control of the national assembly and the supreme court and attempted to restructure the command of the national guard. After only 11 days as president, he was ousted by national guard officers.

Arias de Ávila, Pedro (pā'thrō a'ryas dā a'vēla), known as **Pedrarías** (pā'thra'ryas), c 1440-1531, Spanish colonial administrator. He was sent (1514) as governor to Darien (now part of Panama), then under the rule of Vasco Nuñez de Balboa. A long quarrel between the two ended with Balboa's execution. Pedrarías jealously guarded his power and his administration was notoriously harsh and cruel. He sent (1523) Francisco FERNÁNDEZ DE CORDOBA to usurp control of Nicaragua, conquered the year before by Gil GONZÁLEZ DE ÁVILA. When Fernández de Córdoba attempted to free himself from Pedrarías' control, Pedrarías captured and executed him. Pedrarías extended the Spanish dominions and founded (1519) Panama City, he first aided, but later hindered, Francisco PIZARRO and Diego de Almagro in their conquest of Peru. Superseded as governor in 1526, he went to Nicaragua, where he retained power until his death. His name also appears as Pedrarías Davila.

Arias de Saavedra, Hernando (ārnan'dō a'ryas dā savā'dra), known as **Hernandarias** (ārnan'da'ryas), 1561-1634, Spanish colonial governor, b Asunción, in present-day Paraguay. A remarkable administrator, he was elected (1592) lieutenant governor of Asunción by the CABILDO and was chosen governor of Rio de la Plata prov. three times (1597-99, 1602-9, 1614-18). He consolidated the Spanish settlements, pacified and protected the Indians, introduced public schools, and stimulated the growth of Buenos Aires. In 1617 he secured a royal order for the separation of Paraguay (then Guairá) from Rio de la Plata, and granted the Jesuits territorial privileges for the religious colonization of the region.

Arias Montanus, Benedictus (bēnədīk'tas ā'rēas mōntā'nas), or **Benito Arias Montano** (bānē'tō a'ryas mōntā'nō), 1527-98, Spanish Benedictine monk, editor of the Antwerp POLYGLOT BIBLE. He attended the Council of Trent (1562).

Arica (arē'ka), city (1970 pop. 92,394), N Chile, on the Pacific Ocean, just south of the Peruvian border and at the northern limit of the Desert of Atacama. Peru ceded Arica to Chile after the War of the Pacific (see PACIFIC WAR OF THE). With the settlement of the TACNA-ARICA CONTROVERSY in 1929, Chile retained sovereignty over the city but was required to furnish complete port facilities to Peru. The district of Arica is now a free zone where both Chile and Peru maintain customs houses. The city is a resort and a port through which the mineral exports (chiefly copper, tin, and sulfur) of both countries are shipped.

Aridar (arīd'āt), one of Haman's sons. Esther 9:9

Aridatha (arīd'athə), son of Haman. Esther 9:8

Ariège (ar'yēzh'), department (1968 pop. 138,478), SW France, in Languedoc, bounded by Spain and Andorra. FOIX is the capital.

Arieh (ār'ā), one of the two guards murdered with King Pekahiah. 2 Kings 15:25

Ariel (ār'ēel), aide of Ezra. Ezra 8:16. In two other passages AV calls them "lionlike men" ("two ariels of Moab" in RV). 2 Sam. 23:20, 1 Chron. 11:22. Nothing is known of them. Ariel is also used as a symbolic name of Jerusalem. Isa. 29.

Ariel (ār'ēel), in astronomy, one of the five known moons, or natural satellites, of URANUS.

Aries (ār'ēz) [Lat. = the ram], CONSTELLATION lying on the ECLIPTIC (the sun's apparent path through the heavens) between Taurus and Pisces, it is one of the constellations of the ZODIAC. It contains the bright star Hamal (Alpha Arietis). About 2,000 years ago the vernal EQUINOX was located at the beginning of Aries and was thus also called the "first point of Aries", however, the PRECESSION OF THE EQUINOXES has since shifted the vernal equinox into Pisces. Aries reaches its highest point in the evening sky in December.

Arikara Indians (ārīk'ara), North American Indians whose language belongs to the Caddoan branch of the Hokan-Siouan linguistic stock (see AMERICAN INDIAN LANGUAGES). Archaeological evidence shows that they occupied the banks of the upper Missouri River since at least the 14th cent. A semisedentary group, they lived in earth-covered lodges. In winter they hunted buffalo, returning to their villages for spring planting, the Arikara were influential in bringing agricultural knowledge from the Southwest to the prehistoric peoples of the upper Missouri River. They traded corn with hunting tribes in return for buffalo hides and meat, and they were active in bartering with early white traders, who frequently called them the Rees. They were closely associated with the MANDAN INDIANS and the HIDATSA INDIANS, these three tribes now share the Fort Berthold Reservation in North Dakota. See D. J. Lehmer, *Arikara Archaeology* (1968).

Armathaea (ār'imathē'a), home of St. Joseph of Arimathea, not otherwise known. It may be the same as RAMATHAIM ZOPHIM. Mat. 27:57, Mark 15:43, Luke 23:50,51, John 19:38.

Ariminum: see RIMINI, Italy.

Arioch (ār'ēōk), 1. See CHEDORLAOMER. 2. Captain under Nebuchadnezzar. Dan. 2:14.

Arion (ar'ion), Greek poet, inventor of the dithyramb. He is said to have lived at Periander's court in Corinth in the late 7th cent. B.C. A legend repeated by Herodotus tells how, having been thrown overboard by pirates, Arion was saved by a dolphin charmed by his music. See A. W. Pickard-Cambridge, *Dithyramb, Tragedy, and Comedy* (1927, repr. 1962).

Artosto, Ludovico (lōdōdōvē'kō ar'yōs'tō), 1474-1533, Italian epic and lyric poet. As a youth he was a favorite at the court of Ferrara, later he was in the service of Ippolito I, Cardinal d'Este, and then of the duke of Ferrara. He was never properly rewarded by his patrons. While at the duke's court, he began the *Orlando Furioso*, published in its final form in 1532. This epic treatment of the ROLAND story, theoretically a sequel to the unfinished masterpiece of BOIARDO, greatly influenced Shakespeare, Milton, and Byron. It was intended to glorify the Este family as Vergil had glorified the Julians. Artosto also wrote lyric verse of unequal merit and several comedies, among them *I suppositi* [the pretenders] and *Il negromante* [the necromancer]. See the famous 16th-century translation of *Orlando Furioso* by Sir John Harrington, ed. by Robert McNulty (1972), studies by A. V. Cameron (1930), Benedetto Croce (tr. 1920, repr. 1966), E. G. Gardner (1906, repr. 1968), and Robert Griffin (1974).

Ariovistus (ār'ēōvīs'tas), fl. 58 B.C., Germanic chieftain, leader of the Suebi. He crossed the Rhine c. 71 B.C., defeated the AEDUI, and came to dominate much of Gaul (see GALLIC WARS). In 60 B.C. he was made a friend and ally of Rome, but his power threatened the Romans in Gaul, and Julius Caesar, soon after winning the great victory of Bibracte over the Helvetii, undertook a campaign against him. Caesar defeated Ariovistus somewhere in Upper Alsace in 58 B.C.

Arisai (arīs'āi), son of Haman. Esther 9:9.

Arish, Al (al arēsh'), town (1970 est. pop. 43,000), NE Egypt, in the Sinai peninsula, on the Mediterranean Sea. It is a fishing port and administrative center. In 1118, King Baldwin I of Jerusalem died in Al Arish on the way back from his Egyptian campaign. In 1800, during the venture of Napoleon I in Egypt, the French signed a convention in the city by which they were to evacuate the country. The British did not ratify the convention, and fighting resumed. Israeli troops briefly held Al Arish during the 1956 Arab-Israeli war and occupied the town in the 1967 war. After the 1967 war an Israeli settlement, Nahal Yam, was established nearby. In 1969, Israel evacuated the civilian population of Al Qantarāh, a town on the Suez Canal, to Al Arish.

Arista, Mariano (mar'yā'nō arē'sta), 1802-55, Mexican general and president (1851-53). A royalist in the revolt against Spain, he later joined Agustín de Iturbide. He fought in the Mexican army that tried to put down the Texas revolt (1836). In command of the army in N. Mexico in the Mexican War, he was defeated by Zachary TAYLOR at Palo Alto and at Resaca de la Palma (1846). Arista succeeded J. J. Herrera as president. His administration sought to bring fiscal stability to the nation. Difficulties in maintaining a loyal cabinet and a conservative revolt in 1852 led to his resignation the following year.

Aristaeus (ārīstē'as), in Greek mythology, son of Apollo and Cyrene, especially honored as the inventor of beekeeping. Aristaeus tried to violate Eurydice, wife of Orpheus. Eurydice was fatally bitten by a snake while fleeing him. As punishment, the nymphs, who had previously been his mentors, caused all his bees to die. However, he sacrificed several cattle in atonement, and from their carcasses new swarms of bees were generated. Learned in the arts of medicine and soothsaying, Aristaeus wandered through many lands teaching his skills and curing the sick. He came to be widely worshiped as a beneficent deity.

Aristarchus (ār'īstar'kas), Macedonian companion of Paul. Phil. 2:29, 20:4, 27:2, Col. 4:10.

Aristarchus of Samos (sām'ōs), fl. c. 310 B.C.-c. 230 B.C., Greek astronomer of the Alexandrian school. He is said to have been the first man to propose a heliocentric theory of the universe. Of his writings only a treatise, *The Sizes and Distances of the Sun and Moon*, remains. This does not mention his conclusion that the earth moves around the sun and

that the sun is at rest, but a quotation by Archimedes and statements by Copernicus prove that he held this theory. Other conclusions in which he seems to have anticipated later scientists are that the sun is larger than the earth, that the earth rotates upon its axis causing day and night, and that its axis is inclined to the plane of the ecliptic, causing the change of seasons. See T. L. Heath, *Aristarchus of Samos* (1913).

Aristarchus of Samothrace (sām'ōthrās), c. 217-c. 145 B.C., Greek scholar, successor to his teacher, Aristophanes of Byzantium, as librarian at Alexandria. He was an innovator of scientific scholarship, and his critical revision of Homer is responsible for the excellent texts of Homer that survive. Though only fragments of his works survive (he is said to have written more than 800 volumes of commentary and exegesis), frequent quotations by ancient critics provide an insight into his subjects and method. His works cover such writers as Alcaeus, Anacreon, Pindar, Hesiod, and the tragedians.

Aristides, Saint (ārīstī'dēz), 2d cent., Greek philosopher, author of an early Christian apology. It was presented (c. 126 or 136) to the emperor to protest anti-Christian slanders and persecutions. The text is embedded in transcribed versions of the medieval legend BARLAAM AND JOSAPHAT. Feast Aug. 31.

Aristides (ārīstī'dēz), d. c. 468 B.C., Athenian statesman and general. He was one of the 10 generals who commanded the Athenians at the battle of Marathon (490 B.C.) and in the next year became chief archon. In 483 he was ostracized because he opposed the naval policy of Themistocles. However, in 480 Aristides fought beside his countrymen at Salamis, and the following year he commanded the Athenian army at the battle of Plataea. Later he organized the finances of the Delian League. He is a classic example of probity in public life and was called Aristides the Just.

Aristippus (ārīstīp'əs), c. 435-c. 360 B.C., Greek philosopher of Cyrene, first of the CYRENAICS. He held pleasure to be the highest good and virtue to be identical with the ability to enjoy. His doctrines, comprising the first coherent exposition of HEDONISM, opposed those of the Cynics, although both groups drew upon aspects of Socratic philosophy.

Aristobulus: see MACCABEES.

aristocracy (ār'īstōk'rāsē) [Gr. = rule by the best], in political science, government by a social elite. In the West the political concept of aristocracy derives from Plato's formulation in the *Republic*. The criteria on which aristocracy is based may vary greatly from society to society. Historically, aristocracies have usually rested on landed property, have invoked heredity, and, despite frequent conflicts with the throne, have flourished chiefly within the framework of MONARCHY. Aristocracy may be based on wealth as well as land, as in ancient Carthage and medieval Venice, or may be a theocracy like the Brahman caste in India. Other criteria can be age, race, military prowess, or cultural attainment. The best example of a modern landowning aristocracy that conducted government was in England from 1688 to 1832. A resurgence by the French aristocracy in the 18th cent. was ended by the French Revolution, which abolished most of the privileges on which it was based. Inflation, which cut into the fixed income of the aristocracy, the loss of the traditional military role of the aristocracy, and the rise of industry and decline in the importance of landed property have all worked against the aristocracy. Today the political power of traditional western aristocracy has all but disappeared.

Aristogiton: see HARMODIUS AND ARISTOGITON.

Aristophanes (ār'īstōf'anēz), b. c. 448 B.C., d. after 388 B.C., Athenian comic poet, greatest of the ancient writers of COMEDY. His plays, the only full extant samples of the Greek Old Comedy, mix political, social, and literary satire. The direct attack on persons, the severity of invective, and the burlesque extravagances made the plays fitting for the festival of Dionysus. Aristophanes was conservative in all things, hence he distrusted sophistry and Socrates alike, satirized Euripides' art as degenerate, and deplored the tendency to excessive imperialism that ruined Athens in the Syracusan expedition. The typical plan of an Aristophanic comedy is simple—the protagonist undertakes seriously some preposterous project, and the play is an elaboration of his success or failure. Despite the absurdity of the situation, Aristophanes' characters are real as types, their verisimilitude comes from their perfectly natural behavior in unnatural circumstances. Aristophanes' Greek is exceptionally beautiful, and many of his choruses are among the finest lyric pieces in

Greek literature His careful diction and his ability to characterize in a few words are remarkable, and he shows himself especially astute in his parodies of Euripides. Eleven of his plays survive. *The Acharnians* (425 B.C.), an attack on the Peloponnesian War, *The Knights* (424), a political satire on the demagoguery of the period, *The Clouds* (423), a satire on the sophists and on Socrates, *The Wasps* (422), a satire on the Athenian passion for litigation, *The Peace* (421), a defense of the Peace of Nicias, *The Birds* (414), an escape into an amazing imaginary kingdom, *Lysistrata* (411), in which the Athenian women boycott their husbands to end a war, *The Thesmophoriazousae* or *The Women at Demeter's Festival* (411), in which the women conspire to ruin Euripides because of his misogyny, *The Frogs* (405), a literary satire involving Aeschylus and Euripides, *The Ecclesiazusae* or *The Women in Politics* (c.392), in which the women take over the government, and *Plutus* (388), in which the blind god of wealth recovers his eyesight and distributes the gifts of fortune more equitably. See his plays (tr. by B. B. Rogers, 3 vol., rev. ed. 1950), studies by V. Ehrenberg (3d ed. 1962), G. Murray (1933, repr. 1964), C. Whitman (1964), K. J. Dover (1972), and Alexis Solomos (tr. 1974).

Aristophanes of Byzantium (bizān'shēam, -tēam), c. 257-180 B.C., Greek scholar. He was librarian at Alexandria, edited various texts, and reputedly invented the Greek diacritical marks. Aristarchus of Samothrace was his pupil.

Aristotle (ār'tistōt'al), 384-322 B.C., Greek philosopher, b. Stagira. He is sometimes called the Stagira. His father, Nicomachus, was a noted physician. Aristotle studied (367-347 B.C.) under Plato at the ACADEMY and there wrote many dialogues that were praised for their eloquence. Only fragments of these dialogues are extant. He tutored (342-c.339 B.C.) Alexander the Great at the Macedonian court, left to live in Stagira, and then returned to Athens. In 335 B.C. he opened a school in the Lyceum, some distinguished members of the Academy followed him. His practice of lecturing in the Lyceum's covered portico or walking place (*peripatos*) gave his school the name Peripatetic. During the anti-Macedonian agitation after Alexander's death, Aristotle fled in 323 B.C. to Chalcis, where he died. His extant writings consist largely of notes made on his lectures by his students and edited in the 1st cent. B.C. Chief among them are the *Organon*, consisting of six treatises on logic, *Physics*, *Metaphysics*, *De Anima* [on the soul], *Nicomachean Ethics* and *Eudemian Ethics*, which are both versions of his *Discourse on Conduct*, *Politics*, *De Poetica* [poetics], *Rhetoric*, and a series of works on biology and physics. In the late 19th cent. his *Constitution of Athens*, an account of Athenian government, was found. Aristotle placed great emphasis in his school on direct observation of nature, and in science he taught that theory must follow fact. He considered philosophy to be the discerning of the self-evident, changeless first principles that form the basis of all knowledge. LOGIC was for Aristotle the necessary tool of any inquiry, and the SYLLOGISM was the sequence that all logical thought follows. He introduced the notion of category into logic and taught that reality could be classified according to several categories—substance (the primary category), quality, quantity, relation, determination in time and space, action, passion or passivity, position, and condition. Aristotle also taught that knowledge of a thing, beyond its classification and description, requires an explanation of CAUSALITY, or why it is. He posited four causes or principles of explanation: the material cause (the substance of which the thing is made), the formal cause (its design), the efficient cause (its maker or builder), and the final cause (its purpose or function). In modern thought the efficient cause is generally considered the central explanation of a thing, but for Aristotle the final cause had primacy. He used this reduction of causes to examine the relation of form to matter, and in his conclusions differed sharply from his teacher, Plato. Aristotle believed that a form, with the exception of the Prime Mover, or God, had no separate existence, but rather was immanent in matter. Thus, in the Aristotelian system, form and matter together constitute concrete individual realities, the Platonic system holds that a concrete reality partakes of a form (the ideal) but does not embody it. Aristotle believed that form caused matter to move and defined motion as the process by which the potentiality of matter (the thing itself) became the actuality of form (motion itself). He held that the Prime Mover alone was pure form and as the "unmoved mover" and final cause was the goal of all motion. Aristotle in

ethics reflects Aristotelian metaphysics. Following Plato, he argued that the goodness or virtue of a thing lay in the realization of its specific nature. The highest good for man is the complete and habitual exercise of his specifically human function, which is his rationality. Well-being (*eudaimonia*) is not the pursuit of pleasure (hedonism), but rather is the pursuit of the contemplative life. Aristotle also emphasized the traditional Greek notion of virtue as the mean between extremes. The *Politics* studies man as a political being and holds that in fulfilling the civic function man realizes an intrinsic part of his human virtue. For Aristotle's aesthetic views, which are set forth in the *Poetics*, see TRAGEDY. After the decline of Rome, Aristotle's work was lost in the West. However, in the 9th cent., Arab scholars introduced Aristotle to Islam, and Muslim theology, philosophy, and natural science all took on an Aristotelian cast. It was largely through Arab and Jewish scholars that Aristotelian thought was reintroduced in the West. His works became the basis of medieval SCHOLASTICISM, much of Roman Catholic theology shows, through St. Thomas Aquinas, Aristotelian influence. There has also been a revival of Aristotelian influence on philosophy in the 20th cent. His teleological approach has continued to be central to biology, but it was banished from physics by the scientific revolution of the 17th cent. His work in astronomy, later elaborated by Ptolemy, was controverted by the investigations of Copernicus and Galileo. See edition of his works by Richard P. McKeon (1941), D. J. Allan, *The Philosophy of Aristotle* (1952), Ernest Barker, *The Political Thought of Plato and Aristotle* (rev. ed. 1959), J. H. Randall, *Aristotle* (1960), G. E. R. Lloyd, *Aristotle: The Growth and Structure of his Thought* (1968), John Ferguson, *Aristotle* (1972).

Aristoxenus of Tarentum (āristōk'sānas, tarēn'tam), fl. 4th cent. B.C., pupil of Aristotle. He marks a turning point in Greek musical theory by being the first to base theory on analysis of musical practice. In his two extant treatises, *Elements of Rhythm* and *Elements of Harmony*, he systematized Greek music by clear definitions of terms and orderly arrangement of scales. See H. S. Macran, *The Harmonics of Aristoxenus* (1902).

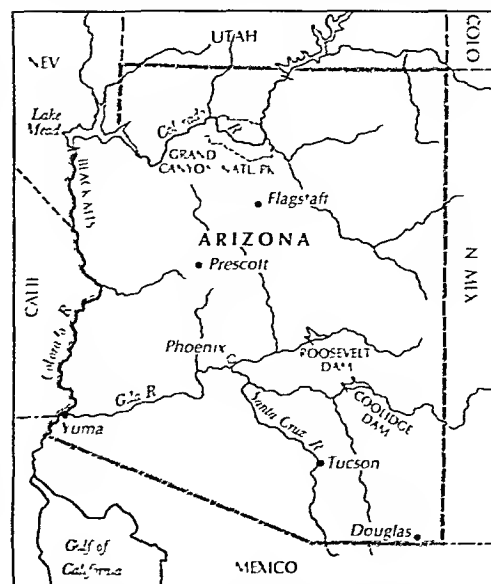
arithmetic, branch of MATHEMATICS commonly considered a separate branch but in actuality a part of ALGEBRA. Conventionally the term has been most widely applied to simple teaching of the skills of dealing with NUMBERS for practical purposes, e.g., computation of areas, proportions, costs, and the like. The four fundamental operations of this study are addition, subtraction, multiplication, and division. The older teaching arbitrarily divided arithmetic into elementary arithmetic and higher arithmetic. In advanced study the concept of number is greatly generalized to include not only complex numbers, but also quaternions, tensors, and abstract entities with no other meaning than that they obey certain laws (see NUMBER THEORY). This division of arithmetic into the practical and the theoretical dates back to classical Greek times, when the term *logistic* referred to elementary arithmetic and the term *arithmetic* was reserved for the theory. The basic operations of arithmetic were formerly learned largely or even entirely by rote. In the early 20th cent., however, new and more practical methods were adopted, and late in the 1950s there was a turn in elementary education toward utilizing the methods developed by higher mathematics and by the use of computers. For the ordinary purposes of practical figuring the old method survives.

arithmetic progression: see PROGRESSION.

Arius (ār'i'as, ār'ē-), c. 256-336, Libyan theologian, founder of the Arian heresy. A parish priest in Alexandria, he advanced the doctrine famous as Arianism and was excommunicated locally (321). He was declared orthodox in Asia Minor, where he had fled (323), but he was anathematized by the Council of Nicea (see NICAEN FIRST COUNCIL OF) and banished by Roman Emperor Constantine (325). But in the reaction after Nicea, he came into imperial favor. The emperor had ordered the Athanasians at Alexandria to receive him at communion when he suddenly died.

Arizona, state (1970 pop., 1,770,900), 113,909 sq mi (295,024 sq km), SW United States, admitted as the 48th state of the Union in 1912. The capital and largest city is PHOENIX. Arizona is bounded on the N by Utah, on the W, where the Colorado River forms the border, by S Nevada and California, on the S by Mexico, and on the E by New Mexico. In N Arizona are the Colorado Plateau, an area of dry plains more than 4,000 ft (1,220 m) high, and deep canyons, in-

cluding the famous Grand Canyon cut out by the Colorado River. Along the Little Colorado River, which runs northwest through the plateau to join



the Colorado, are the Painted Desert, where erosion has left colorful layers of sediment exposed, and the Petrified Forest National Park, one of the world's most extensive areas of petrified wood. South of the Grand Canyon are the San Francisco Peaks, including Humphreys Peak, the highest point (12,655 ft/3,857 m) in the state. The southern edge of the Colorado Plateau is marked by an escarpment called Mogollon Rim. The southern half of the state has desert basins broken up by mountains with rocky peaks and extending NW to SE across central Arizona. To the south, the Gila River, a major tributary of the Colorado, flows west across the entire state. This area has desert plains separated by mountain chains running north and south, in the west the plains tall to the relatively low altitude of c. 140 ft (43 m) in the region around YUMA. Arizona abounds in minerals, including copper, which has given it the name Copper State. Although some mountain peaks receive an annual rainfall of more than 30 in (76 cm), precipitation in most of the state is low, and much of Arizona's history has been shaped by the inadequate water supply. Since the early 20th cent. massive irrigation projects have been built in Arizona's valleys. Roosevelt, Horse Mesa, Mormon Flat, and Stewart Mountain dams, with reservoirs and storage lakes, irrigate the Salt River valley. The Gillespie Dam on the Gila River helps irrigate the Yuma vicinity. The Coolidge Dam, with its San Carlos reservoir, serves Indian lands and surrounding farms near CASA GRANDE in the southeast. W Arizona is irrigated by Colorado River dams, which also serve California. These include Hoover, Glen Canyon, Davis, Parker, Imperial, and Laguna dams. Most major dams in the state are associated with hydroelectric power plants as well as irrigation systems. Arizona also obtains water from groundwater pumping stations. The state's principal crops are cotton, hay, lettuce, and sorghum. Cattle, calves, and dairy products are also important farm products. Agriculture is centered in Phoenix, TUCSON, and Yuma. The state's major industries produce machinery, food products, and primary metals. Copper is still the state's most valuable mineral. Arizona produces over half or all copper mined in the United States. Other leading mineral resources are molybdenum, sand and gravel, and cement. The mountains in the north and central regions have 3,180,000 acres (1,286,900 hectares) of commercial forests, chiefly ponderosa pines and other firs, which support the state's lumber and building-materials industries. The U.S. government owns about 95% of the commercial forests in the state. National and state forests attract millions of tourists yearly. Tourism is bolstered in the N by the Grand Canyon, the Painted Desert, the Petrified Forest, meteor craters, ancient Indian ruins, and the Navaho and Hopi Indian reservations that cover nearly all of the state's northeast quadrant. SE Arizona's warm, dry climate, often recommended for people in ill health, also attracts a large tourist trade. Between 1940 and 1960 Arizona's population increased more than 100% and between 1960 and 1970 it increased another 36%. The mountainous, arid north has not shared the population growth of the southern sections of the state. In the 1960s, the population included some 85,000 Indians. In addition to

the Navaho, the largest tribe in the state, Arizona Indians include Mohave, Apache, Hopi, Paiute, Papago, Pima, Maricopa, Yavapai, Hualapai, and Havasupai. Agriculture is the basis of their economy, but the lack of water makes farming difficult, and there is much poverty. Federal and state projects have sought to support Indian education and to introduce modern farm methods on the reservations. Arizona's Indians produce many fine handicrafts, including leather goods, woven items, pottery, and the famous silver and turquoise jewelry of the Navahos. Little is known of the earliest Indian cultures in Arizona, but Indians probably lived in the region as early as 25,000 B.C. A later culture, the Hohokam (A.D. 500-1450) were pit dwellers who constructed extensive irrigation systems. Pueblo Indians flourished in Arizona between the 11th and 14th cent. and built many of the elaborate cliff dwellings that still stand. Apache and Navaho Indians came to the area in c. 1300 from Canada. Probably the first Spanish explorer to enter Arizona (c. 1536) was Cabeza de Vaca. It is certain that the Franciscan friar Marcos de Niza reached Arizona in 1539, but he encountered hostile Indians and returned to Mexico. He was followed by Francisco Vasquez de Coronado, who led an expedition from Mexico in 1540 in search of seven legendary cities of gold. Coronado's men explored far, with Pedro de Tovar reaching the Hopi villages in the northeast and Garcia Lopez de Cárdenas discovering the Grand Canyon, while an allied expedition under Hernando de Alarcon sailed the lower Colorado. Despite extensive exploration, the region was neglected by the Spanish in favor of the more fruitful area of present-day New Mexico. Antonio de Espejo and Juan de Oñate, both Spaniards, explored the Arizona region in the late 16th cent. and late in the 17th cent. Father Eusebio Kino converted the Indians of Pimeria Alta (Sonora and S. Arizona) and founded the missions of Guevavi (1692) and Tumacacori (1696), near the present-day Nogales, and San Xavier del Bac (1700), near the present-day Tucson. Father Kino, a Jesuit, not only converted the Indians to Christianity but also introduced cattle and sheep raising among them. However, Jesuits were expelled from the Spanish Empire in 1767, and those in Arizona subsequently lost their control over the Indians. Indian uprisings led the Spaniards to establish a presidio at Tubac in 1752, in 1776 it was moved to Tucson, then an Indian settlement. Also at this time, Juan Bautista de Anza and Father F. T. H. Garcés established missions in the Yuma area. The Arizona region came under Mexican control following the Mexican war of independence from Spain (1810-21). In the early 1800s, U.S. MOUNTAIN MEN, trappers and traders such as Kit Carson, trapped beaver in the area, but otherwise there were few settlers. In the Treaty of GUADALUPE HIDALGO (1848), ending the MEXICAN WAR (1846-48), Mexico relinquished control of the area N of the Gila River to the United States. This area became part of the U.S. Territory of New Mexico in 1850. The United States, wishing to build a railroad through the area S of the Gila River, bought the area between the river and the present-day S boundary of Arizona from Mexico in the GADSDEN PURCHASE (1853). Arizona's minerals, valued even by prehistoric miners, had attracted most of the early explorers, and although the area remained a relatively obscure section of the Territory of New Mexico, mining continued sporadically. Small numbers of prospectors, crossing Arizona to join the California gold rush (1849), found gold, silver, and a neglected metal, copper. By the 1870s mining was flourishing, and by the following decade the Copper Queen Company at Bisbee was exploiting one of the area's largest copper deposits. In 1877 silver was discovered at Tombstone, setting off a boom that drew throngs of prospectors to Arizona but lasted less than 10 years. Tombstone also became famous for its lawlessness; Wyatt Earp and his brothers gained their reputations during the famous gunfight (1881) at the O.K. Corral. In 1861, at the outbreak of the Civil War, conventions held at Tucson and Mesilla declared the area part of the Confederacy. In the only major battle of the war in the Arizona area, Confederate troops were defeated NW of Tucson in the battle of Picacho Pass. In 1863, Arizona was organized as a separate territory, with its first, temporary capital at Fort Whipple. Prescott became the capital in 1865. Charles D. Poston, who had worked to achieve Arizona's new status, was elected as the territory's first delegate to the U.S. Congress. The capital was moved to Tucson in 1867, back to Prescott in 1877, and finally to Phoenix in 1889. When Confederate troops were routed and Union soldiers went east to fight in the Civil War, the territory was almost abandoned to the Indians.

Settlement was resumed after the war and encouraged by the Homestead Act (1862), the Desert Land Act (1877), and the Carey Act (1894)—all of which turned land over to settlers and required them to develop it. The region had been held precariously by U.S. soldiers during the intermittent warfare (1861-86) with the Apache Indians, who were led by Cochise and later Geronimo. General George Crook waged a successful campaign against the Apaches in 1882-85, and in 1886 Geronimo finally surrendered to federal troops. Ranching, which had flourished under the Apache attacks on livestock, thrived after their defeat. Cattlemen, who had moved west to open vast grazing areas in the 1870s and 80s, established baronial ranches such as that founded (1872) by Henry Clay Hooker in Sulphur Spring Valley in S. Arizona. Sheep raising grew from solely a Navaho occupation to a major enterprise among the white settlers. Grazing land was open to all until the late 1880s, and range wars developed between sheepmen and cattlemen. After 1897, the U.S. Forestry Bureau issued grazing permits to protect public land from depletion. By 1880 the Santa Fe and Southern Pacific railroads both extended into Arizona. In 1912, Arizona, still a raw frontier territory, attained statehood. Its constitution created a storm, with such "radical" political features as initiative, referendum, and judicial recall. Only after recall had been deleted did President Taft sign the statehood bill. Once admitted to the Union, Arizona restored the recall provision. Irrigation, spurred by the Desert Land Act and by Mormon immigration, had promoted farming in the southern part of the territory. By 1900 diverted streams were irrigating 200,000 acres (80,940 hectares). With the opening of the Roosevelt Dam (1911), a federally financed project, massive irrigation projects began to transform Arizona's valleys. Although Arizona's mines were not unionized until the mid-1930s, strikes occurred at the copper mines of Clifton and Morenci in 1915 and at the Bisbee mines in 1917. In the latter strike more than 1,200 miners suspected of being union members were deported by railroad to New Mexico. During World War II defense industries were established in Arizona. Manufacturing, notably electronic industries, continued to develop after the war, especially around Phoenix and Tucson, and in the 1960s manufacturing achieved economic supremacy over mining and agriculture in Arizona. With the development of irrigation and hydroelectric projects along the Colorado River and its tributaries, water rights became a subject of litigation between Arizona and California. In 1963 the U.S. Supreme Court ruled that California's water rights on the Colorado pertained only to the main stream of the river. Arizona was given rights to a share of the water from the Colorado's main stream and sole water rights over the river's tributaries within Arizona's boundaries. The state's constitution provides for an elected governor and bicameral legislature, with a 30-member senate and a 60-member house of representatives. The governor and members of the legislature serve two-year terms. The unit of local government is the county. The state elects two Senators and four Representatives to the U.S. Congress and has six electoral votes. Until the 1950s and 60s the Democratic party predominated in Arizona politics, but Republicans have since gained. In 1964, Senator Barry M. Goldwater of Arizona was the unsuccessful Republican candidate for the U.S. presidency. Stewart L. Udall, an Arizona Democrat, served as Secretary of the Interior under presidents Kennedy and Johnson. In 1974, Raul H. Castro, a Democrat, was elected governor. Arizona's educational institutions include the Univ. of Arizona, at Tucson, Arizona State Univ., at Tempe, Northern Arizona Univ., at FLAGSTAFF, and several private institutions. See E. H. Peplow, Jr., *History of Arizona* (3 vol., 1958), Federal Writers' Project, *Arizona: A State Guide* (4th rev. ed. 1966), *Arizona and Its Heritage* (Univ. of Arizona, 2d ed. 1969), J. J. Wagoner, *Arizona Territory* (1970), and Univ. of Arizona Faculty, *Arizona: Its People and Resources* (rev. 2d ed. 1972).

Arizona, University of, at Tucson, land-grant and state supported, coeducational, chartered 1885, opened 1891. Because of the proximity of Pueblo Indian villages and rich archaeological sites, Indian archaeology and ethnology are important fields of research.

Arizona State University, at Tempe, coeducational, opened 1886 as a normal school, became 1925 Tempe State Teachers College, renamed 1945 Arizona State College at Tempe. Its present name was adopted in 1958.

ark, in the Bible 1 Boat of NOAH, which he built at God's command to preserve his family and certain

creatures from the Flood. Gen. 6-9, Luke 17:27, Heb. 11:7, 1 Peter 3:20. 2 Ark of the Covenant, the sacred wooden chest of the Hebrews, representative of God or identified with Him. It was overlaid with gold inside and out and was always heavily veiled, the high priest alone could look upon its uncovered surface. Especially guarded, it was carried about by staves thrust through rings on its side, for to touch it was a profanation punished by death. Uzza, while escorting the Ark, inadvertently broke this law and so lost his life. As its presence implied victory, it accompanied the warriors into battle, where once it was captured by the Philistines. Restored after many years, the Ark found a resting place in Solomon's Temple. Ex. 25:10-21, Num. 10:33-36, Deut. 10:1-5, Joshua 3:3-17, 1 Sam. 4-7, 2 Sam. 6, 15:24-29, 1 Kings 8:3, 9, 1 Chron. 13, 15, 16:6, 2 Chron. 5, Jer. 3:16. Heb. 9:4.

Arkansas (ar'kənsō'), state (1970 pop. 1,923,295), 53,104 sq. mi. (137,539 sq. km), central and SW United States, admitted as the 25th state of the Union in 1836. The capital and largest city is LITTLE ROCK, other important cities are FORT SMITH, NORTH LITTLE ROCK, PINE BLUFF, HOT SPRINGS, and WEST MEMPHIS. On the east the Mississippi River separates Arkansas from Tennessee and Mississippi. The state is bounded on the north by Missouri, on the west by Oklahoma and a part of Texas, and on the south by Louisiana. The Arkansas River flows southeast across the state between the Ozark plateaus and the Ouachita Mts. and runs down to the southern and eastern plains to empty into the Mississippi. The other rivers of the state also flow generally SE or S to the Mississippi; these include the Saint Francis (which forms part of the E. Missouri line), the White River, the Ouachita, and the Red River (which forms part of the Texas line). The climate of Arkansas is marked by long, hot summers and mild winters. The state's many lakes and streams and its abundant wildlife provide excellent hunting and fishing and bring thousands of sportsmen annually. The mineral springs at Hot Springs also attract many visitors to Arkansas, where tourism is an important industry. The state's transportation network is based on rivers as well as roads, railroads, and air travel. A development project to improve navigation on the Arkansas River and to expand power and flood control facilities promises to stimulate growth in river port cities. A major cotton-producing state in the 19th cent., Arkansas has since diversified its agricultural production and overall economy. Cotton is still an important crop, but it ranked second in value, below soybeans, in 1971. Rice is also important. Livestock (including chickens, cattle, and calves) and dairy products almost equal crops as a source of farm income. Arkansas's most important mineral products are petroleum, bromine and bromine compounds, natural gas, and bauxite. Arkansas is the nation's leading bauxite producer. Lumbering is important in this heavily wooded state, which has large lumbering and wood-processing plants. About three fifths of the state's land area is wooded. Arkansas's major manufactures are food products, electrical equipment, paper, lumber, and wood products, furniture, and fixtures. The state also has a fast-growing chemical industry. A people known as the Bluff Dwellers, who inhabited caves, probably lived in the Arkansas area before 500. They were followed by the MOUND BUILDERS, who received their name from the mounds they constructed, apparently for ceremonial purposes. The first white men to arrive in Arkansas (1541-42) were probably members of the Spanish expedition under Hernando De Soto. Later the French explorers Jacques Marquette and Louis Jolliet came S along the Mississippi to the mouth of



the Arkansas River Robert Cavelier, sieur de La Salle, en route to the mouth of the Mississippi in 1682, met the friendly Quapaw Indians, who lived at the mouth of the Arkansas River. The Osage and the Caddo Indians also lived in the vicinity. In 1682, La Salle's lieutenant, Henri de Tonti, established Arkansas Post, the first white settlement in the Arkansas area. La Salle claimed the Mississippi valley for France, and the region became part of the French territory of Louisiana. In 1719, John Law, a Scottish financier in France, developed the MISSISSIPPI SCHEME, a colonization plan that brought hundreds of white settlers and Negro slaves to the Arkansas Post area. When Law's financial scheme collapsed in 1720, the settlers abandoned the site. The French ceded the Louisiana territory to Spain in 1762 but regained it again before it passed to the United States with the LOUISIANA PURCHASE (1803). Arkansas became part of the Territory of Missouri in 1812. In 1819 it was made a separate territory, and the first territorial legislature met at Arkansas Post. The capital was moved to Little Rock in 1821. Arkansas achieved statehood in 1836. The cotton boom of 1818 brought the first large wave of settlers, and the Southern plantation system, moving west, fixed itself in the alluvial plains of S and E Arkansas. In the highlands farmers eked out their subsistence. As the Civil War began (1861), the poorer farmers were generally indifferent to questions of slavery and states' rights. The slaveholding planters held the most political power, however, and after some hesitation Arkansas finally seceded (May 6, 1861) from the Union. In the Civil War, Confederate defeats at Pea Ridge (March, 1862), Prairie Grove (Dec., 1862), and Arkansas Post (Jan., 1863) led to Union occupation of N Arkansas, and General Grant's VICKSBURG CAMPAIGN separated states W of the Mississippi from the rest of the Confederacy. In Sept., 1863, Federal troops entered Little Rock, where a Unionist convention in Jan., 1864, set up a government that repudiated secession and abolished slavery. Because the state refused at first to enfranchise Negroes, Arkansas was not readmitted to the Union until 1868, when a new constitution gave Negroes the right to vote and hold office. Reconstruction in Arkansas reached a turbulent climax in the struggle (1874) of two Republican claimants to the governorship, Elisha Baxter and Joseph Brooks. Baxter's apparent success in the election was not accepted by Brooks, and followers of the two men resorted to violence in what became known as the Brooks-Baxter War. After President Ulysses S. Grant declared Baxter to be governor, Baxter called a constituent assembly dominated by Democrats to frame a new state constitution. The convention adopted (1874) the constitution that, in amended form, remains in force today. During Reconstruction the regime of CARPETBAGGERS and SCALWAGS was detested by most Arkansas whites, but it brought advances in education and (at exorbitant costs caused by corruption) railroad construction. Because of high cotton prices and the failure to give the freed Negroes any economic status, the broken plantation system was replaced by sharecropping and farm tenancy. The lives of the people of the Ozarks remained largely unchanged, they retained the customs, skills, and superstitions that have given the hill folk their distinctive regional characteristics. In 1882, Arkansas farmers protested the nearly monopolistic control of money and transportation for agriculture by forming a new political party called the Agricultural Wheel. Although its gubernatorial candidate was unsuccessful in the election of 1888, most of the party's program was gradually adopted by the state Democratic party. In the late 19th cent., as railroad construction proceeded, Arkansas's population grew substantially, and bauxite and lumbering industries developed. Oil was discovered in Arkansas, near El Dorado, in 1921. Disaster struck in 1927 when the Mississippi River overflowed, flooding one fifth of the state. With the fortunes of the state pegged to the price of cotton, the depression of the early 1930s struck hard. Dispossessed tenants, black and white, formed (1939) the Southern Tenant Farmers Union, which, after trouble with the authorities, moved its headquarters to Memphis, Tenn. A strike called in 1936 spread to other regions before its strength waned. Other impoverished farmers migrated W to California as "Arkies"—like the "Okies" from neighboring Oklahoma. After World War I, blacks moved in a steady stream to the industrial North. World War II brought further loss of population as men left Arkansas for war factories elsewhere. The war, however, also created a boom for new industries in the state, notably the processing of bauxite into aluminum. The decline of industrial output after the war was offset by the vigorous ef-

forts of a state development commission formed in 1955 to attract new industry to Arkansas. Arkansas and landlocked Oklahoma have joined in a project to develop the Arkansas River basin to provide water transportation to the Mississippi. In 1957, Governor Orval Faubus of Arkansas became a center of national and world attention when he resisted the attempted desegregation of public schools in Little Rock (see INTEGRATION). The state constitution (1874) provides for an elected governor and bicameral legislature, with a 35-member senate and a 100-member house of representatives. The governor and representatives serve two-year terms, senators serve for four years. Arkansas sends two Senators and four Representatives to the U.S. Congress and has six electoral votes. Arkansas has long been dominated by the Democratic party, but in 1966 Winthrop Rockefeller was elected the state's first Republican governor since Reconstruction. Although reelected in 1968, Rockefeller lost the governorship to a Democrat, Dale Bumpers, in 1970. Bumpers was reelected in 1972, and in 1974 he succeeded J. William Fulbright as one of Arkansas's U.S. Senators. David H. Pryor, a Democrat, was elected governor in 1974. Among the institutions of higher education in the state are the Univ. of Arkansas, at Fayetteville, Arkansas State Univ., near Jonesboro, Hendrix College and the State College of Arkansas, at Conway, Ouachita Baptist College and Henderson State College, at Arkadelphia, the College of the Ozarks, at Clarksville, Arkansas College, at Batesville, and Harding College, at Searcy. See Federal Writers' Project, *Arkansas: A Guide to the State* (1941), J. G. Fletcher, *Arkansas* (1947), T. S. Staples, *Reconstruction in Arkansas, 1862-1874* (1923, repr. 1964), L. J. White, *Politics on the Southwestern Frontier: Arkansas Territory, 1819-1836* (1964).

Arkansas (ärkän'zäs, ärkän'sō'), river, c. 1,450 mi (2,330 km) long, rising in the Rocky Mts., central Colo., and flowing generally SE across the plains to the Mississippi River, SE Ark., drains 160,500 sq mi (415,700 sq km). The Canadian and Cimarron rivers are its main tributaries. It is the chief waterway for the state of Arkansas, where it drains a broad valley. The upper course of the Arkansas River has many rapids and flows through Royal Gorge, one of the deepest canyons in the United States. More than 25 dams on the river provide flood control, power, and irrigation. During the warm months, because of its extensive use for irrigation, the middle course of the Arkansas is reduced to a trickle. The John Martin dam and reservoir in Colorado is one of the largest water-storage and flood-control units in the river basin. The Arkansas River Navigation System, opened in 1971, makes the river navigable to Tulsa, Okla., c. 500 mi (800 km) upstream. The Spanish explorers Coronado and De Soto probably traveled along portions of the river in the 1540s. In 1806, Zebulon Pike, an American army officer, explored the river's upper reaches in Colorado. The Arkansas River was an important trade and travel route in the 19th cent.

Arkansas, University of, mainly at Fayetteville, land-grant and state supported, coeducational, chartered 1871, opened 1872, called Arkansas Industrial Univ. until 1899. The Graduate Institute of Technology, the schools of social work and law, and the medical center are at Little Rock.

Arkansas City (ärkän'zäs), city (1970 pop. 13,216), Cowley co., 5 Kansas, at the confluence of the Arkansas and the Walnut rivers, near the Okla. border, inc. 1872. Located in an agricultural and oil region (rich oil fields were discovered there in 1914), it has oil refineries, flour mills, and meat-packing plants. Arkansas City was the starting point for the "run" (1893) of thousands of homesteaders into the Cherokee strip, a marker south of the city commemorates the event. There is a junior college in the city.

Arkansas Indians see QUAPAW INDIANS

Arkansas Post (ärkän'sō), community on the Arkansas River, SE Ark. Founded by the French in 1686 as a trading post, it is the oldest white settlement in the state, it became the capital of the Arkansas territory in 1819. Once an important port, Arkansas Post was a Confederate stronghold during the Civil War until it was captured by Union troops in 1863. Arkansas Post National Memorial is there (see NATIONAL PARKS AND MONUMENTS, table).

Arkansas State University, near Jonesboro, coeducational, chartered 1909, named State Agricultural and Mechanical College, 1925-1933. In 1933 the school became Arkansas State College, and in 1967 it achieved university status and adopted its present name. There is a branch campus at Beebe.

Arkhangelsk (ärkhän'gīlsk) or **Archangel** (ärk'än'-jäl), city (1970 pop. 343,000), NW European USSR, on the Northern Dvina near its mouth at the White Sea. Although icebound much of the year, it is a leading Soviet port and can generally be made usable by icebreakers. Timber and wood products make up the bulk of the exports. The city has factories producing pulp and paper, turpentine, resin, cellulose, building materials, and prefabricated houses. Fishing and shipbuilding are also major industries. Once the site of a Norse settlement, the city was founded (1584) as Novo-Kholmogory, it was renamed (1613) for the monastery of the Archangel Michael (which still stands). Arkhangelsk was Russia's principal port until the founding of St. Petersburg in 1703, it regained importance after the rail line to Moscow was completed in 1898. A supply port during World War I, Arkhangelsk was occupied from 1918 to 1920 by Allied forces (including Americans) and by the White Army, it served as their base for unsuccessful campaigns against the Bolsheviks. During World War II, U.S. and British shipments landed at Arkhangelsk. The city has a maritime school (1771), a regional museum (1859), and institutes of forestry and medicine.

Arkite (är'kit), Canaanite tribe centered around Arca or Arca, a town near the E Mediterranean Sea NE of Tripoli. Gen. 10:17, 1 Chron. 1:15. Arca, called Arca Caesarea and Caesarea Libani by the Romans, was the birthplace of Alexander Severus, it was vainly besieged by the Crusaders in 1099.

Arklow, urban district (1971 pop. 6,750), Co. Wicklow, E. Republic of Ireland, on St. George's Channel at the mouth of the Avoca River. A small fishing port, it has become a popular resort. Irish rebels were defeated at Arklow in 1798. Shelton Abbey nearby is the seat of the earl of Wicklow.

Arkwright, Sir Richard, 1732-92, English inventor. His construction of a machine for spinning, the water frame, patented in 1769, was an early step in the Industrial Revolution. His machines and his gift for organization enabled him and his partner, Jedediah Strutt, to establish huge cotton mills and thus helped to start the factory system. He became very wealthy and was knighted in 1786. See R. S. Fitton and A. P. Wadsworth, *The Struts and the Arkwrights, 1758-1830* (1958, repr. 1968), The Arkwright Society, *Arkwright and the Mills at Cromford* (1971).

Arlberg (är'l'bérk), pass, 5,946 ft (1,812 m) high, W Austria, beside Arlberg peak, on the boundary between Tyrol and Vorarlberg. The Arlberg region forms the water divide between rivers flowing to the North Sea and those flowing into the Black Sea. The Arlberg Tunnel (built 1880-84) is one of the world's longest (6.2 mi/9.9 km) railway tunnels. The Arlberg district is a noted winter sports center.

Arlen, Harold, 1905-, American jazz and popular composer, b. Buffalo, N.Y. as Hyman Arluck. Arlen sang from the age of 7 in the synagogue where his father was cantor, and at 15 he left school to play jazz piano. After coming to New York City in 1925, Arlen achieved fame by writing songs for various reviews and for the Harlem Cotton Club Shows (1930-34). Many of his songs became jazz standards because of their genuine blues feeling and haunting melodies (e.g., "Ill Wind," "Stormy Weather," "Blues in the Night"). In 1939, Arlen won an Academy Award for the song "Over the Rainbow" in the film *The Wizard of Oz*. Among the other films for which he wrote scores are *Cabin in the Sky* (1943) and *A Star Is Born* (1954). He also wrote the music for several Broadway shows, notably *House of Flowers* (1954).

Arlen, Michael, 1895-1956, English novelist, b. Bulgaria as Dikran Kuyumjian. The son of Armenian parents, he was brought to England as a child. In 1922 he became a British subject and changed his name, and in 1928 he married Countess Alalanta Mercati. Arlen is best remembered for his fantastically successful novel (and play) *The Green Hat* (1924), which depicts the licentious postwar life of fashionable London society. His characters are disillusioned, cynical, and witty. Although sophisticated, the novel is ultimately sentimental. Arlen's novels depicted the mood of the 1920s, and by the 30s he was no longer read. His last novel, *Flying Dutchman*, appeared in 1939. See the biography *Exiles* (1970) by his son Michael J. Arlen.

Arles (är'l), city (1968 pop. 46,136), Bouches-du-Rhône dept., 5 central France, in PROVENCE, on the Rhône River delta. Arles is an important railroad and industrial center with varied manufactures. It was a flourishing Roman town (Arelas) and the metropolis of Gaul in the late Roman Empire. Constantine I convoked (314) a synod at Arles that condemned

ARLES, KINGDOM OF

DONATISM, Constantine II was born there. Arles was an archiepiscopal see from the 4th cent until 1790 and the seat of many synods. It became (879) the capital of Provence and (933) of the kingdom of Arles (see separate article). In the 12th cent it became a free city governed by an elected *podestà*, who appointed the consuls and other magistrates. Arles retained its special status until the French Revolution. Among its noteworthy attractions are a Roman arena (2d cent AD), seating 26,000 and now used for bullfights, a Roman theater (1st or 2d cent AD), the Aliscamps [i.e., Elysian Fields], remains of a Roman cemetery, the Church of St Trophime (11th-15th cent, formerly a cathedral), the town hall (17th cent), and the Museon Arlaten, a museum of Provençal culture and folklore, installed in a 16th-century mansion by Frederic Mistral, who was born near Arles. Arles has attracted many painters, notably Van Gogh and Gauguin.

Arles, kingdom of, was formed in 933, when Rudolf II, king of Transjura BURGUNDY, united the kingdom of PROVENCE or Cispurane Burgundy to his lands and established his capital at Arles. Holy Roman Emperor CONRAD II annexed the kingdom to the Holy Roman Empire in 1034, but few of his successors troubled to be crowned as king of Arles. The imperial rulers exercised little control, and the component parts of the realm (Provence, VIVARAIS LYONNAIS, DAUPHINÉ SAVOY, SWITZERLAND, and FRANCHE COMTÉ) gradually broke away. In 1378, Holy Roman Emperor Charles IV ceded the realm to the dauphin (later King Charles VI of France), and the kingdom for all practical purposes ceased to exist.

Arlington, Henry Bennet, 1st earl of, 1618-85, English statesman. He fought for the royalists in the English civil war and, after going into exile, served as an envoy in Spain for the future CHARLES II. After the Restoration, Charles made him a secretary of state (1662), and he became one of the king's closest advisers, a member of the CABAL. He knew of the king's secret agreement with Louis XIV in the Treaty of Dover (1670) and seems to have encouraged Charles in promulgating the Declaration of Indulgence (1672) and in instigating the third Dutch War. He was made earl of Arlington in 1672. Impeached (1674) for corruption, betrayal of trust, and pro-Catholic activities, he was acquitted, resigned, and became lord chamberlain (1674). See biography by Violet Barbour (1915).

Arlington, county (1970 pop. 174,284), N Va., across the Potomac River from Washington, D.C. A residential suburb of Washington, the county is governed as a single unit. Within its boundaries are ARLINGTON NATIONAL CEMETERY, ARLINGTON HOUSE NATIONAL MEMORIAL, the PENTAGON, Marymount College of Virginia, and Washington National Airport. Most of the residents are employed by the U.S. government. Arlington, formerly called Alexandria, was ceded to the Federal government by Virginia in 1790 and was part of the District of Columbia until 1847, when it was returned to Virginia. It was named Arlington in 1920.

Arlington 1. Town (1970 pop. 53,524), Middlesex co., E Mass., a residential suburb of Boston, settled c. 1630 as Menotomy, inc. as West Cambridge 1807, renamed Arlington 1867. Menotomy was the scene of fierce fighting after the Lexington and Concord battles in 1775. Some 17th-century buildings remain. 2. Industrial city (1970 pop. 90,643), Tarrant co., N Texas, midway between Dallas and Fort Worth, inc. 1896. The center of a rapidly growing area, it has a huge industrial park with its own railroad. There are steel and iron works, and other industries that produce automobile parts, cans and containers, rubber items, mobile homes, electronic equipment, oil-field equipment, aircraft and parts, insecticides, and paving and road equipment. Six Flags Over Texas (a huge amusement park) and the Pecan Bowl are located there. It is the seat of the Univ. of Texas at Arlington.

Arlington Heights, village (1970 pop. 64,884), Cook and Lake counties, NE Ill., a suburb of Chicago, founded 1836, inc. 1887. Its manufactures include heating and air-conditioning equipment, electronic components, radioactive drugs, and office supplies. Arlington Heights's population more than doubled during the 1960s as a result of large-scale residential construction. Arlington Park racetrack and a missile base are in the village.

Arlington House National Memorial, 3 acres (1 hectare), NE Va., in ARLINGTON NATIONAL CEMETERY, est. 1955. Formerly called the Custis-Lee Mansion, it is a memorial to the Confederate Gen. Robert E. LEE. Arlington house was the home of Lee, inherited by his wife, the daughter of George Washington Parke

Custis. It was abandoned by the Lees early in the Civil War and was later used as headquarters for the Union army. The estate was confiscated for nonpayment of taxes, and c. 200 acres (80 hectares) were set aside for a national cemetery in 1864.

Arlington Memorial Bridge, granite and concrete bridge across the Potomac River connecting the Lincoln Monument in Washington, D.C., with Arlington National Cemetery, N Va., built 1926-32.

Arlington National Cemetery, 420 acres (170 hectares), N Va., across the Potomac River from Washington, D.C., est. 1864. More than 60,000 American war dead, as well as notable Americans including Presidents William Howard Taft and John F. Kennedy, Gen. John J. Pershing, and Admiral Robert E. Peary are interred here. Burial in Arlington is limited to active, retired, and former members of the armed forces, Medal of Honor recipients, high-ranking Federal government officials, and their dependents. There are commemorative monuments, including the Tomb of the UNKNOWN SOLDIER. The cemetery is part of "Arlington," the former estate of the Custis and Lee families, and includes Arlington House, now called the ARLINGTON HOUSE NATIONAL MEMORIAL.

Arliss, George, 1868-1946, English actor. He first appeared on the stage in 1887. In 1901 he came to the United States with Mrs. Patrick Campbell to appear in the Belasco production of *The Darling of the Gods*, and thereafter he became extremely popular for his portrayals of the suave villain. His performance in *The Green Goddess* was especially noted. He also became a favorite in films, his performance in *Disraeli* won him an Academy Award (1930). See his autobiographies, *Up the Years from Bloomsbury* (1927) and *My Ten Years in the Studios* (1940).

Arlon (arlôn'), Flemish *Aarlen*, town (1970 pop. 13,745), capital of Luxembourg prov., SE Belgium, near the border with Luxembourg. A strategic point since Roman times, the town has suffered numerous attacks in its history. Of note in Arlon are Roman ruins, the Church of Saint-Donat (17th cent.), and the picturesque marketplace.

arm, upper limb in humans. Three long bones form the framework of the arm: the humerus of the upper arm, and the radius (outer bone) and ulna (inner bone) of the forearm. The radius and ulna run parallel but meet at their ends in such a manner that the radius can rotate around the ulna. This arrangement permits turning the forearm to bring the hand palm up (supination) or palm down (pronation). The radius and ulna hinge with the bones of the hand at the wrist, and with the humerus at the elbow. The BICEPS, a muscle of the upper arm, bends the arm at the elbow; the TRICEPS straightens the arm. Movement of the arm across the chest and above the head is accomplished by the pectoral muscles of the chest and deltoid muscles of the shoulder, respectively. In an adult the arm is normally five sixths as long as the leg.

Armada, Spanish (arma'da), 1588, fleet launched by PHILIP II of Spain for the invasion of England, to overthrow the Protestant Elizabeth I and establish Philip on the English throne, also called the Invincible Armada. Preparations, under the command of the marques de Santa Cruz, began in 1586 but were seriously delayed by a surprise attack on Cadiz by Sir Francis DRAKE in 1587. By the time the expedition was ready Santa Cruz had died, and command was given to the duque de MEDINA SIDONIA. The Armada consisted of 130 ships, including transports and merchantmen, and carried about 30,000 men. It was to go to Flanders and from there convoy the army of Alessandro Farnese, duke of Parma, to invade England. It set out from Lisbon in May, 1588, but was forced into Coruña by storms and did not set sail again until July. Medina Sidonia's orders were to proceed straight up the English Channel and refuse battle until he had made junction with Parma. This gave the initiative to the English, whose main fleet, commanded by Charles Howard (later earl of NOTTINGHAM), sailed out from Plymouth to achieve the windward side of the Spanish and attacked at long range. Three minor actions followed, in which the Armada was somewhat damaged but its formation unbroken. On Aug. 6, Medina Sidonia anchored off Calais, from which position he hoped to make contact with Parma. The following night the English sent fire ships into the anchorage, causing the Spanish fleet to scatter, and then attacked (Aug. 8) at close range off Gravelines. Unable to reform, the Armada was severely battered, but a sudden change in the wind enabled most of the ships to escape northward. In attempting to sail home by Scotland and the west coast of Ireland, the Spanish ships

were dispersed by storms, their provisions gave out and many of those who landed in Ireland were killed by English troops. Only about half the fleet reached home. See Garrett Mattingly, *The Armada* (1959), Alexander McKee, *From Merciless Invaders* (1964), Winston Graham, *The Spanish Armadas* (1972).

armadillo (ar'madil'ô), New World armored mammal of the order Edentata, a group that also includes the SLOTH and the ANTEATER, characterized by peglike teeth without roots or enamel. Armadillos are found from Argentina to Panama, with one species reaching the southern United States. The head and body of an armadillo are almost completely covered by an armor of plates made of bone and horny material, the plates are separated by soft skin which bears a few hairs. The body armor, or carapace, hangs down on either side of the animal's body and is divided into flexible bands across the back. Members of some armadillo species can roll into a ball for protection. Armadillos are omnivorous, although insects form the bulk of their diet. Most are nocturnal, resting during the day in burrows that they excavate with their strong front feet and enormous claws, they can dig into the ground with amazing speed when threatened. There are 21 armadillo species, classified in 9 genera. The largest is the giant armadillo, *Protonotus giganteus*, which reaches 4 ft (120 cm) in length and may weigh 100 lb (45 kg). Members of this species have almost 100 teeth, more than any other mammal. Despite their great bulk, they are able to stand on their hind feet and sometimes walk in this position. This species inhabits the Amazonian forest, most other armadillos are grasslands dwellers. The smallest armadillos are the fairy armadillos, or pichiagos, the smaller of the two pichiago species (*Chlamyphorus truncatus*) is about 6 in. (15 cm) long and bright pink in color, with plumes of white hair about the face and undersides and between the front and back portions of the shield. The nine-banded armadillo, *Dasypus novemcinctus*, is the only species found in the United States, it ranges from Argentina to Texas and Louisiana. It is about 30 in. (76 cm) long and 6 in. (15 cm) high at the shoulder, it weighs about 15 lb (6.4 kg). It normally moves about slowly, but is very swift when threatened. Each animal has several burrows. Females of this species almost always give birth to identical quadruplets. Armadillos are classified in the phylum CHORDATA, subphylum Vertebrata, class Mammalia, order Edentata, family Dasypodidae.

Armageddon (ar'maged'an), great battlefield where, at the end of the world, the powers of evil will fight the powers of good. Rev. 16:16. If the usual etymology is correct, the name alludes to the frequency of battles at MEGIDDO.

Armagh (arma'), county (1971 pop. 133,196), 489 sq mi (1,267 sq km), S Northern Ireland. The county town is Armagh. County Armagh rises from boggy, fertile lowlands in the north to barren hills in the south. It is the fruit-growing center of Northern Ireland, cattle, sheep, pigs, and poultry are also raised. Armagh is noted for its fine linen. Granite is quarried there. Other important towns are LURGAN and PORTADOWN.

Armagh, urban district (1971 pop. 12,297), county town of Co. Armagh, S Northern Ireland. Textiles are produced there. Armagh (originally Ard Macha) has been the ecclesiastical capital of all Ireland since the 5th cent., when St. Patrick founded his church there. It is the seat of both Roman Catholic and Protestant archbishops. Besides its two cathedrals, the town contains an observatory and St. Patrick Diocesan College. Armagh suffered several Danish raids; it was destroyed by Shane O'Neill in 1566 and was burned in 1642. Nearby is Navan Fort, a large elliptical mound, on the site of Emania (or Emain Macha), the legendary pre-Christian capital of Ulster.

Armagnac (armanyak'), region and former county, SW France, in GASCONY, roughly coextensive with Gers dept. Auch is the chief town. Armagnac is famous for the brandy bearing the same name. The counts of Armagnac originated in the 10th cent. as vassals of the dukes of Gascony. Their power reached its height with Count Bernard VII, who dominated France in the early 15th cent. Margaret of Angoulême, sister of Francis I of France, married the last count of Armagnac, who died without issue. Armagnac eventually passed to her second husband, Henri d'Albret, king of Navarre, whose grandson became King Henry IV. Henry added Armagnac to the royal domain in 1607.

Armagnacs and Burgundians, opposing factions that fought to control France in the early 15th cent. The rivalry for power between Louis d'ORLÉANS,

brother of the recurrently insane King Charles VI, and his cousin JOHN THE FEARLESS, duke of Burgundy, led to Louis's murder in 1407. In the conflicts that followed, the partisans of Charles d'ORLÉANS, son of Louis, were led by Charles's father-in-law, BERNARD VII, count of Armagnac, after whom they were named. The followers of the duke of Burgundy, or Burgundians, were allied with members of the lower classes, notably the CABOCHIENS, who were particularly strong in Paris. Open civil war between the two groups broke out in 1411. John the Fearless at first held control of the government, but in 1413 the Cabochiens were ousted by another Parisian faction and John was forced to flee the city. The Armagnacs came into power and conducted the defense of France against King Henry V of England, who invaded the kingdom in 1415. John gave tacit approval to the invasion. The conflict between Armagnacs and Burgundians thus became part of the HUNDRED YEARS WAR. John took advantage of French defeats to return to Paris and seize the king (1418), in the ensuing massacre of the Armagnacs, Bernard VII and numerous followers were killed. Subsequently John attempted to negotiate with Charles VI's son, the young dauphin (later King Charles VII). During the negotiations John was assassinated (1419). His son and successor, PHILIP THE GOOD of Burgundy, immediately concluded a treaty with the English (see TROYES, TREATY OF), by which he recognized the succession to the French throne of Henry V. This alliance remained in force until 1435 when Philip signed the Treaty of Arras with Charles VII. Although the terms *Armagnacs* and *Burgundians* ceased to have their original meanings, the struggle between the French crown and Burgundy continued until the death (1477) of Charles the Bold of Burgundy.

armature, in art see SCULPTURE

armature, in electricity, principal current-carrying member of the electric GENERATOR and electric MOTOR. Essentially it is a coil of wire that rotates in the magnetic field between opposite magnetic poles. In its simplest form the coil is wound around a central core of soft iron, and the whole is rotated. Armatures differ in the way in which the coil is wound about the core, in the shape of the core, and in the number of turns in the coil. Although in general the armature is the rotating part, in some cases it is held stationary and the magnetic field is rotated about it.

Armavir (armavēr, Rus armavēr'), city (1970 pop. 146,000), Krasnodar Krai, SE European USSR, on the Kuban River. An important railroad junction, it has machine and tool plants. Armavir was founded in 1848.

Armenia (armē'nēa), region and former kingdom of Asia Minor. Greater Armenia lies east of the Euphrates River, and Little, or Lesser, Armenia is west of the river. Armenia is generally understood to include NE TURKEY, the ARMENIAN SOVIET SOCIALIST REPUBLIC, and parts of Iranian AZERBAIJAN. It thus forms a continuation of the Anatolian plateau. Mt. ARARAT, the highest point, is in Turkey, as are the sources of the Euphrates, Tigris, and Aras rivers and Lake VAN. Trabzon, on the Black Sea, Erzurum, and Kars are the chief cities of Turkish Armenia, which, unlike Soviet Armenia, has no official standing. According to tradition, the kingdom was founded in the region of Lake Van by Haig, or Haik, a descendant of Noah. Modern scholars, however, believe that the Armenians crossed the Euphrates and came into Asia Minor in the 8th cent. B.C. Invading the Khaldian state called Urartu by the Assyrians, they intermarried with the indigenous peoples there and formed a homogeneous nation by the 6th cent. B.C. This state was a Persian satrapy from the late 6th cent. B.C. to the late 4th cent. B.C. Conquered (330 B.C.) by Alexander the Great, it became after his death part of the Syrian kingdom of SELEUCUS I and his descendants. After the Roman victory over the Seleucids at Magnesia in 190 B.C., the Armenians declared (189 B.C.) their independence under a native dynasty, the Artashesids. The imperialistic ambitions of King TIGRANES led to war with Rome, defeated Armenia became tributary to the republic after the campaigns of LUCULLUS (69 B.C.) and POMPEY (67 B.C.). The Romans distinguished between Greater Armenia and Lesser Armenia, respectively east and west of the Euphrates. TIRIDATES, a Parthian prince, was confirmed as king of Armenia by Nero in A.D. 66. Christianity was introduced early; Armenia is reckoned the oldest Christian state. In the 3d cent. A.D., ARDASHIR I, founder of the SASSANID, came to power in Persia and overran Armenia. The persecution of Christians created innumerable martyrs and kindled nationalism among the Armenians, particularly after the partition (387) of the kingdom between Persia

and Rome. Attempts at independence were short-lived, as Armenia was the constant prey of Persians, Byzantines, White Huns, Khazars, and Arabs. From 886 to 1046 the kingdom enjoyed autonomy under native rulers, the Bagratids; it was then reconquered by the Byzantines, who promptly lost it to the Seljuk Turks following the Byzantine defeat at the battle of Manzikert in 1071. With the Mongol invasion of the mid-13th cent., a number of Armenians, led by Prince Reuben, were pushed westward. In 1080 they established in CILICIA the kingdom of Little Armenia, which lasted until its conquest by the Mamelukes in 1375. Shortly afterward (1386-94) the Mongol conqueror Tamerlane seized Greater Armenia and massacred a large part of the population. After Tamerlane's death (1405) the Ottoman Turks, whom Tamerlane had defeated in 1402, invaded Armenia and by the 16th cent. held all of it. Under Ottoman rule the Armenians, although often persecuted and always discriminated against because of their religion, nevertheless acquired a vital economic role. Constantinople and all other large cities of the Ottoman Empire had colonies of Armenian merchants and financiers. Eastern Armenia was chronically disputed between Turkey and Persia. It was from Persia that Russia, in 1828, acquired the present Armenian SSR. There remains a considerable Armenian minority in NW Iran. The Congress of Berlin (1878, see BERLIN CONGRESS OF) also assigned the Kars, Ardahan, and Batumi districts to Russia, which restored Kars and Ardahan to Turkey in 1921. The Armenian people underwent one of the worst trials in their history between 1894 and 1915. A systematic plan for their extermination was put into action under Ottoman Sultan Abd al-Hamid II and was sporadically resumed, notably in 1915, when the Armenians were accused of aiding the Russian invaders during World War I. The Armenians rose in revolt at Van, which they held until relieved by Russian troops. The Treaty of Brest-Litovsk (1918) between Soviet Russia and Germany made Russian Armenia an independent republic under German auspices. It was superseded by the Treaty of Sevres (see SEVRES TREATY OF, 1920), which created an independent Greater Armenia, comprising both the Turkish and the Soviet Russian parts. In the same year, however, the Communists gained control of Russian Armenia and proclaimed it a Soviet republic, and in 1921 the Russo-Turkish Treaty established the present boundaries, thus ending Armenian independence. Before 1914 there were about 2.5 million Armenians in Russia, Turkey, and Iran, as of 1974 there were more than four million throughout the world. See also ARMENIAN CHURCH and ARMENIAN LITERATURE. See V. M. Kurkjian, *A History of Armenia* (1959), L. Z. Nalbandian, *The Armenian Revolutionary Movement, the Development of Armenian Political Parties through the Nineteenth Century* (1963), R. G. Hovannisian, *Armenia on the Road to Independence, 1918* (1967) and *The Republic of Armenia The First Year, 1918-1919* (1971), Sirarpie Der Nersessian, *The Armenians* (1969), D. M. Lang, *Armenia Cradle of Civilization* (1970), Charles Burney and D. M. Lang, *The Peoples of the Hills* (1971).

Armenia (ārmā nyā), city (1968 est. pop. 142,200), W central Colombia. Located in a fertile agricultural region (especially for coffee and cattle), Armenia is an industrial center and a transportation hub. It has a university.

Armenian Church, autonomous Christian church, sometimes also called the Gregorian Church. Its head, a primate of honor only, is the catholicos of Echmiadzin, in Soviet Armenia. His rule is shared by the patriarchs of Jerusalem and Constantinople and by the catholicos of Sis (Cilicia). In general, Armenian practices resemble those of other Eastern churches, the priests may marry and communion is distributed in both bread and wine, although the use of unleavened bread is a Western practice. The liturgical language is classical Armenian. Armenia became Christian at the end of the 3d cent. through the missionary work of St. Gregory the Illuminator (see GREGORY THE ILLUMINATOR, SAINT). In the next century the young church made itself autonomous, apparently because of the efforts of the metropolitan bishop of Caesarea, St. Basil the Great, to impose certain reforms. After the Council of Chalcedon the Armenians rejected the orthodox position, this adoption, at least tacit, of MONOPHYTISM completed the isolation of the Armenian Church from the rest of Christendom. Part of the Armenian Church reunited with Rome temporarily in the 13th and 14th cent., and missionary work by the Roman Church in the 14th cent. resulted in many converts.

In 1740 the Catholic Armenian rite was officially organized, in communion with the pope but under its own patriarch. See Papken Catholicos Gulesserian, *The Armenian Church* (tr. 1939, repr. 1970), Donald Attwater, *The Christian Churches of the East* (2 vol., rev. ed. 1961).

Armenian language, member of the Thracio-Phrygian subfamily of the Indo-European family of languages (see INDO EUROPEAN). There is evidence that in ancient times a distinct subfamily of Indo-European languages existed that is now called Thracio-Phrygian. To it belonged Phrygian (an ancient and now extinct Indo-European language of Anatolia) and Thracian (a now dead Indo-European tongue of the Balkans in antiquity). Modern Armenian may well be a direct descendant of Phrygian. Today Armenian is the mother tongue of more than four million people, of whom two million live in the Armenian Soviet Socialist Republic, one million live elsewhere in the Soviet Union, and the rest are in the Middle East, the Balkans, and the United States. Armenian is an old, rich, and vital language. Although spoken in antiquity, it was not recorded in writing until the early 5th cent. A.D. At that time an alphabet of 36 letters was specially designed for Armenian by St. Mesrop, who used Greek and Iranian letters as a basis. Later, two more letters were added to the alphabet. In its early, or classical, form, Armenian is called *Grabar* or *Krapar*. This was the literary language until the 19th cent. and is still the liturgical language of the Armenian Church (see ARMENIAN LITERATURE). It differed greatly from the spoken language. Grammatically, it has six cases for the noun and nine tenses for the verb, but it has lost gender. The modern form of Armenian, now used for literature as well as for speaking, dates from the 16th cent. and is known as *Ashksarhik* or *Ashksarhabar*. Its grammar is simpler than that of Classical Armenian. The history of the Armenian people is reflected in the sources of the words borrowed by their language. For example, Armenian has absorbed words from Iranian, owing to Parthian domination in the centuries immediately before and after Christ from Greek and Syriac as a result of Christian influence, from French during the Crusades and from Turkish in the course of several centuries of Turkish rule. For grammars see S. L. Kogian (1949) and K. H. Gulian (1954).

Armenian literature. The first major work of Armenian literature is a 5th-century translation of the Bible; its language became the standard of classical Armenian. The Armenian Church fostered literature from its inception, and the principal works are religious or hagiographical, most of them translations. They constituted the golden age of Armenian literature. Early Mesopotamian influence resulted in the translations from the Syriac of Aphraates and St. Ephraem Syrus. Armenia then turned westward for literary inspiration and produced fine translations of the works of many religious leaders, e.g., Athanasius, Basil the Great, Gregory of Nyssa, Gregory Nazianzen, and John Chrysostom. Among secular works are renderings of Aristotle and of the romance of Alexander. The original writings of the golden age are confined to saints' lives and histories. The 5th-century history of Moses of Khorhni contains practically all that is known of pre-Christian Armenia. Its folklore and epics. Later celebrated historians include Thomas Ardzruni (10th cent.), Matthew of Edessa, who described the Crusades, and Stephanos Orbelian (13th cent.), who wrote of the Mongol hordes. A tradition of epic poetry, nationalistic in character and influenced by Muslim form, enriched Armenian literature, the best-known example is *David of Sassoun*. In the 12th cent. many Armenians went to Cilicia to escape the Seljuk Turks, and a new literary period began. Its principal figure is Catholicos Narses IV, prelate and poet, whose literary style is unexcelled in Armenian. After the decline of Armenian cultural centers in the 14th cent. the literature of Armenians abroad was heavily influenced by their host countries. Contemporary forms of the language came into use for writing in many fields—trade, agriculture, medicine, law, and political administration. In 18th-century Constantinople, Mechitar (1676-1749), a monk of the Catholic Armenians (those in communion with the Holy See), founded a community to cultivate Armenian letters. These monks (Mechitarists) now have their headquarters in Venice and are the principal Armenian publishers. The 19th cent. saw a considerable revival of Armenian letters and the establishment of a modern literary language. The major novelists of the 19th cent. were Khachatur Abovian and Hagop Melik-Agopian (called "Raffi"). Currently there is a flourish-

ishing Armenian journalism, the chief literary genres are satire and folktales. See Z. C. Boyajian, ed., *Armenian Legends and Poems* (2d ed. 1959).

Armenian Soviet Socialist Republic, constituent republic (1970 pop. 2,493,000), 11,500 sq mi (29,785 sq km), SE European USSR, in the S Caucasus. YEREVAN is the capital. Smallest of the USSR's 15 republics, Armenia is bounded by Turkey on the west, the Azerbaijan Republic on the east, Iran on the south, and the Georgian Republic on the north. The region is one of extinct volcanoes and rugged mountains. Many peaks exceed 10,000 ft (3,048 m), perpetually snowcapped Mt. Aragats (13,432 ft/4,094 m) is the highest point in Armenia. The chief rivers are the Araks and its tributary, the Razdan, which provide hydroelectricity and irrigation water. Lake Sevan supports the important fishing industry and is another source of hydroelectric power. Armenia is rich in mineral resources, notably copper but also molybdenum, zinc, lead, iron, pyrite, manganese, gold, chromite, and mercury. These provide the basis for a flourishing chemical industry. Salts and other minerals have enabled numerous health resorts to thrive in Armenia. Food processing, nonferrous metallurgy, and the manufacture of electrical equipment, machinery, textiles, automobiles, and the famous Armenian cognacs and wines are the republic's other major industries. Agriculture holds a significant place in Armenia's economy, with wine grapes and other fruits, wheat, barley, potatoes, and sugar beets as the major food crops and cotton and tobacco as the foremost industrial crops. Armenia's main cities are Yerevan, LENINAKAN, Kirovakan, and Echmiadzin (seat of the Armenian Church). It is one of the USSR's most densely populated and ethnically homogeneous republics, and has, in addition to its predominant Armenian population, Azerbaijani, Russian, and Kurdish minorities. The republic occupies the eastern part of ancient ARMENIA. It was acquired by Russia from Persia in 1828 and made into a province. After the 1917 Bolshevik Revolution, Russian Armenia joined Azerbaijan and Georgia to form the anti-Bolshevik Transcaucasian Federation, which, however, was dissolved in May, 1918. Armenia then became an independent republic. In 1920 it was occupied by the Red Army and proclaimed a Soviet republic. Two years later, Armenia, Azerbaijan, and Georgia were combined to form the Transcaucasian Soviet Federated Socialist Republic, which became a part of the USSR. With the dissolution of the Transcaucasian SFSR in 1936, Armenia, like Azerbaijan and Georgia, became a separate constituent republic of the USSR.

Armentières (arman'tiēr', Fr. arma'ntiēr'), town (1968 pop. 28,469), Nord dept., N France, in Flanders, on the Lys River. It has foundries, boiler works, breweries, and a large textile industry. During most of World War I it was directly behind the Allied lines. It became known through the song "Mademoiselle from Armentières."

Arminianism. see ARMINIUS, JACOBUS

Arminius (armin'ēas), d. A.D. 21, leader of the Germans, called Hermann in modern German. He was a chief of the Cherusci (in an area of present-day Hanover) when the Romans were pushing E from the Rhine toward the Elbe. Arminius, who had been a Roman citizen and soldier, secretly gathered a great force of allies and set upon Publius Quinctilius Varus by surprise in the Teutoburg Forest in A.D. 9. In the ensuing battle Varus' army was utterly destroyed, and Varus, in disgrace, committed suicide. So great was the shock in Rome that it is said that Emperor Augustus afterward would start up from sleep, crying, "Varus, Varus, bring me back my legions!" The Romans never again made any real effort to absorb the territory E of the Rhine, though GERMANICUS CAESAR (called to aid the father of Arminius' wife, Thusnelda, against Arminius) badly defeated and wounded the German leader in A.D. 16. Arminius was later killed by treachery. Tacitus, the modern source for Arminius, glorified him as the noble barbarian. In the romantic period German nationalists made much of Arminius, who became a major national hero and was sometimes wrongly identified with Siegfried. F. G. Klopstock wrote a trilogy of plays about Arminius, and J. E. von Bandel erected a large monument to him near Detmold.

Arminius, Jacobus (jak'ō'bas), 1560-1609, Dutch Reformed theologian, whose original name was Jacob Harmens. He studied at Leiden, Marburg, Geneva, and Basel and in 1588 became a pastor at Amsterdam. He undertook to defend the Calvinist doctrine of predestination against the attacks of Dirck Volkertszoon Coornhert, but as a result of the controversy he changed his own views of the doctrine. He

was professor of theology at the Univ. of Leiden after 1603, and he engaged in violent theological debates, seeking to win the Dutch Reformed Church to his views. His teaching, known as Arminianism, was not yet fully developed, but he asserted the compatibility of divine sovereignty with human freedom, denied John Calvin's doctrine of irresistible GRACE, and thus modified the strict conception of predestination. In this respect his teaching resembled that of the Roman Catholic Council of Trent. Arminianism became a term of abuse among 17th-century Puritans. His ideas were formulated after his death into a definite system by his disciple, Simon Episcopius, who drew up the "Remonstrance" (see REMONSTRANTS). Arminianism later was the doctrine of Charles and John Wesley and most of the Methodist churches.

Armistead, George (ar'mistēd), 1780-1818, American artillery officer distinguished in the War of 1812, b. Virginia. He took part in the capture of Fort George on the Niagara frontier but is better remembered as the defender of FORT MCHENRY against British attack (Sept. 1814)—a defense that served as an inspiration for the STAR SPANGLED BANNER.

Armistead, Lewis Addison, 1817-63, Confederate general, b. New Bern, N.C. He was commissioned (1839) in the U.S. army from Virginia but resigned when that state seceded. In the GETTYSBURG CAMPAIGN, Armistead, commanding a brigade under G. E. PICKETT in the famous charge, accomplished the farthest penetration of the Union lines, but he was mortally wounded. A monument where he fell marks the "high tide" of the Confederacy.

Armoni (armō'ni), one of Saul's sons, killed to end the Gibeonite famine. 2 Sam. 21:1-9.

armor, apparatus for defense of persons, horses, and such objects as vehicles, naval vessels, and aircraft. Body armor developed early as protective suits made of such materials as leather, shells, wood, and basketwork. These were later replaced by metal. Such protective coverings were known to the peoples of the ancient Middle East, and out of them Greeks developed the helmet, cuirass, shin guards (greaves), and shield. The armor of the Roman legionary passed through many stages but was characteristically a cuirass and a shield. After the downfall of the Roman Empire defensive garments reinforced by metal strips and plates appeared. Soon chain mail developed and prevailed until c. 1300, when it was gradually superseded by protective covering of steel plates. The evolution of warfare, with increased mobility, diminished the importance of personal armor even before firearms speeded its disappearance. Helmets and cuirasses were worn in action as late as the 17th cent., later they were used only for ceremonial purposes. In the wars of the 20th cent., steel helmets were reintroduced, and there were some experiments with various types of protective clothing. Armor is used also to protect vehicles (see TANK, military). Armor plate forms an important part of the defense of ships and aircraft.

Armory Show, international exhibition of modern art held in 1913 at the 69th-regiment armory in New York City. It was a sensational introduction of modern art into the United States. The estimated 1,600 works included paintings representing avant-garde movements in Europe. Duchamp's *Nude Descending a Staircase* was singled out by the hostile critics as emblematic of the so-called insanity and degeneracy of the new art. One of the most important exhibitions of art ever held in the United States, the Armory Show aroused the curiosity of the public and helped to change the direction of American painting. See Milton Brown, *American Painting from the Armory Show to the Depression* (1955), and *The Story of the Armory Show* (1963).

Armour, Philip Danforth (ar'mar), 1832-1901, American meat-packer, b. Stockbridge, N.Y. Armour's Chicago meat-packing plants introduced new principles of large-scale organization, as well as refrigeration, to the industry. He is said to have been one of the first to notice the tremendous waste in the slaughtering of hogs and to take advantage of the resale value of waste products. His prestige was dimmed by the scandals of 1898-99 in which his packing-house was charged with selling tainted beef. See biography by Harper Leech and John C. Carroll (1938).

Arms, John Taylor, 1887-1953, American etcher and draftsman, b. Washington, D.C. He studied architecture, but later he devoted himself to etching and became noted for his excellent studies of medieval architecture. Arms illustrated his wife's *Churches of France and Hill Towns and Cities of Northern Italy*. His fine technique and draftsmanship won him nu-

merous awards, and his work is in many principal collections. Arms wrote an excellent *Handbook of Print Making and Print Makers* (1934).

arms, coat of: see BLAZONRY, HERALDRY

Armstrong, Edwin Howard, 1890-1954, American engineer and radio inventor, b. New York City, grad. Columbia (E.E. 1913). He was associated in research with Michael I. Pupin at Columbia and became professor there in 1934. Armstrong received numerous awards for his contributions to the development of radio, which include the invention of the regenerative circuit (1912), the superheterodyne circuit (1918), the basic circuit of nearly all modern radio receivers, the superregenerative circuit (1920), and FREQUENCY MODULATION (1925-33). In 1947 he received the Medal of Merit for his contributions to military communications during World War II. See biography by L. P. Lessing (1956).

Armstrong, Henry, 1912-, American boxer, b. Columbus, Miss. He was originally named Henry Jackson. He began his professional career in 1931, and soon became known as a strong and tireless puncher. Armstrong won the featherweight championship from Petey Sarron in 1936, the welterweight title from Barney Ross in 1938, and in his next fight (10 weeks later) he defeated Lou Ambers to win the lightweight crown. He thus held three titles simultaneously, this prompted the National Boxing Association to rule that a champion must vacate a title if he wins another. In his career (1931-45), Armstrong won 144 matches, scored 97 knockouts, and lost 19 fights. After his retirement he was ordained a minister and devoted himself to helping underprivileged youth, Youthtown at Desert Wells, Ariz., was built through his efforts. See his autobiography (1956).

Armstrong, John, 1717?-1795, American pioneer, known as the "hero of Kittanning," b. Co. Fermagh, Ireland. He laid out the town of Carlisle, Pa. In 1756 he led the expedition that destroyed Kittanning, a Delaware Indian town on the Allegheny. Later he was a major general in the American Revolution and a member of the Second Continental Congress.

Armstrong, John, 1758-1843, American army officer, U.S. Secretary of War (1813-14), b. Carlisle, Pa., son of John Armstrong, "hero of Kittanning." In the American Revolution he was on the staff of Horatio Gates. In 1783, Armstrong wrote the "Newburgh Addresses," or "Newburgh Letters," these anonymously issued appeals urged the restive Continental officers to force Congress to pay salary arrears and adjust other grievances. General Washington denounced the appeals, and the officers soon followed his lead. After marriage (1789) to Alida, sister of Robert R. Livingston, Armstrong moved to Red Hook, N.Y., and became a political supporter of George and De Witt Clinton. He was U.S. Senator (1800-1802, 1803-4), minister to France (1804-10), and then Secretary of War. In the War of 1812 he was held responsible for the disasters of 1813-14, notably the failure of the expedition to Canada and the British capture of the city of Washington. He resigned in public disfavor. Armstrong wrote *No Tides of the War of 1812* (1836-40), biographies of Richard Montgomery and Anthony Wayne, and other books.

Armstrong, Louis "Satchmo" (Daniel Louis Armstrong), 1900-71, American jazz trumpet virtuoso, singer, and bandleader, b. New Orleans. He learned to play the cornet in the band of the Waif's Home in New Orleans, and after playing with Kid Ory's orchestra he made several trips (1918-21) with a Mississippi riverboat band. He joined (1922) King Oliver's group in Chicago, where he met and married the pianist Lilian Hardin. His early playing was noted for improvisation, and his reputation as trumpeter and as vocalist was quickly established. Armstrong was a major influence on the melodic development of jazz in the 1920s, because of his solo performance attained a position of great importance in jazz. He organized several large bands, and beginning in 1932 made numerous foreign tours. Armstrong appeared in Broadway shows, at countless jazz festivals, and in several American and foreign films. See his autobiography (1954), biographies by Max Jones (1971) and H. Panassie (1971).

Armstrong, Samuel Chapman, 1839-93, American educator, philanthropist, and soldier, b. Hawaiian Islands, of missionary parents, grad. Williams, 1862. He served in the Union army in the Civil War, rising to the rank of major general. Appointed an agent of the Freedmen's Bureau in Virginia, he quickly realized the need for vocational training for emancipated slaves and persuaded the American Missionary Association to found, in 1868, the Hampton

Normal and Agricultural Institute, now the Hampton Institute. Because of Armstrong's interest, Indians were later admitted to the institution, which he headed until his death. See *Biography* by E. A. Talbot (new ed. 1969), F. G. Peabody, *Education for Life* (1918), a history of Hampton Institute.

army, armed land force, under regular military organization—distinguished from the horde, the armed mass of all able-bodied men in a tribe. The earliest known army was that of Egypt, like the later Oriental armies of Assyria and Persia, it was a professional body. The Greeks made military service obligatory for citizens, but they also employed large numbers of mercenaries and hired themselves out as such. At first the Roman army was composed of citizen soldiers, but with the growth of Roman power a professional standing army came into being, which was increasingly made up of barbarian mercenaries. The Roman army was divided into units called legions, each of which included heavy and light infantry, cavalry, and a siege train. The method employed by the Germanic tribes, e.g., the Goths, Lombards, and Franks, was the massing of all men of fighting strength into a horde. The army of the Middle Ages depended upon the feudal levy, according to which armed knights and yeomanry owed a set number of days of military service per year to a great lord, the system had limitations, since the knights would often either refuse to serve or desert before the end of the campaign. Alongside the feudal levies grew up bodies of mercenaries, and with the decline of FEUDALISM and the introduction of firearms, which ended the predominance of the knight and the castle, the mercenary became the dominant figure. The CONDOTTIERE hired mercenaries and fought under the prince who was willing and able to pay the most. German and Swiss mercenaries served all over Europe in the 14th and 15th cent. Professional soldiers were also a notable feature of the armies of the Ottoman Turks, who threatened to destroy all the forces of Western Europe in the 15th cent. After the Thirty Years War (1618–48), France emerged as the preeminent European military power. Under Louis XIV and his war minister, the marquis de LOUVOIS, that country organized a national standing army, which was the pattern for all Europe until the French Revolution. A professional body, set apart from civilian life and ruled under an iron discipline, the standing army reached its harsh perfection under Frederick II of Prussia. The introduction of CONSCRIPTION during the French Revolutionary Wars set in motion the development of mass armies built around a professional nucleus. With the advent of hard-surface highway systems and railroads it became possible, in the late 19th cent., to move large concentrations of troops, thus the nations of the world found it increasingly necessary to enlarge their manpower bases by conscription. However, Great Britain and the United States maintained their peacetime armies by voluntary enlistment. The United States traditionally relied for emergencies on its citizen militia (the NATIONAL GUARD), although conscription was used in the Civil War. In 1907, Great Britain organized a militia body, the territorials. These countries also turned to conscription in World War I and, at last, in peacetime—Great Britain in 1939, the United States in 1940. From very early times it was necessary to maintain troops whose major duty was supplying food, quarters, and the like for the troops who actually engaged in fighting—even when the armies simply lived off the land. There was, at first, no formal distinction made between service troops and combat troops, but with the creation of the great citizen armies after the French Revolution formal specialization proliferated, and quartermasters, ordnance troops, engineers, and medical specialists were organized into separate units. The term *army* is still applied to all the armed land forces of a nation, as in "the French army" or "the U.S. army," but it also has other usages. In combat the term came to be used for a self-contained force fighting in a particular region, e.g., the Army of the Potomac in the U.S. Civil War. In the modern armed forces of the United States, the division (usually about 15,000 men) is the smallest self-contained unit (having its own service and supply personnel). Two or more divisions generally form a corps, and an army, with c. 100,000 men or more and commanded by a lieutenant general, is composed of two or more corps. In World War II army groups were created, including several armies (sometimes from different allied armed forces). Above the army groups is the command of a theater of operations, which in turn is under the command of the joint chiefs of staff. See *STRATEGY AND TACTICS*. **WARFARE**. See L. L. Gordon, *Military Origins* (1971).

Army, United States Department of: see *DEFENSE*, UNITED STATES DEPARTMENT OF

armyworm, larva of a moth, *Pseudaletia unipuncta*, found in North America E of the Rocky Mts. When numerous, armyworms move in hordes, traveling by night and devouring grasses, young grains, and some leguminous crops. The full-grown larva is about 2 in. (5 cm) long, dark gray with yellow and green stripes. There are usually two generations in a season, the larvae hatching from eggs in late spring and again in late summer. Pupation (see *INSECT*) is underground. The moth is grayish brown with a white spot on each fore wing. Armyworms are sometimes serious pests, especially in the second generation of the summer, which occurs when corn and wheat are maturing. Control methods include the use of poisoned bait and toxaphene insecticide and the digging of ditches and holes as traps. Armyworms are classified in the phylum ARTHROPODA, class Insecta, order Lepidoptera, family Noctuidae.

Arnall, Ellis Gibbs, 1907–, governor of Georgia (1943–47), b. Newnan, Ga. A lawyer, he served as a member of the state house of representatives (1933–37), assistant attorney general (1937–39), and attorney general (1939–43) before defeating Eugene TALLMADGE in the Democratic primary of 1942. The constitution of 1945 was notable among the many achievements of Arnall's liberal administration as governor. He wrote *The Shore Dimly Seen* (1946) and *What the People Want* (1948).

Arnan (är'nän), descendant of David 1 Chron. 3:21.

Arnaud, Henri (än'rë' arnô'), 1641–1721, pastor and leader of the WALDENSES. When Victor Amadeus II, duke of Savoy, in league with the French, set out to expel the Waldenses, Arnaud led (1686) a band of the Waldenses into Switzerland. In 1689 he led some of them back to their Piedmont valleys, where they withstood a combined French-Savoyard attack. In 1690, Victor Amadeus turned against the French, and Arnaud gained the favor of the duke and acted as his agent while the Waldenses fought on the side of the Savoyards and were repatriated. A new political turn sent Arnaud into exile again, and after 1699 he lived in Würtemberg. He wrote an account of the return of the Waldenses, *Histoire de la glorieuse rentrée des vaudois dans leurs vallées* (1710, tr. 1827).

Arnauld (arnô'), French family involved in Jansenism (see under JANSEN, CORNELIS). The name is also spelled Arnaut or Arnault. The leader was a nun, Marie Angélique de Sainte Madeleine, 1591–1661, abbess from early youth of PORT-ROYAL, a Cistercian house near Paris. Under the influence of St. Francis of Sales she reformed her abbey. She was interested in Jansenism by DUVERGIER DE HAURANNE, and her introduction of the ideas into Port-Royal was an important step in forwarding the movement. See biography by M. L. Trouncer (1957). Her younger brother, Antoine Arnauld, 1612–94, was a leading Jansenist controversialist. He was a priest and a member of the Sorbonne. His best-known work was an attack on the Jesuits, *De la fréquente communion* (1643). He also wrote against Calvinism and the freethinkers. In 1656 he was expelled from the Sorbonne and the faculty of theology. He lived for some years at Port-Royal-des-Champs, where he collaborated on the Port-Royal textbooks. He withdrew to Belgium in 1679. The chief controversy of his later years was with Malebranche on the theology of grace. His elder brother, Robert Arnauld d'Andilly, 1588–1674, was a translator of religious writings and a religious poet of originality. He lived for many years in retirement at Port-Royal-des-Champs.

Arndt, Ernst Moritz (ernst mō'rīts arnt), 1769–1860, German poet and historian. An ardent nationalist and opponent of Napoleon I, he was forced to flee to Sweden and Russia because of his patriotic and martial verse and his book, *Geist der Zeit* [Spirit of the times] (4 vol., 1806–18), which influenced German feelings against the French. He was (1818–20) a professor of history at the Univ. of Bonn but was dismissed because of his liberal ideas and participation in the Burschenschaften, the nationalist students' movement, he was not reinstated until 1840. In 1848, Arndt was elected to the Frankfurt Parliament, the all-German national assembly that attempted to bring about German unification. See A. G. Pundt, *Arndt and the National Awakening in Germany* (1935, repr. 1968).

Arne, Thomas Augustine, 1710–78, English composer. Arne composed the song *Rule, Britannia*, based on an ode by James Thomson. He composed new music for an adaptation of Milton's masque *Comus* (1738) and for some of the songs in Shake-

speare's plays. He also wrote operas, oratorios, including *Judith* (1761), instrumental music, and incidental music for plays.

Arnhem (ar'nəm), Ger. *Amheim*, city (1971 pop. 132,330), capital of Gelderland prov., E Netherlands, a port on the Lower Rhine. It is an industrial and transportation center. Textiles, electrical equipment, and metal goods are manufactured. First mentioned in the 9th cent., Arnhem was long the residence of the dukes of Gelderland. During World War II British airborne troops suffered (Sept., 1944) a serious defeat there (see also EINDHOVEN and NIJMEGEN).

Arnhem Land, 31,200 sq mi (80,808 sq km), N Northern Territory, Australia, on a wide peninsula W of the Gulf of Carpentaria. It contains an aboriginal reservation. Bauxite is mined in the area.

arnica (ar'nəkə), any plant of the genus *Arnica*, yellow-flowered perennials of the family Compositae (COMPOSITE family), native to north temperate and arctic regions. In North America, arnicas grow in woody areas of the plains region and the Pacific coast, northward to arctic Alaska. Medicinal preparations for the treatment of wounds and bruises are sometimes made from arnica plants, chiefly *A. montana* of the European Alps. Arnica is classified in the division MAGNOLIOPHYTES, class Magnoliopsida, order Asterales, family Compositae.

Arnim, Achim or Joachim von (akh'im, yöäkh'im, fan ar'nim), 1781–1831, German writer of the romantic school. He is best remembered for his work with his brother-in-law, Clemens BRENTANO, on the folksong collection *Des Knaben Wunderhorn* [the boy's magic horn] (1806–8). Arnim's novels include *Grafen Doloros* (1810) and the unfinished *Die Kronenwächter* [the guardians of the crown] (1817). He was at his best in his historical novels, notably in *Isabella of Egypt* (1812, tr. 1927) and *Owen Tudor* (1809). Arnim had a predilection for the fantastic and the supernatural. Like Herder, he helped to create a popular German literary tradition. His wife, Bettina von Arnim, 1785–1859, whose maiden name was Elisabeth Brentano, was also a writer. She corresponded with Beethoven and Goethe and published the letters, not as historical documents but in the light of her own highly poetic imagination, as in *Goethe's Correspondence with a Child* (1835, tr. 1837). She was an ardent literary supporter of liberal Young Germany.

Arnim, Mary Annette (Beauchamp), Countess von: see RUSSELL, MARY ANNETTE RUSSELL, COUNTESS

Arno, Peter, 1904–68, American cartoonist, b. New York City. Arno's satirical cartoons appeared in the *New Yorker* magazine from 1925 until his death. He achieved a distinctive drawing style featuring heavily outlined figures. Notable among his urbane characterizations are the self-important executive and the generously endowed woman. His cartoons have been collected in *Peter Arno's Parade* (1929), *Peter Arno's Hullabaloo* (1930), *Sizzling Platter* (1949), and *Lady in the Shower* (1967).

Arno, river, c. 150 mi (240 km) long, rising in the Northern Apennines, Tuscany, central Italy, and flowing south to Arezzo where it turns northwest, it proceeds generally west, through Florence and Pisa, to empty into the Ligurian Sea. The Arno valley is fertile and densely populated. Its upper valley, the Casentino, is famous for its scenery. In 1966 a great flood on the Arno heavily damaged the art treasures of Florence.

Arnold, Benedict, 1741–1801, American Revolutionary general and traitor, b. Norwich, Conn. As a youth he served for a time in the colonial militia in the French and Indian Wars. He later became a prosperous trader. Early in the Revolution, his expedition against Fort Ticonderoga joined that of Ethan ALLEN, and the joint command took the fort. Arnold pushed on to the northern end of Lake Champlain, where he destroyed a number of ships and a British fort. In the QUEBEC CAMPAIGN, he invaded Canada (1775) by way of the Maine forests. The march proved incredibly hard, and the force was exhausted when it reached Quebec. Richard MONTGOMERY arrived from Montreal, and the two small armies launched the unsuccessful assault on Dec. 31, 1775. Arnold was wounded but continued the siege until spring, when Sir Guy Carleton forced him back to Lake Champlain. There he built a small fleet that, although defeated, halted the British advance. In Feb., 1777, Congress, despite General Washington's protests and Arnold's service, promoted five brigadier generals of junior rank to major generalships over Arnold's head. This and subsequent slights by Congress embittered Arnold and may in part have motivated his later treason. Although he soon won his promotion by his spectacular defense (1777)

against William Tryon in Connecticut, his seniority was not restored. In the SARATOGA CAMPAIGN, his relief of Fort Stanwix and his brilliant campaigning under Horatio Gates played a decisive part in the American victory. He became (1778) commander of Philadelphia, after the British evacuation, and there married Peggy Shippen, whose family had Loyalist sympathies. In 1779 he was court-martialed because of disputes with civil authorities. He was cleared of all except minor charges and was reprimanded by Washington, nevertheless he was given (1780) command of West Point. He had already begun his treasonable correspondence with Sir Henry CLINTON in New York City, and he arranged to betray West Point in exchange for a British commission and a sum of money. The plot was discovered with the capture of John ANDRE, but Arnold escaped. In 1781 in the British service he led two savage raids—one against Virginia and the other against New London, Conn.—before going into exile in England and Canada, where he was generally scorned and unrewarded. See biographies by Oscar Sherwin (1931) and Malcolm Decker (1932, repr 1969), Carl Van Doren, *Secret History of the American Revolution* (1941, repr 1968), J. T. Flexner, *The Traitor and the Spy* (1953).

Arnold, Sir Edwin, 1832–1904, English author. After serving as principal of the government college in Poona, India, he joined (1861) the staff of the London *Daily Telegraph*. He won fame for his blank-verse epic *The Light of Asia* (1879), dealing with the life of Buddha. The poem was attacked for its alleged distortion of Buddhist doctrine and for its tolerant attitude toward a non-Christian religion. Besides other volumes of poetry, he wrote a number of picturesque travel books and translated Oriental literature. See study by Brooks Wright (1957).

Arnold, Henry Harley, 1886–1950, American general, chief of the U.S. Army Air Forces (1942–46), known as "Hap" Arnold, b. Gladwyne, Pa., grad West Point, 1907. Assigned (1911) to the aviation division of the Signal Corps, Arnold later served almost entirely with the air arm. He was chief of the Air Corps from 1938 to 1940, when he became deputy chief of staff for the air. Chief of the U.S. Army Air Forces throughout World War II, Arnold was made (1944) general of the army and, after the creation of the air force as a separate department, was made (June, 1949) general of the air force, both of these were five-star ranks. He wrote a number of books, several of them with I. C. Eaker. See his autobiography, *Global Mission* (1949, repr 1972), biography by F. O. Dupre (1972).

Arnold, Matthew, 1822–88, English poet and critic, educated at Rugby, grad Balliol College, Oxford, 1844, fellow of Oriel College, Oxford, 1845. He was the son of the educator Dr. Thomas Arnold. In 1851, after a period as secretary to the 3d marquess of Lansdowne, Arnold was appointed inspector of schools, a position he held until 1886, two years before his death. During his tenure he went on a number of missions to European schools. He was impressed with some educational systems on the Continent—most particularly the concept of state-regulated secondary education—and wrote several works about them. His first volume of poems, *The Strayed Traveler*, appeared in 1849, it was followed by *Empedocles on Etna* (1852). Dissatisfied with both works, he withdrew them from circulation. *Poems* (1853) contained verse from the earlier volumes and new poems, including "The Scholar Gypsy" and "Sohrab and Rustum." *Poems Second Series* appeared in 1855 and was followed by *Merope* a Tragedy (1858) and *New Poems* (1867), the latter volume included "Thyrsis," his famous elegy on Arthur Hugh CLOUGH. His verse is characterized by restraint, directness, and symmetry. Though he believed that poetry should be objective, his verse exemplifies the romantic pessimism of the 19th cent., an age torn between science and religion. His feelings of spiritual isolation are reflected in such poems as "Dover Beach" and "Isolation." To Marguerite. Arnold was one of the most important literary critics of his age. From 1857 to 1867 he was professor of poetry at Oxford, during which time he wrote his first books of criticism, including *On Translating Homer* (1861), *Essays in Criticism* (1865, Ser. 2, 1888), and *On the Study of Celtic Literature* (1867). In *Culture and Anarchy* (1869) and *Friendship's Garland* (1871) he widened his field to include social criticism. His interest in religion resulted in *St. Paul and Protestantism* (1870), *Literature and Dogma* (1873), and *Last Essays on Church and Religion* (1877). In the 1880s he gave several lectures in the United States, which were published as *Discourses in*

America (1885). Arnold was the apostle of a new culture, a culture that would pursue perfection through a knowledge and understanding of the best that has been thought and said in the world. He attacked the taste and manners of 19th-century English society, particularly as displayed by the "Philistines," the narrow and provincial middle class. Strongly believing that the welfare of a nation is contingent upon its intellectual life, he proclaimed that the intellectual life is best served by an unrestricted, objective criticism, which is free from personal, political, and practical considerations. See various editions of his letters, his poetical works (ed. by C. B. Tinker and H. F. Lowry, 1950), his complete prose works (ed. by R. H. Super, 1960–1972, 8 vol.), his notebooks (ed. by H. F. Lowry et al., 1950), biographies by E. K. Chambers (1947, repr 1964) and Lionel Trilling (rev. ed. 1949), studies by J. D. Jump (1955), D. G. James (1961), H. C. Duffin (1963), E. Alexander (1965), A. D. Culler (1966), G. Stange (1967), and D. Bush (1971).

Arnold, Thomas, 1795–1842, English educator, b. Isle of Wight, educated at Winchester school and at Corpus Christi College, Oxford. He was a fellow of Oriel College, Oxford, from 1815 to 1819, was ordained deacon in 1818, and was from 1827 to 1842 headmaster of Rugby school, where he brought about many changes. Mathematics, modern languages, and modern history were added to the traditional classical curriculum, the monitorial system was introduced, and independent thought was encouraged. Arnold's reforms were influential beyond Rugby itself, his changes were adopted by most of the English secondary schools. Through the medium of his weekly sermons to his students in Rugby Chapel, Arnold inculcated the Christian principles and ideals that formed the core of his own religious convictions. An effective preacher, Arnold was an excellent classical scholar and historian as well. An edition of Thucydides (1835), *History of Rome* (3 vol., 1838–43, to the Punic Wars), and *History of the Later Roman Commonwealth* (pub. posthumously, 1845) are among the products of a lifetime of study. Arnold's expression of liberal political and theological views made him unpopular, however, and general recognition was not accorded him until 1841, when he was appointed regius professor of modern history at Oxford. Matthew Arnold was his son and Mary Augusta (Mrs. Humphry) Ward his granddaughter. Thomas Arnold is portrayed in *Tom Brown's Schooldays* (1857), a novel about life at Rugby by Thomas HUGHES. See A. F. Stanley, *The Life and Correspondence of Thomas Arnold*, D.D. (1844), Arnold Whitridge, *Dr. Arnold of Rugby* (1928), N. G. Wymer, *Dr. Arnold of Rugby* (1953, repr 1970), T. W. Bamford, *Thomas Arnold* (1960), Meriol Trevor, *The Arnolds* (1973).

Arnold of Brescia (brěsh'ə), c. 1090–1155, Italian monk and reformer, b. Brescia. A priest of irreproachable life, Arnold studied at Paris, where according to tradition he was a pupil of Peter Abelard. He first gained prominence in a struggle at Brescia between the bishop and the city government. Arnold became sharply critical of the church, declaring that secular powers only ought to hold property, he opposed the possession of property by the church because he believed it was being tainted by its temporal power. At the Synod of Sens (1140), dominated by St. BERNARD OF CLAIRVAUX, Arnold and Abelard were adjudged to be in error. Abelard submitted, but Arnold continued to preach. Pope Innocent II ordered Arnold exiled and his books burned. In 1145, Pope Eugene III ordered him to go to Rome in penitence. There the people had asserted the rights of the commune and had set up a republic. Arnold was attracted to their cause and became their leader, eloquently pleading for liberty and democratic rights. The republicans under Arnold forced Eugene into temporary exile (1146). Arnold was excommunicated by the pope in 1148 but continued to head the republican city-state even after Eugene III was permitted to reenter Rome. When Adrian IV became pope, however, he took stern measures. By placing Rome under an interdict in Holy Week, 1155, he forced the exile of Arnold. When Holy Roman Emperor Frederick I came to Rome, his forces at the pope's request seized Arnold, who was then tried by the Roman Curia as a political rebel (not a heretic) and executed by secular authorities. To the end he was idolized by the Roman populace. See biography by G. W. Greenaway (1931).

Arnoldson, Klas Pontus (klas pōn'təs ar'nōldson), 1844–1916, Swedish journalist and peace advocate. His untiring efforts for peace were rewarded by the 1908 Nobel Peace Prize, which he shared with Fred-

rik Bajer. A book he wrote on world peace (1900) was widely read. As a member (1882–87) of the Swedish Riksdag, he introduced a motion for permanent neutrality. In the union crisis in 1905, he opposed war with Norway. He founded several societies devoted to peace.

Arnold von Winkelried: see WINKELRIED.

Arnolfo di Cambio (ärnōl'fō dē kam'byō), b. c. 1245, d. before 1310, Italian architect and sculptor. He was Nicola Pisano's chief assistant on the Siena pulpit, but he soon began to work independently on important tomb sculpture. He designed admirable monuments to Cardinal Annibaldi (St. John the Lateran, Rome), Pope Adrian V (Viterbo), and Cardinal de Braye (c. 1282, Orvieto). These works became the model for Gothic funerary art. Arnolfo is recognized as the foremost architect of his era. In 1296 he was in charge of construction of the cathedral in Florence. He is said to have had a hand in designing other major buildings in Florence, including the baptistery, the Church of Santa Croce, and the Palazzo Vecchio. The monumental character of Arnolfo's work has left its mark on the appearance of Florence.

Arnon (ar'nōn), river of Jordan, entering the east side of the Dead Sea, called today Wadi Mojib. It is frequently mentioned in the Bible as the border between Moab (on the south) and the Amorites and later as the border between Moab and Israel. The city Aroer was on the Arnon. Num. 21 13, 14, 24, 26, 28, Deut. 2 24, 36, 3 8, 12, 16, 4 8, Joshua 12 1, 2, 13 9, 16, Judges 11 13, 18, 26, 2 Kings 10 33, Isa. 16 2, Jer. 48 20.

Arnstadt (ar'n'shtat), city (1970 pop. 28,762), Erfurt district, SW East Germany, on the Gera River. Gloves, shoes, and machinery are manufactured, and fluorspar and manganese are mined nearby. Arnstadt passed to the counts of Schwarzburg in the 14th cent. and later was the capital of the principality of Schwarzburg-Sonderhausen. Noteworthy buildings include the 13th-century Church of Our Lady and an 18th-century palace. J. S. Bach was organist (1703–5, 1706–7) at the Church of St. Boniface there.

Arnulf (ar'nālf), c. 850–899, Carolingian emperor (896–99), king of the East FRANKS (887–99), illegitimate son of Carloman of Bavaria. In 887 he led the rebellion of the kingdom of the East Franks (Germany) against his uncle, Carolingian Emperor CHARLES III, and was proclaimed their king. He repulsed the Norse invasions in 891 but campaigned less successfully against the Moravians, with whom he finally negotiated (894) a peace. At the request of Pope Formosus, he invaded (894) Italy, which was then in a state of anarchy, but went no further than Piacenza. He returned in 895, captured Rome, and was crowned (896) emperor, but he was stricken with paralysis and went home. Arnulf, whose personal appearance, energy, and bravery have often caused him to be likened to his great-great-grandfather Charlemagne, was the last Carolingian to be crowned emperor.

Arod (ār'ōd), son of Gad. Num. 26 17. He is the Arodi of Genesis 46 16.

Aroe Islands: see ARU ISLANDS, Indonesia.

Aroer (ār'ōər) 1. Border town, on the north side of the Arnon River and E of the Dead Sea, the modern Arair (Jordan). Aroer, which changed hands frequently, is mentioned in the Moabite stone. Deut. 2 36, 3 12, 4 48, Joshua 12 2, 13 9, Judges 11 26, 2 Kings 10 33, Jer. 48 19. 2. City of Gad, near Amman. Joshua 13 25, Judges 11 33. 3. City of Judah, the modern Ararah (Israel), near Beersheba. 1 Sam. 30 28. In 1 Chron. 11 44 an Aroerite is mentioned, it is not known which Aroer is meant in this passage or in Isa. 17 2.

aromatic compound, any of a large class of compounds that includes BENZENE and compounds that resemble benzene in certain of their chemical properties. Common aromatic compounds other than benzene include toluene, naphthalene, and anthracene (all of which are present in coal tar). Each of these compounds contains at least one ring that consists of six carbon atoms, each joined to at least two other carbon atoms, and each joined to adjacent carbon atoms by one single and one double bond. The resulting hexagonal structure is characteristic of many aromatic compounds. The distinguishing characteristic of this aromatic structure is that the electrons are delocalized, being shared by all the carbon atoms of the ring, this results in resonance (see CHEMICAL BONDING), the bonds between the carbon atoms being more stable than a pure double bond such as that in an ALKENE. For this reason, the bonds in the aromatic ring are less reactive than ordinary double bonds, aromatic compounds

tend to undergo ionic substitution (e.g., replacement of a hydrogen bonded to the ring with some other group) rather than addition (which would involve breaking one of the resonant bonds in the ring). Presence of the six-membered benzene ring is not essential for aromatic compounds, for example, furan, a heterocyclic compound that has a five-membered ring that includes an oxygen atom, has aromatic properties, as does pyridine, a heterocyclic compound whose six-membered ring includes a nitrogen atom.

Aroostook (arōōs'tōōk, -tīk, arōōs'-), river, c 140 mi (225 km) long, rising in N Maine and winding E to the St. John River in New Brunswick, Canada. The river gives its name to a county famous for potatoes.

Aroostook War, 19th-century border conflict between the United States and Canada. In 1838, Maine and New Brunswick both claimed territory left undetermined on the U.S.-Canadian border, including the valley of the Aroostook River. Maine farmers were interested in the valley's farmlands, and when New Brunswick sent Canadian lumbermen to do logging there, Maine authorities raised a force to eject them. New Brunswick asked for British regular troops and full-scale fighting seemed imminent, but Gen. Winfield Scott, who had been sent to the area with a small U.S. force, managed to reach an agreement (March, 1839) that prevented trouble. The boundary was later settled by the WEBSTER-ASHBURTON TREATY (1842).

Arosa (arō'za), town (1970 pop. 2,717), alt. c 6,000 ft (1,830 m), Grisons canton, E Switzerland. It is a health resort and sports center.

Arosemena Monroy, Carlos Julio (kar'lōs hōō'lyō arōsāmā'na mōn'roi), 1919-, president of Ecuador (1961-63). A lawyer and diplomat and the son and grandson of former presidents, he became vice president in 1960 and acceded to the presidency upon the ouster of President Velasco Ibarra. He instituted an austerity program and restored a favorable trade balance. Although he was criticized for his leftist leanings, real opposition to him arose from his immoderate drinking. After two unsuccessful attempts to impeach him, he was overthrown by a military junta.

Arp, Jean or Hans, 1887-1966, French sculptor and painter. Arp was connected with the BLAUE REITER in Munich, various avant-garde groups in Paris, including the surrealists, and the Dadaists in Zurich. He consistently created novel and abstract forms in various media—bas-reliefs, collages, painted cutouts, sculpture in the round, and painted wood reliefs. Often given a humorous touch, his works contain elements of organic form while retaining their essential abstraction. Arp finished a monumental wood relief for Harvard Univ. in 1950. See his *Arp on Arp*, ed. by Marcel Jean (1972), catalog of his sculpture by François Arp (1968), study by Herbert Read (1968).

Arpad (ör'pad), c 840-907?, chief of the Magyars. He led his people into Hungary c 895. The leaders of the Magyars and the first dynasty of Hungarian kings (St. Stephen I to Andrew III) were of the house of Arpad (see HUNGARY).

Arpad (ar'pād), unidentified city, probably in W central Syria. Hamath is always named with it. 2 Kings 18:34, 19:13, Isa. 10:9, Jer. 49:23. It is the Arphad of Isa. 36:19, 37:13.

Arphaxad (arfāk'sād), 1 Median king at Ecbatana, defeated by Nebuchadnezzar. He has not been definitely identified with anyone in other records. Judith 1:2. Son of Shem. It has been supposed that he was the eponym of the Chaldeans. Gen. 10:22, 24, 11:10, Luke 3:36.

Arpino, Cavaliere d' see CESARI GIUSEPPE

Arrabal, Fernando (fārnān'dō arabal'), 1932-, French playwright, b. Melilla, Morocco. He spent his youth in Spain, studying law in Madrid, but moved to Paris in 1954. His plays reflect his aversion to political repression, bourgeois complacency, and war. They are often abstract and employ ironic contrast as a dramatic device. Among his works are the volumes *Théâtre I* (1958), includes the plays *Oraison*, *Les Deux Borreaux*, and *Le Crime des voitures*; and *Théâtre II* (1961), includes *Guernica*, *Le Labyrinthe*, *Le Tricycle*, and *La Bicyclette*. A number of his plays have been translated into English.

arrack (ār'ak), strong spirits distilled chiefly in the Orient from fermented fruits, grains, or sugarcane. The introduction of European spirits led to a decline in the native industry. In the 19th cent., Ceylon became quite noted for palm toddy arrack. Primitive methods of distilling yield raw spirits injurious because of a high content of fusel oil and acids. Other names are rack or raki.

Arrah (ūr'ra), city (1971 pop. 92,670), Bihar state, NE India, on the Son Canal. It is the administrative center for a district that produces grain, sugarcane, and oilseed. There are limestone deposits in the city's outskirts. Arrah was the scene of fighting during the INDIAN MUTINY (1857).

Ar Ramadi (ar rama'dē), town (1965 pop. 28,723), provincial capital, central Iraq, on the Euphrates River. It is the eastern terminus of a highway across the desert from the Mediterranean Sea. The town was founded in 1869. The British won an important victory over the Turks there in 1917. The name also appears as Ramadi or Rumadiya.

Arran, earls of see HAMILTON, JAMES, and STUART, JAMES

Ar Raqqah (ar rak'ka) or **El Rashid** (ēl rashēd'), town (1960 pop. 14,554), capital of Ar Raqqah governorate, N Syria, on the Euphrates River. Carpets are manufactured, and the town has an agricultural experimental station. The ancient Nicephorium, Ar Raqqah was prominent during the early Abbasid caliphate. Caliph Harun ar-Rashid built a summer palace there and used the town as military headquarters against Byzantium. Ar Raqqah was destroyed by the Mongols in the early 13th cent.; some ruins survive. The modern name also appears as Raqqa and Rakka.

Arras (aras'), city (1968 pop. 53,573), capital of Pas-de-Calais dept., and historic capital of Artois, N France, on the canalized Scarpe River. It is a communications, farm, and industrial center, with oil works and factories making machinery, metal products, and esparto goods. Of Gallo-Roman origin, it became an episcopal see c 500. It was granted (1180) a commercial charter by the crown and enjoyed international importance in banking and trade. By the 14th cent. it had become a center of wealth and culture, renowned particularly for TAPESTRY. It was nearly destroyed during the wars between Burgundy and France (15th cent.), which ended with the Treaty of Arras (1435). Occupied (1492) by the Spaniards, Arras was conquered (1630) by the French; French possession was confirmed (1659) in the Peace of the Pyrenees. Heavy bombardments in World War I destroyed much of the town, and it was further damaged in World War II. Nevertheless it retains much of its old Spanish-Flemish flavor. The town square, bordered by 17th-century buildings, forms a notable ensemble of Flemish architecture. The damaged town hall (16th cent.) and the Abbey of St. Vaast (18th cent., now housing a museum) have been restored. The house where Robespierre was born still stands. A school of agriculture is there.

Arras, Treaty of 1. Treaty of 1435, between King CHARLES VII of France and Duke PHILIP THE GOOD of Burgundy. Through it, France and Burgundy became reconciled. Philip deserted his English allies and recognized Charles as king of France. In return, Philip received the Somme towns and was exempted from homage to the crown. Charles also agreed to punish the murderers of Philip's father, Duke John of Burgundy. 2. Treaty of 1482, between King LOUIS XI of France and the local governments of the Netherlands, following the death of MARY OF BURGUNDY. In 1483 Mary's widow, Archduke Maximilian of Austria (later Holy Roman Emperor MAXIMILIAN I), reluctantly accepted the treaty. The acquisition of Burgundy by France was recognized. Maximilian's infant daughter, MARGARET OF AUSTRIA, was to marry the dauphin (later King Charles VIII), bringing Artois and Franche-Comté as dowry. Maximilian's infant son (later King PHILIP I of Castile) was to do homage for Flanders to France. When Charles VIII married ANNE OF BRITTANY, Maximilian forced him to restore Margaret's dowry by the Treaty of Senlis (1493).

Arrebo, Anders (an'ərs a'rəbō), 1587-1637, Danish poet, bishop of Trondheim. His massive narrative poem, the *Hexaemeron* (written c 1630, pub. 1661), introduced the alexandrine meter to N Europe, where it became the vehicle for serious poetry.

arrest, in law, seizure and detention of a person, either to bring him before a court body or official, or to otherwise secure the administration of the law. A person may be arrested for an alleged violation of civil or criminal law. Civil arrest is most often used when one has been guilty of civil CONTEMPT of court, but in some states of the United States it is also allowed in cases where it is feared the defendant may attempt to flee the court's jurisdiction or otherwise frustrate justice. Arrest is ordinarily accomplished by a WARRANT issued by a court or officer of justice. In civil arrest a warrant must always be issued and generally anyone named may not be apprehended on Sundays or legal holidays. There are no time restrictions on making a criminal arrest. Any

person may make such an arrest without a warrant if a FELONY is committed in his presence, this is the so-called citizen's arrest. An officer of the law does not even need a warrant to arrest one whom he reasonably suspects of having recently committed a felony. In all other criminal cases there must be a warrant before the arrest. Force may be used in making an arrest, even to the extent of killing a person who resists arrest for a felony that endangers human life. If an arrest is contrary to law, the apprehended person may procure his release by HABEAS CORPUS and may bring a civil suit for FALSE IMPRISONMENT. In most cases the person detained may be released if he can post BAIL. Diplomatic personnel and members of Congress and of state legislatures during legislative sessions are exempt from arrest.

Arrhenius, Svante August (sfan'ta, arā'nēās), 1859-1927, Swedish chemist. He was a professor of physics in Stockholm in 1895 and became director of the Nobel Institute for Physical Chemistry, Stockholm, in 1905. For originating (1884, 1887) the theory of electrolytic dissociation, or ionization, he received the 1903 Nobel Prize in Chemistry. He also investigated osmosis and toxins and antitoxins. His works, translated into many languages, include *Immunochemistry* (1907), *Quantitative Laws in Biological Chemistry* (1915), *The Destinies of the Stars* (tr. 1918), and *Chemistry in Modern Life* (tr. 1925).

arrhythmia, disturbance in the rate or rhythm of the heartbeat. Various arrhythmias can be symptoms of serious heart disorders, however, they are usually of no medical significance except in the presence of additional symptoms. Tachycardia, or heartbeat faster than 100 beats per minute in the adult, can be precipitated by drugs, caffeine, anemia, shock, and emotional upset. Bradycardia, or slow heartbeat, is often present in athletes. Heart murmurs are abnormal sounds (clicks, rumbles, blowing noises) produced by the heart in addition to the normal heartbeat. Premature beats of the atria and ventricles are common and usually of no significance. Murmurs at the various valves sometimes indicate the presence of valvular deformities but also occur in normal hearts. Flutters, and the even faster fibrillations, are rapid, uncoordinated contractions of the atrial or ventricular muscles that usually accompany heart disorders. Ventricular fibrillation is a sign of the terminal stage of heart failure and is usually fatal unless defibrillation is achieved by application of electrical current or mechanical massage. The electrical impulse that is generated to stimulate the heartbeat travels from a clump of tissue on the right atrium called the sinoatrial node to the atria and then to the ventricles. In some cases where there is a disturbance in the conduction of this impulse, called sinoatrial or atrioventricular block, rhythm can be maintained by implanted electrodes that act as artificial pacemakers.

Arrian (Flavius Arrianus) (ār'ēan), fl. 2d cent. A.D., Greek historian, philosopher, and general, b. Nicomedia in Bithynia. He was governor of Cappadocia under Emperor Hadrian and in A.D. 134 repulsed a dangerous invasion of the Alans. His chief work is the *Anabasis*, the prime source on Alexander the Great. Modeled on Xenophon's famous book, the *Anabasis* relies chiefly on the writings of two of Alexander's generals (Ptolemy I and Aristobulus) for source material. Other extant works include the *Indica* (an account of a voyage of Alexander's general Nearchus to India) and parts of his edition of and commentaries on the *Discourses of Epictetus*.

Arrow, Kenneth Joseph, 1921-, American economist, b. New York City, grad. City College of New York (B.S. 1940), Columbia (M.A. 1941, Ph.D. 1951). He taught economics at the Univ. of Chicago (1947-49) and Stanford Univ. (1949-68) before serving on the faculty at Harvard (from 1968). A member of the President's Council of Economic Advisers (1962), he has been a consultant for the RAND Corp. since 1948. A specialist in welfare economics and general equilibrium theory, he shared the 1972 Nobel Memorial Prize in economics with Sir John Richard Hicks. Arrow's publications include *Social Choice and Individual Values* (2d ed. 1963), *Aspects of the Theory of Risk-Bearing* (1965), and *General Competitive Analysis* (1972).

arrowhead, any plant of the genus *Sagittaria*, widely distributed marsh or aquatic herbs of the primitive family Alismataceae (water-plantain family). The name derives from the arrowhead-shaped leaves of many species. The North American Indians prepared a potato-like food by roasting or broiling the tubers, particularly of *S. latifolia*, another species has long been cultivated in the Orient for its starchy root. Arrowheads, which have white, buttercup-like flow-

ers, are often grown in aquariums, ponds, and bog gardens. Arrowheads are classified in the division



Broad-leaved arrowhead, *Sagittaria latifolia*

MAGNOLIOPHYTA, class Liliatae, order Alismatales, family Alismataceae

Arrow Lakes, two expansions of the Columbia River, S British Columbia, Canada. Both lie in narrow valleys bounded by mountain ranges and are noted for their beauty. Upper Arrow Lake has an area of 88 sq mi (228 sq km), Lower Arrow Lake is 59 sq mi (153 sq km). Arrowhead is at the head of the upper lake.

arrowroot, any plant of the genus *Maranta*, usually large perennial herbs, of the family Marantaceae, found chiefly in warm, swampy forest habitats of the Americas and sometimes cultivated for their ornamental leaves. The term arrowroot is also used for the easily digestible starch obtained from the rhizomes of *M. arundinacea*, the true, or West Indian, arrowroot, which is naturalized in Florida. Other plants produce similar starches, e.g., East Indian arrowroot (from *Curcuma augustifolia* of the Zingiberaceae, or GINGER family), Queensland arrowroot (from a CANNA of the family Cannaceae), Brazilian arrowroot, or TAPIOCA, of the family Euphorbiaceae (SPURGE family), and Florida arrowroot, or SAGO. True arrowroot is classified in the division MAGNOLIOPHYTA, class Magnoliopsida, family Marantaceae.

Arrowsmith, Aaron, 1750-1823, English cartographer and geographer. He founded the map-making and publishing business carried on by his sons and by his nephew John Arrowsmith, 1790-1873. John Arrowsmith's London Atlas was famous. He was one of the founders of the Royal Geographic Society. The Arrowsmith maps were among the best of that period.

arrowwood, name for several woody plants, particularly of the family Caprifoliaceae (HONEYSUCKLE family), formerly used for making arrows.

arrowworm. see CHAETOGNATHA

Arru Islands: see ARU ISLANDS, Indonesia

Arsaces (ar'sāsēz), fl. 250 B.C., founder of the Parthian dynasty of the Arsacids, which ruled Persia from c. 250 B.C. to A.D. 226. Arsaces led a successful revolt against Antiochus II of Syria, when Antiochus was engaged in war with Egypt and trying to put down a revolt in Bactria. Among the other Parthian kings were Tiridates, Mithradates I, Mithradates II, and Phraates IV. Their empire became a formidable rival of the Roman power, but began to decay in the 2d cent. A.D. after Emperor ALEXANDER SEVERUS had invaded the country. The Arsacids were overthrown by a revolt of the Persians under ARDASHIR I, who in A.D. 226 slew Artabanus IV (Ardawan IV), the last of the Arsacids.

arsenic (ar'sānik), a semimetallic chemical element, symbol As, at no 33, at wt 74.9216, sublimation point 613°C, sp. gr. (stable form) 5.73, valence -3, 0, +3, or +5. Arsenic appears in several allotropic forms (see ALLOTROPY); the stable form is a silver-gray, brittle crystalline solid that tarnishes rapidly in air, and at high temperatures burns to form a white cloud of arsenic trioxide. A yellow crystalline form and a black amorphous form are also known. Arse-

nic is a member of group Va of the PERIODIC TABLE. It combines readily with many elements with hydrogen to form arsine, an extremely poisonous gas, with oxygen to form a pentoxide and the above-mentioned trioxide (As_2O_3 or As_2O_5), a deadly poison also called arsenic (III) oxide, arsenious oxide, white arsenic, or, simply, arsenic, with the halogens, and with sulfur. The element is used with other metals to make hard, strong, corrosion-resistant alloys. Its compounds are used in pigments, animal poisons, insecticides (e.g., PARIS GREEN), and POISON GASES (such as lewisite) for chemical warfare. They are also used in glassmaking, in calico and indigo printing, in tanning and taxidermy (as preservatives), and in pyrotechnics. Small quantities of arsenic added to lead in the manufacture of shot assure perfectly spherical pellets by delaying the solidification of the molten lead, and thereby allowing it to flow more readily; the arsenic also contributes hardness. A small amount of arsenic is added to germanium in the production of semiconductor devices such as transistors and integrated circuits. A number of organic compounds of arsenic are used in medicine, the best known is Salvarsan, formerly used extensively in the treatment of syphilis and yaws. On the other hand, many arsenic compounds are strong poisons. One delicate test for the presence of even microscopic quantities of arsenic in compounds is the MARSH TEST. Arsenic occurs in many ores, including REALGAR, orpiment, and ARSENOPYRITE, the chief commercial source. When it is prepared commercially from sulfide ores, e.g., arsenical pyrites, the ores are roasted (heated in the absence of air), the arsenic sublimes (passes directly from the solid to the gaseous state) and is condensed. In another method, white arsenic is reduced with carbon. Although realgar, orpiment, and other arsenic minerals were known to the Greeks of Aristotle's time, the element itself was not. The "arsenic" so called by them and by the later alchemists was not true arsenic, but probably arsenic trioxide. The element was first described by Albertus Magnus in the 13th cent.

arsenopyrite (ar'sīnōpī'rīt, ar'sēn'ō-) or **mispickel** (mīs'pīkal), silver-white to steel-gray mineral with the metallic luster characteristic of a PYRITE. It is a sulfarsenide of iron, $FeAsS$, crystallizing in the orthorhombic system and occurring also in massive form. It is widely distributed and is an important source of arsenic. Often it is found associated with other minerals and ores of lead and tin. Saxony, Sweden, Cornwall, and various parts of the United States have important deposits.

arson, at COMMON LAW, the malicious and willful burning of the house of another. Originally, it was an offense against the security of habitation rather than against property rights. Thus, a tenant could not be convicted of arson for burning the house that he rented from his landlord. Although this rule still holds in some states of the United States, in many others statutes have changed the meaning of the offense. Its application has been extended to buildings, structures, and vehicles that are not dwelling places, and greater stress has been placed on protection of property rights. Some statutes distinguish several degrees of arson, e.g., arson committed at night is considered more serious than arson committed in the daytime. In most states setting fire to one's own property to defraud an insurance company is specified as arson.

Arsenal, Arsène d' (ar'sēn' darsōnval'), 1851-1940, French physicist and physician. He worked under Claude Bernard and under C. E. Brown-Sequard (whom he succeeded in 1897 at the Collège de France) and was professor at the Sorbonne from 1894 to 1932. The D'Arsenal galvanometer is named for him. A pioneer in electrotherapy, he studied the medical application of high-frequency currents. He was also involved in the industrial application of electricity.

art The major general surveys on topics in the fine arts are PAINTING, SCULPTURE, DRAWING, still PHOTOGRAPHY, and ARCHITECTURE. These articles contain numerous cross-references to specific related subjects. There are articles about individual artists in many fields and about art critics and art historians. The various movements, schools, styles, and particular eras are covered in articles such as ART NOUVEAU, FOLK ART, MANNERISM, MODERN ART, SCHOOL OF PARIS, BAROQUE, and BYZANTINE ART AND ARCHITECTURE. The art of individual countries and peoples is discussed in articles such as DUTCH ART, SPANISH COLONIAL ART AND ARCHITECTURE, and NORTH AMERICAN INDIAN ART. The many types of subject matter are given separate treatment under such headings as CHILDREN'S BOOK ILLUSTRATION, GENRE LANDSCAPE PAINTING, PORTRAITURE

STILL LIFE, and WATERCOLOR PAINTING. Examples of articles on art media and techniques include TRESCO GLASS, ILLUMINATION, ILLUSTRATION, METALWORK, PLASTER CASTING, PORCELAIN, RELIEF, STAINED GLASS, and TEPA COTTA. For the graphic media, see under GRAPHIC ARTS. Topics related to art subjects are also treated. See, for example, MUSEUMS OF ART and articles about individual museums, e.g., LOUVRE. Other related topics include ACADEMIES OF ART, SALON, ART HISTORY, ART CONSERVATION AND RESTORATION, ICONOGRAPHY, ILLUSIONISM, PERSPECTIVE, COMPOSITION, PASSION CYCLE, and FORGERY.

Arta (ar'tā), formerly **Ambracia** (āmbrā'shā), city (1971 pop. 19,498), capital of Arta prefecture, W Greece, in Epirus, near the mouth of the Arachthos River. It is a trading and shipping center for agricultural goods including cotton, grain, citrus fruits, almonds, and olives. There is a large fishing industry, and leather goods and cotton and woolen textiles are manufactured. Known as Ambracia, the city was founded (7th cent. B.C.) by Corinthian colonists. It was ceded in 294 B.C. by Macedon to Pyrrhus, who made it the capital of Epirus. It was conquered by Rome in 189 B.C.

Artagnan, Charles de Batz-Castelmore d' (sharl də bāts-kastōlmōr' dārtanyān'), c. 1620-1673, French soldier under King Louis XIV. He fell at the siege of Maastricht. Dumas pere used memoirs attributed to him for *The Three Musketeers* and other novels.

Artaphernes (ar'tāfūr'nēs) see PERSIAN WARS

Artaud, Antonin (āntōnān' artō'), 1896-1948, French poet, actor, and director. During the 1920s and 30s he was associated with various experimental theater groups in Paris, and he cofounded the Théâtre Alfred Jarry. He was afflicted with mental illness from his childhood, and in 1936 he was declared insane, he spent much of the rest of his life in mental institutions. Artaud's theories of drama, particularly his concept of the "theater of cruelty," greatly influenced 20th-century theater. He related theater to the plague because both destroy the veneer of civilization, revealing the ugly realities beneath and returning man to a primitive state, in which he lacks morality and reason. The aim of the "theater of cruelty" was to disturb the audience and reveal the forces of nature. To achieve this end he emphasized the nonverbal aspects of theater such as color and movement and stressed the importance of violence as a theatrical device. Artaud's most important work is *Le Théâtre et son double* (1938 tr. 1958). His influence can be seen in the works of Jean GENET, Peter WEISS, Peter BROOK, and Julian BECK and Judith Malina. See his *Selected Writings* ed. by Susan Sontag (1971).

Artaxerxes I (ar'tāzūrksēz), d. 425 B.C., king of ancient Persia (464-425 B.C.), of the dynasty of the Achaemenidae. Artaxerxes is the Greek form of the name Ardāshir the Persian. He succeeded his father, XERXES I, in whose assassination he had no part. The later weakness of the Persian Empire is commonly traced to the reign of Artaxerxes, and there were many uprisings in the provinces. The revolt of Egypt, aided by the Athenians, was put down (c. 455 B.C.) after years of fighting, and Bactria was pacified. The Athenians sent a fleet under CIMON to aid a rebellion of Cyprus against Persian rule. The fleet won a victory, but the treaty negotiated by CALLIAS was generally favorable to Persia. Important cultural exchanges occurred between Greece and Persia during Artaxerxes' reign. He was remembered warmly in the books of Ezra and Nehemiah because he authorized their revival of Judaism. He also befriended the exiled Themistocles. He was succeeded by XERXES II.

Artaxerxes II, d. 358 B.C., king of ancient Persia (404-358 B.C.), son and successor of DARIUS II. He is sometimes called in Greek Artaxerxes Mnemon [the thoughtful], his Persian name is Ardāshir. Early in his reign CYRUS THE YOUNGER attempted to assassinate him and seize the throne. Artaxerxes finally crushed Cyrus' rebellion at the battle of Cunaxa (401 B.C.), where Cyrus was killed. The story of the Greek contingent in the battle was made famous by Xenophon. Artaxerxes was ruled by the will of his wife and mother and relied heavily upon his officials; in addition, the satraps PHARNABAZUS and TISSAPHERNES had real ruling power. They managed by liberal distribution of Persian gold to gain great influence in Greece, and the Peace of ANTALCIDAS (386 B.C.) marked the imposition of Persian control of the Greek city-states. The provinces of the empire eventually became restless. EVAGORAS made himself independent as a ruler of Cyprus but finally (c. 381) submitted to the king. Pharnabazus and Iphicrates, sent to reduce Egypt, disagreed and accomplished

nothing A formidable and longlasting revolt of the satraps (among them Mausolus) against the king was put down just before his death He was eventually succeeded by ARTAXERXES III The reign of Artaxerxes II also saw a revival of the cult of MITHRA

Artaxerxes III, d 338 B.C., king of ancient Persia (358-338 B.C.), son and successor of Artaxerxes II He was originally named Ochus and is sometimes called Artaxerxes Ochus, his Persian name is Ardashir He gained the throne by a general massacre of his brother's family, and throughout his reign he continued a policy of terror An early expedition against Egypt failed (351 B.C.), but he set out again (c 342) and, having destroyed Sidon on his way, reduced Egypt by bloody conquest He also put down the unruly satraps and centralized and strengthened the empire One of his ministers, the eunuch Bagoas, finally poisoned the king, put Artaxerxes' son Arses on the throne in 338, then deposed him in 336 in favor of OARIUS III

art conservation and restoration. Works of art are subject to a variety of disfiguring ills, many of them caused by environmental effects, particularly temperature and humidity changes and pollution Much modern conservation effort is directed toward producing a stable, favorable situation for the display of art works and maintaining regular inspection and diagnostic procedures to combat deterioration Techniques for this inspection have become increasingly sophisticated, they currently involve photographic, X-ray, infra red, and other radiation examination, as well as complex chemical analysis The support (such as wood panel, canvas, paper), the ground (gesso, chalk), and the surface treatment (wax, varnish) of a painting all undergo some form of decay over the years Frescoed walls absorb moisture from the atmosphere The moisture carries to the wall surface soluble salts that effloresce and injure the fresco pigments To halt such injury, water-permeable fixatives may be applied to help stabilize the pigment and prevent it from flaking off A more drastic treatment is transfer, by which the mural and upper layer of plaster are cut away from the wall altogether and made fast to a new support A major instance of successful transfer was carried out on many frescoes unearthed at Pompeii Wood-panel paintings undergo much swelling and shrinking with humidity variations Wood-boring insects and the dry rot of fungus also attack them The painting may be transferred to a new support, or the old one may be strengthened by impregnation with a consolidating medium (including several plastics) or given auxiliary support Insecticides and fungicides may suffice to combat woodworms and dry rot, in cases of advanced destruction, reinforcement by impregnation may be necessary Canvas supports also absorb and lose moisture, swelling and shrinking, and thereby much pigment is lost In addition, canvases may be weakened or torn with comparative ease A method of lining (restretching on a second undercanvas) may be effected whereby the old canvas is attached to the new by means of an adhesive This may be a thermoplastic wax-resin combination or a water-base glue The painted surface becomes impregnated with the adhesive and is consequently stabilized Irregular staining, called foxing, is the bane of print and drawing collectors In humid conditions, foxing attacks the adhesives and mounts of paper-based art, including watercolors, by producing the nutrients favored by molds present in the atmosphere The work may sometimes be sterilized and remounted on a support chosen for its mold-repellent quality It may be further treated with a fungicide Some foxing stains may be removed by careful bleaching and washing, but this is a difficult technique requiring considerable knowledge of materials The restorer's greatest problems concern the surface coating of the painting A decayed or badly discolored varnish may be removed painstakingly by mechanical means or regelled with the judicious use of solvent, often applied as a delicate spray In other cases, the old varnish may be powdered by rubbing and removed by hand or, more commonly, chemically dissolved Such techniques are beset by dangers inherent in the variable nature of the original pigments and varnish, and the risk of injury increases with the age of the painting Repainting and retouching are means by which a damaged work may be restored, but both largely depend for success upon the personal judgment and aesthetic capability of the restorer Repairs may be necessary where the results of overzealous cleanings of the past have produced injury or revealed a **PENITENTINO** that disrupts the composition Much restorative work of the 19th cent shows a tendency to "improve" the work of art with

arbitrary additions and distortions Sculpture, especially that which stands out-of-doors, is particularly vulnerable to environmental changes Placing the sculpture in a temperature- and humidity-controlled situation is the best means by which to preserve it Stone sculpture requires periodic washing, either steam, spray, or trickled water is used, depending on the porosity of the stone Soap, but not detergent, may also be applied Broken sculptures may be mended with clear, cold-setting adhesives, sometimes mixed with a suitably colored filler, or by means of dowelling Large pieces of sculpture are held together with metal dowels, usually of copper, stainless steel, or brass Broken wood sculpture is also dowelled, as is ivory Special cements may also be used to fill cracks Wood sculpture is also vulnerable to woodworm and dry rot and may be treated with insecticide and fungicide Badly decayed wood works may sometimes be preserved by means of impregnation with a plastic medium Metal sculpture may be waxed to protect it from atmospheric corrosives Bronze acquires a patina, or irregular surface pattern caused by deposits of sulfides and oxides, that is widely considered aesthetically pleasing, patina on lead objects results in eventual decay Cracks in metal sculpture may be filled with special adhesives Corrosion may be halted by electrolytic reduction, which, however, destroys patina Various chemical solvents and mechanical techniques are used to remove specific incrustations The flood in Florence in Nov, 1966, was among the greatest disasters in modern history in terms of the destruction of works of art Conservators and restorers from all over the world applied emergency treatment to the treasures of painting, sculpture, and architecture that could be saved Among those were five panels from the bronze doors of the Baptistery by Ghiberti, which had been ripped apart and ruined by the furious oily waters In replacing them, experts made use of an exact replica of the doors in San Francisco In 1972, Michelangelo's *Pieta* in St Peter's, Rome, was attacked and mutilated by a madman with a hammer The most delicate restoration work was required to make unobtrusive repairs on this masterpiece of sculpture All effective art conservation and restoration ultimately depends upon the restorer's understanding of materials, technical craftsmanship, and aesthetic and historical awareness See also **CRAQUELURE** See H J Plenderleith and A E Werner, *The Conservation of Antiquities and Works of Art* (2d ed 1971), Francis Kelly, *Art Restoration* (1972)

art deco, style of popular design during the 1920s and 30s Art deco is characterized by long, thin forms and straight lines The practitioners of the style attempted to describe the sleekness they thought expressive of modern technology The style has undergone a resurgence of popularity in the 1970s

Artem (ärtyöm'), city (1969 est pop 65,000), Primorsky Krai (Maritime Territory), Far Eastern USSR It is a coal-mining center and has an important thermoelectric station that utilizes local coal deposits

Artemas (ar'timas), companion of Paul Titus 3 12

Artemidorus of Ephesus (artēm'idōr'əs, ēf'əsəs), fl 103 B.C., Greek geographer quoted by Strabo He wrote 11 books on his Mediterranean travels Only fragments remain of his work

Artemis (ar'temis), in Greek religion, Olympian goddess, daughter of Zeus and Leto and twin sister of Apollo Artemis' early worship, especially at Ephesus, identified her as an earth goddess, similar to Astarte In later legend, however, she was primarily a virgin huntress, goddess of wildlife and patroness of hunters Of the many animals sacred to her, the bear was most important Artemis valued her chastity so highly that she took terrible measures against anyone who even slightly threatened her (e.g., **ACTAEON**) She was attended by nymphs, whose virginity she guarded as jealously as her own She was also an important goddess in the life of women, concerned with marriage and with the young of all creatures As the complement to Apollo, she was often considered a moon goddess and as such was identified with Selene and Hecate In ancient Greece, the worship of Artemis was widespread The Romans identified her with Diana

Artemisia (är'tēmish'ēə), fl 4th cent B.C., ruler of the ancient region of Caria She was the sister, wife, and successor of MAUSOLUS and erected the MAUSOLEUM at Halicarnassus in his memory A strong ruler, she conquered Rhodes She also patronized the arts An earlier Artemisia ruled part of Caria under Xerxes I of Persia

artemisia: see **WORMWOOD**

Artemisium (är'tēmish'ēəm), cape, N Euboea (now Évvoia), Greece, named for a great temple of Arte-

mis Off the cape in 480 B.C. was fought a naval battle of the Persian Wars The delay won by the defense of Thermopylae under LEONIDAS helped make it possible for the Greeks to ward off the Persian fleet, although the fighting was indecisive and the Greeks were eventually forced to withdraw

Artemovsk (ärtyöm'əfsk), Ukr *Artemivsk*, city (1969 est pop 81,000), S European USSR, in the Ukraine An industrial center of the Donets Basin, it produces metals, mining equipment, glass, bricks, and chemicals Nearby are salt and dolomite deposits that are utilized in the Donets iron and steel and chemical industries

arteriosclerosis (ärtir'ēōsklärō'sis), general term for a condition characterized by thickening, hardening, and loss of elasticity of the walls of the blood vessels These changes are frequently accompanied by accumulations inside the vessel walls of lipids, e.g., cholesterol, this condition is frequently referred to as atherosclerosis The deposition of calcium in the fatty material hardens the walls of the vessels As the vessel walls thicken, the passageways through the vessels narrow, decreasing the blood supply to the affected region Constriction of the coronary arteries may affect the heart (see **HEART DISEASE**) Cerebral arteriosclerosis is often responsible for senility in elderly persons If the leg vessels are affected, there may be loss of movement of the extremities and an onset of gangrene When there is total clotting of a vessel (**THROMBOSIS**) the result may be a heart attack (if it occurs in the coronary arteries) or **APOPLEXY** (if in cerebral arteries) While there is no specific preventive or cure for arteriosclerosis, reduction of body cholesterol to normal levels through a restricted-fat diet, with the substitution of vegetable fats for animal fats is usually prescribed, although the relationship between the level of cholesterol in the bloodstream and arteriosclerosis is not yet fully understood

artery, blood vessel that conveys blood away from the heart Except for the pulmonary artery, which carries deoxygenated blood from the heart to the lungs, arteries carry oxygenated blood from the heart to the tissues The largest arterial trunk is the AORTA, branches of which divide and subdivide into ever-smaller tubes, or arterioles, until they terminate as minute CAPILLARIES, the latter connecting with the VEINS (see **CIRCULATORY SYSTEM**) Other important arteries are the subclavian and brachial arteries of the shoulder and arm, the carotid arteries that lead to the head, the coronary arteries that nourish the heart itself, and the iliac and femoral arteries of the abdomen and lower extremities The walls of the large arteries have three layers a tough elastic outer coat, a layer of muscular tissue, and a smooth, thin inner coat Arterial walls expand and contract with each heartbeat, pumping blood throughout the body The pulsating movement of blood, or PULSE, may be felt where the large arteries lie near the body surface

Artesia (ärtēzh'ə) 1 City (1970 pop 14,757), Los Angeles co., S Calif., founded 1875, inc 1959 Chiefly residential, it serves the surrounding farm area and was named for the many artesian wells in the vicinity 2 City (1970 pop 10,315), Eddy co., SE N Mex., just W of the Pecos River, in an oil, gas, farm, and livestock area, laid out 1903, inc 1939 Artesian wells, under tremendous pressure from the nearby Sacramento Mts., irrigate a large area The city's manufactures include petroleum products and fiberglass and plastic pipes

artesian well, deep drilled WELL through which water is forced upward under pressure The water in an artesian well flows from an aquifer, which is a layer of very porous rock or sediment, usually sandstone, capable of holding and transmitting large quantities of water The geologic conditions necessary for an artesian well are an inclined aquifer sandwiched between impervious rock layers above and below that trap water in it Water enters the exposed edge of the aquifer at a high elevation and percolates downward through interconnected pore spaces The water held in these spaces is under pressure because of the weight of water in the portion of the aquifer above it If a well is drilled from the land surface through the overlying impervious layer into the aquifer, this pressure will cause the water to rise in the well In areas where the slope of the aquifer is great enough, pressure will drive the water above ground level in a spectacular, permanent fountain Artesian springs can occur in similar fashion where faults or cracks in the overlying impervious layer allow water to flow upward Water from an artesian well or spring is usually cold and free of organic contaminants, making it desirable for drinking In

North America, the Dakota sandstone provides aquifers for an artesian system that underlies parts of the Dakotas, Montana, Wyoming, Kansas, Nebraska, and Saskatchewan and supplies great quantities of water to the dry Great Plains region. Many East Coast cities derive their water supplies from aquifers that are exposed along the edge of the Piedmont and dip downward toward the Atlantic coast. The largest artesian system in the world underlies nearly all of E and S Australia. Other important artesian systems serve London, Paris, and E Algeria.

Artevelde, Jacob van (ya'kôp van ar'tavêlda), c1290-1345, Flemish statesman, of a wealthy family of Ghent. In 1337 the Flemish cloth industry underwent a severe crisis. The pro-French policy of the count of Flanders in the conflict between Edward III of England and Philip VI of France cut off English wool imports and thus ruined the Flemish merchants and weavers. Ghent rebelled, and Artevelde was given dictatorial powers as head of the city government. He negotiated (1338) a commercial treaty with England and obtained recognition of Flemish neutrality. The other towns of Flanders followed his lead, the count fled to France, and trade revived and prospered. In 1340, Artevelde had Edward III recognized as king of France (and thus suzerain of Flanders) by the Flemish towns. Artevelde's firm leadership and wealthy origin inevitably aroused resentment. Enemies accused him of proposing the lordship of Flanders to Edward the Black Prince (of England). In 1345 a riot broke out in Ghent, and Artevelde was killed by the mob.

Artevelde, Philip van, 1340-82, Flemish popular leader, captain general of Ghent, son of Jacob van Artevelde. In the struggle between the so-called "Goods" (the propertied classes supported by the count of Flanders) and the "Bads" (the workers, led by the weavers), he put himself (1381) at the head of the rebellious weavers. He captured (1382) Bruges and most of Flanders but was defeated and killed at Roosebeke by the French under Olivier de Clisson.

art galleries see MUSEUMS OF ART

art history, the study of works of art and architecture. In the mid-19th cent., art history was raised to the status of an academic discipline by the Swiss Jacob BURCKHARDT, who related art to its cultural environment, and the German idealists Alois Riegl, Heinrich WOLFFLIN, and Wilhelm Worringer. The latter three saw art history as the analysis of forms and viewed art apart from any function it serves in expressing the spirit of its age. Major 20th-century art historians include Henri Focillon, Bernard BERENSON, Aby Warburg, Émile MAËL, Erwin PANOFSKY, and Ernst GOMBRICH. Modern art history is a broad field of inquiry embracing formal questions of stylistic development as well as considerations of the social function of art. See Arnold Hauser, *The Social History of Art* (4 vol., 1958-60), H. W. Janson, *History of Art* (rev. ed. 1969), Kenneth Clark, *Civilization* (1970).

arthritis, painful inflammation of a joint or joints of the body, usually producing heat and redness. In its various forms, arthritis disables more people than any other chronic disorder. The condition can be brought about by nerve impairment, increased or decreased function of the endocrine glands, or degeneration due to age. Less frequently, it is caused by infection (tuberculosis, gonorrhea, rheumatic fever). The cause of rheumatoid arthritis, the most common and most crippling form, is not known. Women are much more susceptible to it than men. Although rheumatoid arthritis usually appears between the ages of 25 and 50, it also occurs in children. Osteoarthritis, another common type, occurs commonly in those over 50. It tends to be more severe when the joints have been strained by obesity or overwork. GOUT, the third most common form of arthritis, affects men almost exclusively. Aspirin is the usual treatment for the pain of arthritis. Gold salts, cortisone, and adrenocorticotrophic hormone (ACTH) are used in treating arthritis but often have undesirable side effects. Hydrocortisone and phenylbutazone, both chemical relatives of cortisone, are among other drugs that have been used. See S. P. Blau and Dodi Schultz, *Arthritis* (1974).

Arthropoda (arthrôp'ôda) [Gr., =jointed feet], largest and most diverse invertebrate animal phylum, including over 80% (about 800,000) of all known animal species. The arthropods include the fossil TRILOBITES, HORSESHOE CRABS, SCORPIONS, SPIDERS, TICKS, MITES, SEA SPIDERS, CRUSTACEANS, INSECTS, CENTIPEDES, MILLIPEDES, symphylans, and pauropods. Arthropods are characterized by a segmented body covered by a jointed external skeleton (exoskeleton), with paired jointed appendages on each seg-

ment, a complex nervous system with a dorsal brain, connective nerves passing around the upper end of the digestive tract, and a ventral nerve cord with a ganglion in each body segment, an open circulatory system with a dorsal heart into which blood flows through paired openings (ostia), and a greatly reduced body cavity (coelom). Because the jointed exoskeleton blocks growth of the organism, it must be shed periodically. This phenomenon, called molting, or ecdysis, is a characteristic feature of the phylum; it permits rapid growth in size and significant change in body form until the new exoskeleton, secreted by the animal, has hardened. Arthropods are mainly terrestrial, but aquatic representatives are well known. There are three subphyla, comprising nine classes.

Subphylum Trilobita The trilobites comprise a wholly extinct, primitive group of marine animals. They were extremely abundant in the Cambrian and Ordovician geologic periods, becoming extinct in the Permian. The flattened, oval body was composed of a head covered by a dorsal shield, a trunk (thorax), and a terminal segment (pygidium). Most of the 4,000 fossil species ranged in length from 1 to 4 in. (2.5-10 cm), some planktonic forms were smaller, and some species were as long as 2½ ft (76 cm). *Triarthrus eatoni* is a fossil trilobite common in the Ordovician seas.

Subphylum Chelicerata There are three classes of chelicerates, including the living horseshoe crabs (class Merostomata), the arachnids (class Arachnida), and the sea spiders (class Pycnogonida). Chelicerates are characterized by the absence of antennae and jaws and the presence of feeding structures (cheliceræ), which are modified pincerlike appendages used mainly for grasping and fragmenting food. Nearly all the merostomates are extinct, the only living representative being *Limulus*, the horseshoe crab (subclass Xiphosura), which inhabits the soft bottom mud of shallow, coastal seas. Merostomates have five or six gills, which have been modified from body appendages, and a giant tail (telson) lacking appendages. The extinct giant water scorpions (subclass Eurypterida) belong to this class. Members of class Pycnogonida are commonly known as sea spiders. These exclusively marine carnivores are spiderlike in appearance and range in length from 1 mm to ½ in. (13 cm). Some are as large as 2 in. (5 cm), the leg spread is sometimes over 2 ft (61 cm). Sea spiders have four pairs of legs. They are found in oceans all over the world. The largest class of chelicerates, class Arachnida, includes orders Araneae (spiders), Acarina (ticks and mites), Opiliones (daddy longlegs, or harvestmen), and Scorpionida (scorpions), among the most important. Arachnids are predominantly terrestrial, and most are carnivorous, with the digestion of prey starting outside the body. The body is composed of an unsegmented anterior region (prosoma), with a pair of cheliceræ, a pair of leglike appendages (pedipalps), four pairs of walking legs, and a posterior region (opisthosoma), equipped with book lungs or tracheae, for respiration. Arachnids are an ancient group, their fossil records dating back to the Carboniferous period.

Subphylum Mandibulata The mandibulates constitute the largest and most varied arthropod group and are characterized by the presence of modified appendages (mandibles) flanking the mouth and used as jaws. There are six classes, all characterized by various aspects of body form. Members of class Crustacea are characterized by having two pairs of antennae and two pairs of modified appendages (maxillae) used for food handling. There are over 26,000 species of crustaceans, including lobsters, shrimps, crayfish, crabs, copepods, barnacles, and a large number of minute forms making up part of the plankton. Crustaceans are the only arthropods that are mainly aquatic, and most of them are marine. Some have spread to humid areas near water. They bear gills for respiration. The thoracic region typically bears walking legs (pereopods), also used for capturing prey. The abdominal region often is equipped with swimmerets (pleopods) and a tail fan made up of a pair of appendages (uropods) and the telson. Their excretory organs are modified nephridia, as a rule producing a dilute urine that contains a great deal of ammonia. Crustaceans are herbivores, carnivores, or scavengers and are often vital elements of the food chain. Some are important economically as shellfish, such as lobsters, shrimp, and crayfish. Barnacles are important as fouling organisms of ship bottoms and harbor installations. Some crustaceans are significant parasites of other aquatic organisms. As a rule they pass through a complex set of molts during development, involving

a series of larval stages. The characteristic larva is called a nauplius, with three pairs of appendages. More appendages are added as the organism passes through its developmental molts. The cuticle of crustaceans, unlike that of other arthropods, contains calcium deposits. The most familiar subclasses are the Branchiopoda—which includes the orders Notostraca (tadpole shrimps), Diplostraca (clam shrimps and water fleas), Ostracoda (ostracods), Copepoda (copepods), and Cirrhipedia (barnacles)—and the Malacostraca, which includes the orders Stomatopoda (mantis shrimps), Mysidacea (opossum shrimps), Isopoda (isopods), Amphipoda (amphipods), and Decapoda (crayfish, lobsters, shrimps, and crabs). Class Chilopoda includes the 5,000 species of centipedes, all of which are terrestrial. Centipedes are carnivorous and predacious, immobilizing their prey, usually consisting of smaller arthropods, with the aid of their fangs. The body is composed of a head region, bearing a pair of antennae, a pair of mandibles, and two pairs of maxillae, and a trunk region, with one pair of legs on each segment. The anterior pair of trunk appendages (maxillipeds) is equipped with poison glands. Juveniles have fewer appendages than adults, new segments are added during developmental molts. Chilopods are found throughout the globe in tropical as well as temperate climates. There are about 8,000 species belonging to class Diplopoda, which comprises the millipedes and is found worldwide. The head region has a pair of antennae, a pair of mandibles, and two pairs of maxillae that are usually fused into a single mouthpart, the chilognatharium. Millipedes possess a tracheal system for respiration. They are herbivores or scavengers on dead plant material. Many are protected by stink glands that produce toxic or unpleasant compounds. There are about 60 known species belonging to class Pauropoda. Pauropods are soft-bodied, small (0.5-2.0 mm long), soil-inhabiting arthropods which are distributed worldwide. They are elongated and have many pairs of legs, but they have no trachea and no heart. Members of class Symphyla are rapid runners that range in length from 1 to 4 in. (2.5-10 cm). The class includes some 60 species. They are mainly scavengers on decayed vegetation, but one species, *Scutigera immaculata*, is a serious pest of certain crops. Symphylans have twelve pairs of legs and resemble the centipedes. Class Insecta is the largest of the arthropod classes, containing hundreds of thousands of species. Except for a few primitive or highly modified forms, insects are characterized by having one or two pairs of wings attached to the thorax. The head region bears a pair of antennae, a pair of mandibles, and two pairs of modified maxillae forming the mouthparts. The abdomen is well set off from the thorax and has no appendages except reduced ones that are modified as reproductive organs. The typical insect head bears compound eyes and one or more simple eyes and is covered by a continuous exoskeletal armor. The thorax is made up of three segments, each bearing a pair of legs. The last two segments usually bear a pair of wings. Insects are predominantly terrestrial and have tracheae for air-breathing. Insects are also characterized by having unique excretory organs, known as Malpighian tubules, which are useful in conserving water. Members of the class are extremely varied. They have adapted to many different kinds of feeding and play a variety of important roles in their ecological communities. Mouthparts may be adapted to chewing either plant or animal food, for sucking plant sap or blood, or for lapping or swabbing moisture such as fruit juices or animal body fluids. Some burrow and feed in soil or plant tissue, some are runners or jumpers that feed at or near the ground level, and others feed on the wing. Most primitive insects are wingless and have a relatively weak exoskeleton. These are forced to seek humid, protected habitats. Juveniles of primitive insects closely resemble the parents and undergo little change other than growth after hatching. This is called ametabolism. Many of the winged insects undergo paurometabolous development, hatching as nymphs that resemble the parent in many ways but that have small buds instead of wings. With each molt these juveniles change somewhat, and the wings increase in size as the young gradually assume the form of the adult. Some insects have adapted to an aquatic life to a certain extent, and in their juvenile stages they are found in ponds and streams. Some of these are hemimetabolous, the juveniles are naiads, i.e., they resemble the nymphs of paurometabolous insects, but their wings do not grow during the juvenile molts, even though other body changes occur. Instead, the last molt before

the adult stage is reached involves full development of the wings, after which the insect takes up a terrestrial existence. The least primitive of the insects are termed holometabolous. In holometaboly, the eggs hatch to release the usually wormlike larvae, which are often equipped with false legs in the abdominal region to aid in locomotion. Wing buds are entirely lacking. Although the larvae grow at each molt, they do not begin to resemble the adult until later. At the end of the larval stage the young insect enters into a quiescent pupal stage. At the end of this stage a major metamorphosis occurs, and the insect emerges with all the adult organs. Insects often cause great losses in agriculture, attack stored products, parasitize humans and domesticated animals and plants, and serve as important carriers of disease organisms. They are also beneficial, producing honey and silk and pollinating the flowers of the majority of flowering plants. A great many important insect orders are recognized, including Collembola (SPRINGTAILS), Thysanura (SILVERFISH), Ephemera (MAYFLIES), Odonata (DRAGONFLIES), Orthoptera (GRASSHOPPERS, LOCUSTS, KATYDIDS, COCKROACHES, MANTIDS, WALKING STICKS), Dermaptera (EARWIGS), Isoptera (TERMITES), Corrodentia (booklice), Mallophaga (chewing lice, see LOUSE), Anoplura (sucking lice), Thysanoptera (THRIPS), Hemiptera (true BUGS), Homoptera (CICADAS, SCALE INSECTS, LEAFHOPPERS), Neuroptera (lacewings), Hymenoptera (ANTS, BEES, WASPS), Coleoptera (BEETLES), Trichoptera (CADDIS FLIES), Lepidoptera (MOTHS, BUTTERFLIES), Diptera (FLIES), and Siphonaptera (FLEAS). See W. R. Horsfall, *Medical Entomology* (1962), J. D. Carthy, *Behavior of Arthropods* (1965), R. E. Snodgrass, *A Textbook of Arthropod Anatomy* (1952, repr. 1965).

Arthur, king of Britain. see ARTHURIAN LEGEND

Arthur I, 1187-1203?, duke of Brittany (1196-1203?), son of Geoffrey, fourth son of Henry II of England and Constance, heiress of Brittany. Arthur, a posthumous child, was proclaimed duke in 1196, and an invasion by his uncle King Richard I of England was repulsed with French aid. Subsequently, Arthur was brought up at the court of King Philip II of France. On Richard's death (1199), Arthur's claim to the English crown was passed over in favor of his uncle JOHN, youngest son of Henry II. Arthur allied himself with Philip II, who invested him with all of Richard's fiefs in France. The nobles of Anjou, Maine, and Touraine recognized Arthur as their ruler, but the young duke was captured (1202) by John while attempting to subdue Poitou. He was imprisoned in Rouen, his fate is uncertain, although John was suspected of murdering him in 1203. His story is told in Shakespeare's *King John*. Arthur's sister and heir married Pierre Mauclerc, who later became duke of Brittany as PETER I.

Arthur III, 1394-1458, duke of Brittany (1457-58), known before 1457 as comte de Richemont, constable of France in the Hundred Years War. He led the coalition that overthrew Georges de LA TRÉMOILLE, and by the Treaty of Arras (1435) he reconciled Philip the Good, duke of Burgundy and England's former ally, with King Charles VII of France. He captured Paris from the English in 1436 and later helped to regain Normandy for France. His nephew, Francis II, succeeded him.

Arthur, Chester Alan, 1830-86, 21st President of the United States (1881-85), b. Fairfield, VT. He studied law and before the Civil War practiced in New York City. In the war he was (1861-63) quartermaster general of New York state. In 1871, President Grant appointed him collector of the port of New York. Although Arthur was a loyal party man and a believer in the spoils system, he administered this office honestly and efficiently. President Hayes, bent on civil service reform, displaced Arthur in 1878, thus defying Senator CONKING and the New York Republican machine. At the Republican national convention of 1880, Garfield was nominated for President, and the Conkling "Stalwarts," who had supported Grant, were placated by the nomination of Arthur for Vice President. Garfield's assassination soon after his inauguration made Arthur President. He came into office handicapped by a record in machine politics and grave doubt as to his ability and integrity, but his administration proved honest, efficient, and dignified. He effectively supported the civil service reform act of 1883, vetoed a Chinese exclusion bill that violated a treaty with China, and vigorously prosecuted the STAR ROUTE trials. Serious illness kept Arthur from actively seeking renomination in 1884. See biography by George F. Howe (1957).

Arthur, Timothy Shay, 1809-85, American editor and moralist, b. near Newburgh, NY. His only successful editorial venture was *Arthur's Home Magazine*, which he edited (1853-85) while producing a

stream of books and moral tracts in the cause of temperance. His novel *Ten Nights in a Barroom and What I Saw There* (1854) was successfully dramatized by William W. Pratt in 1858.

Arthurian legend, the mass of legend, popular in medieval lore, concerning King Arthur of Britain and his knights. The battle of Mt. Badon—in which, according to the *Annales Cambriae* (c.1150), Arthur carried the Cross of Jesus Christ on his shoulders—but not Arthur's name, is mentioned (c.540) by Gildas. The earliest apparent mention of Arthur in any known literature is a brief reference to a mighty warrior in the Welsh poem *Gododdin* (c.600). Arthur next appears in Nennius (c.800) as a Celtic warrior who fought (c.600) 12 victorious battles against the Saxon invaders. These and several subsequent references indicate that his legend had already developed into a considerable literature before GEOFFREY OF MONMOUTH wrote his *Historia* (c.1135), in which he elaborated on the feats of King Arthur, representing him as the conqueror of Western Europe. After Geoffrey's *Historia* came Wace's *Roman de Brut* (c.1155), which infused the legend with the spirit of chivalric romance. The *Brut* (c.1200) of Layamon, modeled on Wace's work, gives one of the best pictures of Arthur as a national hero. CHRÉTIEN DE TROYES, a 12th-century French poet, wrote five romances dealing with the knights of Arthur's court. His *Perceval* contains the earliest extant literary version of the quest of the Holy Grail (see GRAIL, HOLY). Two medieval German poets important in the development of Arthurian legend are WOLFRAM VON ESCHENBACH and GOTTFRIED VON STRASSBURG. The latter's *Tristan* was the first great literary treatment of the TRISTRAM AND ISOLDE story. After 1225 no significant medieval Arthurian literature was produced on the Continent. In England, however, the legend continued to flourish. *Sir Gawain and the Green Knight* (c.1370), one of the best Middle English romances, embodies the ideal of chivalric knighthood. The last important medieval work dealing with the Arthurian legend is the *Morte d'Arthur* of Sir Thomas MALORY, whose tales have become the source for most subsequent Arthurian material. Many writers have used Arthurian themes since Malory, notably Tennyson in his *Idylls of the King*. Swinburne, William Morris, and Edwin Arlington Robinson also wrote poetic works based on the legend. T. H. White's trilogy *The Once and Future King* (1958) is a charming and decidedly 20th-century retelling of the Arthurian story. It was thought formerly that the Arthurian legend was the work of inventive poets and romancers of the Middle Ages. The generally accepted theory now is that Arthurian legend developed out of stories of Celtic mythology. The most archaic form in which these occur in British sources is the Welsh MABINOGION, but much of Irish mythology is palpably identical with Arthurian romance. It is probable that traditional Irish hero stories fused in Britain with those of the Welsh, the Cornish, and the Celts of North Britain. The resultant legend with its hero, Arthur, was transmitted to their Breton cousins on the Continent probably by the year 1000. The Bretons, famous as wandering minstrels, followed Norman armies over Western Europe and used for their repertory the stories of the legend. By 1100 therefore, Arthurian stories were well known even in Italy.

The Story. Although there are innumerable variations of the Arthurian legend, the basic story has remained the same. Arthur was the illegitimate son of Uther Pendragon, king of Britain, and Igraine, the wife of Gorlois of Cornwall. After the death of Uther, Arthur, who had been reared in secrecy, won acknowledgment as king of Britain by successfully withdrawing a sword from a stone. MERLIN, the court magician, then revealed the new king's parentage. Arthur, reigning in his court at Camelot, proved to be a noble king and a mighty warrior. He was the possessor of the miraculous sword EXCALIBUR, given him by the mysterious LADY OF THE LAKE. Of his several enemies, the most treacherous were his sister Morgan le Fay and his nephew Mordred. Morgan le Fay was usually represented as an evil sorceress, scheming to win Arthur's throne for herself and her lover Mordred (or Modred) was variously Arthur's nephew or his son by his sister Morgause. He seized Arthur's throne during the king's absence. Later he was slain in battle by Arthur, but not before he had fatally wounded the king. Arthur was borne away to the isle of AVALON, where it was expected that he would be healed of his wounds and that he would someday return to his people. Two of the most invincible knights in Arthur's realm were Sir Tristram and Sir Lancelot of the Lake. Both of them, however, were involved in illicit and tragic love

unions—Tristram with Isolde, the queen of Tristram's uncle, King Mark, SIR LAUNCELOT with GUINEVERE, the queen of his sovereign, King Arthur. Other knights of importance include the naive Sir Pelleas, who fell helplessly in love with the heartless Ettarre (or Ettard), Sir Gawain, Arthur's nephew, who appeared variously as the ideal of knightly courtesy and as the bitter enemy of Lancelot, Sir Balin and Sir Balan, two devoted brothers who unwittingly slew one another, Sir Galahad, Lancelot's son, who was the hero of the quest of the Holy Grail, Sir Kay, Arthur's villainous foster brother, Sir Percivale (or PARSIFAL), Sir Gareth, Sir Geraint, Sir Bedivere, and other knights of the ROUND TABLE. To modern readers, Arthurian legend has become the mirror of the ideal of medieval knighthood and chivalry. See studies by R. H. Fletcher (2d ed. 1966), R. L. Loomis (1949, 1956, 1927, repr. 1969, 1963, repr. 1970), Leslie Alcock (1972), John Morris (1973), and R. W. Barber (1973), J. L. Weston, tr., *Arthurian Romances Unrepresented in Malory's Morte d'Arthur* (8 vol., 1907, repr. 1971).

artichoke, name for two different plants of the family Compositae (COMPOSITE family), both having edible parts. The French, or globe, artichoke (*Cynara scolymus*) is a thistlelike plant of which the globular flower heads are used in the immature state as a salad or vegetable, only the lower part of the fleshy bracts ("leaves") and the center ("heart") are eaten. The cultivation of this S. European plant is now a considerable industry in California. A large part of the yearly crop is canned for export to South America. The edible blanched leaves and leafstalks are called chard. The other artichoke plant is the JERUSALEM ARTICHOKE. Artichokes are classified in the division MAGNOLIOPHYTES, class Magnoliopsida, order Asterales, family Compositae.

artificial elements. see SYNTHETIC ELEMENTS

artificial insemination, technique of artificially injecting sperm-containing semen from a male into a female to cause pregnancy. The technique is widely used in the propagation of cattle, especially to produce many offspring from one prize bull. The prepared semen can be preserved for more than a year by refrigeration, and it is frequently shipped over great distances. Artificial insemination is sometimes used in humans when normal fertilization cannot be achieved.

artificial languages, languages that are invented by one or more human beings as opposed to languages that develop naturally among peoples. Examples of artificial languages are Volapuk, Esperanto, and Ido. See INTERNATIONAL LANGUAGE.

artificial limb, mechanical replacement for a missing limb. An artificial limb, called a prosthesis, must be light and flexible to permit easy movement, but must also be sufficiently sturdy to support the weight of the body or to manipulate objects. The materials used in artificial limbs include willow wood, laminated fibers and plastics, and various metallic alloys. One model of artificial leg is made of layers of stockinette cloth coated with plastic, it has duraluminum joints at the knee and ankle, rubber soles on the feet, and a leather cuff cushioning the stump. The cuff fits around the thigh like a corset, holding the artificial leg firmly in place, and connects to a leather belt around the waist. Often, spring joints are employed on foot pieces to give natural-looking movements. Artificial legs may also be secured by suction between socket and stump. Artificial arms, not having to support the weight of the body, may be made of lighter metals and plastics. They are usually strapped to the trunk and controlled by a shoulder harness. Artificial hands vary in structure and utility, research and development has resulted in devices that are both cosmetic and functional. For example, an artificial hand has been devised that utilizes a split hook resembling a lobster claw, this is enclosed within a flexible plastic glove that can be made remarkably lifelike, even having fingerprints. The biceps muscle can be attached to the prosthesis by a surgical procedure called cineplasty, which permits grasping in the terminal device while dispensing with shoulder harnesses.

artificial respiration, any measure that causes air to flow in and out of a person's lungs when natural breathing is inadequate or ceases, as in respiratory paralysis, drowning, electric shock, choking, gas or smoke inhalation, or poisoning. Respiration can be taken over by mechanical appliances such as the artificial lung (especially in respiratory paralysis), the pulmotor, or any other type of mechanical respirator. See RESUSCITATOR. In emergency situations, however, when no professional help is available, rescuers should undertake the mouth-to-mouth or

mouth-to-nose method of artificial respiration (which have been proven far superior to manual methods). First, any foreign material should be swept out of the mouth with the hand, wrapped in a cloth if possible. The victim should be placed on his back, with his head tilted backward and chin pointing upward so that the tongue does not block the throat. The reviver's mouth is then placed tightly over the victim's mouth, with the latter's nostrils kept tightly shut. Alternatively, the reviver's mouth may be placed over the victim's nose, with the victim's mouth kept closed. For a small child or infant, the reviver places his mouth firmly over the mouth and nose. The reviver takes a deep breath and blows into the victim's mouth (or nose). If there is no exchange of air, the reviver should check the position of the head. If there is still no exchange, the victim should be turned on his side and rapped between the shoulder blades to dislodge any foreign matter that may be blocking the air passages. A child can be held by the ankles and rapped between the shoulder blades. The reviver stops blowing when the chest expands, turns his head away, and listens for exhalation. If the victim is an adult, blowing should be vigorous, at the rate of about 12 breaths per minute. For a child the breaths should be shallower, about 20 per minute. For an infant, breaths should come in short puffs. If the victim begins to vomit, the reviver must quickly turn him on his side and wipe out his mouth before continuing artificial respiration. If the victim has had the larynx removed, the above method is used, but the reviver must breathe into the stoma (surgical opening made in front of neck for breathing). Breathing into the subject should be continued until natural breathing resumes or until professional help arrives.

Artigas, José Gervasio (hōsā' hārva'syō artē'gas), 1764-1850, national hero of Uruguay, first leader in the movement toward independence. A typical gaucho of the BANDA ORIENTAL, he joined the revolution against Spain in 1811 and became the leader of the Orientales. In 1813 he instructed the delegates from the Banda Oriental to the Buenos Aires constituent assembly to work for a federation of autonomous La Plata provinces, but they were denied admission to the assembly by the centralist military junta. Artigas then championed Uruguayan independence. After an initial setback in 1813 by Buenos Aires and subsequently the restoration of Spanish power (1816), he still managed to rule much of the territory as protector against Spain, Brazil, and Buenos Aires. Finally in 1820, when Artigas had once again renounced the United Provinces of La Plata (Argentina), the Portuguese captured the territory and annexed it to Brazil. Artigas spent his remaining years in exile in Paraguay. See John Street, *Artigas and the Emancipation of Uruguay* (1959).

artillery, term originally applied to any weaponry (including such ancient engines of war as catapults and battering rams) but later applied only to heavy FIREARMS as opposed to SMALL ARMS. Types of artillery include antiaircraft and antitank guns (which fire at high muzzle velocity through long barrels at flat trajectories) and howitzers (with shorter barrels, lower velocities, and parabolic trajectories). Modern artillery came into use in the mid-14th cent. with the invention of gunpowder. At first used mainly against fortifications, artillery was extensively employed in the field during the Thirty Years War (1618-48), thereafter it played an increasingly important role until the advent of aircraft. Now that few pieces of fixed artillery (e.g., coastal defense guns) still survive, artillery is generally classified as either towed or self-propelled, in Western countries the latter type predominates. Artillery was characteristically smoothbore and muzzle-loaded, firing solid, round shot, until the latter part of the 19th cent., when breech-loaded, rifled, and shell-firing artillery became standard. See study by John Batchelor and Ian Hogg (1972).

Art Institute of Chicago, museum and art school, in Grant Park, facing Michigan Ave. It was incorporated in 1879, George Armour was the first president. Since 1893 the Institute has been housed in its present building, designed in the Italian Renaissance style by Shepley, Rutan, and Coolidge. Among its famous collections are those of early Italian, Dutch, Spanish, and Flemish paintings, including works by El Greco, Rembrandt, and Hals. The Institute is rich in 19th-century American and French paintings, particularly well known is *La Grande Jatte* by Seurat. Modern American and European paintings are also well represented. Other collections include prints and drawings, dating from the 15th cent., and sculpture. The section on decorative arts has porcelains, textiles, glass, and rooms of period furniture. The

Institute also has a fine collection of Chinese art. Other features include the Ryerson library for research and a school of drama.

art nouveau (ar' nōvō'), decorative-art movement centered in Western Europe. It began in the 1880s as a reaction against the historical bombast of mid-19th-century art, but did not survive World War I. Art nouveau originated in London and was variously called *Jugendstil* in Germany, *Sezessionsstil* in Austria, and *Modernismo* in Spain. In general it was most successfully practiced in the decorative arts: furniture, jewelry, and book design and illustration. The style was richly ornamental and asymmetrical, characterized by a whiplash linearity reminiscent of twining plant tendrils. Its exponents chose themes fraught with symbolism, frequently of an erotic nature. They imbued their designs with dreamlike and exotic forms. Stylistic descendants of William Blake and of the PRE-RAPHAELITES, the outstanding designers of art nouveau in England include the graphic artist Aubrey Beardsley, A. H. Mackmurdo, Charles Rickers, Walter Crane, and the Scottish architect Charles R. Mackintosh, in Belgium the architects Henry Van de Velde and Victor Horta, in France the architect and designer of the Paris metro entrances, Hector Guimard, and the jewelry designer René Lalique, in Austria the painter Gustav Klimt, in Spain the architect Antonio Gaudí, whose fantastic buildings reveal him to be one of the most original geniuses of the entire movement, in Germany the illustrator Otto Eckmann and the architect Peter Behrens, in Italy the originator of the ornamental Floreale style, Giuseppe Sommaruga, and in the United States Louis Sullivan, whose architecture was dressed with art nouveau detail, and the designer of elegant glassware Louis C. Tiffany. The aesthetics of the movement were disseminated through various illustrated periodicals including *The Century Guild Hobby Horse* (1894), *The Dial* (1889), *The Studio* (begun, 1893), *The Yellow Book* (1894-95), and *The Savoy* (1896-98). Liberty, the Regent St. store in London, popularized the style in fabrics. In the 1960s there was a general resurgence of interest in art nouveau masters, in the United States the works of Beardsley and Tiffany were especially popular. See definitive studies by R. Schmutzler (1964), M. Rheims (1966), P. Selz and M. Constantine (1960), N. Pevsner's, *Pioneers of Modern Design* (1960).

Artois (artwa'), region and former province, in Pas-de-Calais dept., N France, near the English Channel, between Picardy and Flanders. Arras is the chief city. Slightly hilly, it is largely agricultural and occupies part of the rich Franco-Belgian coal basin. Owned in the Middle Ages by the counts of Flanders, Artois was annexed (1180) to France by Philip II through marriage. Burgundy gained (14th cent.) the territory, also through marriage. Later it was under Austrian rule, and from 1493 until its conquest (1640) by Louis XIII it was under Spanish rule. Confirmation of French possession was made by the Peace of the Pyrenees (1659) and the Treaty of Nijmegen (1678). Renowned for its états (assembly), which met until the 18th cent., it declined in political importance thereafter. Of strategic significance in World War I, it was the scene of heavy fighting. The region gives its name to the ARTESIAN WELL, known there for centuries.

arts and crafts, term for that general field of applied designing in which hand fabrication is dominant. The term was invented in England in the late 19th cent. as a label for the current movement directed toward the revivifying of the decorative arts. The chief influence behind this movement was William MORRIS. By the mid-19th cent., factory processes had almost entirely driven handicraftsmen from their ancient trades and obliterated the techniques by which beautiful objects of utility could be produced. The GOTHIC REVIVAL, however, had brought into existence a great body of knowledge concerning the arts of the Middle Ages, and Morris, together with the Pre-Raphaelite painters and a small group of architects and designers, eagerly returned to these arts as a rich source of inspiration. The pupils and followers of Morris multiplied, and numbers of proficient craftsmen developed. Their methods aimed at a practical demonstration not only of Morris's aesthetic creed but also of his ideas concerning socialism and the moral need for integrating beauty with the accessories of daily life. The revival of folk arts has prospered, especially in remote communities and among American Indians of the Southwest (see NORTH AMERICAN INDIAN ART). Handicrafts are widely taught in schools, have been adopted by hobbyists, and are valued in occupational therapy.

Artzybasheff, Boris (artsība'shēf), 1899-1965, American draftsman, illustrator, writer, and cartoon-

ist, b. Kharkov, Russia, son of Mikhail Petrovich ARTZYBASHEV. In 1919 he went to New York City, where he worked in an engraving shop. Later he became noted for his brilliant and imaginative work as an advertising artist and illustrator of books and periodicals, including many covers for *Time* magazine. Grotesque and weirdly humorous drawings appear in his *As I See* (1955).

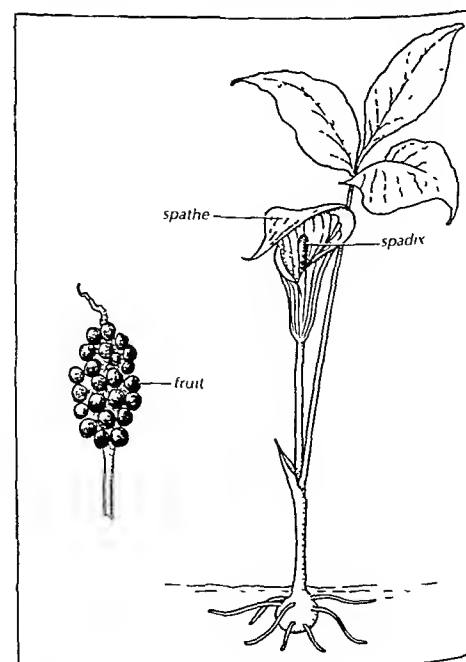
Artzybashev, Mikhail Petrovich (mēkhayē' pētrō'vich artsība'shēf), 1878-1927, Russian novelist, playwright, and essayist. Artzybashev's early works were short stories in the manner of Tolstoy. His novel *Sanine* (1907, tr. 1914) created a sensation and was proscribed as pornographic in many countries. When the *Sanine* cult subsided, he tried to maintain his popularity with similar works, e.g., the novel *Breaking-Point* (1912, tr. 1915). Artzybashev bitterly attacked the Bolsheviks from abroad.

Aruba, island (1970 pop. 60,734), 69 sq mi (179 sq km), in the Leeward Islands group of the Netherlands Antilles. Oranjestad is the capital. Tourism and the refining of oil brought in from nearby Venezuela are the major industries.

Aruboth (ār'yōbōth), part of Solomon's kingdom. Arubboth RSV 1 Kings 4:10.

Aru Islands or Aroe Islands (both ā'rōō), group of about 95 low-lying islands (1961 pop. 29,604), 3,306 sq mi (8,563 sq km), E Indonesia, in the Moluccas, in the Arafura Sea, SW of New Guinea. The largest island is Tanahbesar, Dobo, the chief port of the group, is on Wamar, just off Tanahbesar. Products include sago, coconuts, tobacco, mother-of-pearl, trepang, tortoise shell, and bird of paradise plumes. The inhabitants are of a mixed Papuan and Malay stock. The islands were discovered by the Dutch, who colonized them after 1623. Arru is another spelling.

arum, common name for the Araceae, a plant family mainly composed of species of herbaceous terrestrial plants found in swampy and muddy habitats of the tropics and subtropics, some are native to temperate zones, and a few are epiphytic. The family is characterized by an inflorescence consisting of a single spadix (a fleshy spike bearing small flowers) and a usually showy and flowerlike bract (modified leaf) called a spathe, which surrounds the spadix. The krubi (*Amorphophallus titanum*) of Sumatra, sometimes grown in greenhouses, has the largest plant inflorescence known—the spadix reaches a height of 15 ft (4.6 m) and the spathe a height and upper diameter of some 8 ft (2.5 m). Commonly cultivated for their showy inflorescences are the arum lilies, or callas (genus *Zantedeschia*), native to tropical and S Africa, the common florists' white-spathed calla lily is *Z. aethiopica*. The wild calla, or water arum (*Calla palustris*), of E North America and other northern regions is similar to the calla lily but smaller and is not usually cultivated. Several plants of the arum family are grown (often as house plants).



Jack-in-the-pulpit, *Arisaema triphyllum*, a member of the arum family

for their ornamental foliage, e.g., species of the genera *Monstera*, *Philodendron*, and *Caladium*, all native to the American tropics. *Monstera* is a vine popular for its perforated and deeply lobed leaves. *Philodendron*, usually a climbing shrub in the tropics, is now one of the most popular house plants. *Caladium*, noted for its multicolored foliage, is sometimes mistakenly called elephant's-ear, a name properly applied to *Colocasia esculenta* because of the shape of its large, decorative leaves. *C. esculenta*, with its large, starchy corms or rootstocks (characteristic of the arum family) is a major source of food in the Pacific islands and the Far East; in Hawaii it is the main ingredient of Poi. It is now cultivated in many warm regions, including the United States, in some 1,000 varieties, as a food plant it is known by many local names, the most common being taro and dasheen. Plants of the arum family native to the United States are found chiefly in the eastern and central states, all species are bog or aquatic plants except *Arisaema*, which grows in moist woodlands. The jack-in-the-pulpit, or Indian turnip (*A. triphyllum*), has a spadix (jack) enveloped by a purplish-striped spathe (the pulpit). Its starchy corms were eaten by the American Indians, as were those of the TUCKAHOE or Indian bread, sweet flag (*Acorus calamus*), and skunk cabbage (*Symplocarpus foetidus*). The latter two and the jack-in-the-pulpit are also sources of medicinal substances. Sweet flag, found in many north temperate regions, yields flavorings and calamus, a perfume oil. Skunk cabbage, found in both E Asia and E North America, is one of the most abundant and earliest-blooming northern wild flowers. The unpleasant odor noticeable when the plant is bruised is produced by the acrid sap, which contains needle-shaped crystals of calcium oxalate, called raphides, that are formed as a metabolic by-product. This acidity, characteristic of the arum family, is removed from the corms by cooking. The family is classified in the division MAGNOLIOPHYTES, class Liliatae, order Arales.

Arumah (arōō'ma), town of Palestine. Judges 9:41.

Arunachal Pradesh (ar'anachal prādēsh'), union territory (1971 pop. 444,744), 31,438 sq mi (81,424 sq km), NE India, bordered on the N by the Tibet region of China and on the E by Burma. The capital is ZIRO. Formerly the North-East Frontier Agency special territory, Arunachal Pradesh became a union territory in 1972. A remote region, it includes part of the E Himalayas and extends through mountainous highlands to the plains of Assam. Its border with Tibet, disputed by China, is known as the MacMahon line. It was established by the British, with the agreement of Tibet, in the early 20th cent.; the Chinese claim more than 90% of the territory. In Oct., 1962, after tentative probes, the Chinese launched a massive offensive against the area, and by November they had advanced far into Indian territory, even threatening the tea plantations and oil fields of the rich Assam plain. On Nov. 21, however, the Chinese proclaimed a unilateral cease-fire, and they soon withdrew behind the disputed MacMahon line. Arunachal Pradesh is inhabited by tribesmen of Mongoloid stock, most of whom practice animism. The territory is administered by the home minister in the central government of India but has an elected advisory council. The states of Assam, Nagaland, Meghalaya, Manipur, and Tripura and the union territories of Mizoram and Arunachal Pradesh have a common governor appointed by the president of India.

Arundel, Henry Fitzalan, 12th earl of (ār'endəl), 1517?-1580, English statesman. Lord chamberlain under Henry VIII, he was a member of the council appointed by Henry to govern during the minority of Edward VI. After Edward's death (1553), he helped bring Mary I to the throne, foiling the duke of Northumberland's attempt to crown Lady Jane Grey. Arundel was prominent in Mary's reign and remained powerful, though always under suspicion because he was a Catholic, after the accession (1558) of Elizabeth I.

Arundel, Thomas Howard, earl of, 1585-1646, first great English art collector and patron of arts. Educated at Trinity College, Cambridge, he married a goddaughter of Queen Elizabeth and was always closely connected with the court. He held many high offices; in 1616 he was appointed privy councillor and later made earl marshal of England. Both Rubens and Van Dyck painted portraits of Arundel of himself and his wife in addition to other works. Inigo Jones, long in his service, accompanied him to Rome, where Arundel excavated some Roman statues, which with other ancient sculptures, including

the *Parian Chronicle*, or *Marmor Chironicon*, were given to Oxford University in 1667 and became known as the Arundel Marbles. Most of his sculpture collection is in Oxford's Ashmolean Museum. His collections also included Flemish, Dutch, German, and Italian paintings of the 16th cent.; Dürer and Holbein were particularly well represented. His library was given to the Royal Society, the manuscripts known as the Arundel Collection were later transferred (1831) to the British Museum. The Arundel Society (1848-97) reproduced works by famous artists in order to promote public interest in art. In 1904 the Arundel Club began to print reproductions of works in private collections. See study by Mary F. Hervey (1921, repr. 1969).

Arusha (arōō'sha), city (1967 pop. 32,452), capital of Arusha prov., NE Tanzania. It is an industrial and administrative center, connected by rail with Tanga on the Indian Ocean and with Kenya. Manufactures include textiles, beverages, processed foods, plastics, and electronic equipment. The city is also the headquarters of the East African Community (founded 1967), which regulates aspects of the economy, runs transportation and communications facilities, and sponsors research for Tanzania, Kenya, and Uganda. In Jan., 1967, President Julius Nyerere of Tanzania issued the influential Arusha Declaration, which called for socialism, hard work, and self-reliance in Tanzania. The city is the site of an institute devoted to research in tropical pesticides.

Arvad (ar'vād), variant of ARADUS.

Arvada (arvād'a), city (1970 pop. 46,814), Jefferson and Adams counties, N central Colo., a suburb of Denver, inc. 1904. Primarily residential, Arvada manufactures processed foods, beer, chemicals, and wood and metal products.

Arval Brothers, in Roman religion, college of 12 priests chosen from the most distinguished senatorial families. It was said that the original brothers were sons of ACCA LARENTIA. Theirs was chiefly an agricultural cult, but they were also concerned with the well-being of the imperial house. The Roman emperor was necessarily a member of the college. Their most important ceremony, held in May, was in honor of Dea Dia, a goddess of fields and crops.

Arvida (arv'dā), city (1971 pop. 18,448), S Que., Canada, on the Saguenay River. It has a large aluminum smelter.

Arvika (ar'vē'ka), city (1970 pop. 15,509), Värmland co., W Sweden, on Lake Glänsfjorden. It is a commercial and industrial center, with a lake port. Arvika was mentioned in a 13th-century Norse saga.

Aryabhata (ār'yābhū'ta), c. 476-550, Hindu mathematician and astronomer. He is one of the first known to have used algebra; his writings include rules of arithmetic and of plane and spherical trigonometry, and solutions of quadratic equations.

Aryan [Sanskrit, = noble], term formerly used to designate the Indo-European race or language family or its Indo-Iranian subgroup. Originally a group of nomadic tribes, the Aryans were part of a great migratory movement that spread in successive waves from S Russia and Turkistan during the 2d millennium B.C. Throughout Mesopotamia and Asia Minor, literate urban centers fell to their warrior bands. Archaeological evidence corroborates the text of the VEDA by placing the invasion of India by the Aryans at c. 1500 B.C. They colonized the Punjab region of NW India, and absorbed much of the indigenous culture. The resulting Indo-Aryan period saw the flourishing of a pastoral-agricultural economy that utilized bronze objects and horse-drawn chariots. Before the discovery of the Indus valley sites in the 1920s, Hindu culture had been attributed solely to the Aryan invaders. The idealization of conquest pictured in the Vedic hymns was incorporated into Nazi racist literature, in which German descent was supposedly traced back to Aryan forebears.

Aryana see ARIANA.

Arya Samaj: see SARASWATI, DAYANANDA.

aryl group (ār'il), in chemistry, group of atoms derived from BENZENE or from a benzene derivative by removing one hydrogen that is bonded to the benzene ring (see RADICAL). The simplest aryl group is phenyl, C₆H₅; it is derived from benzene. The tolyl group, CH₃C₆H₄, is derived from TOLUENE (methylbenzene). The xylil group, (CH₃)₂C₆H₃, is derived from xylene (dimethylbenzene). Just as several different ALKYL GROUPS may be derived from certain alkanes, so may several aryl groups be derived from certain aromatic compounds, for example, three different tolyl groups can be formed from toluene by removing hydrogen from different locations relative to the methyl group. When a FUNCTIONAL GROUP is joined with an aryl group, replacing the hydrogen

that had been removed, a compound is formed whose characteristics depend largely on the functional group.

Arza (ār'zā), steward at Tirzah. 1 Kings 16:9.

Arzamas (ar'zamas'), city (1970 pop. 62,000), E European USSR, on the Tyosha River. A rail junction, it has food-processing plants and industries that produce leather and felt goods and farm implements. An ancient Mordvinian settlement, Arzamas became a fortress after Czar Ivan IV captured it from the Kazan Tatars in 1552.

Aš or Asch (both ash), city (1970 pop. 11,539), W Czechoslovakia, in Bohemia, near the Bavarian border. It is a textile center and also manufactures lace, woollens, embroidery, and carpets.

As, chemical symbol of the element ARSENIC.

Asa (ās'a) 1 King of Judah, son and successor of Abijah. He was a good king, zealous in his extirpation of idols. When Baasha of Israel took Ramah (a few miles N of Jerusalem), Asa bought the help of Benhadad of Damascus and recaptured Ramah. His son Jehoshaphat succeeded him. 1 Kings 15:8-24, 2 Chron. 14:16-26. 2 Chron. 1:16.

Asada Goryu (āsād'ā gōryōō), 1734-99, Japanese astronomer who helped to introduce modern astronomical instruments and methods into Japan. Asada spent much of his career in the flourishing commercial city of Osaka, where he practiced medicine for a living. Because of the Japanese government's policy of seclusion, Western scientific theory was generally available only through obsolete Chinese works edited by Jesuit missionaries in China. Yet Asada managed to construct sophisticated mathematical models of celestial movements and is sometimes credited with the independent discovery of Kepler's third law.

Asahel (ās'sahēl, ās'ā-) 1 David's nephew. Murdered by Abner, he was avenged by his brother Joab. 2 Sam. 2:18-32, 3:27, 30, 1 Chron. 11:26, 27, 2, 3 Levites 2: Chron. 17:8, 31:13. 4 Priest. Ezra 10:15.

Asahiah (ās'sahī'a, ās'ā-), the same as ASAIAH 1.

Asahigawa (asahē'gawa), city (1970 pop. 288,490), W central Hokkaido, Japan, on the Ishikari River. Asahigawa is the commercial, industrial, and rail center of a great agricultural region. Pulp, paper, cotton yarn, lumber, wood products, and sake are among the city's industrial products.

Asaiah (ās'sā'i'a, ās'ā-) 1 One of Josiah's deputation to Huldah. 2 Chron. 34:20-22. Asahiah. 2 Kings 22:12-14. 2 Simeonite. 1 Chron. 4:36. 3 Levite. 1 Chron. 6:30, 15:6, 11. 4 Shilonite. 1 Chron. 9:5. Maseiah. Neh. 11:5.

Asaka (asa'ka), city (1970 pop. 67,938), Saitama prefecture, central Honshu, Japan. It is an industrial and residential suburb of Tokyo. There is an important metalworks industry in the city.

Asama, Mount (asa'ma), or **Asama-yama** (-ya'ma), peak, 8,340 ft (2,542 m) high, central Honshu, Japan, near Komoro. One of the largest and most active volcanoes in Japan, it erupted violently in 1783.

asana: see YOGA.

Asansol (āsānsōl'), city (1971 pop. 157,388), West Bengal state, NE India. It is an industrial center in a coal-mining area.

Asaph (ās'sāf) 1 Choirmaster of David's time, or the eponym of a corps of singers. His name is attached to a little collection of psalms. Ps. 50, 73-83. 1 Chron. 6:39, 9:15, 25:1, 2 Chron. 20:14, 29:30, Neh. 11:17, 12:46. 2 The same as ABIASAPH. 3 Father of a chronicler. 2 Kings 18:37, Isa. 36:3, 22. 4 King's forester. Neh. 2:8.

Asareel (āsār'ēēl), son of Jehaleleel. 1 Chron. 4:16.

Asarelah (ās'ārē'lā), Asaphite. 1 Chron. 25:2. Jesarelah. 1 Chron. 25:14.

Asbestos, town (1971 pop. 9,749), SE Que., Canada. Asbestos is mined in the area and asbestos products are made in the town.

asbestos, common name for any of a group of silicate minerals that are fibrous in structure and more or less resistant to acid and fire. The name was originally given to fibrous forms of actinolite and tremolite, varieties of amphibole. Chrysotile asbestos, a form of SERPENTINE, is the chief commercial asbestos. Important varieties of amphibole are amosite, which is not as strong or as easy to spin as chrysotile but is used in insulating materials, crocidolite, known also as blue asbestos, used because of its high strength for making asbestos-cement products, and tremolite, used in laboratories for filtering acids and other chemicals because of its resistance to chemical action. Varieties of amphibole of lesser commercial importance include anthophyllite and actinolite. Asbestos is usually found comprising veins in other

rock, in most cases it appears to be the product of METAMORPHISM. By far the chief asbestos-producing country is Canada, other important producers are the USSR, Rhodesia, Swaziland, the Republic of South Africa, Cyprus, and the United States. Canadian asbestos is mostly chrysotile. South African asbestos, found chiefly in Cape Prov., is largely amosite and crocidolite. In the United States, chrysotile asbestos is produced mainly in Arizona and Vermont. Asbestos is mined both in open quarries and underground. After being crushed, dried, and screened to remove the fibers from the ore, it is graded and sold to manufacturers. The chief products made from it include asbestos yarns and ropes, pipe covering, brake linings, fire-fighting equipment, cloth, shingles, millboard, and plaster and plasterboard. Particles of asbestos are released into the atmosphere by human activity—e.g., when brakes are applied, microscopic asbestos particles are rubbed off the brake linings, larger, visible particles of asbestos are released when asbestos insulation is applied by a spray gun during building construction. Studies have shown that asbestos particles may be carcinogenic. See D. V. Rosato, *Asbestos: Its Industrial Applications* (1959); J. L. Gillson, *Industrial Minerals and Rocks* (1960).

Asbjørnsen, Peter Christian (pā'tar krēs'tyan ās'-byōrnsen), 1812-85, Norwegian folklorist, writer, and naturalist. *Norwegian Folk Stories* (4 vol., 1841-44), which he collected with the poet Jørgen Moe, his friend from school days, was acclaimed throughout Europe for its contribution to comparative folklore and literature. In 1845 he published the first series of his *Norwegian Fairy Stories and Folk Legends*. English translations of his works include *Popular Tales from the Norse* (tr. 1858) and *Fairy Tales from the Far North* (tr. 1897). Asbjørnsen was a forester for many years and wrote numerous scholarly papers on the natural sciences.

Asbury, Francis (āz'barē, -bē-), 1745-1816, Methodist bishop in America, b. England. The Wesleyan conference in London sent him in 1771 as a missionary to America, where he promoted the growth of the CIRCUIT RIDER system that proved so eminently suited to frontier conditions. His powerful preaching, his skill in winning converts, and his mastery of organization had, by the end of the Revolution, established Asbury as the leader of American Methodism. In 1784, John Wesley ordained Dr. Thomas Coke as superintendent of the societies in America; Asbury was to be associate superintendent. At the American conference held that year, however, Asbury was the dominating figure and was made superintendent. He then assumed the title of bishop and took steps to institute a centralized church government. Although tormented by ill health, he maintained personal supervision of the expanding church, traveling on horseback over 5,000 mi (8,047 km) each year and strongly entrenching Methodism over the entire area of the new nation. His journal is valuable for its account of contemporary society as well as of his personal life. See his *Rudolf and Letters* (3 vol., 1958), biography by L. C. Rudolf (1966).

Asbury Park, city (1970 pop. 16,533), Monmouth co., N.J., on the Atlantic coast, inc. 1897. It is a popular resort with a noted beach, boardwalk, convention hall, and auditorium. The steamship *Morro Castle*, which caught fire at sea in Sept., 1934, was grounded there and continued to burn, with the loss of 125 lives.

Ascalon see ASHQELON, Israel

Ascension, island, 34 sq mi (88 sq km), in the S Atlantic, NW of St. Helena and belonging to the British St. Helena colony. Ascension is volcanic and rocky with little vegetation, but it supports considerable livestock (sea turtles, rabbits, wild goats, and partridges), much of which was brought in by the nonindigenous population. The United States maintains a missile and satellite tracking station. Discovered by the Portuguese João da Nova in 1501, Ascension was taken by the British in 1815 and used as a naval station. In 1922 it was made a dependency of St. Helena. Georgetown is the main settlement on the island.

Ascension, name usually given to the departure of Jesus from earth as related in the Gospels according to Mark (16) and Luke (24) and in Acts 1:1-11. The annual commemoration of this is one of the principal feasts in most Christian churches. Ascension Day, as it is called, occurs on the 40th day after Easter, being the Thursday of the sixth week of Easter. In early English usage this festival was known as Holy Thursday.

Ascension Island, Caroline Islands see PONAPE

Ascensius, Jodocus Badius see BADIUS JODOCUS

asceticism (asē'tisizəm), rejection of the world and bodily pleasures through sustained self-denial and self-mortification, with the objective of strengthening spiritual life. Asceticism has been common in Hinduism, Islam, Judaism, and Christianity. All of these have special ascetic cults. It is also known in Buddhism and in other religions. The most common and least severe ascetic practice is prolonged FASTING, used for many purposes—to produce visions, as among the Crow Indians, to mourn the dead, as among various African peoples, and to sharpen spiritual awareness, as among the early Christian saints, such as St. Simeon Stylites. More extreme forms have been flagellation (see FLAGELLANTS) and self-mutilation, usually intended to propitiate or reach accord with a god. Thus the priests of Cybele practiced self-castration. Asceticism has been associated with taboo in primitive societies and in such well-developed religions as Zoroastrianism and Manichaeism. In Greece the Cynics preached the ascetic life. The imposed rules of self-denial in MONASTICISM, both Eastern and Western, are considered rules of austerity rather than asceticism, although individuals may adopt ascetic practices beyond the monastic rules. See ESENES FAKIR, HERMIT, RECHABITES. See Owen Chadwick, ed., *Western Asceticism* (1958).

Asch, Sholem or Shalom (shō'lam āsh, shā'lam), 1880-1957, Jewish novelist and playwright, b. Poland. He first came to the United States in 1909, was naturalized in 1920, and lived in various parts of Europe and the United States. He settled in Israel in 1956. One of the most widely known Yiddish writers, he won his first success with the play *The God of Vengeance*, produced by Max Reinhardt in Berlin in 1910 and given in many languages and places since then. Among his works available in English translations are the novels *Motke the Thief* (1917), *Uncle Moses* (1920), *Three Cities* (1933), *The War Goes On* (1935), *The Nazarene* (1939), *The Apostle* (1943), *One Destiny* (1945), *East River* (1946), *Mary* (1949), *Salvation* (1951), *Moses* (1951), *A Passage in the Night* (1953), and *The Prophet* (1955). His two collections of short stories and novelettes are *Children of Abraham* (1942) and *Tales of My People* (1948). Asch's writings often depict Jewish life in Europe and in the United States, and later works reflect the common spiritual heritage of Jews and Christians. Several of his plays were very successful in the Yiddish theater in New York City.

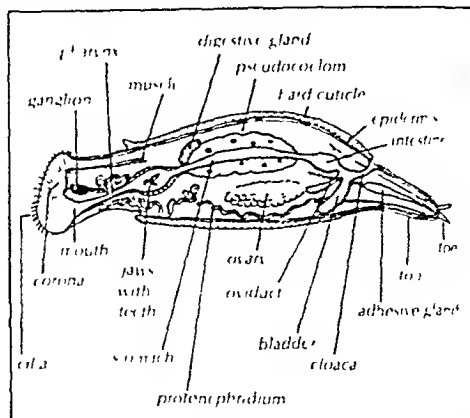
Asch see AS, Czechoslovakia

Aschaffenburg (āshā'fānbōrk), city (1970 pop. 55,193), Bavaria, S central West Germany, on the Main River. Its manufactures include clothing, machinery, precision and optical instruments, and colored paper. Once the location of a Roman garrison and later of a Frankish castle, Aschaffenburg passed to the archbishopric of Mainz in the 10th cent. The imperial diet met there in 1474. It changed hands several times during the Thirty Years War (1618-48) and was stormed in 1672 by the French marshal Henri Turenne. It passed to Bavaria in 1814. Noteworthy buildings include a 12th-century church and a 17th-century castle.

Ascham, Roger (ās'kām), 1515-68, English humanist and scholar, b. Yorkshire. Ascham was a major intellectual figure of the early Tudor period. His *Toxophilus* (1545), an essay on archery, proved him a master of English prose, in it he urged the importance of physical recreation for students and scholars. The essay won him the favor of Henry VIII, and Ascham became tutor (1548-50) to Princess Elizabeth. He seems to have been largely responsible for her love of the classics and her proficiency in Greek. As a member of a diplomatic mission Ascham spent several years on the Continent, in contact with other scholars, and in 1553 was appointed Latin secretary to Queen Mary. He continued as secretary and private tutor to Elizabeth I after Mary's death. *The Scholemaster* (1570), his treatise on the teaching of Latin, urged the use of the double translation method. Dr. Johnson's life of Ascham (1761), included in many editions of Ascham's collected works, is a classic. See W. F. Phelps, *Roger Ascham and John Sturm* (1879), study by L. V. Ryan (1963).

Aschelminthes (āsk-hēlmīn'thēz), large phylum of loosely related, wormlike organisms of extremely varied structure and habits. All are covered by a noncellular coat, or cuticle, and have a pseudocoelom, i.e., a fluid-filled cavity separating the body wall from the gut but lacking a peritoneal lining. In many species the digestive, excretory, and reproductive systems join in a cloaca, or discharge chamber, near the posterior end. Many aschelminthes also show cell constancy, a condition in which each or-

gan of the adult contains the precise number of cells characteristic of the species.



Internal anatomy of a female rotifer, representative of the phylum Aschelminthes

Class Rotifera Rotifers are predominantly free-living microscopic, aquatic or semiterrestrial organisms. Each has a head bearing a crown of cilia, the corona at the anterior end, most rotifers feed with the aid of currents generated by the coronal cilia. A posterior foot, often equipped with two or three toes, contains adhesive glands permitting temporary attachment to objects. Unique grinding jaws are found in the pharynx, and an esophagus, stomach and intestine can be distinguished. The excretory system consists of ciliated cells, called flame cells that move collected liquids into two coiled tubes called protonephridia, these tubes open into a contractile bladder. The reproductive system is simple consisting in the female of ovary, yolk gland, and oviduct, and in the male of testis and sperm duct. The intestine, bladder, and reproductive ducts unite to form a cloaca. Rotifers, of which there are about 2,000 known species, are widely distributed in fresh water and marine habitats, they also live in the soil, in mosses, and associated with lichens on rocks and trees. A few are parasitic. Most feed on bacteria, algal cells, small protozoa, or organic detritus. As a rule, only female rotifers are seen, in some species the males have never been observed. Eggs develop parthenogenetically, i.e., without fertilization, to produce only females. When conditions are unfavorable, haploid male and female eggs are produced, these can unite to form fertilized eggs that have heavy shells and remain dormant until more favorable conditions occur. Many species can survive in a dry form for long periods of time, emerging from a dormant state and becoming active when moisture is available.

Class Gastrotricha Gastrotrichs are microscopic organisms that live in ponds, lakes, or seashore sands. Most have a definite head, a narrower neck, and a trunk that ends in a pair of projections, or rami, containing adhesive glands. The external surface is covered with bristles or plates except on the ventral (under) surface, which is ciliated. The digestive tract consists of a muscular pharynx and a straight stomach-intestine. In freshwater forms flagellated cells called solenocytes open into two protonephridial (excretory) tubules. Details of the reproductive system are not well known, but the excretory, reproductive, and digestive systems do not unite to form a cloaca. Although some gastrotrichs are hermaphroditic, all freshwater forms are females. They produce eggs that develop without fertilization, and some produce thin-walled and thick-walled eggs much like rotifers. Most gastrotrichs have a low reproductive potential, since they are never very abundant, they are not influential in their habitats. They feed on bacteria, algae, protozoa, and organic detritus.

Class Kinorhyncha Containing about 100 species of tiny worms, the class Kinorhyncha is widely distributed in tidal mudflats or shallow, muddy-bottomed marine habitats. The kinorhynch body is divided into 13 or 14 segments, each covered with a heavy cuticle and equipped with characteristic spines. The first segment is a bristly head that can be protruded or withdrawn. Using its head as an anchor, the creature ploughs through the mud pulling its body after it. Kinorhynchs have a relatively complex digestive system, a protonephridial (excretory) system, and a relatively simple reproductive system, no cloaca is formed. Sexes are separate, and the young hatch with three segments, new ones being added as they

grow. They feed on mud, extracting its organic content. Nothing is known of their ecological importance.

Class Nematoda Largest of the aschelminths, the class Nematoda contains thousands of known species, and many more predicted species. Nematodes live in the soil and in other terrestrial habitats as well as in freshwater and marine environments. Many are parasites of plants and animals, including man. The elongated, unsegmented nematode body is covered by a cuticle. The head is poorly developed, either mouth or pharynx may contain parts used to pierce or wound plant or animal tissues. The straight stomach-intestine ends in a short rectum. Nematodes have a unique excretory system consisting, in simpler species, of one or two one-celled glands called renette cells and, in more highly specialized forms, of longitudinal excretory ducts. The excretory physiology of the class is not well understood. The reproductive system is complex, and many parasitic species have a very high reproductive potential. Some nematodes produce live young, the eggs having matured in the female reproductive tract, but most release eggs, the larvae of which molt one or more times before reaching maturity. Nematodes, found in the soil as well as in decaying vegetable and animal matter, are often very abundant. Many of the soil-inhabiting types attack plant roots, making them economically significant. Nematodes are among the most successful of invertebrates in terms of their individual numbers and the number of species. Among the important human parasites are *Ascaris* (roundworms), hookworms, microfilaria, which live in the blood or in the lymphatic system, and *Trichinella*, whose larvae invade muscle tissue. **Class Nematomorpha** The nematomorphs, or horsehair worms, are very slender, elongated creatures found in ponds and streams, whose larvae live as parasites. They emerge as adults for a brief time, then mate and die. Adults are simplified externally and internally, they have no excretory or circulatory systems and only a vestigial digestive tract. The female produces long strings of eggs. After hatching, the larva penetrates any convenient aquatic animal, but its development stops until it has found its way into an appropriate host, typically an insect. The adult nematomorph emerges when the host is in or near water, it molts once after emerging and takes up its brief adult existence. A few species are marine and live as larvae in crabs or shrimps.

Aschersleben (a'shærslā'ban), city (1970 pop. 37,196), Halle district, W East Germany. An industrial city, it manufactures machine tools, chemicals, iron and steel, and woolen goods. There are lignite, salt, and potash mines nearby. Aschersleben was probably founded in the 11th cent. and passed to Prussia in 1813.

ascidian: see CHORDATA, TUNICATE

Asclepius (äsklē'pēās), Lat. *Aesculapius* (ēs'kālā-pēās), legendary Greek physician, son of Apollo and Coronis. His first teacher was the wise centaur Chiron. When he became so skillful in healing that he could revive the dead, Zeus killed him. Apollo persuaded Zeus to make Asclepius the god of medicine. The worship of Asclepius is believed to have originated in Thessaly. Temples were built to him at Epidaurus, Cos, Pergamum, and many other places, where treatments, including massage and baths, were given to the sick. The serpent and the cock were sacred to Asclepius. People who claimed descent from him and those who followed his teachings were known as Asclepiads.

Ascoli Piceno (a'skölē pēchē'nō), city (1971 pop. 55,053), capital of Ascoli Piceno prov., Marche region, central Italy, at the confluence of the Castellano and Tronto rivers. It is the market for a rich agricultural area. A Roman settlement with extensive Roman remains, the city became a free republic in the 12th cent. and passed to papal control in the 15th cent.

Ascomycete: see FUNGI

ascorbic acid: see VITAMIN

Ascot (ä'skät), village, Berkshire, S central England. The famous horse races instituted by Queen Anne in 1711 are held annually in June on Ascot Heath.

Asculum (ä'skyööləm), ancient town, Apulia, SE Italy, 18 mi (29 km) S of Foggia, on a branch of the Appian Way. Here Pyrrhus won a hard-fought battle against the Romans in 279 B.C. Modern Ascoli Satriano is in the region. The name also appears as Ausculum.

Asenath (äs'anäth), Poti-pherah's daughter, the Egyptian wife of Joseph, mother of Manasseh and Ephraim. Gen. 41:45, 50-52, 46:20. Her marriage is the subject of Joseph and Asenath, one of the PSEUD-EPICRAPH.

Asenovgrad (äsänöw'grät), city (1968 est. pop. 38,100), S central Bulgaria. It is a commercial center, with wineries and tobacco manufactures. An ancient Bulgarian stronghold, it became a trade center under Turkish rule (15th-19th cent.). Asenovgrad has several 16th-century churches and the ruins of a 13th-century castle. The city was formerly known as Stanimaka.

asepsis: see ANTISEPTIC

Aser (ä'sar), variant of ASHER

Asfa Wossen (as'fa wöös'sän), 1916-, Ethiopian crown prince. He was proclaimed crown prince and heir shortly after his father, Haile Selassie, became emperor of Ethiopia in 1930. In Dec., 1960, he was placed on the throne briefly during a coup against his father aimed at establishing a constitutional monarchy. He was absolved of all connection with the coup, which was immediately put down. Partially paralyzed by a stroke in 1972, he was living in Switzerland when Haile Selassie was deposed by the military in 1974.

Asgard (äs'gard), in Norse mythology, home of the gods, also known as Aesir. It consisted of luxurious palaces and halls, in which the gods (whose chief was Odin) dwelled, conferred, and banqueted. One of the most beautiful of these halls was VALHALLA. Entrance to Asgard could be gained only by crossing the rainbow bridge Bifrost, which was guarded by Heimdall, the watchman of the gods. See also GERMANIC RELIGION.

Ásgiersson, Ásgeir (as'kēr as'kērsōn), 1894-1972, Icelandic statesman, president of Iceland (1952-68). He was a member of the Icelandic parliament from 1923 to 1952, headed the government bureau of education (1926-31, 1934-38), and served as minister of finance (1931-34) and prime minister (1932-34). He was (1946-52) governor of the International Monetary Fund. In 1952 he was elected president of Iceland and was reelected in 1956, 1960, and 1964.

ash, in botany, any plant of the genus *Fraxinus* of the family Oleaceae (OLIVE family), trees and shrubs mainly of north temperate regions. The ashes are characterized by small clusters of greenish flowers and by fruits with long "wings" to aid in wind dispersal. The most valuable of the species used for hardwood timber is the white ash (*F. americana*), ranging from Nova Scotia to Minnesota and Texas. Its strong, durable wood is used for sporting goods, furniture, tool handles, and oars. The bark of the blue ash (*F. quadrangulata*) yields a blue dye, the Mediterranean flowering ash (*F. ornus*) is the source of commercial MANNA. The name flowering ash is also applied to a shrubby species (*F. cuspidata*) of the California canyon chaparral and to the fringe tree (genus *Chionanthus* of the same family) of North America and China. The MOUNTAIN ASH and PRICKLY ASH are not true ashes. Ashes are classified in the division MAGNOLIOPHYTES, class Magnoliopsida, order Scrophulariales, family Oleaceae.

ash, in chemistry, solid residue of combustion. The chemical composition of an ash depends on that of the substance burned. Wood ash contains metal carbonates (e.g., potassium carbonate) and oxides formed from metals originally compounded in the wood. Coal ash usually has a high content of minerals and is sometimes contaminated with rock, during combustion the mineral matter may become partially fused, forming cinders or clinker. Bone ash is largely made up of calcium phosphate. Seaweed ash (called kelp or varec) contains sodium carbonate, potassium carbonate, and iodine that can be extracted. Fly ash is very fine ash produced during the combustion of many materials.

Ashan (ä'shän), unidentified town of S Palestine, perhaps the same as CHOR-ASHAN, Joshua 15:42, 19:7, 1 Chron. 4:32, 6:59.

Ashanti (ashan'tē) or **Asante**, historic and present-day administrative region, central Ghana, W Africa. The region is the source of much of Ghana's cocoa. It is inhabited by the Ashanti, an Akan, matrilineal people, who constitute one of Ghana's major ethnic groups. Before the 13th cent., Akan peoples migrated into the forest belt of present-day Ghana and established small states in the hilly country in the neighborhood of modern Kumasi. By the late 17th cent. the states had been welded by the Oyoko clan into the Ashanti confederation, with the capital at Kumasi and the Oyoko chieftain as king. After subduing neighboring states the confederation came into conflict with the British settlements on the coast, although treaties of friendship had been negotiated in 1817 and 1820. A series of Anglo-Ashanti wars in the 19th cent. culminated in the defeat of the confederation (1896) and the annexation of

Ashanti (1901) to the British Gold Coast colony. The British exiled the ruling king, Pempeh I, to the Seychelles and, in spite of great resistance, broke up the confederation. It was restored in 1935. In 1945 the Ashanti were given representation in the executive and legislative councils of the Gold Coast. They supported an unsuccessful attempt to give Ghana a federal constitution in 1954 and resisted the centralizing measures of the Nkrumah government. The Ashanti are noted for the quality of their gold work and their colorful kente cloth, and were long famous for the gold-encrusted stool that was the symbol of their sovereignty. See R. A. Lystad, *The Ashanti* (1958, repr. 1968).

Ashbea (äshbē'a), name of either a person or a place. 1 Chron. 4:21.

Ashbel (äsh'bēl), son of Benjamin. Gen. 46:21, Num. 26:38, 1 Chron. 8:1.

Ashbery, John, 1927-, American poet and art critic, b. Rochester, N.Y., grad. Harvard, 1949, M.A. Columbia, 1950. His poems are experimental, with logical narrative and a strong visual sense. Among his volumes of poetry are *Some Trees* (1956), *The Double Dream of Spring* (1970), and *Three Poems* (1972). He has also written a play, *The Compromise* (1960). Since 1960, Ashbery has been art critic for the Paris edition of the *Herald Tribune*. He is also editor of the quarterly *Art and Literature*.

Ashburton, Alexander Baring, 1st Baron: see BARING, family

Ashburton, John Dunning, 1st Baron: see DUNNING, JOHN, 1ST BARON ASHBURTON

ashcan school: see EIGHT, THE

Ashchenaz: see ASHKENAZ

Ashdod [Heb. =stronghold], city (1972 pop. 40,500), SW Israel, on the Mediterranean Sea. It is Israel's leading port after Haifa. Construction is Ashdod's main industry; its manufactures include synthetic fibers, woolen yarn, and knitted goods. Nearby is the site of ancient Ashdod, which was settled as early as the Bronze Age. Conquered by the Philistines in the 12th cent. B.C., it became an important city of the Philistine Pentapolis and a center for the worship of Dagon. The city was later ruled by Judah, Egypt, and Assyria. The Jews of Ashdod had been considered idolatrous by other Jews since the time of the return to Jerusalem (6th cent. B.C.), but they were cleansed by Judas Maccabeus in 163 B.C. Jonathan (see JONATHAN 15), the brother of Judas Maccabeus, took the city in 148 B.C. and destroyed the temple of Dagon. Ashdod was revived by the Romans and was an early Christian center (1 Sam. 5:1, Joshua 15:47, 2 Chron. 26:6, Neh. 4:7, 13:23, Isa. 20:1, Jer. 25:20, 1 Mac. 5:68, 10:84, Acts 8:40). The first modern Israeli settlement in Ashdod was made in 1955, and in 1965 the deepwater port was completed.

Ashdodth-pisgah (äsh'döth-piz'gä), unidentified portion of Mt. Pisgah. The term occurs three times in AV, translated in RV "slopes of Pisgah." Deut. 3:17, Joshua 12:3, 13:20. The same Hebrew expression is translated in Deut. 4:49 "springs of Pisgah" in AV, but RV translates it again as "slopes of Pisgah."

Ashe, Arthur Robert, 1943-, American tennis player, b. Richmond, Va. The first black American male to reach prominence in tennis, Ashe received a tennis scholarship from UCLA in 1962. In 1968 he was the first black U.S. Open champion, and in 1970 he won the Australian Open. Denied a visa by South Africa on racial grounds in 1970, Ashe forced the issue, appearing before the United Nations and urging the World Tennis Union to expel South Africa because of its apartheid policy. Ashe ultimately competed in South Africa in 1973.

Ashe, John, c. 1720-1781, American Revolutionary general, b. Brunswick co., N.C. Speaker of the colonial assembly (1762-65) and a leader of the opposition to the Stamp Act, he was important to the patriot cause in North Carolina. On March 3, 1778, Ashe, a major general commanding North Carolina troops, was defeated by British regulars at Briar Creek, a tributary of the Savannah. The British hold on Georgia was thereby strengthened.

Asheboro (äsh'bära), town (1970 pop. 10,797), seat of Randolph co., central N.C., in the Piedmont, inc. 1796. Its manufactures include hosiery, textiles, clothing, furniture, flashlight batteries, and electric blankets. A prehistoric Keyauwee Indian burial ground is nearby.

Ashendene Press, founded in 1895 at Ashdene, Hertfordshire, England, by Sir C. H. St. John Hornby and moved in 1899 to Chelsea, London. It was a leader (with the KELMSCOTT PRESS and the DOWS PRESS) in the 19th-century revival of fine English printing. Its edition of Dante (1909) is considered an

achievement comparable to the Kelmscott Chaucer by William MORRIS. The Subiaco type used by the Ashendene Press was designed by Sir Emery Walker and S C Cockerell from an early Italian typeface. The Ashendene Press, which set all of its editions by hand, issued 40 books in the years from 1895 to 1915 and from 1920 to 1935. See Will Ransom, *Kelmscott, Doves, and Ashendene* (1952).

Asher (ăsh'ər) [Heb. = happy, Gen. 30:12,13]. 1 Tribe of Israel. Its eponym was Jacob's eighth son. It occupied the northwestern part of Palestine, and its position laid Asher open to influence from other nations and attacks by them. It seems to have become insignificant early in Jewish history. The name occurs in Egyptian inscriptions. Gen. 30, Deut. 33:24, Joshua 19:24-31, Judges 5:17,18. Aser. Luke 2:36, Rev. 7:6. 2 Unidentified place near Shechem. Joshua 17:7.

Asherah (ăsh'ərə) or **Asheroth** (-rōth), Canaanite fertility goddess and the symbol that represented her. After the prophets denounced her cult, it was abolished among the Hebrews. By an ancient mistake AV translates the name as "groves." Judges 3:7, 1 Kings 15:13-14, 18:19, 2 Kings 21:7, 23:4, 2 Chron. 15:16, Jer. 17:2.

Asheville, city (1970 pop. 57,681), seat of Buncombe co., W. N.C., on the French Broad and the Swannanoa rivers and on a plateau in the Blue Ridge Mts., inc. 1797. Located near Great Smoky Mountains National Park and Pisgah National Forest, Asheville is a popular mountain resort. Tourism is a major business. The city is also a financial, distribution, transportation, and retail center for W. North Carolina; tobacco is processed and marketed, and lumber, electronic equipment, textiles, clothing, and paper, food, and glass products are made in Asheville. Local artisans weave wool and make pottery. Asheville's many points of interest include the magnificent Vanderbilt estate, Biltmore, Colburn Mineral Museum, and numerous recreational and scenic attractions. The writer Thomas Wolfe was born and lived in Asheville; his home is a public memorial. The Univ. of North Carolina at Asheville is in the city.

Ashi or **Asser**, **Rab** (a'shē, as'ər), 352-428, Hebrew scholar of Babylon. He headed the Jewish academy at Sura and devoted his life to editing the Talmud, aided by many of the distinguished scholars he had attracted to Sura. The work was completed by his pupil Rabina II c. 500.

Ashikaga (a'shēka'ga), city (1970 pop. 156,004), Tochigi prefecture, central Honshu, Japan. An old silk-weaving center, it is famous for its spinning and silk textile industries. The city is also the ancestral home of the Ashikaga shoguns (1336-1568). It has an ancient school (probably founded 9th cent.), which is known for its vast library of Chinese classics. Ashikaga's 12th-century temple is treasured by the Japanese.

Ashima (ăsh'īma, ăsh'īma), god whose cult flourished in Hamath. 2 Kings 17:30.

Ashingdon, battle of: see ASSANDUN, BATTLE OF.

Ashiya (ăshē'ya), city (1970 pop. 70,938), Hyogo prefecture, W. central Honshu, Japan, on Ōsaka Bay. It is a residential and industrial suburb of Ōsaka.

Ashkelon: see ASHQELON, Israel.

Ashkenaz (ăsh'kēnăz'), eponym of a people perhaps localized in Armenia. He was grandson of Japheth. Gen. 10:3. Ashkenaz. 1 Chron. 16, Jer. 51:27. In modern times the term *Ashkenazim* refers to the German Jews as distinguished from the Sephardim, the Jews of Spain and Portugal.

Ashkhabad (ăsh'kăbăd', ăsh'kăbăd', Rus. ăshkăbăd'), city (1970 pop. 253,000), capital of the Turkmen Soviet Socialist Republic, 5 Central Asian USSR, on the Trans-Caspian RR. The city has textile, motion picture, and machine-building industries. Ashkhabad was founded in 1881 as a fortress. An earthquake in 1948 virtually destroyed the city, which stands in a major fault zone. The Turkmen Academy of Sciences is in Ashkhabad.

Ashland. 1 Uninc. town (1970 pop. 14,810), Alameda co., W. Calif. 2 Industrial city (1970 pop. 29,245), Boyd co., E. Ky., on terraces along the Ohio River near the influx of the Big Sandy, settled 1786, inc. 1854. In a region yielding coal, clay, natural gas, and timber, it is a river and railroad shipping point, with large repair yards. The city is part of a tri-state metropolitan area (embracing also Ironton, Ohio, and Huntington, W. Va.) that is known for its metallurgical industries. In addition to iron and steel, Ashland's many manufactures include coke, refined oil, chemicals, leather products, clothing, and mining equipment. A junior college is located there. 3 City (1970 pop. 19,872), seat of Ashland co., N.

Ohio, in a farm area, inc. 1844. Pumps, spray equipment, rubber products, adhesives, printed materials, animal medications, and machine tools are among its manufactures. Ashland College is there. 4 City (1970 pop. 12,342), Jackson co., SW Oregon, near the Calif. line, inc. 1874. A lumbering center and a processing and shipping point for an irrigated dairy, farm, and orchard area, it is also a resort with mineral springs. It is surrounded on three sides by the Rogue River National Forest. Southern Oregon College, a college of art, and a museum of natural history are located in the city. A Shakespeare festival is held each spring and summer.

Ashley, Anthony Ashley Cooper, Baron: see SHAFTESBURY, ANTHONY ASHLEY COOPER, 1ST EARL OF.

Ashley, William Henry, c. 1778-1838, American fur trader and politician, b. Virginia. In 1820 he was elected lieutenant governor of Missouri. He sent fur-trading expeditions up the Missouri River to the Yellowstone in 1822 and 1823; the parties included Jedediah Smith and other MOUNTAIN MEN. A detachment of the second party under Thomas Fitzpatrick went through South Pass to the Green River valley. In 1825, Ashley accompanied another expedition that crossed from the upper Platte to Green River and began its exploration. In its valley he held the first rendezvous of the mountain fur traders and trappers. In 1826 he led an expedition that reached the vicinity of Great Salt Lake. Having acquired an ample fortune, he retired from the fur trade and devoted himself to politics. He was defeated for the governorship of Missouri in 1824 and 1836, but from 1831 to 1837 was U.S. Representative and an able advocate of measures favorable to Western development. See H. C. Dale, *The Ashley-Smith Explorations* (1918), Bernard De Voto, *Across the Wide Missouri* (1948).

Ashmodai (ăsh'mōdă'ī), DEMON, probably ASMODEUS.

Ashmole, Elias (ăsh'mōl'), 1617-92, English archaeologist and antiquary. He made exhaustive antiquarian studies, especially *The Institution, Laws and Ceremonies of the Order of the Garter* (1672) and *The Antiquities of Berkshire* (3 vol., 1719). In 1677 he donated to Oxford Univ. a collection of curiosities, including his own contributions and those bequeathed to him by a friend. His gift formed the nucleus of the Ashmolean Museum (ăshmō'lēən), the first such public institution in England. He later donated his library to Oxford, and the whole was housed in a building erected by Sir Christopher Wren. The collection is now in a 19th-century building and includes European works of art from medieval to present times as well as Oriental works. See his *Autobiographical and Historical Notes and Correspondence*, ed. by C. H. Josten (1967).

Ashmun, Jehudi, 1794-1828, U.S. agent to Liberia, b. Champlain, N.Y. After entering the Congregationalist ministry and spending a few years in teaching and editorial work, he was sent by the AMERICAN COLONIZATION SOCIETY to Liberia. He found the colony ridden with fever, short of supplies, and threatened by native attack. Ashmun with a handful of men repulsed the attacks, and for the next six years, despite severe hardships, he built up the colony. He wrote *History of the American Colony in Liberia from December 1821 to 1823* (1826). See biography by R. R. Gurley (1835, repr. 1971).

Ashmunayn, Egypt: see HERMOPOLIS MAGNA.

Ashnah (ăsh'nă), two unidentified towns of Palestine, W. of Jerusalem. Joshua 15:33,43.

Ashokan Reservoir (ăshō'kən), 13 sq mi (34 sq km), SE N.Y., completed 1912. It is supplied by the Esopus and Schoharie watersheds and provides part of New York City's water supply. Water is carried to the city via the 92-mi-long (148-km) Catskill Aqueduct. Completed in 1917, the aqueduct delivers water to Kensico Reservoir near White Plains and Hillview Reservoir in Yonkers, from where it is distributed to parts of New York City through tunnels cut in solid rock. The aqueduct passes 1,114 ft (340 m) under the Hudson River at Storm King Mt. A steel pipe under the Narrows of New York Bay carries water to Silver Lake, Staten Island, 120 mi (193 km) from Ashokan Reservoir.

Ashpenaz (ăsh'pēnăz), Nebuchadnezzar's chief eunuch. Dan. 1:3.

Ashqelon (ăsh'kəlōn), city (1972 pop. 43,100), SW Israel, on the Mediterranean Sea. It is a beach resort in an area of citrus groves and cotton plantations. Ashqelon's industries process agricultural products and manufacture cement, wood products, automobile parts, electronic equipment, and watches. Nearby is the site of ancient Ashqelon, or Ashkelon, whose history dates back to the 3d millennium B.C. It

was a trade center and port and a seat of worship of the goddess Astarte. Ancient Ashqelon was conquered by the PHILISTINES in the late 12th cent. B.C., completely rebuilt, and made one of the cities of the Philistine pentapolis (Judges 14:19, Jer. 25:20, Amos 1:8. Askalon. 1 Sam. 6:17. Eshkalon. Joshua 13:3). Ashkelon flourished under the Greeks and Romans, HEROD, believed to have been born there, greatly enlarged the city. It was taken by the Arabs in A.D. 638, conquered by the Crusaders in 1153 and occupied by RICHARD I in 1191, and completely destroyed by Muslims in 1270. An Israeli settlement was established there in 1948. In 1955 the modern city of Ashqelon was founded when Afridar, a town established by South African Jews in 1952, and Migdal, a former Arab town, were merged. A national park in Ashqelon includes Greek and Roman ruins and the remains of ancient synagogues. A Roman tomb (3d cent.) decorated with frescoes, the ruins of a Byzantine church, and a wall built by Crusaders are also in the city.

Ashtabula (ăsh'tabyōō'la), city (1970 pop. 24,313), Ashtabula co., NE Ohio, on Lake Erie at the mouth of the Ashtabula River, settled c. 1801 by New Englanders, inc. as a village 1831, as a city 1891. It is a port of entry on the St. Lawrence Seaway and receives large amounts of iron ore bound for Pittsburgh. Coal is also shipped. Ashtabula manufactures automobile parts, chemicals, fiberglass products, farm tools, clothing, and electric motors. A campus of Kent State Univ. is in the city.

Ashtaro (ăsh'tārōth), 1 Hebrew form of the name of the goddess ASTARTE. 2 City of Bashan, the modern Tell Ashtarh (Syria), E. of the Jordan. Joshua 9:10, 12:4, 13:12,31, 1 Chron. 6:71. Ashtaroth. Deut. 14:8. Esch-terah, an otherwise unidentified town, was probably the same. Joshua 21:27.

Ashteroth Karnaim (ăsh'tērōth karnă'im), place, E. of the Jordan. Gen. 14:5. It is possibly the same as Carnaim in 1 Mac. 5:43,44, and Carnion in 2 Mac. 12:21.

Ashton, Sir Frederick, 1906-, British choreographer and dancer, b. Guayaquil, Ecuador. He studied dance in England with Leonide Massine and Marie Rambert and staged his first work there in 1926. He joined what was later to become the Sadler's Wells Ballet (now the Royal Ballet) in 1935 as chief choreographer, and later became associate director and then director of the company. His mature works are noted for their lyricism, quiet charm, and precision. They include abstract ballets, such as *Symphonic Variations* (1946), short dramatic works, such as *Daphnis and Chloe* and *Tiresias* (both 1951), and full-length traditional ballets, such as *Cinderella* (1948), *Sylvia* (1952), *Ondine* (1958), and *The Dream* (1964). He has also appeared as a dancer in comedy and character roles.

Ashton-under-Lyne, municipal borough (1971 pop. 48,865), Lancashire, NW England, on the Tame River. Its industries include cotton spinning, weaving, and dyeing, coal mining, and the manufacture of diesel, gas, and oil engines. In 1974, it became part of the new metropolitan county of Greater Manchester.

Ashton-Warner, Sylvia, 1905-, British teacher and novelist, b. Stratford, New Zealand. For years a teacher of Maori children, Ashton-Warner developed many stimulating educational methods about which she wrote in the treatise *Teacher* (1963) and her autobiography *Myself* (1967). Her success as a teacher was the result of her thorough commitment to her work and to her conviction that communication, mutual response, is the most important aspect of teaching. *Spearpoint Teacher in America* (1972) recounts her experiences teaching in an experimental school in the United States. Ashton-Warner's novels are written in an exotic, rather florid style and usually concern strong, passionate women. They include *Spinster* (1958), *Incense to Idols* (1960), *Bell Call* (1964), *Greenstone* (1967), and *Three* (1970).

Ashtoreth (ăsh'tōrēth), Hebrew form of ASTARTE.

Ashur (ăsh'ər), founder of Tekoa. 1 Chron. 2:24, 4:5.

Ashur (ăsh'ōor), chief god of Assyria. Important as a god of war, he became the omniscient king of the pantheon, replacing the Babylonian Marduk. His name appears variously as Asur, Assur, Ashshur, Ashshur, and Ashir.

Ashurbanipal: see ASSURBANIPAL.

Ashurites (ăsh'ərīts), unidentified people mentioned in the Bible. 2 Sam. 2:9. There are two possible interpretations: (1) the Geshurites, as the Vulgate indicates, or (2) the house of Asher.

Ashurnasirpal II (ā'shōōrnā'zīrpāl), d. 860? B.C., king of ancient Assyria (884-860? B.C.), also called Ashurnazirpal II and Assurnasirbal II. One of the earliest of the Assyrian conquerors, he gained territory as far west as the Mediterranean. In initiating a system of installing Assyrian governors in conquered lands, Ashurnasirpal helped to create a centralized state. Excavations of the palace and temple built by Ashurnasirpal at CALAH revealed many bas-reliefs portraying the king's conquests in a narrative style. He was succeeded by his son Shalmaneser III.

Ashvath (āsh'vāth), Asherite 1 Chron 7:33

Ash Wednesday, in the Western Church, the first day of LENT, being the seventh Wednesday before Easter. On this day ashes are placed on the foreheads of the faithful to remind them of death, of the

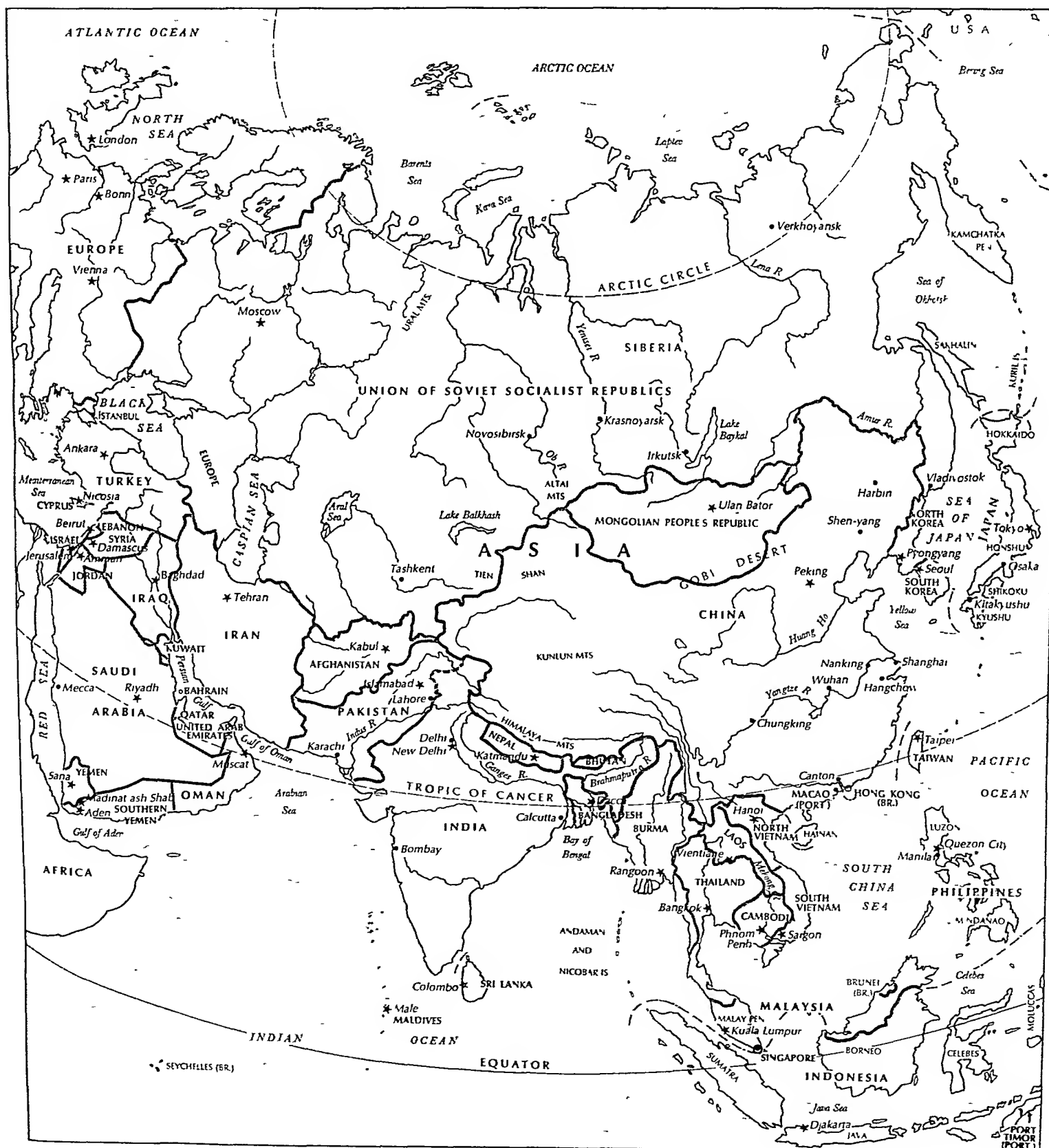
sorrow they should feel for their sins, and of the necessity of changing their lives. This practice dates from the early Middle Ages.

Asia, the world's largest continent, 17,139,000 sq mi (44,390,000 sq km), with about 2,044,000,000 people, more than half the world's total population.

Boundaries Asia's border with Europe—which, geographically, may be regarded as a peninsula of the Eurasian landmass—lies approximately along the Urals, the Ural River, the Caspian Sea, the Caucasus, the Black Sea, the Bosphorus and Dardanelles straits, and the Aegean Sea. The connection of Asia with Africa is broken only by the Suez Canal between the Mediterranean Sea and the Red Sea. In the far northeast of Asia, Siberia is separated from North America by the Bering Strait. The continent of Asia

is washed on the S by the Gulf of Aden, the Arabian Sea, and the Bay of Bengal, on the E by the South China Sea, East China Sea, Yellow Sea, Sea of Japan, Sea of Okhotsk, and Bering Sea, and on the N by the Arctic Ocean.

Physical Environment Geologically, Asia consists essentially of ancient Precambrian rocks—the Arabian and Indian peninsulas in the south and the central Siberian plateau in the north—which enclose a central zone of folded ridges. In accordance with this underlying structure, Asia falls into the following major physiographic structures: the northern lowlands covering W central Asia and most of Siberia, the vast central highland zone of high plateaus, rising to c. 15,000 ft (4,570 m) in Tibet and enclosed by some of the world's greatest mountain ranges (the



Himalayas, the Karakorum, the Kunlun, the Tien Shan, and the Hindu Kush), the southern peninsular plateaus of India and Arabia, merging, respectively, into the Ganges and Tigris-Euphrates plains, and the lowlands of E Asia, especially in China, which are separated by mountain spurs of the central highland zone. Mt Everest (29,028 ft/8,848 m), in Nepal, is the world's highest peak, the DEAD SEA (1,292 ft/394 m below sea level) is the world's lowest point. Great peninsulas extend out from the mainland, dividing the oceans into seas and bays, many of them protected by Asia's numerous offshore islands. Asia's rivers, among the longest in the world, generally rise in the high plateaus and break through the great chains toward the peripheral lowlands. They include the Ob, Yenisei, and Lena of Siberia, the Amur, Huang Ho, Yangtze, Si, Mekong, Salween, and Irrawaddy of E and SE Asia, and the Ganges-Brahmaputra, Indus, and Tigris-Euphrates of S and SW Asia. Central Asia has vast areas of interior drainage, including the Amu Darya, Syr Darya, Ili, and Tarim rivers, which empty into inland lakes or disappear into desert sands. The Aral Sea, Lake Balkhash, and Lake Baikal are among the world's largest lakes. Climatically, the continent ranges through all extremes, from torrid heat to arctic cold and from torrential rains (the product of monsoons) to extreme aridity (as in the Tarim Basin).

Regions. Asia can be divided into five regions, each possessing distinctive physical, cultural, economic, and political characteristics. Southwest Asia (Iran and the nations of ASIA MINOR, the FERTILE CRESCENT, and the ARABIAN PENINSULA), long a strategic crossroads, is characterized by an arid climate and irrigated agriculture, great petroleum reserves, and the predominance of Islam. South Asia (Afghanistan and the nations of the Indian subcontinent) is isolated from the rest of Asia by great mountain barriers and was once entirely under British rule. Southeast Asia (the nations of the southeastern peninsula and the East Indian archipelago) is characterized by monsoon climate, maritime orientation, the fusion of Indian and Chinese cultures, and a great diversity of ethnic groups, languages, religions, and politics. East Asia (China, Mongolia, Korea, and the islands of Taiwan and Japan) is located in the mid-latitudes on the Pacific Ocean, has a strong indigenous culture, and forms the most industrialized region of Asia. Soviet Asia (in the W central and northern third of the continent) accounts for about 75% of the area of the USSR and is the largest section of Asia controlled by one nation. Nomadic tribes have been settled and united under Soviet rule, and agricultural settlement and industrialization are progressing steadily.

Population, Economy, and Culture. The distribution of Asia's huge population is governed by climate and topography, with the monsoons and the fertile alluvial plains determining the areas of greatest density. Such are the Ganges plains of India and the Yangtze and northern plains of China, the small alluvial plains of Japan, and the fertile volcanic soils of Java and Indonesia. Urbanization, a concomitant of industrialization, is greatest in Japan, India, China, and Soviet Asia. Primitive hunting and fishing economies prevail in the forest regions of N and S Asia, and nomadic pastoralism in the central and southwestern regions, while industrial complexes are found in the coastal plains and rivers of S and E Asia. Because of extremes in climate and topography, less than 10% of Asia is under cultivation. Rice, by far the most important food crop, is grown for local consumption in the heavily populated countries (e.g., China, India, Bangladesh, and Japan), while countries with smaller populations (Burma, Thailand, Cambodia, and South Vietnam) are generally rice exporters. Other important crops are wheat, soybeans, peanuts, sugarcane, cotton, jute, silk, rubber, and tea. Asia's economy is predominantly agricultural, but regions where power facilities, trained labor, modern transport, and access to raw materials are available have developed industrially. Japan, China, Soviet Asia, India, North and South Korea, Taiwan, and Turkey are distinguished for their industrialization. In most of these countries, an iron and steel industry has grown on the basis of local coal and iron resources. Japan, the world's third largest steel producer, is the major exception. Contributing greatly to the income of Asian countries are vital mineral exports—petroleum in SW Asia, Soviet Asia, and Indonesia and tin in Malaysia, Thailand, and Indonesia. Asia's other valuable mineral exports include manganese from India and chromite from Turkey and the Philippines. China produces great amounts of tungsten and antimony.

The development of railroads is greatest in the industrialized countries, with Japan, India, China, and Soviet Asia having the greatest track mileage. Almost two thirds of Asia's indigenous population belongs to the Mongoloid groups. Major religions are Hinduism (in India), Buddhism (in Sri Lanka, Burma, Thailand, Cambodia, and Laos in its purest form, in Tibet and Mongolia as Lamaism, or Tibetan Buddhism, in China as an eclectic mixture with Confucianism and Taoism, in Japan as a mixture with Confucianism and Shinto), Islam (in SW and S Asia, W central Asia, and Indonesia), and Roman Catholicism (in the Philippines and South Vietnam).

Outline of History. Asia was the site of some of the world's oldest civilizations. The empires of Sumeria, Babylonia, Assyria, Media, and Persia and the civilizations of Islam flourished in SW Asia, while in the east the ancient civilizations of India, China, and Japan prospered. Later, nomadic tribes (Huns, Tatars, and Turks) in N and central Asia gave rise to great westward migration. Their tribal, military-state organizations reached their highest form in the 13th–14th cent. under the Mongols, whose court was visited by early European travelers, notably the Italian Marco Polo. The Portuguese explorer Vasco da Gama reached India by sea in 1498, and in N Asia Russian Cossacks crossed Siberia and reached the Pacific by 1640. With the formation of English, French, Dutch, and Portuguese trading companies in the 17th cent., great trade rivalry developed along the coasts of India, SE Asia, and China and resulted in increasing European colonial control of Asian lands. In the 19th cent. China and Japan opened their doors to foreign trade, with Japan rapidly rising to a world industrial and military power. World War II and the conflicts of its aftermath hit Asia heavily. In the postwar years, the center of gravity in international affairs tended to shift from Europe, the focus of both World Wars, to Asia, where the decolonization process resulted in the creation of many unstable nations. The Arab-Israeli conflict, the Korean War, and the emergence of Communist-ruled China, North Korea, and North Vietnam, were among the events that heightened tensions in Asia. In the 1950s the Western powers built up military alliances (the Baghdad Pact—later the Central Treaty Organization—in the Middle East, and the Southeast Asia Treaty Organization—SEATO) to help contain Soviet and Chinese domination of Asia. In the 1960s, however, the Sino-Soviet rift appeared to lessen the possibility of joint Communist efforts in Asia. At the end of World War II the United States, Britain, France, and the Netherlands were the chief outside influences in Asia, but in the postwar period India, Japan, and other Asian nations sought a more independent role on the world scene. In the 1960s the British decision to withdraw "east of Suez" and the U.S. determination in the wake of the Vietnam War to decrease its military presence in Asia foreshadowed new power alignments in the area. China's growing strength and increasing involvement in Asian affairs and the Soviet drive to expand relations with Asian states (particularly India and the Middle East Arab nations) became increasingly evident in the early 1970s. Among the conditions determining Asia's political future are the outcome of the long-simmering Arab-Israeli conflict in the Middle East, the relationships in the Indian subcontinent among India, Pakistan, and the new nation of Bangladesh, the resolution of the Vietnam War, with its implications for all Indochina, and the foreign policies of the United States, the USSR, China, Japan, and other countries with large stakes in Asia. See G. B. Cressey, *Asia's Lands and Peoples* (3d ed. 1963), W. Bingham, *A History of Asia* (1964), J. Romein, *The Asian Century* (1965), L. D. Stamp, *Asia: A Regional and Economic Geography* (rev. ed. 1967), C. A. Buss, *Asia in the Modern World* (1968), G. Wint, *Asia: A Handbook* (1967), R. G. Wilson, *Asia Awakes* (1970), W. G. East, O. K. Spate, and C. A. Fisher, ed., *The Changing Map of Asia* (5th ed. 1971), R. Grousset, *The Empire of the Steppes: A History of Central Asia* (1971), J. K. Fairbank, E. D. Reischauer, and A. M. Craig, *East Asia: Tradition and Transformation* (1973).

Asia Minor, great peninsula, c. 250,000 sq mi (647,500 sq km), extreme W Asia, generally coterminous with Asian Turkey, and usually synonymous with Anatolia. It is washed by the Black Sea in the north, the Mediterranean Sea in the south, and the Aegean Sea in the west. The Black and Aegean seas are linked by the Sea of Marmara and the two straits of the Bosphorus and the Dardanelles. Near the southern coast of Asia Minor are the Taurus Mts.,

the rest of the peninsula is occupied by the Anatolian plateau, which is crossed by numerous mountains interspersed with lakes. In ancient times most Oriental and Occidental civilizations intersected in Asia Minor, for it was connected with Mesopotamia by the Tigris and Euphrates rivers and with Greece by the Aegean and Mediterranean seas. The Hittites established the first major civilization in Asia Minor about 1800 B.C. Beginning in the 8th cent. B.C. Greek colonies were established on the coast lands, and the Greeks thus came into contact with Lydia, Phrygia, and Troy. The conquest (6th cent. B.C.) of Asia Minor by the Persians led to the Persian Wars. Alexander the Great incorporated the region into his empire, and after his death, in the wars of the Diadochi, it was divided into small states. It was reunified (2d cent. B.C.) by the Romans, but was subject to repeated attacks by invaders, notably the Arabs and the Seljuk Turks, while under the Byzantine Empire. After being held by the Crusaders for a short time in the early 13th cent., Asia Minor was gradually (13th–15th cent.) conquered by the Ottoman Turks. It remained part of the Ottoman Empire until the establishment of the Republic of Turkey after World War I.

Asiel (ä'së'ël), Simeonite 1 Chron. 4:35

Asimov, Isaac (äz'äm'öf), 1920–, American scientist and author, b. USSR, grad. Columbia (B.S., 1939, M.A., 1941, Ph.D., 1948). He became professor of biochemistry at Boston Univ. in 1955 and gained note with serious scientific works, but he reached wider audiences with his much-admired science-fiction stories such as *I, Robot* (1950, repr. 1970), *The Caves of Steel* (1954), and *The Gods Themselves* (1973). Asimov also received high praise for his popular introductions to science written for the layman, among them are *The Intelligent Man's Guide to Science* (2 vol., 1960, rev. ed. 1965), which surveys the fields of modern science, *Wellsprings of Life* (1960), which concerns evolutionary theory, and *The Stars in Their Courses* (1971). *Inside the Atom* (1961) is representative of his books for high school students.

Aske, Robert: see PILGRIMAGE OF GRACE

Askia Muhammad. see SONGHAI

Askja (as'kya), volcano, c. 4,950 ft (1,510 m) high, E central Iceland, one of the highest in Europe. Its great eruption of 1875 devastated a large area; Askja last erupted in 1961. Askja caldera, surrounded by mountains of tuff, contains Öskjuvatn, a crater lake c. 550 ft (170 m) deep.

Asmara (asma'ra, az-), city (1971 est. pop. 218,360), capital of Eritrea prov., N Ethiopia, at an altitude of c. 7,300 ft (2,225 m). A commercial and industrial center, it is connected by rail with the Red Sea port of Massawa. Textiles and clothing, processed meat, beer, shoes, and ceramics are the major industrial products. Asmara was a small village until the 1880s, when it became an Ethiopian regional administrative center. Occupied by the Italians in 1889, it became (1900) the capital of the Italian colony of Eritrea. In the 1930s, Asmara was rapidly developed as a base for the Italian invasion (1935–36) of Ethiopia; later, in 1941, the city was taken by British forces. It is the site of the Univ. of Asmara (1958).

Asmodeus (äs'mōdë'äs), DEMON of Hebrew story. He plays an important role in the book of Tobit. Tobit 3:8.

Asmoneans: see MACCABEES

Asnah (äs'na), head of a family that returned with Zerubbabel. Ezra 2:50.

Asnappar. see ASSURBANIPAL

Asnieres-sur-Seine (anyär'-sur-sën), formerly **Asnieres**, industrial suburb of Paris (1968 pop. 80,530). Hauts-de-Seine dept., N central France, on the Seine River. Boats and perfumes are the major manufactures.

Asoka (asō'kə), d. c. 232 B.C. Indian emperor (c. 273–c. 232 B.C.) of the MAURYA dynasty, grandson of CHANDRAGUPTA. One of the greatest rulers of ancient India, he brought nearly all India, together with Baluchistan and Afghanistan, under one sway for the first time in history. However, after his bloody conquest (c. 261 B.C.) of the state of Kalinga, Asoka was remorseful for the suffering he had inflicted, he converted from Brahmanism to BUDDHISM and abandoned wars of conquest. Thenceforth he proclaimed his belief in ahimsa, or nonviolence. Although tolerant of all faiths, he made Buddhism the state religion of India and erected numerous monasteries and stupas, regulated the slaughter of animals, and softened the harsh laws of his predecessors. He sent Buddhist missionaries throughout India and its adjacent lands and as far as Syria.

Egypt, and Greece His own son or brother headed the mission to Ceylon It is said that under his auspices a great Buddhist convocation was held at his capital, Pataliputra, its purpose was probably to suppress heresy and to confirm the Buddhist canon Knowledge of Asoka's rule is obtained chiefly from the many boulders and pillars inscribed with his pious exhortations, a notable example is at SARNATH India prospered and art flourished under the reign of Asoka, who, beyond his many imperial accomplishments, is most celebrated for his elevation of Buddhism from a simple Indian sect to a world religion After his death the Mauryan empire swiftly declined See studies by V A Smith (1909, repr 1964), Romila Thapar (1961), R D Mookerji (3d ed 1962), and B G Gokhale (1966), N A Nikam and R P McKeon, *Asoka, King of Magadha Edicts* (1958)

Asopus (as'op'as), in Greek mythology, river god He tried to prevent Zeus from abducting his daughter Aegina, but Zeus drove him off with a thunderbolt

Aso-san (ä'sō-sän), volcanic mountain, central Kyushu, Japan Aso-san is topped by one of the world's largest calderas (circumference 75 mi/121 km) that contains five volcanic cones Taka-dake (5,225 ft/1,593 m) is the highest cone, Naka-dake (4,340 ft/1,323 m) is an active volcano Cable cars carry people over the caldera Aso-san is part of Aso National Park (282 sq mi/730 sq km, est 1934), which also includes Kuju-san (5,866 ft/1,788 m), the highest peak of Kyushu

asp, popular name for several species of VIPER, one of which, the European asp (*Vipera aspis*), is native to S Europe It is also a name for the Egyptian COBRA (*Naja haje*) It is believed that the asp Cleopatra used to commit suicide was either that cobra or the horned viper (*Cerastes comutus*) of N Africa

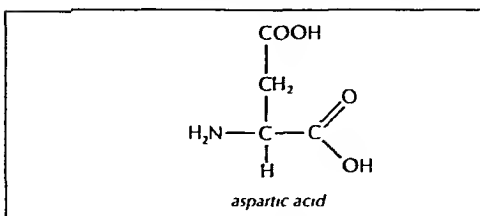
Aspadana, Iran see ESFAHAN

asparagine (äspär'äjën), organic compound, one of the 22 α -AMINO ACIDS commonly found in animal proteins Only the L-stereoisomer participates in the biosynthesis of mammalian proteins Its structure is identical to that of the amino acid ASPARTIC ACID, except that the latter compound's acidic side-chain carboxyl group has been coupled with ammonia, yielding an amide Like GLUTAMINE, asparagine is im-

portant in the metabolism of toxic ammonia in the body

genus *Smilax* Asparagus is classified in the division MAGNOLIOPHYTA, class Liliatae, order Liliales, family Liliaceae

aspartic acid, organic compound, one of the 22 α -AMINO ACIDS commonly found in animal proteins Only the L-stereoisomer participates in the biosynthesis of proteins Its acidic side chain often adds a



negative charge and hence a greater degree of water-solubility to proteins in neutral solution and has been shown to be near the active sites of some enzymes (see PEPsin) Aspartic acid is not essential to the human diet It was discovered in protein in 1868

Aspatha (äs'pātha, äspā'-), one of the sons of Haman Esther 9:7

Aspen, city (1970 pop 2,437), alt 7,850 ft (2,390 m), seat of Pitkin co, S central Colo, on the Roaring Fork River, founded c 1879 by silver prospectors from Leadville, inc 1881 Once a booming silver camp (there is still some mining), it has been transformed by the private capital of a Chicago industrialist into a popular, modern, cosmopolitan ski resort The Aspen Institute for Humanistic Studies and the Aspen Music School (which holds an annual festival) are there

aspen: see WILLOW

Aspen Music Festival, annual summer event, held in Aspen, Colo A former silver-mining boom town, Aspen fell into decline and was culturally revived by Walter Paepcke, who formed the Aspen Institute for Humanistic Studies The Aspen Music Festival and Music School were founded under the auspices of the Institute in 1949 The Music Festival is held for nine weeks every summer Artists from all over the world come to teach and to perform in recitals, concerts, and operas In 1970 the festival presented a Beethoven retrospective concert series under the direction of Jorge Mester

asperges (äspür'jes), ceremonial sprinkling of the people with holy water by the priest before the Sunday High Mass in the Roman Catholic Church The accompanying antiphon begins, *Asperges me, Domine, hyssopo et mundabor* [Thou shalt sprinkle me with hyssop, O Lord, and I shall be cleansed] At Easter time the antiphon is different, beginning, *Vidi aquam* [I saw water], this is based on Ezek 47:2

asphalt (äs'fölt, -fält), brownish-black substance used commonly in road making, roofing, and waterproofing Chemically, it is a natural mixture of hydrocarbons It varies in consistency from a solid to a semisolid, has great tenacity, melts when heated, and when ignited will burn with a smoky flame leaving very little or no ash It is found in nature in deposits called asphalt lakes Natural asphalt was probably formed by the evaporation of petroleum Asphalt is obtained as a residue in the distillation or refining of petroleum This is its important commercial source It occurs also in asphalt rock, a natural mixture of asphalt with sand and limestone, which when crushed is used as road-building material Asphalt is also used in the manufacture of paints and varnishes, giving an intensely black color

asphodel (äs'fädäl'), name for plants of several genera of the family Liliaceae (LILY family) The true asphodels belong to two small and very similar genera (*Asphodelus* and *Asphodeline*) of the Mediterranean region and India The showy flower spike of the former is usually white, of the latter, yellow Both are stemless, hardy herbs The asphodel (or king's spear) of the ancients, sacred to Persephone and associated with the fields of the dead, was *Asphodeline lutea*, the asphodel of the early French and English poets was a narcissus The false asphodel is *Tofieldia*, represented in North America by *T. glutinosa* and a few other species The turkeybeard (*Xerophyllum asphodeloides*) of the Atlantic coastal plains is also called mountain asphodel Asphodels are classified in the division MAGNOLIOPHYTA, class Liliatae, order Liliales, family Liliaceae

asphyxia (äs'fik'sēa), deficiency of oxygen and excess of carbon dioxide in the blood and body tissues Asphyxia, often referred to as suffocation, usually

results from an interruption of breathing due to mechanical blockage of the breathing passages, paralysis of the respiratory muscles following electric shock, inundation of the lungs as may occur with pneumonia or drowning, or substitution of carbon monoxide for oxygen in the red blood cells Symptoms of asphyxia vary but may include light-headedness, nausea, and gasping, followed by unconsciousness and death An area quickly affected is the cerebral cortex, the brain center for speech and other conscious behavior, it can be irreparably damaged by as little as five minutes of oxygen deprivation Damage to the medulla may result in interference with the heartbeat or other involuntary processes ARTIFICIAL RESPIRATION is the most practical first-aid procedure for asphyxia Trained personnel can provide oxygen and employ techniques to maintain the heart rate and respiration (see RESUSCITATOR)

Aspida (äspē'dä, -thä) [Gr, =shield, an acronym formed by the Greek initials for *Officers, Save the Country, Ideals, Democracy, Meritocracy*], secret organization of Greek left-wing junior army officers founded in the 1960s, it allegedly aimed at deposing King Constantine II, purging the government of rightists and royalists, and establishing a leftist regime Charges that Aspida members—reportedly led by Andreas PAPANDREOU—had penetrated the Greek army contributed to the downfall of Premier George Papandreu's Central Union government in July, 1965

Aspinwall: see COLÓN, Panama

aspirin, acetyl derivative of salicylic acid that is commonly used to lower fever, relieve pain, and reduce inflammation (see SALICYLATE) Aspirin is believed to act by interfering with the synthesis of specific PROSTAGLANDINS in the body It is used to relieve headache, muscle and joint pain, and the inflammation caused by rheumatic fever and arthritis Normal dosage may cause nausea, vomiting, diarrhea, or gastrointestinal bleeding Large doses cause acid-base imbalance and respiratory disturbances Acetaminophen (Tylenol), which does not cause gastric irritation but does lower fever and relieve pain, is often substituted for aspirin See ANALGESIC

Asplund, Erik Gunnar (ä'rīk göön'när as'pländ), 1885-1940, Swedish architect He designed the central library of Stockholm (completed 1928), but he is best known for the group of pavilions that he planned for the Stockholm Exhibition of 1930 There Asplund employed the forms of the new architecture but added a dynamic line and a dignity of proportion

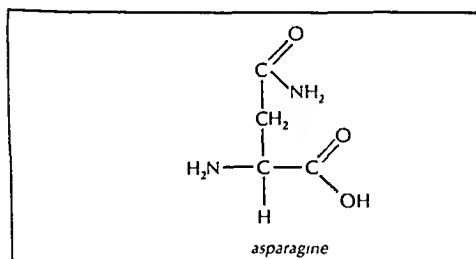
Aspropotamos: see AKHELOOS, river, Greece

Asquith, Herbert Henry: see OXFORD AND ASQUITH, HERBERT HENRY ASQUITH, 1ST EARL OF

Asquith, Margot: see under OXFORD AND ASQUITH, HERBERT HENRY ASQUITH, 1ST EARL OF

Asriel (äs'rēel), descendant of Manasseh Joshua 17:2, Num 26:31 Asriel 1 Chron 7:14

ass, hoofed, herbivorous mammal of the genus *Equus*, closely related to the HORSE It is distinguished from the horse by its small size, large head, long ears, and small hooves There are two living species *Equus hemionus*, the Asian ass, and *E. asinus*, the African ass The latter species includes the domesticated variety, *E. asinus asinus*, commonly known as the donkey A male ass is called a jackass and a female, a jenny Wild asses are swift desert animals that may attain speeds of up to 40 mi (60 km) per hr They live in herds of up to 1,000 animals The Asian wild ass typically has a sandy-colored coat with lighter-colored legs and belly, a short erect black mane, a black spinal stripe, and a black tail tuft Its neigh is shrill Different races of this species vary in size, but all are smaller than the African ass They were once widely distributed across Asia, but they have been crowded out of their grazing lands by domestic livestock and have been hunted for their flesh and hides Each race is now restricted to a very limited territory Among them are the Persian ass, or ONAGER, of central Asia, the Mongolian ass, or kulan, of NE Asia, the Tibetan ass, or kiang, presently the most numerous Asian wild ass, and the Indian ass, or ghorkhar All are considered endangered, and the continued survival of the onager and the kulan is particularly threatened The Syrian wild ass, of SW Asia, is probably already extinct The two wild races of the African species, called Nubian and Somali wild asses, are also becoming rare They are found in the mountains and deserts of NE Africa The African ass averages about 4½ ft (135 cm) in shoulder height, it is grayish in color, with longer ears and mane than the Asian ass, and with a char-



portant in the metabolism of toxic ammonia in the body The relatively unreactive, neutral amide group on the side chain of asparagine confers no special properties upon this amino acid once it is included within a protein by two peptide bonds Asparagine is not essential to the human diet, since it can be synthesized from aspartic acid The first amino acid to be isolated from a natural source, asparagine was purified from asparagus juice in 1806, proof of the occurrence of this amino acid in proteins was finally obtained in 1932

asparagus, perennial garden vegetable (*Asparagus officinalis*) of the family Liliaceae (LILY family), native to the E Mediterranean area and now naturalized over much of the world As in the other species of this Old World genus of succulent plants, the stems are green and function as leaves, while the leaves themselves are reduced to small scales The tender shoots of asparagus are cut and eaten in the spring It grows wild in the salt marshes of Europe and Asia, where it has also been under cultivation from antiquity In early times it was regarded as a panacea Cato in his *On Farming* gave directions for growing asparagus similar to those in a modern manual of agriculture The San Joaquin valley is the main asparagus-growing area of the United States, over half the crop is processed, i.e., canned or frozen The feathery sprays of the mature garden asparagus are sometimes used by florists, but more popular for decorative purposes are other plants of the same genus—the asparagus fern (*A. plumosus*, not a true fern) and the florists' smilax (*A. asparagoides*), both climbing vines native to S Africa The wild smilax, usually called greenbrier, belongs to the

acteristic loud, harsh bray. Its descendant, the donkey, is the oldest domestic beast of burden, it is believed to have been domesticated in Egypt by c 4000 B.C. A variety of the Asian ass was used in ancient Mesopotamia but did not survive as a domestic animal, all modern domestic donkeys are descended from the African species. The donkey is still used widely as a pack and draft animal in underdeveloped regions of the world. Although not as swift or powerful as the horse, it is strong for its size and has great powers of endurance. Donkeys are more surefooted than horses in mountainous country and are cheaper to maintain, as they feed on dry scrub. They may live up to 47 years, about twice as long as a horse. In some regions the donkey is crossbred with the horse to produce a MULE. The donkey was once widely used in Mexico and the SW United States, where it was known by its Spanish name of *burro*. A large population of feral donkeys (wild descendants of domesticated animals) now exists in the deserts of that region. Feral donkeys are also found in the Old World, where they have given rise to some confusion about the number of true wild asses left in existence. Asses are classified in the phylum CHORDATA, subphylum Vertebrata, class Mammalia, order Perissodactyla, family Equidae.

Assab (asab'), town (1970 est. pop. 15,000), Eritrea prov., E Ethiopia, a port on the Red Sea. Exports include salt, coffee, oilseeds, and hides and skins. The town has a petroleum refinery. Once the terminus of caravans from the interior of Ethiopia, Assab was acquired by a private Italian shipping company in 1869. In 1882 it was taken over by the Italian government, and in 1890 Assab was included in the colony of Eritrea. The name also is spelled Aseb.

Assad, Hafez al- (hafēz' al-as-sad'), 1928-, president of Syria. He graduated (1953) from the Syrian Military Academy and advanced through the ranks to become a general. He served (1965-70) as Syria's Minister of Defense and commander in chief of the air force. Using that position, Assad was able to become the most powerful figure in Syria, and in 1965 he became the country's president after leading a coup d'état. He is considered a militant anti-Zionist and a strong supporter of Palestinian commando groups.

As Salamiya (as-sālām'ēya), town, W central Syria. It is a transportation center situated in a fertile plain where cereals, vegetables, and cotton are grown. As Salamiya was conquered by the Arabs in the 7th cent. and built up under the early Abbasid caliphate. The Ismailis chose the town as their center c 860. It was later destroyed (903) by the Karmathians and then came under Fatimid control. Taken by the Ottoman Empire in the 16th cent., the town declined until it was resettled by Ismailis in the 19th cent. The name also appears as Selemyia.

Assam (āsām'), state (1971 pop. 14,630,422), c 30,000 sq mi (77,700 sq km), extreme NE India. SHILLONG is the capital. Almost completely separated from India by Bangladesh (formerly East Pakistan), Assam is bordered by Burma on the east and China and Bhutan on the north. The terrain consists largely of hill ranges running generally from northeast to southwest and separated by streams and rivers that flow southwest. The river valleys, particularly those of the Brahmaputra and Surma, contain the richest soil and support more than half of the population. The rainfall is often excessive, Cherrapunji in the southwest reputedly has the heaviest precipitation in the world (c 430 in /1,092 cm annually). Tea, grown on large plantations, is by far the principal crop. Rice, citrus fruit, sugarcane, sesame, cotton, and jute are also grown. Industry is mainly limited to the processing of agricultural products. The hills produce abundant timber and some coal and limestone. Assam is an important oil-producing region, there are refineries at Digboi and Nunmati. Rail and road transportation is limited. Calcutta, in West Bengal state, is the nearest large Indian city. Assam has a highly heterogeneous population. Tribal peoples, such as the Nagas, Lushais, and Garos, constitute a large part of the populace. Assamese, a dialect related to Bengali, is the predominant language. The Ahom dynasty (from which the name Assam derives) established its rule in Assam c 1400 and held it intermittently for four centuries. Aurangzeb, the Mogul emperor, conquered Assam in 1661-62 but ruled it for only a short time. The British assisted the Assamese several times in expelling Burmese invaders. By the Treaty of Yandabo (1826), ending an Anglo-Burmese war, Great Britain acquired Assam, it was administered as part of Bengal until 1919, when it became a governor's province. It was made a self-governing province in

1937. A southwest section was incorporated in 1947 into East Pakistan. Education, particularly for the tribal peoples, has been expanded. Assam's first university was opened in 1948. There were serious riots in 1959-60 when Hindu refugees, fleeing from Muslim East Pakistan, settled in Assam. More refugees fled to Assam from East Pakistan in 1971. In 1959 the Chinese invaded the North-East Frontier Agency (now the union territory of Arunachal Pradesh), which is N of Assam, and overran a large part of the area, threatening the tea plantations and oil fields of Assam. To improve its defenses, India then embarked on a vast road-construction program in Assam. Assam is governed by a chief minister and cabinet responsible to an elected unicameral legislature. The states of Assam, Nagaland, Meghalaya, Manipur, and Tripura and the union territories of Mizoram and Arunachal Pradesh have a common governor appointed by the president of India.

Assamese (ās'āmēz'), language belonging to the Indic group of the Indo-Iranian subfamily of the Indo-European family of languages. See INDO-IRANIAN LANGUAGES.

Assandun, battle of (ā'sandən), a victory by the Danes under CANUTE over the English led by EDMUND IRONSIDE. The battle was fought Oct. 18, 1016, at what is now Ashington, in SE Essex.

Assassin (āsās'īn) [Arab, =user of hashish], European name for the member of a secret order of the Ismaili sect of ISLAM. They are known as Nizaris after Nizar ibn al-Mustansir, whom they supported as caliph. The members of the order were distinguished by their blind obedience to their spiritual leader and by their use of murder to eliminate foes. The order was founded by Hasan ibn al-Sabbah when he gained control (c 1090) of the mountain fortress of Alamut, located S of the Caspian Sea. The order spread over Persia and Syria, gaining control of many strongholds, and it soon inspired terror throughout the Muslim world. The founder took the title Sheikh al-Jabal and was known in Western Europe as the Old Man of the Mountain. Under him members were organized into strict classes, according to degree of initiation into the secrets of the order. The most important of the classes were the devotees, who sought martyrdom and were the instruments of assassination. It is generally believed that they were given hashish and treated to great sensual pleasures in their strongholds as a foretaste of the pleasures of paradise that they were promised if they died at their duties. Hasan and the grand masters who ruled the order after him wielded great political power until the coming of the Mongols. Hulagu Khan attacked and destroyed (1256) their fortresses and massacred most of the Persian branch of the sect. The Syrian branch, with which the Crusaders came in contact, suffered a similar fate at the hands of Baybars, the Mameluke sultan of Egypt. Only scattered groups of the order survived, they are said to persist today, particularly in N Syria. Tales of the Crusaders and the writings of Marco Polo brought the Assassins and the Old Man of the Mountain into European folklore. The term *assassin* came into English and is used today to mean murderer and particularly one who kills for political motives. See Bernard Lewis, *The Assassins* (1967), Enno Franzius, *History of the Order of Assassins* (1969).

assassin bug, common name for members of the family Reduviidae, one of the largest and most varied groups belonging to the order Hemiptera (suborder Heteroptera). Assassin bugs are generally brownish to black, medium-sized to large insects, with heads that are elongate and narrow compared to the thorax. The predaceous front legs are used for grasping prey. Most assassin bugs are found on foliage, and some occasionally enter houses. The majority of species are predaceous on other insects, but a few are bloodsucking and will bite humans if carelessly handled. The bite of some species is painless, while the bite of others is extremely painful, resulting from a venom produced by the bug, the effect of which lasts for months. A painful biter is the common, black, wheel bug (*Ariulus cristatus*), easily identified by the semicircular crest resembling a cogwheel on the top of its prothorax. Another is the masked hunter (*Reduvius personatus*), often found in houses where it preys on bedbugs and other insects. The adults often bite humans around the mouth, hence its other common name, the kissing bug. In the Southwest assassin bugs of the genus *Triatoma* are common. Called conenoses or Mexican bedbugs, they also invade houses and may bite man. In Central and South America certain species of this genus are the vectors for a highly fatal TRYPA-

NOSOME disease known as Chagas' disease. Assassin bugs are classified in the phylum ARTHROPODA, class Insecta, order Hemiptera, family Reduviidae.

Assateague Island National Seashore: see NATIONAL PARKS AND MONUMENTS (table).

assault, in law, any unlawful attempt to use violence with the intent and the apparent ability to do bodily harm to another. If there is actual violence, the offense is BATTERY. Every criminal assault is a TORT, for which the party assaulted may sue for damages. At common law, assault was a MISDEMEANOR. Under modern criminal statutes, certain degrees of assault (e.g., assault with intent to kill, to do great bodily harm, to rape) are recognized as aggravated assaults and are felonies, though simple assault is still a misdemeanor. Malevolence and recklessness (e.g., driving a car in reckless disregard of human life) have come to constitute felonious assault in most jurisdictions. See W. L. Prosser, *Handbook of the Law of Torts* (3d ed. 1964).

assaying (āsā'yīng, ās'āyīng), in metallurgy, process of determining the specific metallic content of an ore, alloy, or other substance, especially one containing precious metals. It consists, in some cases, of subjecting the substance to complete chemical analysis and, in others, of simply determining the quantity present of one or more of the metal constituents. An accurate assay depends first upon procuring a representative sample of the ore in question. Since distribution of the ore's components is not uniform, a common method employed in obtaining this sample is to procure several samples, crush and mix them together, and from the final mass take the sample to be assayed. Assays are said to be gravimetric when the weight of the metal is determined and volumetric when the analysis involves the volume of the metal in solution as compared to that in a standardized solution. A wet assay (one which involves the use of liquid reagents) is generally used in a determination of weight. In a dry assay the ore is fused and the metal is finally obtained in a pure state. The U.S. government has assay offices in many cities.

assemblage: see COLLAGE.

Assemblies of God, religious sect, the largest Pentecostal organization in the United States, founded at Hot Springs, Ark., in April, 1914. In doctrine the Assemblies of God affirm the basic teachings of PENTECOSTALISM (i.e., baptism with the Holy Spirit as evidenced through GLOSSOLALIA and divine healing, and the daily presence of the charismatic gifts basic to the early church) and of FUNDAMENTALISM, emphasizing the premillennial belief in a return of Jesus Christ and his saints to reign over a period of peace and righteousness. The U.S. membership, numbering nearly 600,000, is organized into over 8,500 local autonomous churches with a general council and a general presbytery formulating and administering policies respectively. The sect maintains some 900 missions in 75 countries, the largest number being in Brazil. See Klaude Kendrick, *Promise Fulfilled: A History of the Modern Pentecostal Movement* (1961), W. W. Menzies, *Anointed to Serve* (1971).

assembly, unlawful: see RIOT, ROUT, AND UNLAWFUL ASSEMBLY.

assembly line, manufacturing technique in which a product is carried by some form of mechanized conveyor between stations at which the various operations necessary to its assembly are performed. It is used to assemble quickly large numbers of a uniform product. When its output is high, the cost per unit is relatively low. However, it is somewhat inflexible, as it must be designed and installed for a particular product. Also, the operations on the product must be performed in a sequence that is strictly ordered or very nearly so. A malfunction or shortage of parts that shuts down a single assembly station necessitates shutdown of the entire line. Some automobile manufacturers have found that if full crews are used to assemble cars unit by unit, the decrease in errors and the consequent decrease in rejects more than counterbalance the cost penalty involved in abandoning the assembly line.

Assen (as'an), city (1971 pop. 40,471), capital of Drenthe prov., NE Netherlands. It is an administrative and industrial center. Its main growth began in 1945.

Asser (ās'ar), d. 909, Welsh clergyman, monk of St David's Abbey, Pembrokeshire. He went c 884 to the court of King Alfred, helped Alfred learn Latin, and later was made a bishop. He is remembered for his biography of Alfred to 893, apparently modeled on that of Charlemagne by Einhard. He combined a

translation of some text of the Anglo-Saxon Chronicle with his original observations on Alfred's life

Asser, Rab: see ASHI, RAB

Asser, Tobias Michael Carel (tōbē'ās mē'khāl kārāl ās'ar), 1838-1913, Dutch jurist. He was a delegate to many international conferences, including the Hague Conference of 1899, and he wrote on international law. A proponent of international arbitration, he shared the 1911 Nobel Peace Prize with Alfred Fried.

Asshurim (āshōō'rīm), unidentified Arabian tribe, whose eponym is named in Gen. 25:3.

Assideans: see HASIDIM

assignats (ās'ignāts, āsēnyā'), paper currency issued during the FRENCH REVOLUTION. To redeem the huge public debt and to counterbalance the growing deficit, the revolutionary constituent assembly issued (Dec., 1789) treasury notes, called assignats, to the amount of 400 million livres at 5% interest. These were intended as short-term obligations pending the sale of confiscated crown and church land. They were made legal tender in April, 1790, and subsequent issues bore no interest. Inflation resulted, and early in 1796 the assignats in circulation amounted to less than 1% of their original value, their value did not even cover the cost of printing them. *Mandats territoriaux* [land notes], adopted in 1796 as a new currency also based on confiscated lands, were also soon depreciated. Inflation stopped only when all paper currency was demonetized and redeemed at the rate of 3,000 livres in assignats or 100 francs in land notes to one franc in gold. On May 21, 1797, all unredeemed assignats were declared void. See study by S. E. Harris (1930, repr. 1969).

Assiniboine (āsīn'abōin), river, 590 mi (950 km) long, rising in S. Sask., Canada, and flowing SE into Man. then E to the Red River at Winnipeg, named for the Assiniboin Indians. The Qu'Appelle and Souris rivers are its chief tributaries. The Assiniboine valley is one of Canada's leading wheat growing areas. The river was discovered by the Verendrye family in 1736, and forts were built at its mouth and near the site of Portage la Prairie. Settlement spread westward along the river from the Red River valley to the plains.

Assiniboine, Mount, 11,870 ft (3,618 m) high, on the British Columbia-Alta. line, Canada, on the Continental Divide in the Rocky Mts. It is the focal point of Mt. Assiniboine Provincial Park (20 sq mi/52 sq km, est. 1922).

Assiniboin Indians (āsīn'abōin'), North American Indians whose culture is that of the N. Great Plains, their language belongs to the Siouan branch of the Hokan-Siouan linguistic stock (see AMERICAN INDIAN LANGUAGES). At the time of the first contact with European settlers they had no permanent village sites, they moved about as their search for food required. They were a branch of the Yanktonai Dakota, who moved north and westward prior to the 17th cent. to the region of Lake Winnipeg, later they went to the upper Saskatchewan and the upper Missouri rivers. After the acquisition of horses and firearms in the 18th cent. they became a typical Plains tribe. They were allied with the Cree against the Blackfoot. The Assiniboin in the United States now live in the Fort Belknap and Fort Peck reservations in Montana, where they number more than 4,000, another 1,000 live in Canada. See M. S. Kennedy, ed., *The Assiniboines* (new ed. 1961), Dan Kennedy, *Recollections of an Assiniboine Chief*, ed. by J. R. Stevens (1972).

Assinie (āsēnē'), town, SE Ivory Coast, on a lagoon off the Gulf of Guinea. Because of its location on the coast and its contacts with the interior, Assinie became an early stopping place for European traders who sought gold and ivory. Portuguese merchants came to Assinie in the late 16th cent. French missionaries established a temporary post there in 1637, and a French fort and merchant community were maintained from 1701 to 1703. French traders returned in the early 19th cent. In 1842-43 the French gained treaty rights in the town and built a new fort. Assinie became a center of the palm oil trade, and coffee plantations were established nearby. The first European school in the Ivory Coast was opened there in 1887. In the 20th cent. the town declined as trade shifted to nearby Abidjan.

Assir (ās'ir) 1 Son of Korah. Ex. 6:24, 1 Chron. 6:22. 2 Ancestor of Samuel. 1 Chron. 6:23, 37. 3 Son of Jeconiah, according to AV and RV, translated as "Jeconiah, the Captive" in RSV. 1 Chron. 3:17.

Assis, Joaquim Maria Machado de: see MACHADO DE ASSIS, JOAQUIM MARIA.

Assisi (ās-sē-zē), town (1971 pop. 23,777), Umbria, central Italy. A religious and tourist center, it is situ-

ated on a hill in the Apennines with a magnificent view of the plains below. Although a well-known town in Roman times and throughout the Middle Ages, it owes its modern fame chiefly to St. Francis of Assisi (see FRANCIS, SAINT), who was born there in 1182 and died there in 1226. Above the saint's tomb are two Gothic churches (both consecrated 1253)—the lower church and the upper church, they are decorated with frescoes depicting the life of St. Francis and other scenes, executed by Cimabue, Giotto, Martini, and others. The Franciscan convent nearby has a valuable library. Other landmarks in Assisi are the Cathedral of San Rufino (begun 1140), the Church of Santa Chiara (1257-65), and a 14th-century castle. In the plain below the town is the imposing late-Renaissance Church of Santa Maria degli Angeli (1569-1679), built around the little chapel of Porziuncola, where St. Francis relinquished active leadership of his order. Also near the town are the Carceri Hermitage (15th cent.) and the Convent of San Damiano (begun 11th cent.).

Associated Press: see NEWS AGENCY

association, in psychology, a connection between two sensations, feelings, or ideas by virtue of their previous occurrence together in experience. When an association has been formed, one member of the pair tends to remind an individual of its partner. The concept of association, developed by Plato and Aristotle, entered contemporary psychology through the empiricist philosophers Locke, Berkeley, Hume, and Hartley, and the British associationist school of psychology of James Mill, J. S. Mill, and others (see ASSOCIATIONISM). Translated into the stimulus-response terms of BEHAVIORISM, association has been thought of as the basis of learning, conditioning, and creative thinking. The frequency of occurrence of paired experience and the principle of reinforcement are often invoked to explain associative learning, however, GESTALT psychologists, who believe that association between items is dependent on the relation of the items to each other, interpret association as an aftereffect of perceptual organization. In a basic technique in psychoanalysis known as free association, the patient voices his thoughts exactly as they occur to him, even though they may seem trivial, absurd, or shocking. This procedure is designed to reveal the areas of basic conflict in the patient and to bring into consciousness traumatic events and desires that have been repressed. It rests on the assumption that the originally repressed material and distorted derivatives may be brought to awareness by relating contemporary thoughts to earlier experiences.

associationism, theory that all consciousness is the result of the combination, in accordance with the law of ASSOCIATION, of certain simple and ultimate elements derived from sense experiences. It was developed by David HARTLEY and advanced by James MILL. Associationist principles continue to be important in the psychology of learning.

Association of Producing Artists—Phoenix (APA-Phoenix), a coalition of a theatrical touring company (APA) and a producing organization (Phoenix) formed to present theater classics off-Broadway. The APA was founded by Ellis Rabb in New York City in 1960. Two years later it became affiliated with the Professional Theatre Program of the Univ. of Michigan. Among the major productions mounted by the APA-Phoenix were *Pantagloize*, *The Misanthrope*, and *You Can't Take It with You*.

associative law, in mathematics, law holding that for a given operation combining three quantities, two at a time, the initial pairing is arbitrary, e.g., using the operation of addition, the numbers 2, 3, and 4 may be combined $(2+3)+4=5+4=9$ or $2+(3+4)=2+7=9$. More generally, in addition, for any three numbers a , b , and c the associative law is expressed as $(a+b)+c=a+(b+c)$. Multiplication of numbers is also associative, i.e., $(a \times b) \times c = a \times (b \times c)$. In general, any binary operation, symbolized by \circ , joining mathematical entities A , B , and C obeys the associative law if $(A \circ B) \circ C = A \circ (B \circ C)$ for all possible choices of A , B , and C . Not all operations are associative. For example, ordinary division is not, since $(60 \div 12) \div 3 = 5 \div 3 = 5/3$, while $60 \div (12 \div 3) = 60 \div 4 = 15$. When an operation is associative, the parentheses indicating which quantities are first to be combined may be omitted, e.g., $(2+3)+4=2+(3+4)=2+3+4$.

assonance: see RHYME

Assos (ās'ōs) or **Assus** (–ās), ancient city, Mysia, NW Asia Minor, on the Gulf of Adramyttium E of Point Lectum, westernmost point of Asia. St. Paul passed through Assos (Acts 20:13,14).

Assuan: see ASWAN, Egypt

Assumption of the Virgin: see MARY

Assur: see ASSYRIA

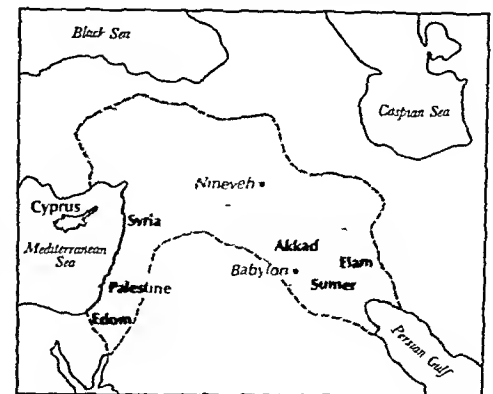
assurance: see INSURANCE

Assurbanipal (ā'sōōrbā'nēpāl) or **Ashurbanipal** (ā'shōōr–), d. 626? B.C., king of ancient Assyria (669-633 B.C.), son and successor of ESAR-HADDON. The last of the great kings of Assyria, he drove Taharka out of Egypt and firmly established NECHO in power there only to have Necho's son PSAMTIK revolt in 660 B.C. and wrest Egypt permanently from Assyria. The uprising took place during a campaign by Assurbanipal against the Elamites and Chaldeans. His brother, in command at Babylon, also headed a serious revolt by the enemies of the king. This insurrection was suppressed, though not without difficulty, and in retaliation, Assurbanipal took Babylon and slaughtered (648 B.C.) many of the inhabitants. He then defeated Elam and sacked Susa, Elamite power disappeared. Under Assurbanipal, Assyria reached the height of sumptuous living. The famous lion-hunt reliefs in the royal palace at Nineveh date from his reign and are among the finest examples of ancient sculpture. Assurbanipal was interested in learning, excavations at Nineveh have uncovered 22,000 clay tablets from his library—the chief sources of knowledge of ancient Mesopotamia. Among the tablets were found copies of the Babylonian flood and creation stories as well as historical and scientific literature. His reign ended the greatness of the empire (although two of his sons ruled briefly after his death), and Assyria succumbed to the Medes and the Persians only a few years later. His great expenditures in wars to preserve the state contributed somewhat to its collapse. Assurbanipal is probably the Assnapper or Osnapper of Ezra 4:10. He is identified with, but only faintly resembles, the SARDANAPALUS of the Greeks.

Assurnasirbal II: see ASHURNASIRPAL II

Assus, variant of ASSOS

Assyria (ās'irēā), ancient empire of W. Asia. It developed around the city of Ashur, or Assur, on the upper Tigris River and south of the later capital, Nineveh. The nucleus of a Semitic state was forming by the beginning of the 3d millennium B.C., but it was overshadowed by the greatness of Sumer and Akkad. Ashur was Assyria's chief god, but the gods of the Babylonians and Hittites were also honored. In the 17th cent. B.C., Assyria expanded briefly, but it soon relapsed into weakness. The 13th cent. B.C. saw Assyria threatening the surrounding states, and under TIGLATHPILESER I Assyrian soldiers entered the kingdom centered about Urartu (Ararat, see ARMENIA), took Babylonia, and crossed N. Syria to reach the Mediterranean. This empire was, however, only ephemeral, and Assyrian greatness was to wait until the 9th cent., when ASHURNASIRPAL II came into power. He was not only a vigorous and barbarously cruel conqueror who pushed his conquests N. to Urartu and W. to Lebanon and the Mediterranean, but he was also a shrewd administrator. Instead of merely making conquered kings pay tribute, he installed Assyrian governors so that he could have more control over the empire. Shalmaneser III (see under SHALMANESER I) attempted to continue this policy, but, although he exacted heavy tribute from Jehu of Israel and claimed many victories, he failed to establish hegemony over the Hebrews and their Aramaic-speaking allies. The basalt obelisk, called the Black Obelisk (British Mus.), describes the expeditions and conquests of Shalmaneser III. Raids from Urartu were resumed and grew more destructive after the death of Shalmaneser. CALAH, the capi-



Assyrian Empire (c. 650 B.C.)

tal of Assyria during the reigns of Ashurnasirpal II and Shalmaneser III, has been excavated. In the 8th cent B C conquest was pushed by TIGLATHPILESER III. He subdued Babylonia, defeated the king of Urartu, attacked the Medes, and established control over Syria. As an ally of Ahaz of Judah (who became his vassal), he defeated his Aramaic-speaking enemies centering at Damascus. His successor, Shalmaneser V, besieged Samaria, the capital of Israel, in 722-721 B C, but it was SARGON, his son, who completed the task of capturing Israel. Sargon's victory at Raphia (720 B C) and his invasions of Armenia, Arabia, and other lands made Assyria indisputably one of the greatest of ancient empires. His son SENNACHERIB devoted himself to retaining the gains his father had made. He is particularly remembered for his warfare against his rebellious vassal, Hezekiah of Judah. Sennacherib's successor, ESAR-HADDON, defeated the Chaldeans, who threatened Assyria, and carried his conquests (673-670) to Egypt, where he deposed Tirhakah and established Necho in power. Under ASSURBANIPAL, Assyria reached its zenith and approached its fall. When Assurbanipal was fighting against the Chaldeans and Elamites, an Egyptian revolt under Psamtik I was successful. The rapid decline of Assyria had begun, but the reign of Assurbanipal saw the Assyrian capital of NINEVEH at its height of splendor. The library of cuneiform tablets he collected ultimately proved to be one of the most important historical sources of antiquity. The magnificent Assyrian bas-reliefs reached their peak. The royal court was luxurious. Assyrian culture owed much to earlier Babylonian civilization, and in religion Assyria seems to have taken much from its southern neighbor and subject (see MIDDLE EASTERN RELIGIONS). The military aspect of the empire was its most prominent feature, for Assyria was prepared for conflict from beginning to end. Because of the ever-present need for men to fight the incessant battles, agriculture suffered and ultimately the Assyrians had to import food. The division of society into a fairly rigid three-class system was not unlike that of other early western Asiatic peoples (see BABYLONIA), but it did not supply a solid base for the overgrown Assyrian state. The lavish expenditures of Assurbanipal on warfare and building drained the resources of the empire and contributed to its weakness. The king of the Medes, Cyaxares, and the Babylonian ruler Nabopolassar, joined forces and took Nineveh in 612 B C. Under the son of Nabopolassar, NEBUCHADNEZZAR, Babylonia was renewed in power, and the great-grandson of Cyaxares, Cyrus the Great, was to establish the Persian Empire, which owed much to the earlier Assyrian state. See A. T. E. Olmstead, *History of Assyria* (1923, repr 1960), D. D. Luckenbill, *Ancient Records of Assyria and Babylonia* (2 vol., 1926-7, repr 1968).

Assyrian art. An Assyrian artistic style distinct from that of Babylonian art (see SUMERIAN and BABYLONIAN ART), which was the dominant contemporary art in Mesopotamia, began to emerge c 1500 B C and lasted until the fall of NINEVEH in 612 B C. The characteristic Assyrian art form was the polychrome carved stone relief. The precisely delineated reliefs concern royal affairs, chiefly hunting and war making. Predominance is given to animal forms, particularly horses and lions, which are magnificently represented in great detail. Human figures are comparatively rigid and static but are also minutely detailed, as in triumphal scenes of sieges, battles, and individual combat. Among the best known of Assyrian reliefs are the lion-hunt alabaster carvings showing Assurnasirpal II (9th cent B C) and Assurbanipal (7th cent B C), both of which are in the British Museum. Guardian animals, usually lions and winged beasts with bearded human heads, were sculpted partially in the round for fortified royal gateways, an architectural form common throughout Asia Minor. At Nimrud carved ivories and bronze bowls were found that are decorated in the Assyrian style but were produced by Phoenician and Aramaean craftsmen. Exquisite examples of Assyrian relief carving may be seen at the British and Metropolitan museums. See C. J. Gadd, *The Stones of Assyria* (1936), R. D. Barnett, *Assyrian Palace Reliefs* (1960), Andre Parrot, *The Arts of Assyria* (1961), T. A. Madhloom, *The Chronology of Neo-Assyrian Art* (1970).

Assyrian Church see NESTORIAN CHURCH

Assyrian language, Northeast Semitic dialect that evolved from AKKADIAN after 1500 B C. The term Assyrian is sometimes incorrectly used for the Akkadian language as a whole because the first inscriptions in Akkadian to be found in modern times were discovered in the region that was Assyria in antiquity.

Assyrian religion: see MIDDLE EASTERN RELIGIONS

Astacus* see NICOMEDIA

Astaire, Fred, 1899-, American dancer, actor, and singer, b. Omaha, Neb. His original name was Frederick Austerlitz. After 1911 he and his sister Adele formed a successful Broadway vaudeville team. After his sister retired, Astaire became a film actor (1933). He became known as a debonair song-and-dance man, particularly in the films he made with Ginger Rogers, which elevated the tap dance to an elegant, disciplined art. Among his most notable films are *The Gay Divorcee* (1934), *Top Hat* (1935), *Swing Time* (1936), *Funny Face* (1956), and *On the Beach* (1959). See his autobiography, *Steps in Time* (1959).

Astaroth (ās'tarōth), variant of ASHTAROTH

Astarte (āstar'tē), Semitic goddess of fertility and love. She was the most important goddess of the Phoenicians and corresponds to the Babylonian Ishtar and the Greek Aphrodite. She took a dominant place in Eastern religions, and the Jews strictly forbade use of her name. In the Bible she is referred to (with condemnation) first as Ashtaroth and later as Ashtoreth (Judges 2:13, 10:6, 1 Sam 12:10, 31:10, 1 Kings 11:5, 33, 2 Kings 23:13).

astatine (ās'tatēn, -tīn) [Gr. = unstable], semimetallic radioactive chemical element, symbol At, at no 85, at wt of most stable isotope 210, m p, b p, and density unknown, valence believed to be +1, +3, +5, or +7. Astatine is the heaviest known HALOGEN (group VIIa of the PERIODIC TABLE). Its chemical properties are believed to be similar to those of IODINE. The most stable isotope, astatine-210, has a half-life of 8.3 hr. More than 20 isotopes of astatine have been identified. Small amounts of astatine exist in equilibrium with uranium and thorium in the earth's crust, but the total amount of astatine is probably less than 1 oz. Astatine-211 (half-life 7.2 hr) is sometimes used as a radioactive tracer, like iodine, it collects in the thyroid gland. The discovery of astatine (first called alabamine) was announced in 1931 by Fred Allison and E. J. Murphy. In 1940, Emilio Segre, D. R. Corson, and K. R. Mackenzie produced astatine-211 by bombarding bismuth-209 with alpha particles in the cyclotron at the Univ. of California.

Astell, Mary (ās'təl), 1666-1731, English author and feminist. Her *Serious Proposal to the Ladies* (2 parts, 1694-97) offered a scheme for a women's college, an idea far in advance of the time. The project was not realized, and her ideas were ridiculed in the *Tatler*, possibly by Swift and Addison. See study by Florence M. Smith (1916).

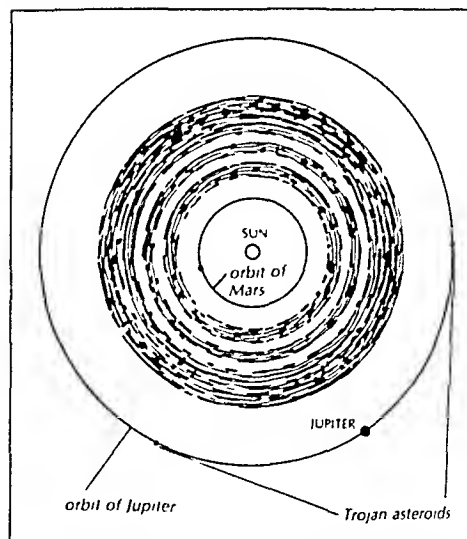
aster [Gr. = star], in North America, name for plants of the genus *Aster*, sometimes called wild asters, and for a related plant more correctly called China aster (*Callistephus chinensis*), all members of the family Compositae (COMPOSITE family). In North America, where most species are native, plants of the genus *Aster* are regarded as wild flowers, but in Europe they are cultivated as garden flowers and often called Michaelmas daisy (they usually bloom at Michaelmas). Most species of *Aster* are perennial and fall-blooming. They have small daisylike or starlike flower heads on leafy, often tall, stems. Their colors vary from white to pink, blue, and purple. Among the more showy native species cultivated in North American gardens are the purple New England aster (*A. novae-angliae*) and the violet or blue New York aster (*A. novi-belgii*). The New England aster was used by Shakers as an application for skin disorders. The China aster is the common aster of florists and flower gardens. It is an Asian plant that in cultivation has a very full head of ray flowers, varying from white and pink to deep purple. Other related genera with similar flowers are sometimes called asters, e.g., the golden asters (*Chrysopsis*). Asters are classified in the division MAGNOLIOPHYTA, class Magnoliopsida, order Asterales, family Compositae.

Asterabad. see GORGAN, Iran

Asteria (āstēr'ēa), in Greek mythology, daughter of the Titans Coeus and Phoebe, mother of Hecate by Perseus. To escape Zeus' amorous advances, she turned into a quail, jumped into the sea, and became the isle of Orygia (quail island).

asteroid, planetoid, or minor planet, small body orbiting the sun. More than 2,000 asteroids have been tracked and cataloged, thousands more exist. Most asteroids are irregularly shaped, unlike the major planets, which are spherically shaped. The largest asteroid, CERES, has a diameter of c 470 mi (750 km),

the three next largest are PALLAS, VESTA, and JUNO. Only Vesta can be seen with the naked eye. The other asteroids are so small that their sizes cannot



The asteroid belt lies between the orbits of Mars and Jupiter. Gaps where no asteroids are found are called Kirkwood gaps. The Trojan asteroids share Jupiter's orbit with the planet.

be measured directly by telescope, in many cases their sizes have been estimated from their brightnesses and distances. The ORBITS of most asteroids lie at least partially between the orbits of Mars and Jupiter, the orbit of ICARUS is most eccentric, and that of Hidalgo has the greatest inclination to the plane of the ecliptic. The average orbital distance of the asteroids from the sun is about 2.9 astronomical units (or A.U., 1 A.U. is the mean distance from the earth to the sun). Toward the end of the 18th cent astronomers were searching for a planet whose orbit should, according to BODE'S LAW, have an average distance from the sun of 2.8 A.U. On Jan. 1, 1801, G. Piazzi discovered Ceres while studying the sky in the constellation Taurus. Ceres was later found to have an orbit very near that predicted by Bode's law. Pallas was discovered in 1802, Juno in 1804, and Vesta in 1807. Astrea, discovered in 1845, was the fifth asteroid to be found, its discovery followed 15 years of searching by K. Hencke. By 1890 more than 300 asteroids had been discovered by visual means. In 1891, Max Wolf introduced the method of identifying an asteroid by the record of its path on an exposed photographic plate; it appears as a short line in a time exposure, rather than the sharp point of a star. Brucia was the first asteroid discovered by this method. Asteroids sometimes come very close to the earth. HERMES, discovered in 1937, comes within 485,000 mi (780,000 km), and EROS comes within 14 million mi (22 million km). The TROJAN ASTEROIDS, two groups of asteroids in Jupiter's orbit, are interesting as a phenomenon predicted by one solution of the three-body problem of mathematics. The origin of asteroids is unclear, one theory claims that they are fragments of a planet that occupied approximately their present position and met with some disaster in the remote past, another theory proposes that the asteroids were formed from material that, because of perturbation effects, could not condense into a single planet, a third theory suggests that they are material from the nuclei of old comets.

asthenosphere (āsthēn'əsfēr), region in the upper mantle of the earth's interior, characterized by low density, semiplastic rock material with little strength. The upper part of the asthenosphere, called the plastic layer, at a depth of 60 to 100 km, is believed to be the zone upon which the great lithospheric plates of the earth's crust move about (see PLATE TECTONICS). Although its presence was suspected as early as 1926, the worldwide occurrence of the plastic zone was confirmed by analyses of earthquake waves from the Chilean earthquake of May 22, 1960. Because earthquakes caused by faulting do originate in this zone and deeper, it is thought that the semiplastic rocks of the asthenosphere behave in a brittle fashion when subjected to sudden forces, yet yield by flowage to long-term stresses. It may also be that crustal plates sinking into the mantle are responsible for earthquakes originating in the asthenosphere. See LITHOSPHERE.

asthma, chronic respiratory disorder characterized by wheezy breathing that may be continuous and paroxysmal. A cough producing sticky mucoid sputum is symptomatic. Asthma usually results from an allergic reaction, and in many cases exhibits a hereditary pattern (see ALLERGY). Such psychogenic factors as mental or emotional stress may precipitate an attack. Reactions to specific allergens (commonly pollen, house dust, animal dander, common food-stuffs) is characteristic of childhood asthma, also known as extrinsic asthma. In adults asthma is often related to respiratory infections, and there is sometimes no clear-cut allergen. This form of the disease is called intrinsic asthma. Treatment of asthma usually includes an attempt at identifying and avoiding contact with the specific allergen. Injections of epinephrine bring immediate relief, ACTH and cortisone injections provide longer-lasting relief in chronic cases, especially when there is no response to other measures.

Asti (a'stè), city (1971 pop. 76,048), capital of Asti prov., in Piedmont, NW Italy, on the Tanaro River. It is a commercial and industrial center, noted for its sparkling wine (Asti spumante). The city, which retains its medieval appearance, has a fine Gothic cathedral (14th cent.).

astigmatism, type of faulty vision caused by a non-uniform curvature in the refractive surfaces—usually the cornea, less frequently the lens—of the eye. As a result, light rays do not all come to a single focal point on the retina. Instead, some focus on the retina while others focus in front of or behind it. The condition may be congenital, or it may result from disease or injury; it can occur in addition to NEARSIGHTEDNESS or FARSIGHTEDNESS. The spherical lenses used to correct nearsightedness and farsightedness must be specially adapted to correct the out-of-focus plane of vision of the astigmatic eye. When the patient observes a pattern of straight lines placed at various angles, those running in one direction appear sharp while those in other directions (particularly at right angles to the sharp lines) appear blurred. A special cylindrical lens is placed in the out-of-focus axis to correct the condition. In many cases contact lenses are the most effective means of correcting astigmatism.

Aston, Francis William, 1877–1945, English physicist and chemist. He was affiliated with the Cavendish Laboratory, Cambridge, from 1910. In 1922 he received the Nobel Prize in Chemistry mainly for his discovery, by means of a mass spectrograph of his own invention, of a number of isotopes in nonradioactive elements. His writings include *Isotopes* (1922) and *Mass-Spectra and Isotopes* (1933).

Astor, John Jacob, 1763–1848, American merchant, b. Waldorf, near Heidelberg, Germany. At the age of 16 he went to England, and five years later, in 1784, he arrived in Baltimore, penniless. He later went to New York City, where in a few years he entered into business with a small shop for trade in musical instruments and furs. Shrewdness, driving ambition, and stolid concentration brought him to a commanding position in the burgeoning economy of the United States. He became a leader of the China trade and was an astute investor in lands, principally in and around New York City, but he is perhaps best remembered as a fur trader. He chartered the AMERICAN FUR COMPANY (1808) and founded subsidiary companies—the Pacific Fur Company (see ASTORIA, Oregon) and the South West Company (operating around the Great Lakes). His firm exercised a virtual monopoly of the trade in U.S. territories in the 1820s and still did when he retired from it in 1834. The wealthiest man in the United States at his death, he left a fortune that has continued to make the family name prominent. Part of his money went to found the Astor Library (see NEW YORK PUBLIC LIBRARY). His Astor House was a forerunner of family hotel properties that much later included the Astor Hotel and the Waldorf-Astoria. See biographies by J. U. Terrell (1963) and K. W. Porter (1936, repr. 1966).

Astor, John Jacob, 1822–90, American financier, b. New York City, educated at Columbia and Göttingen universities and at Harvard law school, son of William Backhouse Astor (1792–1875). The third Astor in the United States, he served in the Peninsular campaign in the Civil War and later took a minor part in New York civic and political affairs. His son was William Waldorf Astor.

Astor, John Jacob, 1864–1912, American financier, b. Rhinebeck, N.Y., son of William Backhouse Astor (1829–92). The fourth of the name in the United States, he served in the Spanish-American War. Drowned in the Titanic disaster, he left two sons, Vincent, the son of his first marriage, and John Jacob

Astor, fifth of the name in America, the son of his second marriage.

Astor, Nancy Witcher (Langhorne) Astor, Viscountess, 1879–1964, British politician, b. Virginia. She was first married to Robert Gould Shaw, and after her divorce (1903) from him she went to England. There she was married (1906) to Waldorf Astor. When he succeeded his father as viscount and had to give up his seat in the House of Commons as member for Plymouth, she was elected in his place and became the first woman to sit in Parliament. In her years as a Conservative member (1919–45) her sharp tongue in debate, her passionate espousal of temperance and of reforms in woman and child welfare, and her cheerful lack of reverence for any and all won respect and attention. In the 1920s she and her husband were leaders in the "gradual" reform program of "Tory democracy." In the late 1930s their pleas for settlement and peace with the fascist powers in Europe were interpreted as treasonable by their enemies. At their country house, Cliveden (given to the government in 1942), the Astors brought together great literary figures and leaders of all political persuasions. See biographies by Maurice Collis (1960) and Christopher Sykes (1972), Elizabeth Langhorne, Nancy Astor and Her Friends (1974).

Astor, William Backhouse, 1792–1875, American financier, b. New York City, son of John Jacob Astor (1763–1848). Educated in Germany, he was associated with his father in business after 1818. Later called the landlord of New York, he also inherited money from his uncle Henry Astor and left an immense fortune.

Astor, William Backhouse, 1829–92, American financier and sportsman, b. New York City. The son of William Backhouse Astor (1792–1875), he was a retiring man, notable principally for his wealth and for his marriage to Caroline Schermerhorn. With the assistance of Ward McAlister, she became famous as the Mrs. Astor of modern folklore, queen of New York City society's legendary Four Hundred. Their son was John Jacob Astor (1864–1912).

Astor, William Waldorf Astor, 1st Viscount, 1848–1919, American-British financier, b. New York City, educated in Germany and in Italy and at the Columbia law school, son of John Jacob Astor (1822–90). He served as a state assemblyman and senator, but his political career was halted by his failure to win an election to the U.S. Congress. He was then appointed minister to Italy (1881–85). In 1890 he moved to England, where he acquired control of a newspaper and several magazines. He also founded—mainly to forward the literary ambition he had shown in two mediocre novels—*Pall Mall Magazine*. His estates, Cliveden and Hever Castle, were magnificent, his entertainments extravagant, his contributions to public causes—especially in World War I—munificent. He was made a baron in 1916 and a viscount in 1917. His elder son, Waldorf Astor (1879–1952), succeeded him as viscount and was a leader of "Tory democracy." His wife was Nancy, Lady Astor. The younger son, John Jacob Astor (1886–1971), bought a major share of *The Times* of London and was made 1st Baron Astor of Hever.

Astoria (ä'stôr'ëä), 1 Commercial, industrial, and residential section of NW Queens borough of New York City, SE N.Y., settled in the 17th cent. as Hallett's Cove. It was renamed for John Jacob Astor in 1839. Several 18th-century houses remain. 2 City (1970 pop. 10,244), seat of Clatsop co., NW Oregon, on the Columbia River estuary, inc. 1876. A port of entry, Astoria is the trading center for the lower Columbia basin. Its principal industries are fishing and fish processing, lumbering, and tourism, agriculture and shipbuilding are also important. The LEWIS AND CLARK EXPEDITION spent the winter of 1805–6 at a nearby encampment, Fort Clatsop (rebuilt in 1955 and now a national memorial). Fort Astoria, a fur-trading post established in 1811 by John Jacob Astor's Pacific Fur Company, was the first permanent U.S. settlement on the Pacific coast. Although the post was sold to the British in 1813, its vigorous activities helped to establish American claims to the Oregon country and contributed much to the exploration of the continent. Fort Astoria was formally restored to the United States in 1818, but trade remained in British hands until the mid-1840s, when American pioneers followed the Oregon Trail to the fort. In the late 18th cent., Astoria grew as a coastal and river port, it later attracted Scandinavian settlers, whose descendants make up most of its present-day population. Points of interest include the Astoria Column, 125 ft (38 m) high, built in 1926 to commemorate the region's early history. A junior college is in the city.

Astrabad: see GORGAN, Iran

Astraea (ä'strë'ä), in Greek religion, goddess of justice, daughter of Zeus and Themis. Because of the wickedness of man, she withdrew from the earth at the end of the Golden Age and was placed among the stars as the constellation Virgo.

Astraeus (ä'strë'as) see EOS

Astrakhan (ä'strāk'än, Rus. a'strākhan'ä), city (1970 pop. 411,000), capital of Astrakhan oblast, SE European USSR. A Caspian Sea port on the Volga River's southern delta, it is a center for river transport and has shipyards, repair docks, and fish-processing plants. Astrakhan is also an important rail junction and a major transshipment center for oil, fish, grain, and wood. The capital of the khanate of Astrakhan (see TATARS) from the 1460s, it was conquered by Ivan the Terrible in 1556. Astrakhan had a flourishing trade with Persia, Khiva, and Bukhara until 1917. It has a kremlin (1587–89) and a cathedral (1700–1710).

astrakhan (ä'strāk'än) [from Astrakhan], pelt of the newborn Persian lamb, used like fur in garments, and also the woolen fabric woven to resemble real astrakhan. The cloth is woven on a cotton base entirely covered by a pile of closely curled mohair. Before being woven the mohair is wound on spindles and steamed to produce a tight, permanent curl.

astrigent (ä'strī'jant), substance that shrinks body tissues. Astrigent medicines cause shrinkage of mucous membranes or exposed tissues and are often used internally to check discharge of serum or mucous secretions in sore throat, hemorrhage, diarrhea, or peptic ulcer. Externally applied astrigents, which cause mild coagulation of skin proteins, dry, harden, and protect the skin. Mildly astrigent solutions are used in the relief of such minor skin irritations as those resulting from superficial cuts, allergies, insect bites, or athlete's foot. Astrigent preparations include silver nitrate, zinc oxide, calamine lotion, tincture of benzoin, and vegetable substances such as tannic and gallic acids, catechu, and oak bark. Some metal salts and acids have also been used as astrigents.

astrobleme, large, circular geologic structure ranging from c. 1/2 mi to 40 mi (8–64 km) in diameter. Astroblemes are found at numerous places on the earth's surface, e.g., Barringer Crater in Arizona, Brent Crater in Ontario, and Vredefort Ring in South Africa. The presence of meteor fragments, strange conical fracture patterns (called shatter cones), and coesite (a superdense, high-pressure form of quartz) in the rocks at astroblemes suggest an impact, rather than volcanic, origin to these circular structures.

astrolabe (ä'sträläb), instrument probably used originally for measuring the altitudes of heavenly bodies and for determining their positions and movements. Although its origin is ancient and obscure, its invention is frequently ascribed either to Hipparchus or to Apollonius of Perga. For many centuries it was used by both astronomers and navigators. A simple astrolabe consisted of a disk of wood or metal with the circumference marked off in degrees. It was suspended by an attached ring. Pivoted at the center of the disk was a movable pointer called by Arabian astronomers the alidade. By sighting with the alidade and taking readings of its position on the graduated circle, angular distances could be determined. Mariners, if sufficiently skilled in navigation, could use the astrolabe to determine latitude, longitude, and time of day and as an aid in making other calculations. It was much used on voyages of discovery in the 15th cent. and was important until the invention of the sextant in the 18th cent. The more elaborate astrolabes bore a star map (the planisphere, a circular map, was added by Hipparchus), a zodiacal circle, and various other useful or decorative devices.

astrology, form of DIVINATION based on the theory that the movements of the celestial bodies—the stars, the planets, the sun, and the moon—influence human affairs and determine the course of events. Celestial phenomena have been the object of religious sentiment since earliest times (see MOON WORSHIP, SUN WORSHIP). The Chaldeans and the Assyrians were the first to discard their sky gods in favor of a nondeistic system of divination founded upon astronomy and numerology. They saw the heavenly bodies as exerting an influence upon the lives of individuals and the destinies of empires. Generally, all future events were believed determined beforehand by a universal order that was a result of the motions of the planets and stars. The practices of astrology spread throughout the ancient Middle

East, Asia, and Europe, but with the rise of Christianity, which emphasized divine intervention and free will, interest in astrology subsided, although astrologers continued to flourish. During the European Renaissance astrology as a form of divination regained popularity, due in part to the rekindled interest in science and astronomy. The European astrologer, considered a scholar exploring the mysteries of the universe through science and reason, was held in high esteem in the community for many centuries. However, in the 16th and 17th cent., Christian theologians waged an all-out war against astrology. In 1585 astrology was officially condemned in a bull of Pope Sixtus V, and in 1631, Pope Urban VIII reinforced this with another bull. At the same time the astronomical work of such men as Copernicus, Tycho Brahe, Kepler, and Galileo was undermining the tenets of astrology. Astrology, however, continued to be practiced. All of the aforementioned scientists remained practicing astrologers, as did other great thinkers such as Descartes and Newton, moreover, Copernican theory did not find sudden and widespread acceptance. Gradually, however, astrology declined, although this form of divination is still very much alive, especially in India. One's horoscope is a map of the heavens at the time of one's birth, showing the position of the heavenly bodies in relation to the 12 "houses" or signs through which they pass (see ZODIAC) and their positions in relation to each other. Each house has as its "lord" one of the heavenly bodies, the one in the "ascendant" is the one of greatest significance to the inquirer, supposedly endowing him with his temperamental qualities, his tendencies to particular diseases, and his liability to certain fortunes or calamities. See Ellen McCaffery, *Astrology: Its History and Influence in the Western World* (rev. ed. 1942), Lynn Thorndike, *History of Magic and Experimental Science* (rev. ed. 1958), Michel Gauquelin, *The Cosmic Clocks* (1967), Christopher McIntosh, *The Astrologers and their Creed* (1969).

astrometry. see ASTRONOMY

astronaut, crew member on a U.S. manned spaceflight mission, the Soviet term is cosmonaut. Candidates for manned spaceflight are carefully screened to meet the highest physical and mental standards, and they undergo rigorous training. The early astronauts had all previously been test pilots, but later astronauts have included scientists and physicians. As far as is possible, all conditions to be encountered in space are simulated in ground training. Astronauts are trained to function effectively in cramped quarters while wearing restrictive space suits, they are accelerated in giant centrifuges to test their reactions to the inertial forces experienced during liftoff, they are prepared for the physiological disorientation they will experience in space arising from WEIGHTLESSNESS, and they spend long periods in isolation chambers to test their psychological reactions to solitude. Using trainers and mock-ups of actual spacecraft, astronauts rehearse every maneuver from liftoff to recovery, and every conceivable malfunction and difficulty is anticipated and prepared for. In addition to flight training, astronauts are required to have thorough knowledge of all aspects of SPACE SCIENCE, such as celestial mechanics and rocketry. Concurrent with all other preparation, astronauts must maintain a physical condition equal to that of first-class athletes. Manned spaceflight began on April 8, 1961, when the Soviet cosmonaut Yuri Gagarin orbited the earth. Other prominent cosmonauts included Vladimir Komarov, commander of the first Voskhod spacecraft, Alexis Leonov, first man to walk in space, and Valentina Terechkova, first woman cosmonaut. American astronauts participated in four major programs between 1960 and 1973: Mercury, Gemini, Apollo, and Skylab (see SPACE EXPLORATION). Many astronauts participated in more than one program. The first American astronaut was Alan B. Shepard, Jr., who made a suborbital flight on May 5, 1961. John H. Glenn, Jr., was the first American to orbit the earth, and Edward H. White, 2d, was the first American to walk in space. The first lunar landing was accomplished by the crew of Apollo 11: Neil A. Armstrong, Jr., Edwin E. Aldrin, Jr., and Michael Collins, in 1969. See D. C. Knight, ed., *American Astronauts and Spacecraft* (1972), Michael Collins, *Carrying the Fire* (1974).

astronautics: see SPACE SCIENCE

astronomical coordinate systems. A coordinate system is a method of indicating positions. Each coordinate is a quantity measured from some starting point along some line or curve, called a coordinate axis. There are four basic systems of astronomical coordinates: the EQUATORIAL COORDINATE SYSTEM, the

altazimuth or HORIZON COORDINATE SYSTEM, the celestial or ECLIPTIC COORDINATE SYSTEM, and the GALACTIC COORDINATE SYSTEM. These systems are based on three common principles: (1) all stars are considered to be located on the inner surface of the CELESTIAL SPHERE, the imaginary sphere centered on the earth and representing the entire sky, (2) each coordinate axis is a great circle on the celestial sphere, and (3) coordinate measurements of an object to be located are made along two great circles, one a coordinate axis and the other perpendicular to it and passing through the object. Measurements are made either in degrees or in hours. Since there are 24 hours or 360 degrees in a circle, 1 hour is equal to 15 degrees ($1^h = 15^\circ$). The stars are so distant that their apparent annual motion relative to one another is very small. In a coordinate system that is constructed so that it ignores the daily rotation and annual revolution of the earth, the coordinates of any star remain nearly constant. However, it is impossible to construct a coordinate system, centered at the earth, that gives constant coordinates for another body that orbits the sun.

Astronomical Ephemeris. see EPHEMERIS

astronomical unit (A.U.), mean distance between the earth and sun, one A.U. is c. 92,960,000 mi (149,604,970 km). The astronomical unit is the principal unit of measurement within the solar system, e.g., Mercury is just over $\frac{1}{2}$ A.U. and Pluto is about 39 A.U.

astronomy, branch of SCIENCE that studies the motions and natures of celestial bodies, such as PLANETS, STARS, and GALAXIES, more generally, the study of MATTER and ENERGY in the UNIVERSE at large. Astronomy is perhaps the oldest of the pure sciences. It is difficult to fix the exact date when systematic observations of the heavens began. In many primitive civilizations the regularity of celestial motions was recognized, and attempts were made to keep records and predict future events. The first practical function of astronomy was to provide a basis for the CALENDAR, the units of month and year being determined by astronomical observations. Later, astronomy served in navigation and timekeeping. The Chinese had a working calendar as early as the 13th cent. B.C. About 350 B.C., Shih Shen prepared the earliest known star catalog, containing 800 entries. Chinese astronomy is best known today for its observations of SUPERNOVAS, or "guest stars," as they were called. The Babylonians, Assyrians, and Egyptians were also active in astronomy. The earliest astronomers were priests, and no attempt was made to separate astronomy from the pseudoscience of ASTROLOGY. In fact, an early motivation for the detailed study of planetary positions was the preparation of horoscopes. The highest development of astronomy in the ancient world came with the Greeks in the period from 600 B.C. to A.D. 400. The methods employed by the Greek astronomers were quite distinct from those of earlier civilizations, such as the Babylonian. The Babylonian approach was numerical and ad hoc, best suited for studying the complex lunar motions that were of overwhelming interest to the Mesopotamian peoples. The Greek approach, on the contrary, was geometric and schematic, best suited for complete cosmological models. Thales, an Ionian philosopher of the 6th cent. B.C., is credited with introducing geometrical ideas into astronomy. Pythagoras, about a hundred years later, imagined the universe as a series of concentric spheres in which each of the seven "wanderers" (the sun, the moon, and the five known planets) were embedded. The spheres rotated independently, producing the "music of the spheres." Eudoxus developed the idea of rotating spheres by introducing extra spheres for each of the planets to account for the observed complexities of their motions. This was the beginning of the Greek aim of "saving the appearances," that is, providing a theory that would account for all observed phenomena. The theoretical models of the universe did not necessarily correspond to absolute truth or reality, which, according to Plato, was inaccessible to man and could only be approached or approximated. This Greek attitude toward scientific knowledge mirrors modern positivism. Aristotle (384-322 B.C.) summarized much of the Greek work before him and remained absolute authority until late in the Middle Ages. Although his belief that the earth does not move was to have a retarding effect on astronomical progress, he gave the correct explanation of lunar eclipses and a sound argument for the spherical shape of the earth. The apex of Greek astronomy was reached in the Hellenistic period by the Alexandrian school. Aristarchus (c. 310-c. 230 B.C.) determined the sizes and distances of the moon and sun

relative to the earth and advocated a heliocentric (sun-centered) cosmology. Although there were errors in his assumptions, his approach was truly scientific, his work was the first serious attempt to make a scale model of the universe. The first accurate measurement of the actual (as opposed to relative) size of the earth was made by Eratosthenes (284-192 B.C.). His method was based on the angular difference in the sun's position at the high noon of the summer SOLSTICE in two cities whose distance apart was known. The greatest astronomer of antiquity was Hipparchus (190-120 B.C.). He developed TRIGONOMETRY and used it to determine astronomical distances from the observed angular positions of celestial bodies. He recognized that astronomy requires accurate and systematic observations extended over long time periods. He therefore made great use of old observations, comparing them to his own. Many of his observations, particularly of the planets, were intended for future astronomers. He devised a geocentric system of cycles and epicycles (a compounding of circular motions) to account for the movements of the sun and moon. Ptolemy (A.D. 85-165) applied the scheme of epicycles to the planets as well. The resulting PTOLEMAIC SYSTEM was a geometrical representation of the SOLAR SYSTEM that predicted the motions of the planets with considerable accuracy. Among his other achievements was an accurate measurement of the distance to the moon by a PARALLAX technique. His 13-volume treatise, the *Almagest*, summarized much of ancient astronomical knowledge and, in many translations, was the definitive authority for 14 centuries. During this period European astronomy was largely dormant, and the only significant work was carried out by the Muslims and the Hindus. It was by way of Moorish Spain that Greek astronomy reached medieval Europe. One of the great landmarks of the revival of learning in Europe that brought about the scientific revolution of the 16th and 17th cent. was the publication (1543) by Nicolaus Copernicus (1473-1543) of his *De revolutionibus orbium coelestium* (*On the Revolutions of the Celestial Spheres*). According to the COPERNICAN SYSTEM, the earth rotates on its axis and, with all the other planets, revolves around the sun. The assertion that the earth is not the center of the universe was to have profound philosophical and religious consequences. Copernicus's principal claim for his new system was that it made calculations easier. He still retained the epicycles and uniform circular motion of the Ptolemaic system, but by placing the sun at the center, he was able to reduce the number of epicycles. Copernicus also determined the sidereal periods (time for one revolution around the sun) of the planets and their distance from the sun relative to the sun-earth distance (see ASTRONOMICAL UNIT). The next great astronomer, Tycho Brahe (1546-1601) was principally an observer, a conservative in matters of theory, he rejected the notion that the earth moves. Under the patronage of King Frederick II, Tycho established Uraniborg, a superb observatory on the Danish island of Hven. Over a period of 20 years (1576-97), he and his assistants compiled the most accurate and complete astronomical observations the world had seen. At his death his records passed to Johannes Kepler (1571-1630), who had been his last assistant, in Prague. Kepler spent nearly a decade trying to fit Tycho's observations, particularly of Mars, into an improved system of heliocentric circular motion. At last, he conceived the idea that the orbit of Mars was an ellipse with the sun at one focus. This discovery led him to the three laws of planetary motion that bear his name (see KEPLER'S LAWS). Galileo Galilei (1564-1642) made fundamental discoveries in both astronomy and physics; he is perhaps the single man best described as the founder of modern science. Galileo was the first to make astronomical use of the TELESCOPE. His discoveries of the four largest moons of Jupiter and the phases of Venus were persuasive evidence for the Copernican cosmology. His discoveries of craters on the moon and blemishes on the sun (SUNSPOTS) discredited the ancient belief in the perfection of the heavens. These findings were announced in *The Sidereal Messenger*, a small book published in 1610. Galileo's *Dialogue on the Two Chief Systems of the World* (1632) was an eloquent argument for the Copernican system over the Ptolemaic. However, the new astronomical ideas had fallen into increasing disfavor with the church. Galileo was called before the Inquisition and forced to abjure all doctrines considered contrary to Scripture. His writings joined those of Kepler and Copernicus on the Papal Index. Isaac Newton (1642-1727), possibly the greatest scientific genius of all time, succeeded in uniting the

sciences of astronomy and PHYSICS. His laws of motion and theory of universal GRAVITATION provided a physical, dynamic basis for the merely descriptive laws of Kepler. Until well into the 19th cent., all progress in astronomy was essentially an extension of Newton's work. Among the many triumphs of Newtonian theory was the beginning of an adequate theory of the TIDES. In the 18th cent. the work of many astronomers vindicated the Newtonian world system, which became the basis of all physical science. In 1728, James Bradley measured the periodic shifts in stellar positions due to the ABERRATION of light. Edmund Halley's prediction that the comet of 1682 would return in 1758 was refined by A. C. Clairault, who included the perturbing effects of Jupiter and Saturn on the orbit to calculate the nearly exact date of the return of the comet. Nevil Maskelyne measured the earth's mean density, which was essential for computing the masses of the earth and other bodies in the solar system. In 1781, William Herschel accidentally discovered a new major planet, eventually named Uranus. Discrepancies between the observed and theoretical orbits of Uranus indicated the existence of a still more distant planet that was affecting Uranus's motion. J. C. Adams and U. J. J. Leverrier independently calculated the position where the new planet, Neptune, was actually discovered (1846). (Similar calculations led in 1930 to the discovery of the most distant known planet, Pluto.) By the early 19th cent., the science of CELESTIAL MECHANICS had reached a highly developed state at the hands of Leonhard Euler, L. Lagrange, P. S. Laplace, and others. Powerful new mathematical techniques allowed solution of most of the remaining problems in classical gravitational theory as applied to the solar system. It was demonstrated that the present configuration of the planetary orbits will remain stable for the indefinite future. In 1801, Giuseppe Piazzi discovered Ceres, the first of many ASTEROIDS. When Ceres was lost to view, C. F. Gauss applied the advanced gravitational techniques to compute the position where the asteroid was subsequently rediscovered. In 1838, F. W. Bessel made the first measurement of the distance to a star, using the method of parallax with the earth's orbit as a baseline; he determined the distance of the star 61 Cygni to be 60 trillion mi (about 10 LIGHT-YEARS), a figure later shown to be 40% too large. Astronomy was revolutionized in the second half of the 19th cent. by the introduction of techniques based on photography and SPECTROSCOPY. Interest shifted from determining the positions and distances of stars to studying their physical composition (see STELLAR STRUCTURE and STELLAR EVOLUTION). The dark lines in the solar SPECTRUM that had been observed by W. H. Wollaston and Joseph von Fraunhofer were interpreted in an elementary fashion by G. R. Kirchhoff on the basis of classical physics, although a complete explanation came only with the QUANTUM THEORY. Between 1911 and 1913, Ejnar Hertzsprung and H. N. Russell studied the relation between the colors and luminosities of typical stars (see HERTZSPRUNG-RUSSELL DIAGRAM). With the construction of ever more powerful telescopes (see OBSERVATORY), the boundaries of the known universe constantly increased. Harlow Shapley determined the size and shape of our galaxy, the MILKY WAY. E. P. Hubble's study of the distant galaxies led him to conclude that the universe is expanding (see HUBBLE'S LAW). Various rival theories of the origin and overall structure of the universe, e.g., the big bang and steady state theories, were formulated (see COSMOLOGY). Albert Einstein's theory of RELATIVITY plays a central role in all modern cosmological theories. Most recently, the frontiers of astronomy have been expanded by SPACE EXPLORATION and observations in new parts of the spectrum (see SATELLITE, ARTIFICIAL, RADIO ASTRONOMY, X RAY ASTRONOMY). The new observational techniques have led to the discovery of strange new astronomical objects, such as PULSARS, QUASARS, and BLACK HOLES. See Arthur Berry, *Short History of Astronomy* (1961); John L. Dreyer, *History of Astronomy from Thales to Kepler* (2d ed. 1953); G. O. Abell, *Exploration of the Universe* (2d ed. 1969); Nigel Calder, *Violent Universe* (1970); Lloyd Motz and Annetta Duveen, *Essentials of Astronomy* (1971); Zdeněk Kopal, *Man and His Universe* (1972); Robert Jastrow and M. H. Thompson, *Astronomy* (1972); Alexandre Koyre, *The Astronomical Revolution* (1973).

astrophysics, application of the theories and methods of physics to the study of STELLAR STRUCTURE, STELLAR EVOLUTION, the origin of the SOLAR SYSTEM, and related problems of COSMOLOGY.

Asturias, Miguel Ángel (mēgēl' āng'hēl āstōō'ryās), 1899–1974, Guatemalan novelist, short-story writer,

and poet. He worked as a journalist, foreign correspondent, and diplomat, serving as ambassador to El Salvador and later to France. His best-known works include *Las leyendas de Guatemala* [the legends of Guatemala] (1930), dealing with the early legends and folklore of Guatemala, *El señor presidente* (1946, tr. 1963), a novel about a Latin American dictatorship, *Viento fuerte* (1950, tr. *Strong Wind*, 1968), *El papa verde* (1954, tr. *The Green Pope*, 1971), and *Los ojos de los enterrados* (1955, tr. *The Eyes of the Interred*, 1973), a grim trilogy about banana exploitation in the Caribbean. Among his other works are *Week-end in Guatemala* (1956), a collection of short stories, *Mulata de tal* (1963, tr. *Mulata*, 1967), a mystical novel about the Guatemalan Indians, *The Talking Machine* (tr. 1971), a book for children about a frog, and *The Bejeweled Boy* (tr. 1972), a complex allusive novel replete with mysticism and Guatemalan legends. In 1967, Asturias was awarded the Nobel Prize in Literature. See study by R. J. Gallan (1970).

Asturias (āstōō'ryās), region (1970 pop. 1,045,635) and former kingdom, NW Spain, S of the Bay of Biscay and E of Galicia, and coextensive with Oviedo prov. Drained by numerous swift rivers, it is crossed by the Cantabrian Mts. The coal mines, exploited since Roman times, are the richest in Spain. Iron, zinc, lead, and manganese are also mined. The steel mills and metallurgical industries have been important since the late 19th cent., although production and transportation costs are high. Cattle are raised on the broad mountain pastures. The extensive forests are favored by abundant rainfall. Along the coast, apple orchards are the source of a world-famous cider. Gijón is the chief port, and fishing is a major occupation. Most of the population, however, is engaged in mining. The name Asturias is derived from an Iberian people that lived there before the Roman conquest (2d cent. B.C.). When the Moors overran the peninsula, Christian nobles fled into the Asturian mountains. They created the first Christian kingdom of Spain (see RELAYO) and defended themselves at the battle of COVADONGA. From Asturias came the Christian reconquest of Spain, as the successors of King Alfonso I extended their control over Asturias, Galicia, Leon, and parts of Castile, Navarre, and Vizcaya. Astorga was one of the chief cities of the Asturian kingdom in the 9th cent. In the 10th cent. the capital was moved from Oviedo to León, and the kingdom of Asturias became the kingdom of Asturias and Leon, which three centuries later was united with the kingdom of Castile. In 1388, John I of Leon and Castile made his son prince of the Asturias—the title borne from that time on by the heir to the throne. The Asturians are noted for their stubborn courage and independence—traits shown in the warfare against Napoleon, in various uprisings against the Spanish government, in the civil war of 1936–39, and in the general strike of 1962.

Astyages (āsī'ājēz), fl. 6th cent. B.C., king of the Medes (584–c. 550 B.C.), son and successor of Cyaxares. His rule was harsh, and he was unpopular. His daughter is alleged to have married the elder Cambyses and was said to be the mother of CYRUS THE GREAT, who rebelled against Astyages and overthrew him (c. 550 B.C.), thus creating the Persian Empire.

Astyanax (āsī'ānāks), in Greek mythology, son of Hector and Andromache. When the Greeks captured Troy, they killed him out of fear that he would avenge his father and his city. He was also known as Scamandrius.

Asunción (asōōnsyōn'), city (1970 est. pop. 437,000), S Paraguay, capital of Paraguay, on the Paraguay River. It is the principal port and chief industrial and cultural center of Paraguay. Meat-packing is the main industry. From the east bank of the river, the city spreads out on gentle hills in a pattern of rectangular blocks. Asunción is one of the oldest cities in South America and has a decidedly colonial aspect, enhanced by red-tiled roofs, colorful patios, and flowering trees. Its outstanding structures are the government buildings, the Godoi Museum, the Church of La Encarnación, and the Panteón Nacional, a smaller version of Les Invalides in Paris, where many of the nation's heroes are entombed. The city's botanical gardens are notable. The site of the city may have been visited by the conquistador Juan de Ayolas, but the town, called Nuestra Señora de la Asunción [Our Lady of the Assumption], was founded in Aug. 1536 or 1537, by Juan de Salazar and Gonzalo de Mendoza. It became a trading post on the route to Peru and flourished under the governorship of Domingo Martínez de Irala, who founded there the first cabildo in South America. As

the most important town in the Rio de la Plata region, Asunción became the center of the Jesuits' activities in converting the Indian population. The city developed further under the great Creole governor Hernando Arias de Saavedra (first elected 1592). In 1731 the uprising of *comuneros* under Jose de Antequera y Castro was one of the first major rebellions against Spanish colonial rule. The eminence of Asunción was ended by the growth of Buenos Aires, which was separated from Asunción's jurisdiction in 1617. After the War of the Triple Alliance (1865–70), Asunción was occupied by Brazilian troops until 1876. The National Univ. and several colleges are in the city.

Asuppim (āsūp'im) KJV in 1 Chron. 26:15 reads "the house of Asuppim"; RSV reads more correctly "the storehouse."

Aswan or Assuan (both āswān', āswān'), city (1970 est. pop. 206,000), capital of Aswan governorate, S Egypt, on the Nile River at the First Cataract. Long famous as a winter resort and commercial center, the city has become an important industrial center since the start nearby of hydroelectricity production in 1960. A chemical fertilizer plant is the largest of the new industries. Iron ore and hematite are mined in the vicinity. The city was called Syene or Seveneh in the Bible and is described as the southern limit of Egypt. It was a trade center, serving as the gateway to the Sudan and Ethiopia, and was the place where the annual Nile flood was first sighted in Egypt. From the syenite quarries nearby came stone for the temples and statuary of the Pharaohs. ON ELEPHANTINE island, in the Nile opposite Aswan, and PHILAE island (submerged by the Aswan High Dam complex), south of the city, are found ancient Egyptian and Roman ruins. Aga Khan III (1877–1957), leader of the Muslim ISMA'ILIS, is buried in Aswan. The Aswan Dam, 3 mi (4.8 km) south of the city, was built by the British and completed in 1902. It and the barges at Asyut in central Egypt were the chief means of storing irrigation water for the Nile valley before the completion of the Aswan High Dam (see below). After being enlarged in 1934, the dam added c. 1 million acres (404,700 hectares) of cropland along the Nile. In 1960 a hydroelectric station with an annual capacity of 2 million kilowatt hours was opened at the dam. The Aswan High Dam, about 4 mi (6.4 km) S of the Aswan Dam, was constructed from 1960 to 1970, and was dedicated in 1971. Plans for the dam as the cornerstone of Egyptian President Gamal Abdal Nasser's economic development program were announced in 1953. Construction was delayed, however, until 1960 by disputes with Sudan over water rights and by the withdrawal in 1956 of U.S. and British financial aid. After 1956 the Soviet Union took over much of the financing (contributing ultimately about one third of the total cost of more than \$1 billion) and technical supervision of the project. Built of earth and rock fill with a core of clay and cement, the High Dam is 375 ft (114 m) high and 11,811 ft (3,600 m) long. Lake Nasser (c. 2,000 sq mi/5,180 sq km), the dam's reservoir and one of the world's largest artificial lakes, has a storage capacity of c. 204 billion cu yd (157 billion cu m). The water of Lake Nasser has a potential for expanding agriculture in Egypt by c. 2 million acres (809,400 hectares)—two thirds of which would be former desert land and one third of which would be former one-crop land planted with two crops yearly. By 1970, c. 650,000 acres (263,000 hectares) of land had been reclaimed. In addition, water from Lake Nasser has a potential for increasing cropland in the Sudan by 5 million acres (2 million hectares). There are plans for a large fishing industry based on Lake Nasser. The High Dam's 12 turbines have an annual hydroelectricity capacity of 10 billion kilowatt hours, more than enough to satisfy Egypt's current needs, and enough to power considerable industrial expansion in the country. The creation of Lake Nasser required the relocation of 90,000 people, most of whom lived in Sudan, and of many archaeological treasures. Under UNESCO auspices, the Nubian temples at ABU SIMBEL were moved (1963–68) to a cliff 200 ft (61 m) above the old site and reconstructed. In return for its financial assistance in this project, the United States was given the Roman temple of Dendur, which was disassembled and shipped to the Metropolitan Museum of Art in New York City for reconstruction.

asylum (āsī'lām), extension of hospitality and protection to a fugitive and the place where such protection is offered. The use of temples and churches for this purpose in ancient and medieval times was known as SANCTUARY. In modern international law, the granting of asylum to refugees from other lands is the right of a state by virtue of its territorial sover-

eightly A fugitive, however, has no right to demand asylum from the state to which he flees, that state makes its own determination in each case. Between most nations there are treaties of EXTRADITION providing for the mutual surrender of fugitives from justice, and there is a tendency to confine the granting of asylum to political refugees and victims of apparent discrimination and intolerance. A situation causing many international disputes is the use of embassies and legations, by virtue of their status of EXTRATERRITORIALITY, as places of refuge in times of disorder and conflict. Most countries do not offer this type of asylum except when it seems necessary for the preservation of human life.

asymmetric carbon atom: see ISOMER

Asyncritus (əsin'krītəs), Roman Christian. Rom 16:14

Asyut (asyōt'), city (1970 est. pop. 175,700), E central Egypt, on the Nile. An industrial and trading center and also the seat of a university, it is famed for its pottery, carved ivory and wood, leatherwork, and silk shawls. Nearby is the Asyut barrage, which helps to regulate the flow of the Nile and impounds water for irrigational use. Asyut was the ancient Greek city of Lycopolis and later a station of the caravan trade. The city has a large Coptic Christian population.

At, chemical symbol of the element ASTATINE

Atabrine: see QUINACRINE

Atacama, Desert of (atāka'ma), arid region, c 600 mi (970 km) long, N Chile, extending south from the border of Peru. The desert itself, c 2,000 ft (610 m) above sea level, is a series of dry salt basins flanked on the W by the Pacific coastal range, averaging c 2,500 ft (760 m) high, and on the E by the Andes. There is practically no vegetation, rain has virtually never been recorded in some localities. Of the streams descending from the Andes only the Loa River reaches the Pacific. Antofagasta and other regional ports are without protected anchorages and are subject to frequent and severe earthquakes. The Atacama has been a source of great nitrate and copper wealth. The first European to cross the forbidding waste was Diego de Almagro, the Spanish conquistador, in 1537. From then until the middle of the 19th cent. it was largely ignored, but with the discovery of the use of sodium nitrate as a fertilizer and later with the invention of smokeless powder using nitroglycerin, the desert had a mining boom. Although the southern half of Atacama belonged to Bolivia, the companies exploiting the deposits were Chilean. Differences arose, and in the ensuing war (see PACIFIC WAR OF THE), Chile won the entire area. When synthetic nitrates were developed after World War I, the boom collapsed. Economically, the Atacama is declining, as reserves are depleted and the desert expands southward into once arable land.

Atad (ā'tād), name of the unidentified threshing floor where Joseph and his brethren mourned the death of Jacob. Gen. 50:10,11

Atahualpa (atawal'pa), d. 1533, favorite son of Huayna Capac, Inca of Peru. At his father's death (1525) he received the kingdom of Quito while his half brother, the legitimate heir HUASCAR, inherited the rest of the Inca empire. Shortly before the arrival (1532) of Francisco PIZARRO, Atahualpa invaded the domains of Huascar, whom he defeated and imprisoned, and made himself Inca. On Nov. 16, 1532, Pizarro met Atahualpa at Cajamarca. Invited into the city, Atahualpa was seized and imprisoned. He offered a room full of gold as ransom and at the same time secretly ordered the death of Huascar. He was tried for his brother's murder and for plotting against the Spanish and was executed. He is also known as Atabalipa.

Atalanta (atālän'tə), in Greek mythology, huntress famous for her speed and skill. She took part in the Calydonian hunt and was rewarded by Meleager with the pelt of the boar. Later, warned by an oracle not to marry, she demanded that each suitor run a race with her, on the condition that the winner would marry her and the losers would die. Hippomenes won the race by dropping three golden apples which Atalanta stopped to retrieve. Later, because Hippomenes and Atalanta made love in a temple sacred to Cybele, they were turned into lions and yoked to Cybele's chariot. Another version of the legend makes Milanion Atalanta's successful suitor.

Atami (ata'mē), city (1970 pop. 51,281), Shizuoka prefecture, central Honshu, Japan. It is a major resort, famed for its scenery and its hot springs. Atami was once the site of a geyser which, according to tradition, wrought destruction until moved by Bud-

dhist prayers. After an earthquake in 1923 the geyser stopped erupting.

Atarah (āt'arə), one of Jerahmeel's wives. 1 Chron. 2:26

Atargatis (ātargā'tīs), ancient Syrian goddess. Of obscure origin, she probably belongs to the general pattern of mother goddesses that were worshiped throughout W Asia and Greece. In Rome she was called Dea Syria.

Ataroth (āt'arōth) 1 Town of Gilead. Num. 32:3,34. 2 Unidentified place, E central Palestine. Joshua 16:7. 3 See ATAROTH ADAR. 4 Place or family of Judah. 1 Chron. 2:54.

Ataroth-adar (āt'arōth-ā'dar), unidentified town, N of Jerusalem. Joshua 18:13. Ataroth. Joshua 16:2. Ataroth-adar. Joshua 16:5.

Ataroth-addar, the same as ATAROTH ADAR.

Atascadero (atāskādār'ō), uninc. town (1970 pop. 10,290), San Luis Obispo co., SW Calif., on the Salinas River, founded 1913 as a model community. It is a residential and farming town. A state mental hospital is located there.

Ataturk, Kemal (kēmal' ataturk'), 1881-1938, Turkish leader, founder of modern Turkey. He took the name in 1934 in place of his earlier name, Mustafa Kemal, when he ordered all Turks to adopt a surname, it is made up of the Turkish words Kemal [the perfect] and Ataturk [father of the Turks]. Born at Thessaloniki, he secretly applied to a military academy, where his excellence at mathematics won him the surname Kemal. As a military officer he joined the Young Turks, a liberal movement that sought to establish a constitutional government for the Ottoman Empire (Turkey). However, he disagreed with its pro-German policy, because he considered Turkish interests to be paramount. In 1908 he took part in the successful Young Turk revolution as chief of staff of ENVER PASHA, whom he later opposed over the German issue. He served in Libya (1911-12) and in the Second Balkan War (1913). In World War I his efficient work in the Dardanelles, on the Armenian front, and in Palestine, though it merely helped to postpone disaster, won him the title pasha. After the Ottomans capitulated to the Allies, Sultan MUHAMMAD VI sent Kemal to E Anatolia in an effort to curb his influence. Arriving in May, 1919, Kemal organized the Turkish Nationalist party and began to form an army. When the Turks were aroused by the Greek landing at Smyrna (now IZMIR) he convoked nationalist congresses at Erzurum (July, 1919) and Sivas (Sept.). Outlawed by the sultan, who was in the hands of the Allies in Constantinople, he set up a rival government at Ankara. The signing of the Treaty of SEVRES by the Constantinople government made the split with Ankara final. With the tacit consent of Soviet Russia, Kemal retook Kars and Ardahan from Armenia (1920). Then, taking advantage of disagreements among the Allies, he expelled the Greeks from Anatolia in a brilliant campaign (1921-22). For his victory he received the official name Ghazi [victorious]. On Nov. 1, 1922, Kemal proclaimed the abolition of the sultanate, and Sultan Muhammad VI fled to a British warship. The Treaty of Lausanne (1923, see LAUSANNE, TREATY OF) was a triumph for the nationalist cause, an independent and sovereign Turkey was recognized by the European powers. Kemal was elected president (1923) of the newly founded Turkish republic and reelected in 1927, 1931, and 1935—all four times by a unanimous parliament. With astounding energy he set out on a program of internal reform and "Westernization"; 15 years of his rule changed Turkey profoundly in the most essential as well as the most minute aspects of its life (see TURKEY). Although a dictator, Kemal was prepared to tolerate limited opposition, but he was ruthless toward those he considered extremists. Regarding Islam as a conservative influence, he abolished (1924) the CALIPHATE (thereby in effect disestablishing Islam as the state religion) and broke all religious opposition to reform. Abroad, he pursued a policy of conciliation and neutrality. He established friendly relations with all neighbors, particularly Russia, helped to bring about the BALKAN ENTENTE, and freed Turkey from foreign influence, even though he had to refuse capital for industrialization of the country. On his death he was succeeded as president by Ismet Inönü. In 1953 his remains were transferred to a new mausoleum in Ankara. See biographies by Dagobert von Mikusch (tr. 1931), H. E. Wortham (1931), Hanns Froemberg (tr. 1937), and Lord Kinross (1966), D. E. Webster, *Turkey of Ataturk* (1939).

Ataulf (āt'ālf), d. 415, Visigothic king (410-15). Succeeding his brother-in-law, ALARIC I, he abandoned Alaric's scheme of southward expansion and led the

Visigoths out of Italy into S Gaul (France) in 412. He sought the alliance of the Western emperor, HONORIUS, whose sister GAILA PLACIDIA he married in 414. However, the general Constantius (later Emperor CONSTANTIUS III), jealous of Ataulf, turned Honorius against him. Constantius blockaded the Gallic ports, and Ataulf, cut off from supplies, led his people into N Spain (see VISIGOTHS). He was assassinated at Barcelona.

atavism (āt'avīzəm), the appearance in an individual of a characteristic not apparent in the preceding generation. Originally this phenomenon was thought to be a reversion to a hypothetical ancestral prototype. Mendelian law and the findings of GENETICS demonstrate that abnormal characteristics result from random recombinations of the recessive traits (masked in the intervening generations) that determined the characteristics of the earlier individual. So-called reversion to type may also be produced by disease or by aberrations in embryonic development.

ataxia (atāk'sēə), lack of coordination of the voluntary muscles resulting in irregular movements of the body. Ataxia can be brought on by any injury, infection, or degenerative disease of the central nervous system, e.g., syphilis, encephalitis, brain tumor, or multiple sclerosis. The term is also used to designate a specific type of CEREBRAL PALSY.

Atbara (āt'bara), river, NE Africa, rising in NW Ethiopia and flowing c 500 mi (800 km) to the Nile in Sudan. There are few permanent settlements along its banks. The Atbara's water level is very low, except during the rainy season (from June to October). The river is called the Takazze in its early stages in Ethiopia and the Setit in W Ethiopia and E Sudan.

Atbarah (āt'barə), town (1969 est. pop. 53,000), NE Sudan, at the junction of the Atbara and Nile rivers. An important rail junction, it is also the headquarters of the Sudan railway system and has large railroad workshops. Most of the town's workers are connected with service and maintenance jobs on the rail lines. Sudanese trade unionism originated in Atbarah in 1946 with the founding of a workers' association among railroad employees.

Atchafalaya (əchā'fālī'ə), navigable river, c 170 mi (270 km) long, S central La. The Atchafalaya meanders south, in a former channel of the Mississippi, to the Gulf of Mexico. A distributary of the Red and Mississippi rivers, the Atchafalaya flows to the Gulf through an extensive system of guide levees and floodways. The system serves as a flood control for the lower Mississippi, especially around New Orleans.

Atchison, David Rice, 1807-86, U.S. Senator, b. Froggton, Ky. A lawyer and politician in Missouri, he served in the Senate from 1843 to 1855. As a proslavery Democrat, Atchison was instrumental in having the KANSAS NEBRASKA ACT passed. After his defeat for reelection in 1855, he was a leader of the border ruffians in the raids into Kansas (1855-56). He supported the Confederacy in the Civil War. Atchison, Kansas, is named for him. See biography by W. E. Parrish (1961).

Atchison, city (1970 pop. 12,565), seat of Atchison co., NE Kansas, on the Missouri River, inc. as a city 1881. It is a trade and industrial center in a rich farm area. Steel castings and grain products are produced there. Atchison was founded (1854) near a military post, established (1818-19) on Cow Island in the Missouri River. The Atchison, Topeka & Santa Fe RR was chartered there in 1859, and the city boomed as an important wagon-train, river, and railroad terminal, one of the outfitting points for westward travel. Benedictine College is located in the city.

Ate (ā'tē), in Greek mythology, personification of the rash temper that leads men to folly and misfortune. She was the daughter of Zeus, who, angered by her mischief, cast her from Olympus. In Greek tragedy she was an avenger of evil deeds and thus was similar to Nemesis and the Furies.

Ater (āt'ar) 1 Ancestor of a family that returned with Zerubbabel. Ezra 2:16, Neh. 7:21, 10:17. 2 Ancestor of a family of porters. Ezra 2:42, Neh. 7:45.

Atget, Eugene (ozhēn' atzhē'), 1857-1927, French photographer. After working as a sailor and then as an actor for many years, Atget became a photographer at the age of 42. He began at once to produce his detailed visual record of Paris and its environs, particularly St. Cloud and Versailles. Atget made his living by selling his images of the city to painters for use as source material, and later to the Parisian historical monuments society. In making his photographs of the parks, lakes, shop windows, vendors, prostitutes, ragpickers, buildings, flower markets,

sculpture gardens, doorways, bridges, and street scenes of Paris. Atget went beyond documentation. His quiet, reflective, and poetic images are dramatic with the force of time gone by. A large number of his many thousands of pictures are in the Museum of Modern Art, New York City. Atget's work was published and brought to international attention by the photographer Berenice ABBOTT. See A. D. Trottenberg, ed., *A Vision of Paris: The Photographs of Eugene Atget* (1963), Berenice Abbott, *The World of Atget* (1964).

Athabasca (äthabäs'ka), river, 765 mi (1,231 km) long, rising in the Columbia snowfield of the Canadian Rockies near the Alta-British Columbia line and flowing N through Jasper National Park, then NE and N across central Alta to Lake Athabasca. It is the southernmost headstream of the Mackenzie River. Its chief tributaries are the Pembina, Lesser Slave, and Clearwater rivers. The Athabasca River has long been the main route to the Mackenzie valley. There are extensive deposits of oil-bearing sand along the river near McMurray.

Athabasca, Lake, fourth largest lake of Canada, c 3,120 sq mi (8,100 sq km), c 200 mi (320 km) long and from S to 35 mi (8-56 km) wide, NE Alta, and SW Sask., at the edge of the Canadian Shield. A part of the Mackenzie River system, the lake receives the Athabasca River from the south and drains N into Great Slave Lake by way of the Slave River. Gold and uranium are found nearby. Fort Chipewyan was built (1788) at the west end of the lake by Roderick McKenzie of the North West Company and has been maintained. Steamers of the Hudson's Bay Company ply the lake in summer between Chipewyan and Fond du Lac, from where the canoe route runs by way of Wollaston and Reindeer lakes to the Churchill River. Philip Turnor, the British surveyor, surveyed and mapped the lake between 1790 and 1792.

Athabasca, Mount, 11,452 ft (3,491 m) high, W Alta, Canada, in the Canadian Rockies at the headwaters of the Athabasca River. It is on the edge of the Columbia snowfield, and the Saskatchewan and Athabasca glaciers flow around it.

Athabaskan (äthabäs'kən), **Athapaskan**, or **Athapaskan** (both -päs'-), group of related North American Indian languages forming a branch of the Nadene linguistic family or stock. In the precontact period, Athabaskan was a large and extensive group of tongues. Its speakers lived in what are now Canada, Alaska, Oregon, California, Arizona, New Mexico, Texas, and parts of Mexico. Today the surviving Athabaskan languages include Chipewyan, Kutchin, Carrier, and Sarsi (all in Canada), Chasta-Costa (in Oregon), Hoopa or Hupa (in California), Navaho (in New Mexico, Arizona, and Utah), and Apache (in Oklahoma, Arizona, New Mexico, Texas, and Mexico). These and other Athabaskan languages are the mother tongues of about 100,000 Indians. The speech communities of most Athabaskan languages today are small, with the exception of Navaho, which has roughly 80,000 speakers, most of whom can also speak English. The Navaho is one of the largest Indian tribes in the United States. A feature of the Navaho language, perhaps the best-known tongue in the Athabaskan group, is its tonal quality. There are high tones, low tones, rising tones, and falling tones. Another important Athabaskan tongue, Apache, is spoken in its various dialects by about 5,000 Indians. According to some authorities, the Athabaskan languages face extinction relatively soon. See AMERICAN INDIAN LANGUAGES. See Harry Hoijer et al., *Studies in the Athapaskan Languages* (1963).

Athabasca Pass, 5,736 ft (1,748 m) high, W Alta and E British Columbia, Canada, leading from the headwaters of the Athabasca River across the Continental Divide to the Columbia River. It was discovered by David Thompson, a Canadian fur trader, or one of his agents c 1811, and for the next 50 years it was the chief route of the Hudson's Bay men on their journeys to and from the Columbia River country.

Athach (äthä'k), place in S Palestine, visited by David 1 Sam 30:30.

Athaiah (äthä'yä), Judahite Neh 11:4. Uthai 1 Chron 9:4.

Athaliah (äth'älä) 1 The only queen to occupy the throne of Judah, daughter of Ahab of Israel, wife of JEHOAM 2 of Judah, and mother of AHAZIAH 2 of Judah, whom she succeeded. She had the males of the royal family murdered, but her stepdaughter Jehosheba hid away a baby son of Ahaziah. Some years later, Jehosheba and her husband JEHOIADA 1 effected a coup d'état in favor of this baby, JEHOASH 2. Athaliah they killed. These events are the subject

of Racine's *Athalie*. 2 Kings 11, 2 Chron 22-23. 2 Benjaminite 1 Chron 8:26. 3 Father of one who returned with Ezra. Ezra 8:7.

Athamas (äth'amäs), in Greek mythology, king of Boeotia. He married Nephele, who bore him Phrixus and Helle, but he later fell in love with Ino, who bore him Learchus and Melicertes. According to one legend, Athamas went mad, killed Learchus and forced Ino, who was fleeing with Melicertes, to leap to her death in the sea.

Athanagild (athän'ägild), d 567, Visigothic king of Spain (554-67). Having deposed his predecessor, Agila, with the aid of an army sent by Byzantine Emperor Justinian I, he ceded a large portion of S Spain to the Byzantines and was unable to prevent them from further extending their territory. Although throughout his rule he had to fight the Byzantines, the Franks, and the Basques, Athanagild strengthened his kingdom internally by conciliating the Catholics, whom his Arian predecessors had oppressed. His court at Toledo was famed for its splendor. Athanagild was the father of the Frankish queens Brunhilda and Galswintha. He was succeeded by his brothers Liuva and Leovigild.

Athanaric (athän'ärík), d 381, Visigothic chieftain. He led the VISIGOTHS against Emperor VALENS and negotiated a favorable peace in 369. A pagan, he persecuted the Christians, and, possibly for that reason, he was involved in a civil war with FRITIGERN. Defeated by the Huns in 376, he fled to Transylvania and later (381) to Constantinople. There he was received with royal honors by Theodosius I, but he died two weeks later.

Athanasian Creed (äthänä'zhan), exact, elaborate Roman Catholic statement on the Trinity and the Incarnation. It is no longer believed to have been written by Athanasius, but rather by an unknown Western author of the 6th cent. An English translation appears in the English Book of Common Prayer. It is sometimes called *Quicumque* or *Quicunque Vult* [whoever wishes (to be saved)].

Athanasius, Saint (äthanä'zhas), c 297-373, patriarch of Alexandria (328-73), Doctor of the Church, great champion of orthodoxy during the Arian crisis of the 4th cent. (see ARIANISM). In his youth, as secretary to Bishop Alexander, he took part in the christological debate against Arius at the Council of Nicaea (see NICAEA, FIRST COUNCIL OF), and thereafter became chief protagonist for Nicene orthodoxy in the long struggle for its acceptance in the East. He defended the formula known as *homoousion*, which holds that Christ is of the same substance as the Father, against the various Arian parties who held that Christ was not identical in substance with the Father. The term itself, however, is not particularly his. Made bishop of Alexandria upon the death of his superior, he faced a conspiracy led by EUSEBIUS OF NICOMEDIA to return the condemned Arius to Egypt. When Athanasius refused, a pro-Arian council held at Tyre (335) found him guilty of sacrilege, the practice of magic, dishonest grain dealings, and even murder. Athanasius appealed to Constantine who demanded a retrial, then unaccountably ordered Athanasius into exile—the first of five. Reinstated (337) and exiled again (339), he fled to the West where, under Pope JULIUS I, the Council of Sardica vindicated him (343). To placate his Catholic brother Constans, the Arian Constantius permitted Athanasius to return to his see in 346. There he reigned, a beloved pastor, for ten fruitful years, strengthening orthodoxy in Egypt and composing some of his greatest works, including his *Defense Against the Arians* (348). When Constans died, Constantius procured the condemnation of Athanasius (Arles, 357), again forcing him into exile. It was during this period of hiding with the hermit monks of the Egyptian desert, whom he admired greatly, that he wrote his best exposition of Nicene christology, *Discourses Against the Arians*, attacking both the Arians and the views of MARCELLUS OF ANCYRA. By now a conservative reaction in the East issued in the strongly anti-Arian Lucianic creed promulgated at the Council of Seleucia (359), a step which led to the final victory of Nicene orthodoxy at the Council of Constantinople in 381. Athanasius was restored briefly in 362, only to be quickly exiled by Julian and again by Valens (365). The climate was changing, however, and by 366 Athanasius was secure in his see, where he remained the spokesman for orthodoxy until his death. After him, ST BASIL THE GREAT secured the victory of orthodoxy in the East. Selected works appear in collections of patristic literature—particularly his *De Incarnatione* (c 318). Feast May 2.

Athapascan or **Athapaskan**: see ATHABASCAN, AMERICAN INDIAN LANGUAGES.

Atharva-Veda (äth'va-vä'dä,-vë-) see VEDA.

atheism, denial of the existence of God or gods and of any supernatural existence, to be distinguished from AGNOSTICISM, which holds that the existence cannot be proved. The term *atheism* has been used as an accusation against all who attack established orthodoxy, as in the trial of Socrates. There were few avowed atheists from classical times until the 19th cent., when popular belief in a conflict between religion and science brought forth preachers of the gospel of atheism, such as Robert G. Ingersoll. There are today many individuals and groups professing atheism.

Athelney, Isle of (äth'alnë), small area formerly surrounded by marshland, Somerset, SW England. King Alfred took refuge from the Danes there in 878 and founded a Benedictine abbey in 888. Relics have been found, including the Alfred Jewel, now in the Ashmolean Museum at Oxford.

Athelstan or **Æthelstan** (both äth'alstan, äth'elstan), d 939, king of Wessex (924-39), son and successor of Edward the Elder. As a youth he lived in the household of his aunt, Æthelflæd, Lady of the Mercians. After coming to the throne, he vigorously built up his kingdom on the foundations laid by his grandfather ALFRED. He made himself overlord of all England, establishing his hegemony firmly by victory over a coalition of his enemies at BRUNANBURH in 937. He was popular as well as able, was generous to the church, and issued laws that attempted to impose royal authority on customary law. Athelstan married his sisters to Charles III of France, the French duke Hugh the Great, Otto I of Germany, and Louis, king of Arles. He was succeeded by his brother Edmund. See F. M. Stenton, *Anglo-Saxon England* (2d ed 1947).

Athena (ath'na), or **Pallas Athena** (päl'äs), in Greek religion, one of the most important Olympian deities. According to myth, after Zeus seduced Metis he learned that any son she bore would overthrow him, so he swallowed her alive. Later Hephaestus split Zeus' skull with an ax, and out sprang Athena, fully armed. Athena was a deity of diverse functions and attributes. Her most conspicuous role was perhaps that of a goddess of war, the female counterpart of Ares. However, she was also a goddess of peace, noted for her compassion and generosity. Like Minerva, with whom the Romans identified her, she was a patron of the arts and crafts, especially spinning and weaving. In later times she was important as a goddess of wisdom. Athena was also a guardian of cities, notably Athens, where the Parthenon was erected as her temple. In a contest with Poseidon concerning dominion over Attica, Athena made an olive tree grow on the Acropolis while Poseidon caused a saltwater stream to gush from the Acropolis. The other Olympians, asked to judge the contest, decided in favor of Athena. Her statue, the PALLADIUM, was supposed to protect the city that possessed it. It was said that because she accidentally killed PALLAS she set the name Pallas before her own. Although a virgin goddess, she was concerned with fertility, and at Athens and Elis her worship was notably maternal. Athena is represented in art as a stately figure, armored, and wielding the AEGIS. Her most important festival was the PANATHENAEA.

Athenaeus (äth'anë'äs), fl c 200, Greek writer, b Naucratis, Egypt. His anthological work, the *Deipnosophistae* (Banquet of the Sophists), is valuable because of the wealth of information it contains on Greek manners and customs.

Athenodorus: see LAOCOON.

Athens (äth'inz), Gr *Athinaí*, city (1971 pop 867,023), capital of Greece, E central Greece, on the plain of Attica, between the Kifisos and Ilissos rivers, near the Saronic Gulf. Mt. Agialeos (1,534 ft/468 m), Mt. Parnis (4,633 ft/1,412 m), Mt. Pendelikon (3,638 ft/1,109 m), and Mt. Hymettus (3,370 ft/1,027 m) rise in a semicircle around the city. The capital of Attica prefecture, Athens is Greece's largest city and its administrative, economic, and cultural center. Greater Athens, which includes the port of PIRAEUS and numerous suburbs, has a population of more than 2.5 million and accounts for most of Greece's industrial output. Manufactures include silk, wool, and cotton textiles, machine tools, steel, ships, food products, beverages, chemicals, pottery, printed materials, and carpets. Greater Athens is a transportation hub, served by rail lines, major roads, airlines, and ocean-going vessels. There is a large tourist industry. Water for the city is supplied by the Marathon reservoir (1931), formed by a dam made of Pentelic marble.

The cultural legacy of ancient Athens to the world is incalculable, to a great extent the references to the Greek heritage that abound in the culture of Western Europe are to Athenian civilization. Athens, named after its patron goddess Athena, was inhabited in the Bronze Age. Its citizens later proudly claimed that their ancestors had lived in the city even before the settlements of Attica were molded into a single state (according to legend, by THESEUS). According to tradition, Athens was governed until c 1,000 B C by Ionian kings, who had gained suzerainty over all Attica. After the Ionian kings Athens was rigidly governed by its aristocrats through the archontate (see ARCHONS), until SOLON began to enact liberal reforms in 594 B C. Solon abolished serfdom, modified the harsh laws attributed to DRACO (who had governed Athens c 621 B C), and altered the economy and constitution to give power to all the propertied classes, thus establishing a limited democracy. His economic reforms were largely retained when Athens came under (560-511 B C) the rule of the tyrant PISISTRATUS and his sons HIPPIAS and HIPPARCHUS. During this period the city's economy boomed and its culture flourished. Building on the system of Solon, CLEISTHENES then established (c 506 B C) a democracy for the freemen of Athens, and the city remained a democracy during most of the years of its greatness. THE PERSIAN WARS (500-449 B C) made Athens the strongest Greek city-state. Much smaller and less powerful than SPARTA at the start of the wars, Athens was more active and more effective in the fighting against Persia. The Athenian heroes MILTIADES, THEMISTOCLES, and CIMON were largely responsible for building the city's strength. In 490 B C the Greek army defeated Persia at MARATHON. A great Athenian fleet won a major victory over the Persians off the island of Salamis (480 B C). The powerful fleet also enabled Athens to gain hegemony in the DELIAN LEAGUE, which was created in 478-477 B C through the confederation of many city-states, in succeeding years the league was transformed into an empire headed by Athens. The city arranged peace with Persia in 449 B C and with its chief rival, Sparta, in 445 B C, but warfare with smaller Greek cities continued. During the time of PERICLES (443-429 B C) Athens reached the height of its cultural and imperial achievement. Under Pericles, the philosopher SOCRATES and the dramatists AESCHYLUS, SOPHOCLES, and EURIPIDES were active. The incomparable Parthenon was built, and sculpture and painting flourished. Athens became a center of intellectual life, probably never again in the history of the West (unless perhaps in Renaissance Florence) was so much creative genius gathered in one place. However, the rivalry with Sparta had not ended, and in 431 B C the PELOPONNESIAN WAR between Sparta and Athens began. It went badly for Athens from the start. The Long Walls built to protect the city and its port of Piraeus saved the city itself as long as the fleet was paramount, but the allies of Athens fell away and the land empire Pericles had tried to build already had crumbled before his death in 429 B C. The war dragged on under the leadership of CLEON and continued even after the collapse of the expedition against Sicily, urged (415 B C) by ALICIBIADES. The Peloponnesian War finally ended in 404 B C with Athens completely humbled, its population cut in half, and its fleet reduced to a dozen ships. Under the dictates of Sparta, Athens was compelled to tear down the Long Walls and to accept the government of an oligarchy called the THIRTY TYRANTS. However, the city recovered rapidly. In 403 B C the Thirty Tyrants were overthrown by THRASYBULUS, and by 376 B C Athens again had a fleet, had rebuilt the Long Walls, had re-created the Delian League, and had won a naval victory over Sparta. Sparta also lost power as a result of its defeat (371 B C) by Thebes at LEUCTRA, and, although Athens did not again achieve hegemony over Greece, it did have a short period of great prosperity and comfort. However, the growth of Macedon's power under Philip II heralded the demise of Athens as a major power. Despite the pleas by DEMOSTHENES to the citizens of Athens to stand up against Macedon, Athens was decisively defeated by Philip at Chaeronea in 338 B C. The city did not dare dispute the mastery of Philip's son and successor, Alexander the Great. After his death Athens revolted (323-322 B C) against control by Macedon, but the revolt was quashed, and Athens lost its remaining dependencies and declined into a provincial city. Its last bid for greatness (266-262 B C) was firmly suppressed by ANTIGONUS II, king of Macedon. Through the troubled times of the Peloponnesian War and the wars against Philip, Athenian achievements in philosophy, drama, and art had continued. ARISTOPH-

ANES wrote comedies, PLATO taught at the Academy, ARISTOTLE compiled an incredible store of information, and Thucydides wrote a great history of the Peloponnesian War. As the city's glory waned in the 3d cent B C, its earlier contributions were spread over the world in Hellenistic culture. Athens became a minor ally of growing Rome, and a period of stagnation was broken only when the city unwisely chose to support Mithridates VI of Pontus against Rome. As a result, Athens was sacked by the Roman general Sulla in 86 B C. Nevertheless, Athens sent out many teachers to Rome and retained a certain faded glory as a moderately prosperous small city in the backwash of the empire. It remained so until the time when the Eastern Empire began to fall to the barbarians. Athens was captured in A D 395 by the Visigoths under Alaric I. It became a provincial capital of the Byzantine Empire and a center of religious learning and devotion. Following the creation (1204) of the Latin Empire of Constantinople (see CONSTANTINOPE, LATIN EMPIRE OF), Athens passed (1205) to Othon de la Roche, a French nobleman from Franche-Comte, who was made *megaskyr* [great lord] of Athens and Thebes. His nephew and successor, Guy I, obtained the ducal title, and the duchy of Athens, under Guy I and his successors, enjoyed great prosperity while becoming thoroughly French in its institutions. In 1311 the duchy was captured by a band of Catalan soldier-adventurers who offered (1312) the ducal title to King Frederick II of Sicily, a member of the house of Aragón. Members of the house of Aragón carried the title, but Athens was in fact governed by the "Catalan Grand Company," which also acquired (1318) the neighboring duchy of Neopatra. The French feudal culture disappeared, and Athens sank into insignificance and poverty, particularly after 1377, when the succession was contested in civil war. Peter IV of Aragón assumed sovereignty in 1381, but ruled from Barcelona. On his initiative, the devastated duchy was settled by Albanians. Athens again prospered briefly after its conquest in 1388 by Nerio I Acciajuoli, lord of Corinth, a Florentine noble. Under the Acciajuoli family's rule numerous Florentine merchants established themselves in Athens. However, the fall of the Acropolis to the Ottoman Turks in 1458 marked the beginning of nearly four centuries of Ottoman rule, and Athens once more declined. Venice, which had held Athens from 1394 to 1402, recovered it briefly from the Turks in 1466 and besieged it in 1687-88. During the siege the Parthenon, used by the Turks as a powder magazine, was largely blown up in a bombardment. Modern Athens was constructed only after 1834, when it became the capital of a newly independent Greece. OTTO I, first king of the Hellenes (1832-62), rebuilt much of the city, and the first modern Olympic games were held in Athens in 1896. The population of Athens grew rapidly in the 1920s, when Greek refugees arrived from Turkey. The city's inhabitants suffered extreme hardships during the German occupation (1941-44) in World War II, but the city escaped damage in the war and in the country's civil troubles of 1944-50. The main landmark of Athens is the ACROPOUS (412 ft/126 m), which dominates the city and on which stand the remains of the PARTHENON, the PROPYLEAE, and the ERECHTHEUM. Occupying the southern part of Athens, the Acropolis is ringed by the other chief landmarks of the ancient city—the Pnyx, where the citizens' assemblies were held, the AREOPAGUS, the Theseum of Hephaestum, a well-preserved Doric temple of the 5th cent B C, the old Agora and the Roman forum, the temple of Zeus or Olympieum (begun under Pisistratus in the 6th cent B C and completed in the 2d cent A D under Hadrian, whose arch stands nearby), the theatre of Dionysius (oldest in Greece), and the Odeum of HERODES ATTICUS. There are many Roman remains in the "new" quarter, built east of the original city walls by Emperor Hadrian (1st cent A D), there the modern royal palace and gardens also stand. The STADIUM is E of the Ilissus River. Parts of the ancient city walls are still visible, particularly at the Dipylon, the sacred gate on the road to Eleusis (Eleusis), however, the Long Walls connecting Athens and Piraeus have almost entirely disappeared. The most noteworthy Byzantine structures are the churches of St. Theodora and of the Holy Apostles, both built in the 12th cent. Athens is the see of an archbishop who presides over the Synod of the Greek Orthodox Church. The city is the seat of the National and Capodistrian University (1837), a polytechnic institute, an academy of sciences, several schools of archaeology, and many museums and libraries. A nuclear research center is nearby, at Aghia Paraskevi. The Greek geographer PAUSANIAS wrote an extensive

description of Greece. HERODOTUS, THUCYDIDES, XENOPHON, and POLYBIUS were great Greek historians. Modern general works on ancient Greece include those of J. B. BURY and Michael ROSTOVITZ. See A. H. M. Jones, *Athenian Democracy* (1957), C. A. Robinson, *Athens in the Age of Pericles* (1959), P. L. MacKendrick, *The Athenian Aristocracy* (1967), J. C. Hill, *The Ancient City of Athens, Its Topography and Monuments* (rev. ed. 1969), G. Giannelli, *The World of Classical Athens* (1970), C. M. Bowra, *Persian Athens* (1971), Russell Meiggs, *The Athenian Empire* (1972). See also bibliography under GREECE.

Athens. 1 City (1970 pop 14,360), seat of Limestone co., N Ala., near the Tenn. line, in a farm area, inc. 1818. It has food-processing industries and plants that make textiles, thermostats, stoves, and chemicals. Sacked and occupied by Federals in 1862, it was recaptured by Gen. N. B. Forrest in 1864. Fine antebellum buildings remain. Athens College is there, and a nuclear power plant is nearby. 2 City (1970 pop 44,342), seat of Clarke co., NE Ga., on the Oconee River, in a piedmont area, inc. 1806. The city was founded as the site of the Univ. of Georgia. Its industries include poultry processing and the manufacture of clocks, watches, radios, and textiles. Numerous Georgia statesmen have lived in Athens, and some of their houses are among the city's many fine examples of classic revival style—the Howell Cobb house (1850), the T. R. Cobb house (1830-43), and the Joseph H. Lumpkin house (c. 1845). 3 City (1970 pop 23,310), seat of Athens co., SE Ohio, on bluffs overlooking the Hocking River, in a coal-mining area of the Appalachian foothills, inc. 1811. There are diverse industries in the city. Athens was surveyed in 1795-96 by the Ohio Company of Associates as the site of a university and was settled shortly thereafter. It is the seat of Ohio Univ. and of a state mental hospital. Wayne National Forest is to the north. 4 City (1970 pop 11,790), seat of McMinn co., E Tenn., in a farm and resort area, inc. 1829. Furniture, plastics, farm implements, dairy products, and insecticides are made. Tennessee Wesleyan College is there.

atherosclerosis (ăth'ərōsklārō'sīs) see ARTERIOSCLEROSIS

Atherton, Gertrude Franklin (Horn), 1857-1948, American writer, b. San Francisco. She wrote a series of historical novels about California, which include *The Californians* (1898), *Rezanov* (1906), and *The Ancestors* (1907). Her most popular books are *The Conqueror* (1902), which is a fictionalized biography of Alexander Hamilton, and the sensational novel *Black Oxen* (1923), concerning a woman who is rejuvenated by a glandular operation and based on Atherton's own experience of glandular therapy. See her autobiography *The Adventures of a Novelist* (1932).

Athlai (ăth'lī, ăthlāt'), Israelite. Ezra 10:28

athlete's foot: see RINGWORM

athlete's heart, common term for an enlarged HEART associated with repeated strenuous exercise. As a result of the increased workload required of it, the heart will stretch, or hypertrophy, enlarging the size of the chambers and increasing the volume of blood pumped per stroke. Consequently, the heart has to contract less frequently and at rest will beat as few as 40 times per minute as compared with an average number of 70 beats in a normal heart. The condition is not pathological, and there is probably no danger of cardiac disability arising from it.

Athlone, Godart van Ginkel, 1st earl of: see GINKEL, GODART VAN

Athlone (ăthlōn'), urban district (1971 pop 9,821), Co. Westmeath, central Republic of Ireland, on the Shannon River. It is an important road and rail junction and a busy inland port, reached by the river and two canals. Industries include the production of cotton textiles, woolens, mineral water, and furniture. The English occupied the town in the 13th cent. and built Athlone Castle. Possession of the town was disputed during succeeding centuries, and the castle was often besieged. Athlone fell to the forces of William III of Great Britain in 1691. It is an important military station and the main transmitting station of the Irish National Radio.

Athol (ăth'əl), town (1970 pop 11,185), Worcester co., N. Mass., inc. 1762. Its manufactures include tools, drills, shoes, and toys. The area was settled in 1735.

Atholl (ăth'əl), successively an earldom, a marquessate, and a dukedom of Scotland. See STUART, JOHN, and MURRAY, JOHN.

Athor: see HATHOR

Athos (āth'ōs, ā'thōs) or **Akte** (āk'tā), easternmost of the three peninsulas of KHALKIDHIKI, c 130 sq mi (340 sq km), NE Greece, in Macedonia. At the southern tip of the peninsula is the virtually independent state of the monks of Mount Athos, also called Hagion Oros [Gr. = Holy Mountain], which rises to c 6,670 ft (2,030 m). Mount Athos is a community of about 20 monasteries of the Order of St. Basil of the Orthodox Eastern Church and includes c 30 sq mi (80 sq km) of territory. The first monastery was founded c 963. The community of monks (see MONASTICISM) enjoyed administrative independence under the Byzantine and Ottoman empires and under the modern Greek government. In 1927 it was made a theocratic republic under Greek suzerainty, ruled by the patriarch of Constantinople. Karyai, the chief town of Athos, is the seat of the Holy Community, a committee made up of one representative from each monastery, which governs the monks of Mount Athos. No woman or female animal is allowed in the religious community. The icons from Mount Athos are celebrated, the libraries contain a great wealth of Byzantine manuscripts.

Atitlán (ātētlan'), volcanic lake, 53 sq mi (137 sq km), 17 mi (27.3 km) long and 11 mi (17.7 km) wide, SW Guatemala. One of the most magnificent lakes of Central America, it is set among lofty mountains with three inactive volcanoes nearby. Atitlán volcano (11,565 ft/3,525 m) is the tallest. The fertile lakeshore is densely populated by subsistence farmers. Through the principal towns on the lake, Santiago Atitlán, San Lucas Tolimán, and Panajachel, the Indians, paddling dugouts, transport produce to and from the Pacific coast and the highlands.

Atkinson, Brooks (Justin Brooks Atkinson), 1894–, American journalist, b. Melrose, Mass. He began his career as a reporter for the *Springfield, Mass., Daily News* and later worked for the *Boston Transcript*. After serving as an editor for the *New York Times*, he became its drama critic in 1925. Except for his service as a foreign correspondent during World War II, he held the position as critic until 1960. His critical opinion had much influence on the success or failure of Broadway plays. Upon his retirement as drama critic, a New York theater was named for him. Atkinson's books include *Henry Thoreau, the Cosmic Yankee* (1927), *Broadway Scrapbook* (1947), and *Broadway* (1970). An ardent naturalist and conservationist, he wrote *This Bright Land: A Personal View* (1972).

Atkinson, Henry, 1782–1842, American army officer, b. North Carolina. After service as a colonel in the War of 1812, he was a commander in the West and led two expeditions (1819, 1825) to the Yellowstone River. He was general commander of forces in the BLACK HAWK WAR and later supervised removal of the Winnebago Indians to Iowa. Jefferson Barracks (near St. Louis) and Fort Leavenworth were begun under his direction. See biography by R. L. Nichols (1965).

Atlanta (atlán'tā, āt-), city (1970 pop. 497,421), state capital and seat of Fulton co., NW Ga., near the Appalachian foothills, inc. as a city 1847. It is the largest city and the cultural, industrial, transportation, financial, and commercial center of the state, a port of entry, a busy air traffic hub, and one of the leading cities of the South. Manufactures include textiles, furniture, chemicals, glass, paper, lumber, steel, and leather, electrical, and aluminum products. There are flour mills, automobile and aircraft assembly plants, and printing and publishing houses. Hardy Ivy, the first settler, built a cabin there (1833) on what had been Creek Indian land. The town, founded (1837) as Terminus, the end of a railroad line, was incorporated as Marthasville in 1843 and renamed Atlanta in 1845. It became a railroad and marketing hub and in the Civil War was an important communication and supply center; it fell to Gen. W. T. Sherman on Sept. 2, 1864 (see ATLANTA CAMPAIGN). Most of the city was burned on Nov. 15, before Sherman began his march to the sea. The city was rapidly rebuilt and thrived as a commercial and industrial center. It was chosen temporary state capital in 1868 and became permanent capital following a popular vote in 1877. A number of conventions and expositions in the 19th and 20th cent. drew attention to Atlanta's strategic distributive position. Points of interest include the capitol (1889), housing the state library, the city hall (1929), the High Museum of Art, the state archives building, containing an historical museum and library, the building housing the huge *Cyclorama of the Battle of Atlanta*, Oakland Cemetery, containing Civil War dead. "Underground Atlanta," a four-block tract covered for 50 years by a vast viaduct system, now

being restored, the grave of Martin Luther King, Jr., and Grant Park, with the municipal zoo and Confederate Fort Walker (restored). The Federal penitentiary there (est. 1899) is one of the most widely known prisons in the United States. Many departments of the Federal government have branches in Atlanta, also there are Fort McPherson, headquarters of the US 3d Army, and a naval air station. The city's numerous parks are famous for their dogwood blooms, and in the area are Stone Mountain Park, with enormous relief carvings of Confederate figures, and Kennesaw Mountain National Battlefield Park (see NATIONAL PARKS AND MONUMENTS, table). Atlanta is the seat of Emory Univ., Georgia Institute of Technology, Georgia State Univ., Oglethorpe Univ., Beulah Heights College, the Atlanta School of Art, and Atlanta Univ., with its adjacent and affiliated schools, Clark College, Morehouse College, Morris Brown College, and Spelman College. There is a symphony orchestra, and the Atlanta stadium is home for the city's professional football and baseball teams.

Atlanta campaign, May–Sept. 1864, of the U.S. Civil War. In the spring of 1864, Gen. W. T. Sherman concentrated the Union armies of G. H. Thomas, J. B. McPherson, and J. M. Schofield around Chattanooga. On May 6 he began to move along the railroad from Chattanooga to Atlanta against Dalton, Ga., c 30 mi (48 km) southeast, where Gen. J. E. Johnston had a smaller Confederate force. Sherman had a twofold objective: the destruction of Johnston's army and the capture of Atlanta, c 140 mi (225 km) southeast. Since Johnston was strongly entrenched, Sherman turned his left flank, forcing him back to Resaca, c 12 mi (19 km) south. The campaign continued in this way—Sherman outflanking Johnston, who withdrew to previously fortified positions—until June 27, when Sherman tried a direct attack at Kennesaw Mt., c 25 mi (40 km) NW of Atlanta, and was repulsed. He then reverted to flank operations. By July, Johnston had withdrawn to the south bank of the Chattahoochee River, where he prepared to fight on his own terms. On July 17, the day Sherman crossed the Chattahoochee, John Bell Hood replaced Johnston. Following Johnston's plan, Hood unsuccessfully attacked Sherman's divided army (July 20) as it crossed Peach Tree Creek, a small tributary of the Chattahoochee. In the battles of Atlanta (July 22) and Ezra Church (July 28), Hood again failed to stop the Union advance, he then retired behind the strong works of Atlanta, which Sherman soon had under bombardment. The Union lines were gradually extended until the Confederate line of communications south of the city was broken on Sept. 1. Hood abandoned Atlanta that night and Sherman occupied it on Sept. 2, 1864. See A. A. Hoehling, *Last Train from Atlanta* (1958), Samuel Carter, *The Siege of Atlanta, 1864* (1973).

Atlanta University Center, at Atlanta, Ga., coeducational. It was organized in 1929 when Atlanta Univ. (chartered 1867), Morehouse College (1867), and Spelman College (1881) became affiliated in a university plan, in which Atlanta Univ. was to be devoted exclusively to graduate education, with the other two colleges providing undergraduate programs. In 1947 the Atlanta Univ. School of Social Work (1920) merged with Atlanta Univ. Later Clark College (chartered 1877), Interdenominational Theological Center, and Morris Brown College (1885) also joined the university center's affiliation agreement.

atlantes (ātlan'téz) [Latin plural of ATLAS], sculptured male figures serving as supports, or apparent supports, in place of a column or pier. The earliest (c 480–460 B.C.) and most important example from antiquity is in the Greek temple of Zeus at Agrigento, Sicily. The baroque architecture of the 17th cent. made considerable use of atlantes, and they were a frequent decorative motif in mantelpieces and doorways of the classical revival in the early 19th cent.

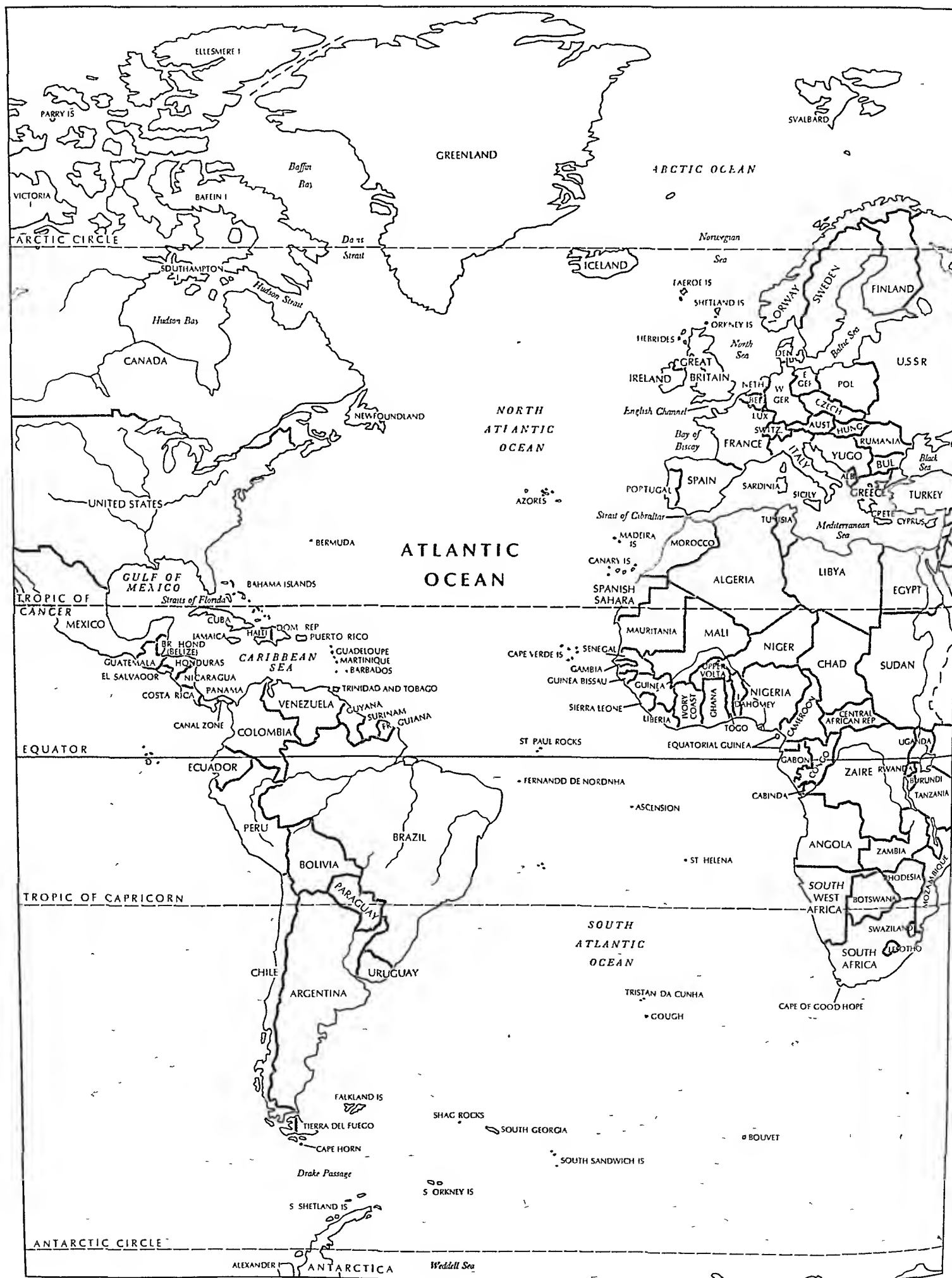
Atlantic cable· see CABLE

Atlantic Charter, joint program of peace aims, enunciated by Prime Minister Winston Churchill of Great Britain and President Franklin Delano Roosevelt of the United States on Aug. 14, 1941. Britain at that time was engaged in World War II, and the United States was to enter the war four months later. The statement, which was not an official document, was drawn up at sea, off the coast of Newfoundland. It supported the following principles and aims: renunciation of territorial aggrandizement, opposition to territorial changes made against the wishes of the people concerned, restoration of sovereign rights and self-government to those forc-

ibly deprived of them, access to raw materials for all nations of the world and easing of trade restrictions, world cooperation to secure improved economic and social conditions for all, freedom from fear and want, freedom of the seas, and abandonment of the use of force, as well as disarmament of aggressor nations. In the United Nations declaration of Jan. 1, 1942, the signatory powers pledged adherence to the principles of the charter.

Atlantic City, city (1970 pop. 47,859), Atlantic co., SE N.J., an Atlantic resort and convention center, settled c 1790, inc. 1854. Situated on Absecon Island, a sandbar that is 10 mi (16.1 km) long, Atlantic City was a fishing village until the construction of a railroad in 1854, when it became a fashionable resort for Philadelphians and New Yorkers. The first boardwalk was built in 1870. Atlantic City's chief industry is tourism, about 15 million visitors come annually. The present boardwalk, lined with hotels, shops, and amusements, is 6 mi (9.7 km) long and from 40 to 60 ft (12.2–18.3 m) wide. Rolling chairs, introduced in 1884, provide pleasant rides along the boardwalk. Five amusement piers, including the famous Steel Pier (1898), run out to sea from the boardwalk. Atlantic City has a large convention hall, football games are played in its main arena and the Democratic national convention took place there in 1964. The Miss America Pageant is held in Atlantic City every September. Absecon Lighthouse, in operation from 1854 to 1932, is now a tourist attraction. The first Ferris wheel was built in Atlantic City in 1869. The board game Monopoly, which makes use of the city's street names, was invented there in 1930. Saltwater taffy, developed in Atlantic City, is the chief manufacture.

Atlantic Ocean [Lat. = of Atlas], second largest ocean (c 31,800,000 sq mi/82,362,000 sq km, c 36,000,000 sq mi/93,240,000 sq km with marginal seas), extending in an S shape from the arctic to the antarctic regions between North and South America on the west and Europe and Africa on the east. It is connected with the Arctic Ocean by the Greenland Sea and Smith Sound, with the Pacific Ocean by Drake Passage, the Straits of Magellan, and the Panama Canal, and with the Indian Ocean by the Suez Canal and the expanse between Africa and Antarctica. The shortest distance across the Atlantic Ocean (c 1,600 mi/2,575 km) is between SW Senegal, W Africa, and E Brazil, E South America. The principal arms of the Atlantic Ocean are (in the west) Hudson and Baffin bays, the Gulf of Mexico, and the Caribbean Sea, (in the east) the Baltic, North, Mediterranean, and Black seas, the Bay of Biscay, and the Gulf of Guinea, and (in the south) Weddell Sea. The continental shelf of the Atlantic Ocean is generally narrow, with the widest sections found off NE North America, SE South America, and NW Europe. The Atlantic has relatively few islands, with the greatest concentration found in the Caribbean region. Most of the islands are structurally part of the continents, such as the British Isles, Falkland Islands, Canary Islands, and Newfoundland Islands such as Iceland, the Azores, the Cape Verde Islands, Ascension, the South Sandwich Islands, the West Indies, and Bermuda are exposed tops of submarine ridges. The Bahamas are low coral islands, while the Madeiras are high volcanic islands. The floor of the Atlantic has an average depth of c 12,000 ft (3,660 m). It is separated from that of the Arctic Ocean by a submarine ridge extending from SE Greenland to N Scotland, part of the floor (c 3,000 ft/910 m deep) is known as "telegraph plateau" because of the network of cables laid there. A shallow submarine ridge across the Strait of Gibraltar separates the Mediterranean basin from the Atlantic and limits the exchange of water between the two bodies. The Mid-Atlantic Ridge (c 300–600 mi/480–970 km wide), a submarine mountain range extending c 10,000 mi (16,100 km) from Iceland to near the Antarctic Circle, generally follows the trend of the coastlines of the continents. It rises to an average height of c 10,000 ft (3,050 m), and a few peaks emerge as islands. The ridge, which is the center of volcanic activity and earthquakes, has a great rift that is constantly widening (see SEA-FLOOR SPREADING) and filling with molten rock from the earth's interior. As a result the Western Hemisphere and Europe and Africa are moving away from each other. The Mid-Atlantic Ridge divides the floor of the Atlantic Ocean into eastern and western sections that are composed of a series of deep-sea basins (abyssal plains). The greatest depth (c 28,000 ft/8,530 m) is the Milwaukee Deep, in the Puerto Rico Trench, N of Puerto Rico. More large rivers, including the Mississippi, the Congo, and the Amazon, drain into the



Atlantic than into any other ocean. The surface waters in the Atlantic's trade wind belts attain the highest salinity known in ocean water. Because of its shape, the Atlantic may be divided into two basins—North Atlantic Ocean and South Atlantic Ocean—each with a distinct circulation system. The clockwise-moving currents of the North Atlantic (North Equatorial Current, Antilles Current, Gulf Stream, North Atlantic Drift, Canaries Current) and the counterclockwise-moving currents of the South Atlantic (South Equatorial Current, Brazil Current, West Wind Drift, Benguela Current) are separated from each other by the Equatorial Counter Current, the Guinea Current off W Africa is a link between the two systems. At the Grand Banks off Newfoundland heavy fogs form along the front where the warm Gulf Stream meets the cold Labrador Current. The Grand Banks along with the Dogger Banks of the North Sea contain some of the world's best commercial fishing grounds. The North Atlantic Ocean has the world's busiest shipping lanes, the northern lanes are patrolled for icebergs. Commerce between the Mediterranean Sea and the NE Atlantic Ocean was initiated by the Carthaginians. From the 7th cent. A.D., Scandinavians navigated the Atlantic, they probably reached North America c 1000. Trade routes along the coast of Africa were opened by Portugal in the 15th cent. and to the Western Hemisphere by Spain after the voyages of Columbus. Scientific knowledge of the ocean floor dates from the CHALLENGER EXPEDITION (1872-76). See A. J. Villiers, *Wild Ocean: The Story of the North Atlantic and the Men Who Sailed It* (1957), B. C. Heezen et al., *The Floors of the Ocean: The North Atlantic* (1959), John Murray and Johan Hjort, *The Depths of the Ocean* (1912, repr. 1965), M. V. Klenova, ed., *Oceanographic Research in the Atlantic* (tr. 1967), V. H. Cassidy, *The Sea Around Them: The Atlantic Ocean*, A.D. 1250 (1968).

Atlantic Provinces, term used since 1949 to designate the Canadian provinces of Newfoundland, Nova Scotia, New Brunswick, and Prince Edward Island.

Atlantis, in Greek legend, large island in the western sea. Plato, in his dialogues the *Timaeus* and the *Critias*, tells of the high civilization that flourished there before the island was destroyed by an earthquake. The legend has persisted, and societies for the discovery of Atlantis are perennially active. Plato described Atlantis as an ideal state, and the name is considered synonymous with UTOPIA. Francis Bacon called his account of the ideal state *The New Atlantis*. See N. F. Zhirov, *Atlantis* (tr. 1970), J. S. Bowman, *The Quest for Atlantis* (1971).

Atlas (ä'tlās), in Greek mythology, a Titan, son of Iapetus and the nymph Clymene and the brother of Prometheus. He joined with Cronus and led the Titans in their defense against the Olympians. (See TITAN.) When the Titans were defeated, Atlas was condemned to hold the sky on his shoulders for all eternity—a mythical explanation of why the sky does not fall. He is identified with the Atlas mountains in NW Africa.

atlas, in geography, collection of maps or charts. It usually includes data on various features of a country, e.g., its topography, natural resources, climate, and population, as well as its agriculture and main industries. In astronomy, a star atlas is a collection of maps or photographs covering much or all of the celestial sphere and showing the locations of stars and other objects. Although the first known atlas was compiled by the Greek geographer Ptolemy in the 2d cent. A.D., its modern form was introduced in 1570 with the publication of *Theatrum orbis terrarum* by the Flemish geographer Abraham Ortelius. In 1595 his close friend Gerardus Mercator published *Atlas sive cosmographicae*. Its frontispiece was a figure of the titan Atlas holding a globe on his shoulders. The name *Atlas* subsequently came to be applied to volumes of maps and information in this format.

Atlas Mountains, system of ranges and plateaus in NW Africa, extending c 1,500 mi (2,410 km) from SW Morocco, through N Algeria, to N Tunisia, Jebel Toubkal (13,671 ft/4,167 m), in SW Morocco, is the highest peak. The Atlas Mts., predominantly folded mountains of sedimentary rock, were uplifted during the late Jurassic period. Geologically related to the Alpine system of Europe, they are separated from the Sierra Nevada of Spain by the Strait of Gibraltar and from Sicily and the Apennines of Italy by the Mediterranean Sea, the Canary Islands are a westward extension. The Atlas system is most rugged in Morocco, where, from north to south, the Rif Atlas, Middle Atlas, High or Grand Atlas (the highest

part of the system), and Anti-Atlas are found, fertile lowlands separate the ranges. In Algeria the system becomes a series of plateaus, with the Tell Atlas and the Saharan Atlas rimming the extensive Plateau of the Chotts before converging in Tunisia. The Atlas Mts. are a climatic barrier between the Mediterranean basin and the Sahara Desert. The slopes facing north are generally well watered and have important farmland and forests, on these slopes are the headwaters of many streams used for irrigation. The slopes facing south and the drier areas of the system are generally covered with shrub and grasses and have salt lakes and salt flats, sheep grazing is important there. The Atlas Mts. are rich in minerals, especially phosphates, coal, iron, and oil.

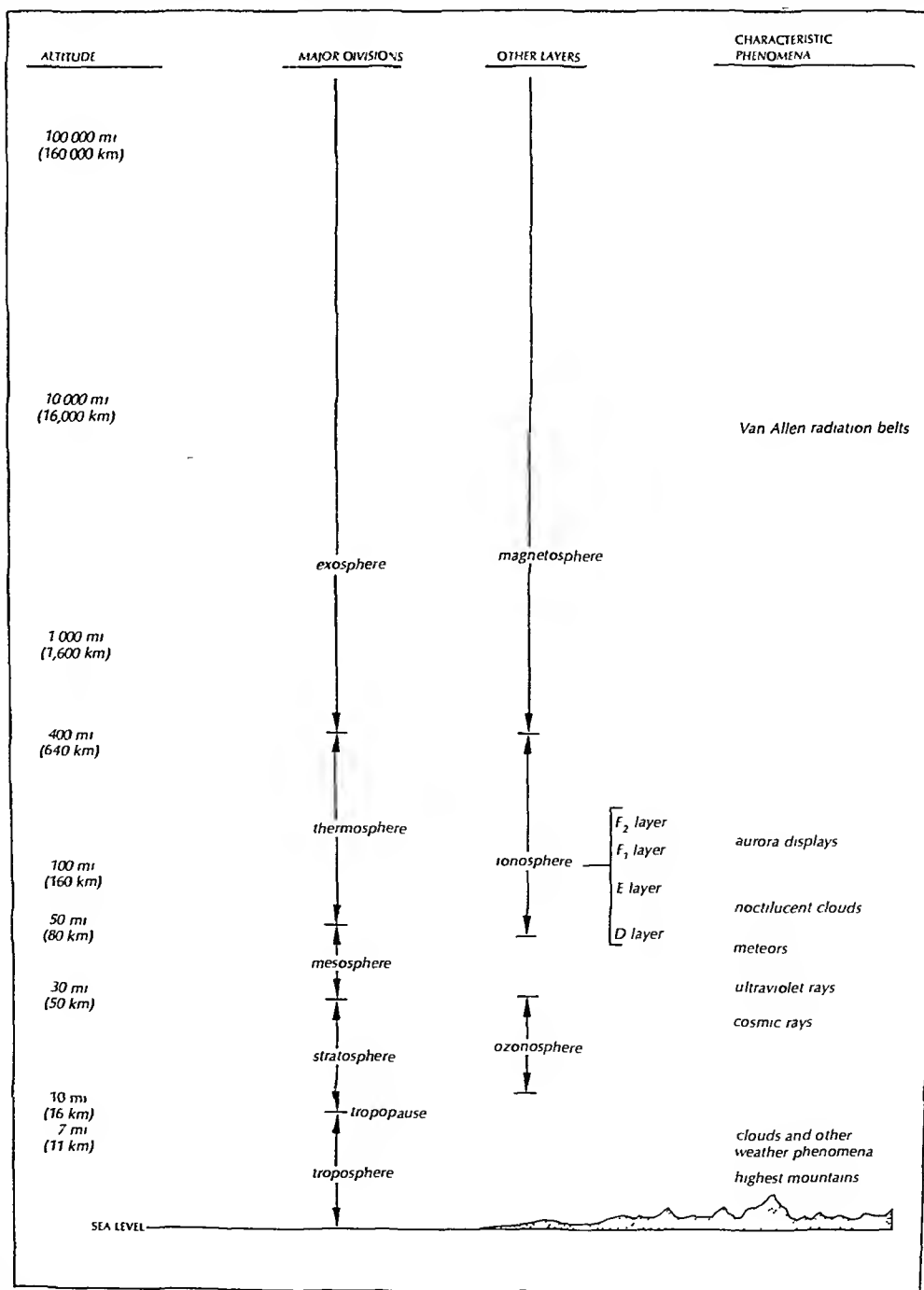
atlatl (at'lātāl), throwing stick used to give a spear greater propulsion. Archaeological evidence indicates that it was employed extensively by Indians of North and South America prior to A.D. 1200, when it was superseded by the bow and arrow.

Atli: see ETZEL.

Atlin Lake (ä'tlīn), long, irregular mountain lake, c 300 sq mi (780 sq km), NW British Columbia, Canada, touching the Yukon Territory boundary. It is the source of the Yukon River. The town of Atlin is on the east shore and is the headquarters of the Atlin dist., a region in which there is both placer and quartz gold mining. The region is noted for its scenery and its hunting.

atmometer: see EVAPORIMETER.

atmosphere [Gr., =sphere of air], the mixture of gases surrounding a celestial body with sufficient gravity to maintain it. Although some details about the atmospheres of Mars and Venus are known, and various remote measurements have hinted at the atmospheric properties of other planets, a complete description is available only for the earth's atmosphere, the study of which is called meteorology. The gaseous constituents of the atmosphere are not chemically combined, and thus each retains its own characteristic properties. Within the first 40 to 50 mi (64-80 km) above the earth the mixture is of uniform composition, except for a high concentration of ozone at 30 mi (50 km). This whole region contains more than 99% of the total mass of the earth's atmosphere. Calculated according to their relative volumes, the gaseous constituents are nitrogen, 78.09%, oxygen, 20.95%, argon, 0.93%, carbon dioxide, 0.03%, and minute traces of neon, helium, methane, krypton, hydrogen, xenon, and ozone. Above this well-mixed region is a narrow layer extending to about 72 mi (120 km) and containing nitrogen and oxygen. It is covered by an atmosphere consisting primarily of oxygen, extending to an altitude of about 600 mi (970 km). Helium predominates in the next higher region, which reaches to an altitude of about 1,500 mi (2,400 km). The outermost layer of atmosphere is composed mainly of hydro-



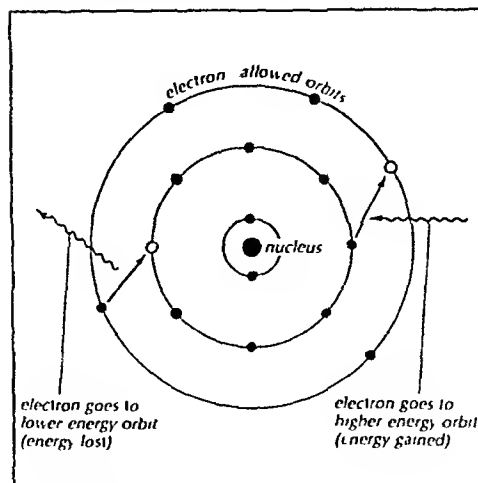
Atmosphere

gen The diffusion of these gases into such distinct layers is caused by the floating of lighter gases to the outer layers of the atmosphere. The lower atmosphere also contains varying amounts of water vapor, which determine its HUMIDITY. Condensation and sublimation within the atmosphere cause clouds or fog, and the resulting liquid water droplets or ice crystals may precipitate to the ground as rain, sleet, snow, hail, dew, or frost. The air also carries many kinds of DUST, including some of meteoric as well as terrestrial origin, and microorganisms, pollen, salt particles, and various gaseous and solid impurities resulting from human activity (see POLLUTION). The earth's atmosphere is the environment for most of its biological activity and exerts a considerable influence on the ocean and lake environment, where the remainder of biological activity occurs (see BIOSPHERE). WEATHER consists of the day-to-day fluctuations of environmental variables, and CLIMATE is the normal or long-term average state of the atmospheric environment (as determined in spans of about 50 years). Because of the pull of gravity the density of the atmosphere and the pressure exerted by air molecules are greatest near the earth's surface (about 1 gram per 10^3 cc and about 10^6 dynes per sq cm, respectively). Air pressure decreases quickly with altitude, reaching one half of its sea-level value at about 18,000 ft (5,500 m). The instrument used to measure air pressure is called a BAROMETER. The earth's atmosphere is composed of certain distinct regions. The troposphere extends upward from the earth to a height of about 5 mi (8.1 km) at the poles, to about 7 mi (11.3 km) in mid-latitudes, and to about 10 mi (16.1 km) at the equator. The air in the troposphere is in constant motion, with both horizontal and vertical air currents (see WIND). Throughout the troposphere temperature decreases with altitude at an average rate of about 3.6°F per 1,000 ft (2°C per 305 m), reaching about -70°F (-57°C) at its apex, the tropopause. Above the troposphere is the STRATOSPHERE, which extends upward to about 30 mi (50 km), in this region temperature changes little with altitude. Above the stratosphere the mesosphere extends to about 50 mi (80 km), the temperature rises sharply to a maximum of about 170°F (77°C) at the mesopause—about 30 mi (50 km) in altitude—and then decreases to about 28°F (-2°C) toward the top of the mesosphere. The thermosphere extends upward from the mesosphere to about 400 mi (640 km), its temperature reaches several thousand degrees, although, because of the thinness of the air, very little heat energy is available. Certain layers of the atmosphere within the main regions described above exhibit other characteristic properties. The ozonosphere is in the region that includes the mesopause, its high concentration of ozone absorbs much of the solar ultraviolet radiation that otherwise might penetrate into the lower atmosphere and present a hazard to biological activity. The region where solar energy triggers chemical reactions is called the chemosphere. The IONOSPHERE is in the range (50–400 mi/80–640 km) that contains a high concentration of electrically charged particles (ions), these particles are responsible for reflecting radio signals. The uppermost region of the atmosphere is called the exosphere, the atmosphere is so attenuated at this altitude that the average distance air molecules travel without colliding is equal to the radius of the earth. Although some gas molecules and particles out to about 40,000 mi (64,400 km) are trapped by the earth's gravitational and magnetic fields, the density of the atmosphere at an altitude of about 6,000 mi (9,700 km) is comparable to that of interplanetary space. The atmosphere protects the earth from harmful radiation and cosmic debris by absorbing and scattering the radiation and causing the solid matter (see METEOR) to burn from the heat generated by air friction. See AURORA BOREALIS, VAN ALLEN RADIATION BELTS.

atoll: see CORAL REEF

atom [Gr. = uncuttable (indivisible)], basic unit of MATTER, more properly, the smallest unit of a chemical ELEMENT having the properties of that element. The atomic theory, which holds that matter is composed of tiny, indivisible particles in constant motion, was proposed in the 5th cent. B.C. by the Greek philosophers Leucippus and Democritus and was adopted by the Roman Lucretius. However, Aristotle did not accept the theory, and it was ignored for many centuries. Interest in the atomic theory was revived during the 18th cent. following work on the nature and behavior of gases (see GAS LAWS). Modern atomic theory begins with the work of John Dalton, published in 1808. He held that all the atoms of an element are of exactly the same size

and weight (see ATOMIC WEIGHT) and are in these two respects unlike the atoms of any other element. He stated that atoms of the elements unite chemi-



Bohr-Rutherford atom

cally in simple numerical ratios to form compounds. The best evidence for his theory was the experimentally verified LAW OF SIMPLE MULTIPLE PROPORTIONS, which gives a relation between the weights of two elements that combine to form different compounds. Evidence for the theory also came from Michael Faraday's law of ELECTROLYSIS. A major development was the PERIODIC TABLE, devised simultaneously by Dmitri Mendeleev and J. L. Meyer, which arranged atoms of different elements in order of increasing atomic weight so that elements with similar chemical properties fell into groups. By the end of the 19th cent. it was generally accepted that matter is composed of atoms that combine to form molecules. In 1911, Ernest Rutherford developed the first coherent explanation of the structure of an atom. Using alpha particles emitted by radioactive atoms, he showed that the atom consists of a central, positively charged core, the NUCLEUS, and negatively charged particles called ELECTRONS that orbit the nucleus. Almost the entire mass of the atom is concentrated in the nucleus, which occupies only a tiny fraction of the atom's volume. There was one serious obstacle to acceptance of the nuclear atom, however. According to classical theory, as the electrons orbit about the nucleus, they are continuously being accelerated (see ACCELERATION), and all accelerated charges radiate electromagnetic energy. Thus, they should lose their energy and spiral into the nucleus. This difficulty was solved by Niels Bohr (1913), who applied the QUANTUM THEORY developed by Max Planck and Albert Einstein to the problem of atomic structure. Bohr proposed that electrons could circle a nucleus without radiating energy only in orbits for which their orbital angular MOMENTUM was an integral multiple of Planck's constant h divided by 2π . The discrete spectral lines (see SPECTRUM) emitted by each element were produced by electrons dropping from allowed orbits of higher energy to those of lower energy, the frequency of the PHOTON of light emitted being proportional to the energy difference between the orbits. Around the same time, experiments on x-ray spectra (see X RAY) by H. G. J. Moseley showed that each nucleus was characterized by an atomic number, equal to the number of unit positive charges associated with it. By rearranging the periodic table according to atomic number rather than atomic weight, a more systematic arrangement was obtained. The development of quantum mechanics during the 1920s resulted in a satisfactory explanation for all phenomena related to the role of electrons in atoms and all aspects of their associated spectra. With the discovery of the NEUTRON in 1932 the modern picture of the atom was complete. The nucleus of an atom was seen to consist of neutrons and protons, the neutron being an uncharged particle and the PROTON a positively charged one. Their masses are almost equal. The atomic number of an atom is simply the number of protons in its nucleus. The atomic weight of an atom is given in most cases by the mass number of the atom, equal to the total number of protons and neutrons combined. Atoms containing the same number of protons but different numbers of neutrons represent different forms, or ISOTOPES, of the same element. An atom may be conveniently symbolized by its chemical symbol with the atomic number and mass number written as subscript and

superscript, respectively. For example, the symbol for uranium is U (atomic number 92), the isotopes of uranium with atomic weights 235 and 238 are indicated by $^{235}_{92}\text{U}$ and $^{238}_{92}\text{U}$. Surrounding the nucleus of an atom are its electrons, for a neutral atom, the number of electrons is equal to the atomic number. The outermost electrons of an atom determine its chemical and electrical properties. An atom may combine chemically with another atom in various ways, either by giving up or receiving electrons, thus setting up an electrical attraction between the atoms (see ION), or by sharing one or more pairs of electrons (see CHEMICAL BOND). Because metals have few outermost electrons and tend to give them up easily, they are good conductors of electricity or heat (see CONDUCTION). The electrons are often described as revolving about the nucleus as the planets revolve about the sun. However, this picture is misleading. The quantum theory has shown that all particles in motion also have certain wave properties. For a particle the size of an electron, these properties are of considerable importance. As a result, the electrons in an atom cannot be pictured as localized in space but rather should be viewed as smeared out over the entire orbit so that they form a cloud of charge. The electron clouds around the nucleus represent regions in which the electrons are most likely to be found. The shapes of these clouds can be very complex, in marked contrast to the simple elliptical orbits of planets. Another discovery is that the sizes of all atoms are comparable, in spite of the large differences in the number of electrons they contain. With many of the problems of individual atomic structure and behavior now solved, attention has turned to both smaller and larger scales. On a smaller scale, the nucleus itself is being studied in order to determine the details of its structure and to develop sources of energy from nuclear fission and fusion (see NUCLEAR ENERGY), for the atom is not at all indivisible, as the ancient philosophers thought, but can undergo a number of possible changes. On a larger scale, new discoveries about the behavior of large groups of atoms are being made (see SOLID STATE PHYSICS). The question of the basic nature of matter has been carried beyond the atom and now centers on the nature of and relations between the hundreds of ELEMENTARY PARTICLES that have been discovered in addition to the proton, neutron, and electron. Some of these particles have been used to make new types of "atoms" such as positronium (see ANTIPARTICLE) and muonium (see MUON). See George Gamow, *The Atom and Its Nucleus* (1961), H. A. Boorse and Lloyd Motz, ed., *The World of the Atom* (2 vol., 1966).

atomic bomb, weapon deriving its explosive force from the release of atomic energy through the fission (splitting) of heavy nuclei (see NUCLEAR ENERGY). The first atomic bomb was produced at the Los Alamos, N. Mex., laboratory and successfully tested near Alamogordo, N. Mex., on July 16, 1945. This test was the culmination of a mammoth program of U.S. scientific research and technological development that began in 1940, soon after the discovery of fission in uranium in 1939 by the German scientists Otto Hahn and Fritz Strassman. On Aug. 6, 1945, an atomic bomb was dropped on Hiroshima with an estimated equivalent explosive force of 20,000 tons of TNT, followed three days later by a second, more powerful, bomb on NAGASAKI. Both caused widespread death, injury, and destruction. Atomic weapons were developed also by the USSR (1949), Great Britain (1952), France (1960), China (1964), and India (1974), with other nations also engaged in nuclear research. Practical fissionable nuclei for atomic bombs are the isotopes uranium 235 and plutonium 239, which are capable of undergoing CHAIN REACTION. If the mass of the fissionable material exceeds the critical mass (a few pounds), the chain reaction multiplies rapidly into an uncontrollable release of energy. An atomic bomb is detonated by bringing together very rapidly (e.g., by means of a chemical explosive) two subcritical masses of fissionable material, the combined mass exceeding the critical mass. An atomic bomb explosion produces, in addition to the shock wave accompanying any explosion, intense neutron and gamma radiation, both of which are very damaging to living tissue. The neighborhood of the explosion becomes contaminated with radioactive fission products. Some radioactive products are borne into the upper atmosphere as dust or gas and may subsequently be deposited partially decayed as radioactive FALLOUT far from the site of the explosion. The proliferation of nuclear weapons has been an increasing cause of concern throughout the world. Treaties have been signed

limiting certain aspects of nuclear testing and development, and there have been continued efforts to negotiate additional restraints. See also *DISARMAMENT, NUCLEAR*. See Stephane Groueff, *Manhattan Project* (1967), Michael Blom, *The History of the Atomic Bomb* (1968).

atomic clock, electric or electronic timekeeping device that is controlled by atomic or molecular oscillations. A timekeeping device must contain or be connected to some apparatus that oscillates at a uniform rate to control the rate of movement of its hands or the rate of change of its digits. Mechanical clocks and watches use oscillating balance wheels, pendulums, and tuning forks. Much greater accuracy can be attained by using the oscillations of atoms or molecules. Because the frequency of such oscillations is so high, it is not possible to use them as a direct means of controlling a clock. Instead, the clock is controlled by a highly stable crystal oscillator whose output is automatically multiplied and compared with the frequency of the atomic system. Errors in the oscillator frequency are then automatically corrected. Time is usually displayed by an atomic clock with digital or other sophisticated readout devices. The error between a pair of atomic clocks, i.e., the difference in indicated time if both are started at the same instant and later compared, is typically about one part in one trillion. This extremely low error has allowed their use in an experiment confirming an important prediction of Einstein's theory of relativity. The first atomic clock, invented in 1948, utilized the vibrations of ammonia molecules.

atomic energy: see *NUCLEAR ENERGY*

Atomic Energy Agency, International, intergovernmental organization established in 1957 under the aegis of the United Nations to promote the peaceful uses of atomic energy. Its headquarters are in Vienna. The agency is authorized to purchase and sell fissionable materials and to offer nuclear fuels, technical assistance, and other services for the peaceful application of nuclear energy. It may establish and administer safeguards designed to ensure that its services do not further military purposes or endanger public health. The organization is made up of a general conference, consisting of representatives of all member states, a board of governors of 25 members, and a secretariat headed by a director general. In 1973 there were 103 members.

Atomic Energy Commission (AEC), U.S. government commission created by the Atomic Energy Act of 1946 and charged with the development and control of the U.S. atomic energy program. The explosion of the atomic bombs at the end of World War II demonstrated the cataclysmic possibilities of the use of atomic energy. To channel that use to peaceful rather than destructive ends became a national problem. The U.S. Congress set about creating a national control body, with debate centering around the question of whether it should be a predominantly military or civilian commission. A special committee on atomic energy, chaired by Senator Brien McMahon, conducted an investigation and prepared the McMahon Bill in Dec., 1945. This bill, which provided for a full-time commission whose members were to have no conflicting military or business interests, became the basis of the Atomic Energy Act of 1946. Amendments provided for a military liaison committee, which the AEC was directed to advise and consult with on all atomic energy matters that related to military applications. The act provided for a five-member commission appointed by the President with the advice and consent of the Senate, and it further provided for a permanent joint Congressional committee on atomic energy that was to be kept advised of the commission's activities. Finally, it created the General Advisory Committee (GAC), composed of nine members appointed from civilian life by the President to advise the commission on scientific and technical matters relating to materials, production, and research. From 1946 to 1952 the chairman of the GAC was J. Robert Oppenheimer, who had directed the development of the atomic bomb but who opposed the manufacture of the hydrogen bomb. The AEC became the center of a nation-wide controversy in 1954 as a result of Oppenheimer's suspension (1953) as a consultant to the commission on the alleged grounds that he was a security risk. The activities of the AEC include the production of fissionable materials, the manufacture and testing of nuclear weapons, the development of nuclear reactors for military and civilian use, and research in biological, medical, physical, and engineering sciences. The Atomic Energy Act of 1954 provided for private par-

ticipation in such programs as research, development, and production of atomic energy and nuclear materials, and the commission is responsible for the licensing and regulation of such civilian activities. Although the bulk of the AEC's work has been in the field of atomic weaponry, projects relating to the peaceful uses of atomic energy (e.g., the development of atomic power plants for the production of electricity) have become increasingly prominent in the commission's activities. See G. E. Dean, *Report on the Atom* (2d ed. 1957), R. G. Hewlett and O. E. Anderson, Jr., *A History of the United States Atomic Energy Commission* (2 vol., 1962-69), Harold Orlans, *Contracting for Atoms* (1967), Corbin Allardice and Edward Trapnell, *The Atomic Energy Commission* (1974).

atomic mass, the mass of a single atom, usually expressed in atomic mass units (amu). Most of the mass of an atom is concentrated in the protons and neutrons contained in the nucleus. Each proton or neutron weighs about 1 amu, and thus the atomic mass is always very close to the mass number (total number of protons and neutrons in the nucleus). Atoms of an isotope of an element all have the same atomic mass. Atomic masses are usually determined by mass spectrography (see *MASS SPECTROGRAPHY*). They have been determined with great relative accuracy, but their absolute value is less certain.

atomic mass unit or amu, in chemistry and physics, unit defined as exactly $1/12$ the mass of an atom of carbon-12, the isotope of carbon with six protons and six neutrons in its nucleus. One amu is equal to approximately 1.66×10^{-24} grams. Before the adoption of the carbon-12 standard, two different definitions of the amu existed. The discrepancy arose for historic reasons. Before the 20th cent., atomic theory held that all atoms of an element have the same mass, and when naturally occurring oxygen was chosen as the basis for the scale of atomic weights it was assigned an atomic weight of exactly 16. Isotopes of radioactive elements were discovered early in the 20th century, and in 1929 oxygen was shown to have three isotopes. Physicists subsequently chose oxygen-16 as the basis of a scale of atomic weights. Under this definition, the atomic weight of oxygen was 16.0045 amu, since naturally occurring oxygen is a mixture of oxygen-16 (over 99%) and traces of oxygen-17 and oxygen-18. Chemists, however, continued to use the older scale. The discrepancy was eliminated when the International Union of Pure and Applied Physics, in 1960, and the International Union of Pure and Applied Chemistry, in 1961, decided to adopt the carbon-12 scale. The scale went into effect on Jan. 1, 1962.

atomic number, often represented by the symbol *Z*, the number of protons in the nucleus of an atom. Atoms with the same atomic number make up a chemical element. Atomic numbers were first assigned to the elements c. 1913 by H. G. J. Moseley, he arranged the elements in an order based on certain characteristics of their X-ray spectra and then numbered them accordingly. The elements are now arranged in the periodic table in the order of their atomic numbers. Mendeleev's periodic law was originally based on atomic weights. See *MASS NUMBER*.

atomic weight, mean (weighted average) of the masses of all the naturally occurring isotopes of a chemical element, as contrasted with atomic mass, which is the mass of any individual isotope. Atomic weight is usually expressed in atomic mass units. Most naturally occurring elements have one principal isotope and only insignificant amounts of other isotopes. The atomic mass of any isotope is very nearly a whole number, so most atomic weights are nearly whole numbers, e.g., hydrogen has atomic weight 1.00797 and nitrogen has atomic weight 14.007. However, some elements have more than one principal isotope, and the atomic weight for such an element is not close to a whole number. The two principal isotopes of chlorine have atomic masses very nearly 35 and 37 and occur in the approximate ratio 3 to 1, so the atomic weight of chlorine is about 35.5. Some other common elements whose atomic weights are not nearly whole numbers are antimony, barium, boron, bromine, cadmium, copper, germanium, lead, magnesium, mercury, nickel, strontium, tin, and zinc. Atomic weights were formerly determined directly by chemical means, now a mass spectrograph is usually employed. The atomic mass and relative abundance of the isotopes of an element can be measured very accurately and with relative ease by this method, whereas chemical determination of the atomic weight of an element requires a careful and

precise quantitative analysis of as many of its compounds as possible.

History J. L. Proust formulated (1797) what is now known as the law of definite proportions, which states that the proportions by weight of the elements forming any given compound is definite and invariable. John Dalton proposed (c. 1810) an atomic theory in which all atoms of an element have exactly the same weight. He made many measurements of the combining weights of the elements in various compounds. By postulating that simple compounds always contain one atom of each element present, he assigned relative atomic weights to many elements, assigning a weight of 1 to hydrogen as the basis of his scale. He thought that water had the formula HO, and since he found by experiment that 6 weights of oxygen combine with 1 weight of hydrogen, he assigned an atomic weight of 6 to oxygen. Dalton also formulated the law of multiple proportions, which states that when two elements combine in more than one proportion by weight to form two or more distinct compounds, their weight proportions in those compounds are related to one another in simple ratios. Dalton's work sparked an interest in determining atomic weights, even though some of his results were soon shown to be incorrect. While Dalton was working on weight relationships in compounds, J. L. Gay-Lussac was experimenting with the chemical reactions of gases, and he found that when under the same conditions of temperature and pressure, gases react in simple whole-number ratios by volume. Avogadro proposed (1811) a theory of gases that holds that equal volumes of two gases at the same temperature and pressure contain the same number of particles, and that these basic particles are not always single atoms. This theory was rejected by Dalton and many other chemists. P. L. Dulong and A. T. Petit discovered (1819) a specific-heat method for determining the approximate atomic weight of elements. Among the first chemists to work out a systematic group of atomic weights (c. 1830) was J. J. Berzelius, who was influenced in his choice of formulas for compounds by the method of Dulong and Petit. He attributed the formula H₂O to water and determined an atomic weight of 16 for oxygen. J. S. Stas later refined many of Berzelius's weights. Stanislaw Cannizzaro applied Avogadro's theories to reconcile atomic weights used by organic and inorganic chemists. The availability of fairly accurate atomic weights and the search for some relationship between atomic weight and chemical properties led to J. A. R. Newlands's table of "atomic numbers" (1865), in which he noted that if the elements were arranged in order of increasing atomic weight "the eighth element, starting from a given one, is a kind of repetition of the first." He called this the law of octaves. Such investigations led to the statement of the periodic law, which was discovered independently (1869) by D. I. Mendeleev in Russia and J. L. Meyer in Germany. T. W. Richards did important work on atomic weights (after 1883) and revised some of Stas's values. After the discovery of isotopes by F. Soddy (c. 1913), the atomic mass of many individual isotopes was determined, leading eventually to the adoption of the current atomic mass unit.

atomism, philosophic concept of the nature of the universe, holding that the universe is composed of invisible, indestructible material particles. The theory was first advanced in the 5th cent. B.C. by Leucippus and was elaborated by Democritus. Epicurus restated the doctrine, giving the atoms weight. Atomism, nearly forgotten in later antiquity and the Middle Ages, was revived in the 17th cent. by Pierre Gassendi and was given consideration by Robert Boyle, Isaac Newton, and John Locke.

atom smasher: see *PARTICLE ACCELERATOR*

atonality, in music, systematic avoidance of reference to tonal centers by harmonies and melodies that imply a keynote (see *KEY*). The term *atonality*, like *modality* (see *MODE*), has been used in contrast to *tonality*. Often the term has been applied in an aesthetic sense to 20th-century music in which the user of the term is unable to distinguish the tonal centers that are present. A precise technical use of the term designates a method of composition in which the composer has deliberately rejected a principle of musical organization. This principle is tonality, and it involves a clear distinction between consonance and dissonance, a definite classification of harmonic results as more and less dissonant, and arrangement of tones in a scale which implies harmonic and melodic functions. The gradual rejection of this principle has been apparent since the mid-19th cent., when greatly increased use of chromatic harmonies in the music of Wagner and Richard

Strauss and the use of nonfunctional harmonies in the music of Debussy almost completely obscured whatever basic tonalities are present in their music. The abandonment of the principle of tonality in the early 20th cent. by SCHOENBERG, Ives, and many other composers was the next logical step in the evolution of musical style. To compensate for this lack of one principle of order, another had to be substituted. The most successful one proposed thus far is that of dodecaphony, or 12-tone music (see SERIAL MUSIC). See Rudolph Reti, *Tonality in Modern Music* (1962), Graham George, *Tonality and Musical Structure* (1970), George Perle, *Serial Composition and Atonality* (3d ed. 1972), Allen Forte, *The Structure of Atonal Music* (1973).

atonement, in Christian theology, the reconciliation of sinful man with God. The conception of the atonement most widely held in traditional theology is often called vicarious atonement. It was first explicitly stated by St. ANSELM in *Cur Deus Homo?* His doctrine, slightly altered or elaborated, has become part of Roman Catholic theology and of that of many Protestant churches. God, desiring the reconciliation of man, offers man pardon for his sins if man will make satisfaction for them. But man's offense to God's majesty is greater than any conceivable satisfaction he can give. Therefore, God sent Jesus Christ to earth to reconcile man. As God, Jesus Christ can satisfy God, and as man He can take on the sins of man. By His life on earth, by His sufferings, and especially by His death on the cross, He satisfied God for the sins of man, and man, accepting His Redeemer, may enjoy the atonement. Christ has bought. In modern Catholic and Protestant theology this understanding has been superseded by one that places emphasis on God's mercy and on a gradual growth toward union with God and the overcoming of sin. The juridical concept has been replaced by an organic and social concept.

Atonement, Day of, Heb. *Yom Kippur*, the most sacred Hebrew holy day, falling at the end of September or the beginning of October (on the 10th day of the 7th month, Tishri). It is a day of prayer for forgiveness for sins committed during the year. The Jews gather in synagogues on the Eve of Yom Kippur, when the fast begins, and return the following morning to continue confessing, doing penance, and praying for forgiveness. The most solemn of the prayers, Kol Nidre, is chanted on the Eve of Yom Kippur.

ATP. see ADENOSINE TRIPHOSPHATE

Atrato (atratō), river, c. 375 mi (600 km) long, rising in the Cordillera Occidental, W Colombia. It meanders north, across the base of the Isthmus of Panama, to the Gulf of Uraba. Quibdo is the head of navigation. The Atrato drains a region of rain forests. Its headwaters are in Colombia's chief platinum-producing area. Cartagena is the chief outlet for the products of the valley.

Atreus (ātrēās), in Greek mythology, the son of Pelops and the father of Agamemnon and Menelaus. He vied with his brother Thyestes for the throne of Mycenae. When Thyestes seduced Atreus' wife, Aerope, in order to attain the golden ram whose possession signified kingship, Atreus, in retaliation, murdered the sons of Thyestes and served them to him at a feast. Thyestes thereupon laid a curse upon the house of Atreus. Thyestes' son Aegisthus, who was not involved in the mass murder, killed Atreus and restored the kingdom to Thyestes.

atrium (ātrēām), term for an interior court in Roman domestic architecture and also for a type of entrance court in early Christian churches. The Roman atrium was an unroofed or partially roofed area with rooms opening from it. In early times its center held a cooking hearth. After the 2d cent. B.C., when the hearth was placed elsewhere, the center of the atrium held a tank (impluvium) to receive rain water falling through the opening, which also furnished light to the surrounding rooms. In more luxurious and complex Roman dwellings, the private apartments had a court of their own, called the peristyle, and the atrium served merely as a semipublic reception hall. The ruins of Pompeii contain remains of atria in their various forms. In early Christian churches, the atrium was a large arcaded or colonnaded open court, serving as a general meeting place, in front of the church itself, with a fountain used for ablutions in its center. The basilican churches of Sant'Ambrogio, Milan, and San Clemente, Rome, have noteworthy atria. This type of large forecourt is also a characteristic element of the Muslim mosque.

Atropatene: see AZERBAIJAN, region, Iran

atrophy (ātrōfē), diminution in the size of a cell, tissue, or organ from its fully developed normal size. Temporary atrophy may occur in muscles that are not used, as when a limb is encased in a plaster cast. Interference with cellular nutrition, as through starvation, diseases affecting the nerve supply of tissues, e.g., poliomyelitis and muscular dystrophy, and prolonged disuse may cause a permanent wasting away of tissue. Atrophy may also follow HYPERTROPHY.

atropine (ātrāpēn, -pīn), alkaloid drug derived from BELLADONNA and other plants of the family Solanaceae (nightshade family). Available either as the tincture or extract of belladonna, or as the pure substance atropine sulfate, it is a DEPRESSANT of the parasympathetic NERVOUS SYSTEM. It has some chemical similarity to the body substance ACETYLCHOLINE and interferes with nerve impulses transmitted by that substance. Atropine produces rapid heart rate, dilated pupils, dry skin, and anesthetizes the nerve endings in the skin. Because it relaxes smooth muscle and suppresses gland and mucous secretions, it is widely used to treat peptic ulcer by reducing the production of stomach acid. Atropine is given before general anesthesia to keep the air passages clear and is an ingredient in various preparations for symptomatic relief of colds and asthma. It also acts as an antidote in poisoning from such agents as mushrooms, morphine, prussic acid, and nerve gas, but overdosage causes delirium, convulsions, and coma. A related alkaloid, SCOPOLAMINE, is used mainly as a SEDATIVE.

Atropos (ātrāpōs'), see FATES

Atroth (ātrōth), unidentified town, E of the Jordan. Num. 32:35. Atroth should probably be spelled with the name, Shophan, thus, RV has Atroth-shophan.

Atsina Indians: see GROS VENTRE INDIANS

Atsugi (āt'sōō'gē), city (1970 pop. 82,888), Kanagawa prefecture, E central Honshu, Japan, on the Sagami River. It is an industrial and agricultural center. An air force base is nearby.

Attai (āt'āi) 1 Descendant of Jerahmeel. 1 Chron. 2:35,36. 2 One of David's Gadite warriors. 1 Chron. 12:11. 3 Son of Rehoboam. 2 Chron. 11:20.

Attaleia or **Attalia**, Turkey. see ANTALYA

Attar: see FARID AD-DIN ATTAR

attar of roses or **rose oil**, fragrant essential oil obtained from roses and used in making perfume. It is one of the most valuable of the volatile oils. Rose water is water in which a small amount of the oil is dissolved.

Attawapiskat (āt'awāpīskāt), river, c. 465 mi (750 km) long, flowing E from Attawapiskat Lake, N Ontario, Canada, then N and E into James Bay. The trading posts of Attawapiskat and Lansdowne House are on the river.

Attica (āt'īka), region of ancient Greece, a triangular area at the eastern end of central Greece, around ATHENS. According to Greek legend, the four Attic tribes were founded by Ion, in later legend Theseus combined 12 townships into a single state. This process of unification, which probably occurred over a period of time, was in all likelihood completed c. 700 B.C. Cleisthenes (fl. 510 B.C.) reclassified the people into 10 tribes. By the 5th cent. B.C. Athens was dominant, and thereafter the history of Attica was that of its chief city.

Atticus Herodes: see HERODES ATTICUS

Attila (āt'il'a, āt'āla), d. 453, king of the HUNS (445-53). After 434 he was coruler with his brother, whom he murdered in 445. In 434, Attila obtained tribute and great concessions for the Huns in a treaty with the Eastern Roman emperor Theodosius II, but, taking advantage of Roman wars with the Vandals and Persians, he invaded the Balkans in 441. Peace was made and Attila's tribute was tripled. In 447 he again attacked the empire, and the following three years were spent negotiating a new peace. In 450, however, the new Eastern emperor, MARCIAN, refused to render further tribute as did VALENTINIAN III, emperor of the West. In a bid for power, and without her brother's knowledge, Valentinian's ambitious sister, Honoria, jeopardized his peaceful relations with Attila by attempting an alliance with the Hun. Attila took her proposal as a marriage offer and made a demand of half of the Western Empire as a dowry, a demand that was refused. Leaving Hungary with an army of perhaps half a million Huns and allies, Attila invaded Gaul but was defeated (451) by AETIUS at Maunaca. Attila turned back and invaded (452) N Italy but abandoned his plan to take Rome itself. His withdrawal, often ascribed to the eloquent diplomacy of Pope Leo I, appears instead to have been motivated largely by a shortage of provisions and the outbreak of pestilence in the Hun army. Soon afterward in Hungary, Attila died of a nasal hemor-

rhage suffered while celebrating his marriage to Ildico. The fear Attila inspired is clear from many accounts of his savagery but, though undoubtedly harsh, he was a just ruler to his own people. He encouraged the presence of learned Romans at his court and was far less bent on devastation than other conquerors before and after him. Often called the Scourge of God, he appears in many legends, particularly as Etzel in the Nibelungenlied (see under NIBELUNGEN). See E. A. Thompson, *History of Attila and the Huns* (1948), C. D. Gordon, *The Age of Attila* (1960), Otto Manchen-Helfen, *The World of the Huns* (1973).

Attis (āt'is) or **Atys** (ā'-), in Phrygian religion, vegetation god. When Nana ate the fruit of the almond tree, which had been generated by the blood of either Agdistis or of CYBELE, she conceived Attis. Later, Agdistis or Cybele fell in love with Attis, and so that none other would have him, she caused him to castrate himself. Like Adonis, Attis came to be worshipped as a god of vegetation, responsible for the death and rebirth of plant life. Each year at the beginning of spring his resurrection was celebrated in a festival. In Roman religion he became a powerful celestial deity. See Sir J. G. Frazer, *Adonis, Attis, Osiris* (1907, new ed. 1961).

Attleboro (āt'albārə), industrial city (1970 pop. 32,907), Bristol co., SE Mass., near the R.I. line, settled 1634, inc. as a city 1914. Its jewelry industry began in 1780, silverware, scientific instruments, and fabricated metal products are also made.

Attlee, Clement Richard Attlee, 1st Earl (āt'lē), 1883-1967, British statesman. Educated at Oxford, he was called to the bar in 1905. His early experience as a social worker in London's East End led to his decision to give up law and devote his life to social improvement through politics. In 1907 he joined the Fabian Society and soon afterward the Independent Labour party. He was a lecturer in social science at the London School of Economics, and, after service in World War I, he became (1919) the first Labour mayor of Stepney. He entered Parliament in 1922. In 1927 he visited India as a member of the Simon commission and was converted to views that strongly favored Indian self-government. He joined the Labour government in 1930 but resigned in 1931 when Ramsay MacDonald formed the National government. As leader of the Labour party from 1935, Attlee was an outspoken critic of Conservative foreign policy, objecting particularly to the government's failure to intervene in the Spanish civil war. During World War II he served (1940-45) in Winston Churchill's coalition cabinet, and on Labour's electoral victory in 1945 he became prime minister. Under Attlee's leadership, the Bank of England, the gas, electricity, coal, and iron and steel industries, and the railways were nationalized. His government also enacted considerable social reforms, including the National Health Service. Independence was granted to Burma, India, Pakistan, Ceylon, and Palestine, and Britain allied itself closely with the United States in the cold war confrontation with the Soviet Union. The postwar economic crisis required stringent economic and financial controls, which reduced support for the government. Labour won the 1950 general election by a narrow margin, but in 1951, Attlee decided to go to the country again and was defeated. He was leader of the opposition until his retirement in 1955, when he received the title of Earl Attlee. See his autobiography, *As It Happened* (1954), and his memoirs, as recorded by Francis Williams, *Twilight of Empire* (1962).

attorney, agent put in place of another to manage particular affairs of the principal. An attorney in fact is an agent who conducts business under authority that is controlled and limited by a written document called a letter, or power, of attorney granted by the principal. An attorney at law is an officer of a court of law authorized to represent the person employing him (the client) in legal proceedings. England retains the distinction between the attorney as agent, the SOLICITOR, who deals directly with the client but does not act as an advocate in court, and the attorney as pleader, the barrister (called advocate in Scotland), who presents the case in court. Most senior and distinguished barristers are designated King's (Queen's) counsel. The distinction between agent and pleader also exists in Europe. In the United States, a similar distinction was formerly made in some states between a counselor at law, who argued the case in court, and an attorney, who prepared the case but did not argue it, but that distinction has now generally disappeared. Today an attorney at law is authorized to exercise all the functions of a practicing lawyer. The growth of large

business corporations, beginning in the 19th cent., has brought into existence a large group of attorneys who rarely or never act as trial lawyers yet are among the most influential members of the profession. They work directly for corporations or are members of large law firms and specialize in areas of commercial law. All of them must, however like the ordinary attorney, be admitted to the bar. The term *attorney* is also used for county, state, and Federal prosecuting officers, as county attorney, district attorney, and Attorney General (see JUSTICE, UNITED STATES DEPARTMENT OF). See Albert Blaustein and C. O. Porter, *The American Lawyer* (1954), Martin Mayer, *Lawyers* (1967).

Attu, island see ALEUTIAN ISLANDS

Atuona (atwō'nā) or **Atuana**, town, in the MARQUESE ISLANDS, South Pacific, in FRENCH POLYNESIA. Situated on the southern coast of the island of HIVA OA, Atuona overlooks the Bay of Traitors. GAUGUIN lived in Atuona Valley and is buried there.

Atwater, Wilbur Olin, 1844-1907, American agricultural chemist, b. Johnsburg, N.Y. He was professor at several American universities and helped to set up and later became director of the first state agricultural experiment station (in Connecticut) in the United States. Along with Edward Bennett Rosa, he developed the respiration calorimeter, determined the caloric value of many foods, and prepared calorie tables widely used today. In 1888 he founded and headed the Office of Experiment Stations for the U.S. Dept. of Agriculture.

Atwater, city (1970 pop. 11,640), Merced co., central Calif., in the San Joaquin valley, inc. 1922. It is the processing and commercial center of an irrigated farming area. Castle Air Force Base and a state park are nearby.

Atys see ATTIS

Au, chemical symbol of the element GOLD

Aub, Max (maks oup), 1903-72, Spanish author, b. Paris. He was educated in Spain where he lived until 1942, when he emigrated to Mexico. His style combines realism with fantasy. He used the Spanish civil war and its consequences as the theme for his most important work, a trilogy of novels—*Campo cerrado* [closed field] (1943), *Campo de sangre* [bloody field] (1945), and *Campo abierto* [open field] (1951). His other works include *José Torres Campalans* (1958) and *La calle de Valverde* [Valverde street] (1961).

Aube (ōb), department (1968 pop. 270,325), NE France, in Champagne. TROYES is the capital.

Auber, Daniel François Esprit (dānyēl' frānswā' ēsprē' ōbēr'), 1782-1871, French operatic composer. His greatest successes resulted from his collaboration with the librettist Scribe. Their first success together was *Le Maçon* (1825), and among the long succession that followed were *Fra Diavolo* (1830), *Le Domino noir* (1837), and *La Part du diable* (1843), witty, tuneful, sophisticated works that were very popular in their time. *La Muette de Portici* (1828, also known as *Masaniello*) was the model of the French grand opera of the 1830s.

Auberjonois, René Victor (rənā' vēktōr' ōbāzhōn-wā'), 1872-1957, Swiss artist. Auberjonois settled in Lausanne in 1914 and created costumes for Stravinsky's *Histoire du Soldat* (1917). His paintings, characterized by muted colors and geometric forms, reveal an independent spirit influenced by CUBISM.

Aubert de Gaspé, Philippe. see GASPÉ, PHILIPPE AUBERT DE

Aubervilliers (ōbervēlyā'), town (1968 pop. 73,808), Seine-Saint Denis dept., N central France, NE of Paris. It is an important industrial center where chemicals, pharmaceuticals, metals, and leather goods are produced. Aubervilliers was a pilgrimage site from the 14th cent. onward. The Church of Notre-Dame-des-Vesous dates from the 15th to the 16th cent.

Aubigné, Jean Henri Merle d': see MERLE D'AUBIGNÉ, JEAN HENRI

Aubigné, Théodore Agrippa d' (tāōdōr' āgrēpā' dōbēnyā'), 1552-1630, French poet and Huguenot soldier. A devoted follower of Henry of Navarre (Henry IV) from 1568, he was later associated with Henri de Rohan in an abortive plot and fled (1620) France to live in Geneva. His *Histoire universelle* (1616-18) is an account of the Huguenots from 1553-1602. D'Aubigné's reputation rests on *Les Tragiques* (1616), a long poem on many subjects—astrology, magic, natural science, mathematics, military tactics, and political theory.

Aubrey, John, 1626-97, English antiquary and miscellaneous writer, b. Kingston, Wiltshire, educated at Trinity College, Oxford. He knew most of the fa-

mous people of his day and left copious memorandums as well as letters. His most celebrated work, *Lives of Eminent Men*, was originally compiled for the use of Anthony Wood in his *Athenae Oxonienses*. The *Lives* first appeared in print in 1813. Only his *Miscellanies* (1696), a collection of stories and folklore, was published in his lifetime. Extremely interested in antiquities, he wrote the *Natural History of Wiltshire* (ed. by John Britton, 1847) and *Perambulation of Surrey*, which was included in the *Natural History and Antiquities of Surrey* (1719). See study by Anthony Powell (1948, 2d ed. 1964).

Aubry de Montdidier (ōbrē' dā mōNdēdyā'), in French legend, a French courtier of King Charles V, murdered c.1371 near Montargis by one Macaire. The animosity of Aubry's dog toward Macaire was so great that the king ordered trial by combat between the dog and Macaire, armed with a cudgel. The dog won, Macaire confessed and was hanged. It is thought that the account of this event in medieval works was based on an older story.

Auburn. 1 City (1970 pop. 22,767), Lee co., E Ala., inc. 1839. The city's economy centers around Auburn Univ. Lumber products are also made. 2 City (1970 pop. 24,151), seat of Androscoggin co., SW Maine, on the Androscoggin River (there crossed by several bridges) opposite Lewiston, settled 1765 on the site of an Indian village, inc. 1842. It is a major shoe-manufacturing center, its huge shoe industry dates from c.1835. With Lewiston, Auburn forms one of the most important industrial complexes in Maine, abundant water power has spurred a great variety of manufactures. Nearby Mt. Apatite is a source of apatite and feldspar. 3 Town (1970 pop. 15,347), Worcester co., S central Mass., inc. 1778. Its industries include warehousing and the manufacture of electronic equipment, motors, cement products, plastics, and musical instruments. 4 City (1970 pop. 34,599), seat of Cayuga co., W central N.Y., in the Finger Lakes region, on the outlet of Owasco Lake, settled 1793, inc. 1848. Its manufactures include diesel engines, rope, shoes, rugs, electronic parts, and air conditioners. It is the site of Auburn State Prison (built 1816), in which Thomas Mott Osborne, the prison reformer (who was born in Auburn), served a voluntary term. The city's museum has collections of historical documents and Indian relics. The houses of William H. Seward and Harriet Tubman are preserved, and a junior college is in the city. 5 City (1970 pop. 21,817), King co., W Wash., on the Green and White (Stuck) rivers, between Seattle and Tacoma, settled 1855, inc. 1914. It is a railroad junction and farm trade center, with large aircraft industries. Wood products are also made. A junior college is there.

Auburn University, main campus at Auburn, Ala., land-grant and state supported, opened 1859 as East Alabama Male College, reorganized 1872 as the Agricultural and Mechanical College of Alabama, became coeducational 1892, renamed Alabama Polytechnic Institute 1899, Auburn University 1960. It has technical and engineering schools as well as a liberal arts college. A large agricultural experiment station system is maintained by the university. In 1967 the Nuclear Science Center was completed.

Aubusson, Pierre d' (pyēr dōbusōn'), 1423-1503, French soldier, a cardinal of the Roman Catholic Church, and grand master of the KNIGHTS HOSPITALERS (1476-1503). In 1480 he valiantly defended Rhodes against Ottoman Sultan Muhammad II. After the accession (1481) of Sultan BAYAZID II, Aubusson gave shelter to Jem, Bayazid's brother. However, he soon sent Jem to France as a virtual prisoner and obtained a truce and a large annual pension from Bayazid in exchange for keeping Jem confined. In 1489 Aubusson ceded his valuable hostage to Pope Innocent VIII, who made Aubusson a cardinal and granted new privileges to his order.

Aubusson (ōbūsōn), town (1968 pop. 6,761), Creuse dept., central France, in the former province of Marche, on the Creuse River. Its famous tapestry and carpet manufactures date from the 15th cent. Aluminum, electric lamps, and rubber goods are also made. Aubusson is the seat of a school of decorative arts and a museum of tapestry.

Auch (ōsh), town (1968 pop. 23,718), capital of Gers dept., SW France, in Gascony, on the Gers River. It is a farm market and commercial center with a variety of manufactures and an important trade in Armagnac brandy, and in wine and grain. One of the chief towns of Roman Gaul, it was an archiepiscopal see, the capital of Armagnac (10th cent.), and the capital of Gascony (17th cent.). The old part of town, steep and hilly, is topped by a flamboyant-style Gothic cathedral (15th-16th cent.).

Auchincloss, Louis (ō'kīnkłōs), 1917-, American novelist, b. New York City. A practicing lawyer, Auchincloss writes polished novels of manners about the white, Anglo-Saxon, Protestant, American upper class. His fictional works include *Venus in Sparta* (1958), *Portrait in Brownstone* (1962), *The Rector of Justin* (1965), *The Embezzler* (1966), and *The Partners* (1974). He has also written *Reflections of a Jacobite* (1961), on Henry James, *Edith Wharton: A Biography* (1971), and *Richelieu* (1972).

Auchinleck, Sir Claude John Eyre (ār ō'kīnlēk', ō'khīn-), 1884-, British field marshal. A long army career led to command of the 1933 and 1935 operations based in the North-West Frontier Prov., India. In World War II he commanded briefly (1940) at Narvik, Norway, then in building defenses in England and in India (1940-41). After succeeding (July, 1941) Gen. Sir Archibald P. Wavell in the Middle East Command, he launched, in Nov., 1941, a campaign into Libya, but in June, 1942, his forces were thrust back into Egypt. In June, 1943, he once more became commander in chief in India, remaining so until 1947. He was made field marshal in 1946. See biography by J. H. Robertson (1959), Correlli Barnett, *The Desert Generals* (1960).

Auchmuty, Sir Samuel (ōkmyōō'tē, ōk-, ā'matē), b. 1758 (not, as commonly stated, 1756) in New York City, d. 1822, British general. A Loyalist soldier in the American Revolution, he went to England at the end of the war. Successful service in India (1783-97) and in Egypt (1801-3) brought him popularity and a knighthood (1803). He served under John WHITELOCKE in the unsuccessful attack (1807) on Buenos Aires. He became (1810) commander in chief at Madras and captured (1811) Java from the Dutch. In 1821 he was appointed commander in chief in Ireland. See Annette Townsend, *The Auchmuty Family of Scotland and America* (1932).

Auckland (ōk'lānd), city (1971 pop. 151,580, urban agglomeration pop. 698,400), NW North Island, New Zealand. It is situated on an isthmus and is the largest city and chief port of the country. The chief exports are frozen meats, dairy products, wool, hides, and wood pulp. Petroleum, iron and steel, wheat, sugar, and fertilizers are the leading imports. Auckland is also New Zealand's leading industrial center. The chief industries are engineering (including shipbuilding and boilermaking), automobile and chemical manufacturing, and food processing. It is also a fishing port and the chief base of the New Zealand navy. Auckland was founded in 1840 and was formerly (1841-65) the capital of New Zealand. Educational institutions include the Univ. of Auckland and the Auckland Technical Institute. There are Anglican and Roman Catholic cathedrals. The War Memorial Museum has a collection of Maori art. In the area of the city are many extinct volcano cones, including Mt. Eden (within the city) and Rangitoto (offshore).

Auckland Islands, small uninhabited group (234 sq mi/606 sq km), S Pacific, c. 300 mi (480 km) S of South Island, New Zealand, to which they belong. There is some sealing. The islands were discovered in 1805.

auction bridge: see BRIDGE

Aude (ōd), department (1968 pop. 278,323), S central France, in Languedoc. CARCASSONNE, its capital, and NARBONNE are the chief cities.

Auden, W. H. (Wystan Hugh Auden), (ō'dān), 1907-73, Anglo-American poet, b. York, England, educated at Oxford. A versatile, vigorous, and technically facile poet, Auden ranks among the major literary figures of the 20th cent. Often written in everyday language, his poetry ranges in subject matter from politics to modern psychology to Christianity. During the 1930s he was the leader of a left-wing literary group, which included Christopher Isherwood and Stephen Spender. With Isherwood he wrote three verse plays, *The Dog beneath the Skin* (1935), *The Ascent of F6* (1936), and *On the Frontier* (1938), and also *Journey to a War* (1939), a record of their experiences in China. Auden lived in Germany during the early days of Nazism, and he was a stretcher-bearer for the Republicans during the Spanish Civil War. His first volume of poetry appeared in 1930. Later volumes include *Spain* (1937), *New Year Letter* (1941), *For the Time Being*, a Christmas Oratorio (1945), *The Age of Anxiety* (1947, Pulitzer Prize), *Nones* (1951), *The Shield of Achilles* (1955), *Homage to Clio* (1960), *About the House* (1965), *Epistle of a Godson and Other Poems* (1972), and *Thank You, Fog* (1974). His other works include *Letters from Iceland* (with Louis MacNeice, 1937), librettos, with Chester Kallman, for Stravinsky's opera *The Rake's Progress* (1953) and Mozart's *Magic*

Flute (1957), and *A Certain World. A Commonplace Book* (1970). In 1939, Auden moved to the United States, and he became a citizen in 1946. Subsequently he lived in various places, including Italy and Austria, and in 1971 he returned to England. From 1956 to 1961 he was professor of poetry at Oxford. He was awarded the National Medal for Literature in 1967. See his *Collected Poetry* (1945), *Collected Shorter Poems, 1927-1957* (1967), and *Collected Longer Poems* (1969), studies by M. K. Spears (1968), John Fuller (1970), and Francois Du-chene (1972), bibliography by B. C. Bloomfield and Edward Mendelson (2d ed 1972).

Audenarde: see OUDENAARDE, Belgium

audiencia (oudyān'sya), royal court of justice in Spain and the Spanish Empire, varying greatly in its form and function but having some administrative as well as judicial capacity. Use of the term also extended to the court's jurisdictional area. Originally a court of appeal primarily, the audiencia had evolved by the late 15th cent. into a tribunal of two chambers, one for civil and the other for criminal jurisdiction. Generally at least four *oidores* (judges or auditors) exercised judicial power within a district. The system of territorial and regional audiencias was instituted in Spanish America in the early 16th cent. to help counterbalance the independence and haphazard administration of the conquistadors. The colonial *audiencia pretorial*, however, differed widely from its peninsular counterpart in exercising executive and legislative, as well as judicial functions, and serving in a sense as the core of Spanish colonial government. As a chief organ of royal authority with the right of appeal to the Council of the Indies, it kept close watch on the acts of the civil administrators. The courts were at first powerful enough to uphold the rights of private individuals, but in the course of the 17th and 18th cent. they became corrupt and inefficient.

audio frequency, frequency at which a longitudinal mechanical wave is audible to the human ear as sound. The range of audio frequencies is not the same for every individual, but is approximately from 15 to 20,000 HERTZ. See SOUND, RADIO.

audio-visual education, term denoting the use of nonverbal materials to enrich learning experiences. It applies particularly to pictures, sounds, and other materials that develop sense perception. The successful use of visual aids in the U.S. armed forces during World War II demonstrated the effectiveness of this medium as a tool of instruction. The use of nonverbal materials—formerly confined to maps, graphs, textbook illustrations, and museum and field trips—now includes all the developments of the photographic and film industries as well as radio, sound and video-tape recordings, and television. The field of PROGRAMMED INSTRUCTION also employs computers and other types of audio-visual teaching machines. Many local school systems in the United States have their own film libraries that are often supplemented by films rented from universities and government offices. The growth of educational television has been exceedingly rapid. In 1952 the Federal Communications Commission reserved over 240 channels for educational purposes. By the end of the 1960s approximately 185 such channels were in operation. The Public Broadcasting Act (1967) set up the Corporation for Public Broadcasting, an independent agency responsible for the distribution and support of educational television programs. Another important aspect of educational television has been the development of closed-circuit and cable television systems. By using coaxial cables, such systems allow for simultaneous communication between the teacher in a studio and students receiving a program at home. See W. A. Wittich and C. F. Schuller, *Audio-Visual Materials: Their Nature and Use* (4th ed 1967), Paul Saettler, *A History of Instructional Technology* (1968), Caleb Gattegno, *Towards a Visual Culture: Educating Through Television* (1969), Sloan Commission on Cable Communications, *On the Cable: The Television of Abundance* (1971).

auditing, examination and statement of accounts and of other documents connected with accounts by persons who have had no part in their preparation. Systems of financial inspection have long been used, especially in connection with public accounts. In Italy the elaboration of commerce considerably increased the duties of an auditor in the late Middle Ages, but the auditing of business accounts did not become common until the 19th cent., when there were an increasing number of businesses continually growing in size and complexity. Corporate charters usually came to be granted only on condition

that licensed experts conduct annual audits. Such audits are particularly useful to the owners (partners or stockholders), executives (managers, officers, and directors), creditors or prospective creditors (investors, note brokers, and commercial and investment bankers), and receivers, trustees, and creditors' committees of a business. Audits are also useful to the vendors of a firm's merchandise, the owners of patents and other recipients of profit shares or royalties, governmental regulatory bodies, and prospective donors to institutions. An audit settles certain categories of questions. It must determine whether all assets and liabilities shown are actual, and that they are properly incurred, valued, and recorded. A check must be made of the surplus, income, and capital-stock accounts, verified by the examination of the authorizations for stock issues and by comparing the amounts issued with the amounts authorized. Finally, auditing constitutes an independent check on the tendency to overstate assets and understate liabilities. The duties of auditors have even expanded into a comprehensive survey and analysis of the entire conduct of the financial and accounting branches of an enterprise. Thus the auditor needs, in addition to his knowledge of ACCOUNTING, a broad understanding of business and finance. The accountant records the facts of a business, the auditor must determine whether or not such recording has been accurately and honestly done and then interpret and judge the facts, perhaps adding to his report recommendations for the future conduct of the business. In many countries, auditors are now established as a separate profession, requiring government licensing. In the United States, private audits are usually performed by certified public accountants, auditing of the federal government's accounts is conducted by the General Accounting Office (established 1921). The Internal Revenue Service periodically audits individual and corporate tax returns. See W. A. Staub, *Auditing Developments during the Present Century* (1942), H. F. Stettler, *Auditing Principles* (3d ed 1970), A. W. Holmes, *Auditing Principles and Procedure* (7th ed 1971).

Audley of Walden, Thomas Audley, Baron, 1488-1544, lord chancellor of England (1533-44) under Henry VIII. He was made speaker of the House of Commons in 1529 and lord keeper of the great seal in 1532. A loyal servant of Henry VIII, he supported the king's divorce (1533) from Katharine of Aragón and as chancellor presided (1535) over the trials of Sir Thomas More and John Fisher. He also aided in the prosecution of Anne Boleyn (1536), Sir Thomas Cromwell (1540), and other notables. He was created baron in 1538.

Audubon, John James (ô'dəbŏn), 1785-1851, American ornithologist, b. Les Cayes, Santo Domingo (now Haiti). The son of a French naval officer and a Creole woman, he was educated in France and in 1803 came to the Audubon estate, "Mill Grove," near Philadelphia. There he spent much time observing birds and making the first American bird-banding experiments. In 1808 he married Lucy Bakewell, whose faith and support were factors in his eventual success. Between 1808 and 1820 he lived mostly in Kentucky, frequently changing his occupation and neglecting his business to carry on his bird observations. He began painting portraits for a livelihood and descended the Mississippi to New Orleans, where for a time he taught drawing. From 1823 to 1828 his wife conducted a private school, in which he taught for a short time, in West Feliciana parish, La. In 1826 he went to Great Britain in search of a publisher and subscribers for his bird drawings, meeting with favorable response in Edinburgh and London. *The Birds of America*, in elephant folio size, was published in parts between 1827 and 1838, with engravings by Robert Havell, Jr. The accompanying text, called the *Ornithological Biography* (5 vol., 1831-39), was prepared largely in Edinburgh in collaboration with the Scottish naturalist William MacGillivray, who was responsible for its more scientific information. Extracts from Audubon's contributions, edited in 1926 by F. H. Herrick as *Delineations of American Scenery and Character*, reveal his stylistic qualities and furnish many pictures of American frontier life. Audubon worked on a smaller edition of his great work and also, in collaboration with John Bachman, began *The Viviparous Quadrupeds of North America*, which was completed by his sons Victor Gifford Audubon and John Woodhouse Audubon (plates, 30 parts, 1842-45, text, 3 vol., 1846-54). During these years his home was on the Hudson River in the northern part of Manhattan island. While his drawings and paintings of bird life may not wholly satisfy both the critical artist and the meticulous scientist, their

achievement in both areas is considerable. They remain one of the great achievements of American intellectual history and have gained wide popularity, having been reprinted many times. See his journal (1929) and letters (1930, repr 1969), both ed. by Howard Corning, studies by A. J. Tyler (1937), S. C. Arthur (1937), A. E. Ford (1964), A. B. Adams (1966), F. H. Herrick (2d ed 1938, repr 1968), and K. H. Proby (1974).

Audubon, borough (1970 pop. 10,802), Camden co., SW N.J., a suburb of Camden, inc. 1905. Audubon is mostly residential. It was named after John James Audubon, the ornithologist, who studied the birds of the area in 1829.

Audubon Society, National, one of the oldest and largest organizations in the Americas devoted to the conservation of wildlife and the natural environment, founded 1905 by George Bird Grinnell and named for John James Audubon. The society, a non-profit organization with a membership of over 325,000, maintains numerous wildlife sanctuaries, a few of which are open to the public, as well as camps and nature centers and provides various forms of educational services. The organization is actively at work on a wide range of critical issues affecting the natural environment, including strip mining, land use control, resource (land, water, and air) conservation, and, on an international level, protection of endangered species. Its publications include *American Bird* and *Audubon* (formerly *Bird Lore*), the society's official magazine.

Aue, Hartmann von: see HARTMANN VON AUE

Auenbrugger, Leopold (lä'öpŏlt ou'änbröögər), 1722-1809, Viennese physician. His findings on the use of percussion in diagnosing chest diseases were published in 1761 (tr. *On Percussion of the Chest*, 1936). Although ignored for some 40 years, his method, revived by Jean Nicolas Corvisart, was ultimately generally adopted.

Auer, Leopold (ou'ər), 1845-1930, Hungarian violinist and teacher, studied at the conservatories of Budapest and Vienna and with Joseph Joachim in Hanover. He taught at the St. Petersburg Conservatory, 1868-1917. Among his pupils were Mischa Elman, Jascha Heifetz, and Nathan Milstein. In 1918 he came to the United States, where he taught at the Institute of Musical Art, New York City, and the Curtis Institute of Music, Philadelphia. He became an American citizen in 1926. He was tremendously successful as a concert violinist and conductor. See his autobiography (1923).

Auerbach, Berthold (bĕrt'hŏlt ou'ərbakh), 1812-82, German novelist. He fought in the Revolution of 1848 and in the Franco-Prussian War. As a result of his *Schwarzwalder Dorfgeschichten* (1843-53, tr. *Vol. I Village Tales from the Black Forest*, 1846-47), somewhat stylized pictures of peasant life that were much imitated, he became the virtual founder of the peasant-story genre in German. Typical of his use of the novel are *Die Frau Professorin* (1846, tr. *The Professor's Wife*, 1850), *Die Helm von Buchenberg* (1852), and *Barfüßel* (1856, tr. *The Barefooted Maiden*, 1857). Of his longer works (some of them stories of Jewish life), the best known is *Auf der Höhe* (1865, tr. *On the Heights*, 1867). A dramatization of *Die Frau Professorin* by Charlotte Pfeiffer held the stage for 50 years in Germany.

Auerstedt (ou'ərshĕt), village, Erfurt dist., SW East Germany. At Auerstedt on Oct. 14, 1806 (the same day Napoleon I triumphed at Jena), French Marshal Louis Nicholas Davout defeated the Prussians under Duke Charles of Brunswick.

Augeas (ôjĕ'ās), in Greek mythology, son of Helios and king of Elis. He kept his huge herds of cattle in the Augean Stables. As his sixth labor, Hercules cleaned the stables in one day by diverting the course of a river (possibly the Alpheus) through them.

auger (ô'gər) see DRILL

Augereau, Pierre François Charles (pyĕr fraŋswa' sharl ôzhərô'), 1757-1816, marshal of France. He fought in the French Revolutionary and Napoleonic wars and was a principal in the coup d'état of 18 FRUCTIDOR (Sept. 4, 1797). For his heroism in the Italian campaign he was made duke of Castiglione. After the restoration of the Bourbons in 1814, Augereau rallied to Louis XVIII.

Aughrim or **Aghrim** (ôg'rĭm, ôkh-), village, Co. Wicklow, SW Republic of Ireland. It was the scene of a battle (July 12, 1691) in which the forces of William III of Great Britain won a decisive victory over those of James II.

Augier, Émile (Guillaume Victor Émile Augier) (gĕyôm' vĕktôr' âmĕl' ôzhyă'), 1820-89, French dra-

matist His plays, early examples of realism, satirize the social foibles of his time and uphold the values of bourgeois family life His chief work, *Le Gendre de M Poirier* (1854, tr 1915), was written with Jules Sandeau

Augsburg (ouks'bōrk), city (1970 pop 211,566), capital of Swabia, Bavaria, 5 West Germany, an industrial center on the Lech River The major industries include the manufacture of textiles, clothing, machinery, motor vehicles, and airplanes The city is an important rail junction Augsburg was founded (c 14 B C) by Augustus as a Roman garrison called *Augusta Vindelicorum* In early medieval times it was controlled by the Frankish kings It was made a free imperial city in 1276 and was later a powerful member of various Swabian leagues, including the SWABIAN LEAGUE of 1488-1534 Augsburg was one of Europe's most important commercial and banking centers in the 15th and 16th cent and was a rallying point of German science and art The city was the home of the FUGGER and WELSER families and was the birthplace of Hans Holbein the Elder, Hans Holbein the Younger, and Hans Burgkmair Several important agreements, including the Augsburg Confession (1530), were concluded there during the Reformation Augsburg suffered greatly in the Thirty Years War (1618-48) In 1806 it became part of Bavaria Augsburg's many noteworthy structures include the cathedral (begun in the 9th cent), the 16th-century Fuggerei, an enclosed settlement for poor persons founded by the Fugger family, and the 17th-century town hall Bertolt Brecht was also born in Augsburg

Augsburg, League of, defensive alliance formed (1686) by Holy Roman Emperor Leopold I with various German states, including Bavaria and the Palatinate, and with Sweden and Spain so far as their German interests were concerned It was an acknowledgment of a community of German feeling against French expansion The war that broke out after the French attack on the Palatinate in Oct, 1688, is sometimes designated the War of the League of Augsburg In 1689 a new coalition against the French, the Grand Alliance, was formed by Austria, England, and the Netherlands Savoy and Spain later joined the Alliance and the war of 1688-97 is more properly known as the War of the Grand Alliance (see GRAND ALLIANCE, WAR OF THE)

Augsburg, Peace of, 1555, temporary settlement within the Holy Roman Empire of the religious conflict arising from the REFORMATION Each prince was to determine whether Lutheranism or Roman Catholicism was to prevail in his lands (*cuius regio, eius religio*) Dissenters were allowed to emigrate, and the free cities were obligated to allow both Catholics and Lutherans to practice their religions Calvinists and others were ignored Under a provision termed the ecclesiastical reservation, the archbishops, bishops, and abbots who had become Protestant after 1552 were to forfeit their offices and incomes

Augsburg Confession: see CREED 4

Augsburg Interim: see REFORMATION

Augur, Hezekiah, 1791-1858, American sculptor After a business failure he devoted himself to art and was encouraged by Samuel F B Morse His bust of Washington and the statuette group *Jephtha and His Daughter* (Yale Univ) are among his best-known works

augur: see OMEN

August: see MONTH

Augusta (ougō'stā), city (1971 pop 34,709), E Sicily, Italy, on an island (formerly a peninsula) in the Ionian Sea, connected by bridge with the Sicilian mainland It is an important port and a fishing and industrial center Manufactures include refined petroleum, chemicals, textiles, and fertilizer The city was a Greek settlement and then a Roman military base It was refounded by Emperor Frederick II in 1232 and later (15th-early 16th cent) was a thriving banking town Augusta was badly damaged by earthquakes in 1693 and 1848 Of note is Frederick II's castle (now a penitentiary)

Augusta (ōgūs'tā, āgūs'-), 1 City (1970 pop 59,864), seat of Richmond co, E Ga, inc 1798 At the head of navigation on the Savannah River and protected by levees, Augusta is the trade center for a broad band of counties in Georgia and South Carolina known as the Central Savannah River Area It is also an important industrial center, manufacturing textiles, chemicals, bricks and tiles, fertilizers, cleansers, hospital supplies, tools, and wood, paper, metal, and plastic products The city is a popular resort, noted especially for its golf tournaments Augusta grew from an old river trading post existing as early as 1717 and was named by James Oglethorpe in 1733

after the mother of George III In the American Revolution, Augusta changed hands several times and was finally taken by Continental forces in 1781 under Andrew Pickens and Light-Horse Harry Lee It was the capital of Georgia from 1785 to 1795, and the U S Constitution was ratified there Augusta boomed after the American Revolution, during the rapid expansion of the tobacco industry, followed by the growth of the cotton industry By 1820 the city was the terminus for river boats, wagon trains, and traders, all carrying the produce of the interior to the sea Manufacturing began in 1828, when Augusta's first textile plant began operation with machinery brought laboriously from Philadelphia During the Civil War, Augusta housed the largest Confederate powder works The city's historical attractions include a boyhood home of Woodrow Wilson, a U S arsenal (1815-1955), whose surviving buildings are now part of Augusta College, and old homes of Georgian and classic-revival styles Paine College, Georgia Medical College, and two large veterans hospitals are also in Augusta Nearby is Fort Gordon, with training schools for military police, the signal corps, and the corps of engineers 2 City (1970 pop 21,945), state capital and seat of Kennebec co, 5W Maine, on the Kennebec River, inc as a town 1797, as a city 1849 Shoes, fabrics, and paper products are manufactured there Traders visited the site, long known as Cushnoc, even before 1628, when the Plymouth Company established a trading post Fort Western was built in 1754, and Benedict Arnold's expedition to Quebec gathered at the fort in 1775 (The garrison house was restored as a museum in 1921) The settlement around the fort developed with the shipping and shipbuilding on the Kennebec, and manufacturing began in 1837, when a dam was built across the river The capitol building (1829) was designed by Charles Bulfinch but has been considerably enlarged and remodeled James G Blaine's early 19th-century home is the governor's mansion A junior college (a branch of the Univ of Maine), a veterans hospital, and a U S arsenal are also in Augusta

Augustenburger, Christian Augustus, Herzog von: see SCHLESWIG-HOLSTEIN

Augustine, Saint (ō'gastēn, -tīn, ōgūs'tīn), Lat *Aurelius Augustinus*, 354-430, Doctor of the Church, one of the four Latin fathers, bishop of Hippo (near present-day Annaba, Algeria), b Tagaste (c 40 mi/60 km S of Hippo) His mother, St Monica, was a great influence in his life She brought him up as a Christian, but he gave up his religion when he went to school at Carthage There he became adept in rhetoric In his *Confessions* he repents of his wild youth in Carthage, during which time he fathered an illegitimate son At some time in his youth he became a convert to Manichaeism After 376 he went to Rome, where he taught rhetoric with success, in 384, at the urging of the Manichaeans, he went to Milan to teach His years at Milan were the critical period of his life Already distrustful of Manichaeism, he came to renounce it after a deep study of Platonism and skepticism Augustine, troubled in spirit, was greatly drawn by the eloquent fervor of St Ambrose, bishop of Milan After two years of great doubt and mental disquietude, Augustine suddenly decided to embrace Christianity He was baptized on Easter, 387 Soon afterward he returned to Tagaste, where he lived a monastic life with a group of friends In 391, while he was visiting in Hippo, he was chosen against his will to be priest of the Christians there For the rest of his life he remained in Hippo, where he became auxiliary bishop in 395 and bishop soon after He died in the course of the siege of Hippo by the Vandals St Augustine's influence on Christianity is thought by many to be second only to that of St Paul, and theologians, both Roman Catholic and Protestant, look upon him as the founder of theology His *Confessions* is considered a classic of Christian mysticism This work (c 400), the prime source for St Augustine's life, is a beautifully written apology for the Christian convert Next to it his best-known work is the *City of God* (after 412)—a mammoth defense of Christianity against its pagan critics, and famous especially for the uniquely Christian view of history elaborated in its pages Augustine regarded all history as God's providential preparation of two mystical cities, one of God and one of the devil, and to one or the other of which all mankind will finally belong His greatest purely dogmatic work is *On the Trinity*, a systematization of Christian doctrine, but much of his theological teaching comes from his polemic writings His works against the Manichaeans, especially *Against Faustus* (his Manichaean teacher), are important for the light they throw on this religion Against DONA-

TISM St Augustine directed two works, *On Baptism* and *On the Correction of the Donatists*, in which he formulated the idea, since then become part of Roman Catholicism, that the church's authority is the guarantee of the Christian faith, its own guarantee being the APOSTOLIC SUCCESSION The most spectacular controversy in which St Augustine was involved was his battle against PELAGIANISM The Pelagians denied original sin and the fall of man The implication of this, that God's grace was unnecessary for the first step toward salvation, aroused Augustine, who held that man was corrupt and helpless He wrote many treatises in this controversy and continued to elaborate his ideas afterward From his writings the great controversies on grace proceed, and as professed followers of Augustine, John Calvin and the Jansenists developed predestinarian theologies Though revering Augustine, many theologians have refused to accept his more extreme statements on grace itself Another of St Augustine's important treatises, *On the Work of Monks*, has been much used by monastics He also composed works on biblical exegesis One of his most interesting treatises is called *Retractions*, composed late in life, a kind of review of his works, in which he revised some of his views He was a master of style His letters are numerous and revealing His most important works are available in translation Feast Aug 28 See biographies by Jacques Chabannes (tr 1962) and P R L Brown (1967), R W Battenhouse, ed, *A Companion to the Study of St Augustine* (1955), H A Deane, *The Political and Social Ideas of St Augustine* (1963), R A Markus, *Saeculum History and Society in the Theology of St Augustine* (1970), Eugene Teselle, *Augustine the Theologian* (1970)

Augustine of Canterbury, Saint, d c 605, Italian missionary, called the Apostle of the English, first archbishop of Canterbury (from 601) A Roman Benedictine monk, he was sent to England, as the head of some 40 monks, by Pope St Gregory I Arriving in 597, they were well received by King ÆTHELBERT, who was converted by Augustine, thus making him the first Christian king in Anglo-Saxon England Æthelbert gave the monks land at Canterbury, and a church was built on the site of the present cathedral A monastery was also founded Augustine's mission, introducing the more indulgent Roman ways, was resented by Celtic monks of the British isles, whose austerities were more severe and who kept a different date of Easter Their differences were eventually settled in 663 at the Synod of Whitby, when England abandoned Celtic practices Feast May 28 (May 26 in England and Wales) See Bede's *Ecclesiastical History*, biographies by F van der Meer (1961) and J Gnallor (1965), studies by R W Battenhouse (1955) and T Prosper (1963)

Augustinians, religious orders in the Roman Catholic Church The name is derived from the Rule of St Augustine, an old, rather generalized monastic rule The canons regularly adopted this rule in the 11th cent and became known as Augustinian, or Austun, canons Subsequent orders of canons regular, such as the Premonstratensians, are outgrowths The Austin friars are an entirely different group of religious, dating from the 13th cent (see FRIAR) Officially known as Hermits of St Augustine, they now exist in three independent branches—the Calced Augustinian Hermits, the more austere and less numerous Discalced Augustinian Hermits, and the Recollects of St Augustine There are also congregations of women corresponding to both canons and friars

Augustus (ōgūs'tas, āgūs'-), 63 B C -A D 14, first Roman emperor, a grandson of the sister of Julius CAESAR Named at first Caius Octavius, he became an adoption by the Julian gens (44 B C) Caius Julius Caesar Octavianus (Octavian), Augustus was a title of honor granted (27 B C) by the senate When Octavian was a youth, Caesar took a great interest in his education and made him his heir without the boy's knowledge Octavius was in Illyricum when Caesar was killed, and he promptly set out for Rome to avenge the dictator's death Before he reached the city, he heard that he was Caesar's heir At Rome, ANTONY was in control, and Octavian was recognized by Cicero and the senate as a leader against him Antony went north to take Gaul and was defeated (43 B C) at Mutina (modern Modena) Octavian, now dominant in Rome, secured the consulship and made an alliance with Antony and LEPIDUS (d 13 B C) as the Second Triumvirate Having proscribed the enemies of the triumvirate, Octavian and Antony went east and defeated (42 B C) the army of Marcus Junius BRUTUS and Caius CASSIUS Longinus at Philippi Octavian's forces then attacked Sextus POMPEIUS, who controlled Sicily and

Sardinia, and Marcus Vipsanius AGRIPPA defeated (36 B C) Pompeius at Mylae. Meanwhile, at Rome, Octavian had been consolidating his power. He was helped by the growing impatience of Rome with Antony's intrigue with Cleopatra, and he had himself appointed (31 B C) general against Antony. After the naval battle off ACTIUM, which Agrippa won over Antony and Cleopatra, Octavian controlled all Roman territories. He set about at once to reform the city and the provinces. He purged the senate of unworthy members, restored and built temples, and fostered a revival of Roman tradition. Augustus had no court, and he considered himself, at least publicly, not the ruler, but rather the first citizen, of the republic. The senate delighted to honor him. In 29 B C he was made imperator [Lat., =commander, from it is derived *emperor*], in 28 B C princeps [leader, from it is derived *prince*], in 27 B C augustus [august, reverend], in 12 B C pontifex maximus [high priest], and a month (Sextilis) was renamed Augustus (August) in his honor. His reforms were prudent and far-reaching, and he was responsible for Rome's return from a military dictatorship to a constitutional rule. He divided the provinces into two classes—senatorial, ruled by a proconsul chosen by the senate with a term of one year, and imperial, in charge of a governor solely responsible to Augustus with an indefinite term. To control the provinces Augustus spread the army throughout the empire, before this Italy had been burdened with a huge standing army. Augustus desired no further conquest, and his consequent policy was to hold the borders set by Caesar. His attempt to make a buffer state of the German territory between the Rhine and the Weser (or the Elbe) led to a rebellion by ARMINIUS in which Varus was defeated, this was the only real reverse Augustus suffered. Augustus studied the plans of Caesar for colonization throughout the empire. He made taxation more equitable and had general censuses taken. Knowing that the roads were the arteries of the empire, he lavished expenditures on them. He built a new forum, beautified the streets, improved housing conditions, and set up adequate police and fire protection. He was munificent to arts and letters, and he was a close friend of MAECENAS and a patron of Vergil, Ovid, Livy, and Horace. Augustus established the concept of the Pax Romana [Roman peace], which strengthened the imperial government. He was succeeded by his stepson TIBERIUS. See Victor Ehrenberg and A. H. M. Jones, *Documents Illustrating the Reigns of Augustus and Tiberius* (2d ed., 1955), H. T. Rowell, *Rome in the Augustan Age* (1962), G. W. Bowersock, *Augustus and the Greek World* (1965), A. H. M. Jones, *Augustus* (1971).

Augustus II, 1670-1733, king of Poland (1697-1733) and, as Frederick Augustus I, elector of Saxony (1694-1733). He commanded the imperial army against the Turks (1695-96), but had no success and was replaced by Prince Eugene of Savoy as soon as he competed for the Polish throne, left vacant by the death of John III. By becoming a Catholic and granting the Polish nobility unprecedented privileges he was elected king with the support of the Holy Roman emperor and the pope. With help from PATKUL, Augustus allied himself (1699) with PETER I of Russia and FREDERICK IV of Denmark for an attack on young CHARLES XII of Sweden. In the resulting conflict (see NORTHERN WAR) Augustus invaded LIVONIA with his Saxon troops but was defeated (1702) by Charles XII. The Treaty of Altranstadt (1706) forced him to renounce the Polish crown in favor of STANISLAUS I and to give up his alliance with Russia. After Charles's defeat by the Russians at Poltava (1709), Augustus revived the alliance and recovered Poland. In Poland, where he kept a Saxon force, Augustus was highly unpopular. After his death, the ascension of his son and successor in Saxony, Augustus III, to the Polish throne was unsuccessfully contested by Stanislaus I, who was backed by France. Among Augustus's many mistresses was Maria Aurora KÖNIGSMARK, her son, Maurice de SAXE, was one of Augustus's innumerable illegitimate offspring. A patron of the arts, Augustus greatly embellished Dresden and created the MEISSEN china manufactures. He is also called Augustus the Strong.

Augustus III, 1696-1763, king of Poland (1735-63) and, as Frederick Augustus II, elector of Saxony (1733-63), son of Augustus II, whom he succeeded in Saxony. Elected king of Poland by a minority, he allied himself with Empress Anna of Russia and Holy Roman Emperor CHARLES VI in the War of the POLISH SUCCESSION (1733-35) and secured the throne from STANISLAUS I. In the War of the AUSTRIAN SUCCESSION (1740-48), Augustus at first offered to support Maria Theresa in return for a corridor between Poland and

Saxony. He was refused and entered the coalition against her, claiming rights as a son-in-law of her uncle, Holy Roman Emperor Joseph I. He changed sides in 1742. When the SEVEN YEARS WAR began (1756) with a surprise attack on Saxony, Augustus fled to Poland; he returned to Dresden only after the war was over (1763). He was a patron of the arts, and his indolence and sensuality kept him from state affairs, which he left to his ministers, notably Count BRÜHL. Augustus's death ended the union of Saxony and Poland. His grandson became elector of Saxony (and later, as FREDERICK AUGUSTUS I, king), but STANISLAUS II was elected king of Poland with Russian support.

auk (ôk), common name for a member of the family Alcidae (alcid family), swimming and diving birds of the N Atlantic and Pacific, which includes the guillemots and puffins. Their legs are set far back on their bodies, making them clumsy on land, where they seldom venture except to nest. The extinct, flightless great auk, *Pinguinus impennis*, or garefowl, represents the largest species. It was about the size of a goose, black above and grayish white below, and was formerly abundant in the N Atlantic. Slaughtered in its breeding grounds for its flesh, feathers, and oil, it became extinct c 1844. The least auklet (about 6½ in /16.3 cm), common in the Bering Sea region, is the smallest of the family, and the razor-billed auk, *Alca torda* (16-18 in /40-45 cm), is the largest surviving member. The Eskimos hunt the dovekie (*Plautus alle*), or little auk, for food and use its feathered skin for clothing. Auks return to the same breeding grounds every year, and each individual goes to the very same nesting site. The single egg is laid on bare rock on cliff ledges, and incubation duties are shared by both parents. Auks are classified in the phylum CHORDATA, subphylum Vertebrata, class Aves, order Charadriiformes, family Alcidae.

Aukrust, Olav (ô'lav ou'krööst'), 1883-1929, Norwegian lyric poet. Aukrust's work, which contains strong religious and nationalist sentiment, draws much of its inspiration from Norway's peasant life, traditions, and majestic landscape. His best-known volumes of poetry include *Himmelvarden* [the mountain cairn] (1916) and *Solrenning* [sunrise] (1930). Aukrust writes symbolically of the individual's struggle against dark, elemental powers and his redemption through Christian faith. He uses this theme as a metaphor for Norwegian national development.

Aulard, Alphonse (alfôn's ôlar'), 1849-1928, French historian. He was the first professional historian of the French Revolution, and he devoted his life to this study. A professor at the Univ of Paris, he founded the Société de l'Histoire de la Révolution and the monthly review *Revue française*. Aulard regarded the conservative interpretation of Taine as prejudiced, nevertheless, he himself clearly represented the republican, bourgeois, and anticlerical concept of the Revolution. He concentrated on political history. Some of his students, notably Albert MATHIEZ, broke with his emphasis and turned to social and economic issues. Aulard's works include *Études et leçons sur la Révolution française* (9 vol., 1893-1924), *Histoire politique de la Révolution française* (1901, tr. *The French Revolution: A Political History*, 4 vol., 1910, repr. 1965), *Les Grands Orateurs de la Révolution*, Mirabeau, Vergniaud, Danton, Robespierre (1914), and *La Révolution française et le régime féodal* (1919).

Aulis (ô'lis), small port of ancient Greece, in Boeotia, E central Greece. From there the Greek fleet sailed against Troy after the sacrifice of IPHIGENIA. Its ancient temple of Artemis is in ruins.

Aulus Gellius: see GELLIUS, AULUS.

Aunis (ônēs'), small region and former province, W France, on the Atlantic coast. It is now part of the Charente-Maritime and Deux-Sevres depts and includes the islands of Re and Oleron. La Rochelle, the historic capital and one of the leading ports of the region, and Rochefort are the chief cities. A part of Aquitaine, it was recovered from England in 1373 and incorporated into the French crown lands.

aura. see SPIRITISM.

Aurangabad (ourûng'gabad'), town (1971 pop. 150,514), Maharashtra state, W India. A district administrative center, it also carries on trade in cotton and wheat. Silverware is produced. Aurangabad, founded in 1610, is the home of Marathwada Univ. Nearby is the great mausoleum (1711) of Aurangzeb's empress.

Aurangzeb (ô'rângzëb') or **Aurangzib** (-zîb'), 1618-1707, Mogul emperor of India (1658-1707), son and successor of SHAH JAHAN. He served (1636-44,

1653-58) as viceroy of the Deccan but was constantly at odds with his father and his eldest brother, Dara Shikoh, the heir apparent. When Shah Jahan fell ill in 1658, Aurangzeb seized the opportunity to fight and defeat Dara and two other brothers in a battle for succession. He imprisoned his father for life and ascended the throne of Delhi with the reign title Alamgir [world-shaker]. A scholarly, austere man, fanatically devoted to Islam, he persecuted the Hindus, destroying their temples and monuments. He executed the guru of the SIKHS when he refused to embrace Islam. Such measures produced a fierce Hindu reaction. Thus, although the Mogul empire reached its greatest extent under Aurangzeb, it was also fatally weakened by revolts of the Sikhs, Rajputs, and Jats in the north and the rebellion of the Mahrattas in the Deccan. From 1682, Aurangzeb concentrated all his energies on crushing the Mahrattas, but his costly campaigns were only temporarily successful and further weakened his authority in the north. The Mogul empire fell apart soon after his death. His name also appears as Aurungzebe, Aurungzeb, and Aureng-Zebe. See biography by Sir J. Dunath Sarkar (5 vol., 1912-24), study by Stanley Lane-Poole (1964).

Auray (ôrá'), town (1968 pop. 8,639), Morbihan dept., NW France, in Brittany, on the Auray River estuary. Oysters are bred, food is canned, and there is some light manufacturing. Nearby the decisive battle of the War of the BRETON SUCCESSION took place (1364). On the Champ des Martyrs, also near Auray, some 800 royalists, who had landed at Quiberon, were massacred (1795). North of the town is the famous Basilica of Sainte-Anne-d'Auray, built in Renaissance style in the 19th cent. Pilgrimages to the shrine have occurred every July 26 since the 17th cent., when a peasant, Yves Nicolazic, claimed to have seen a vision of St. Anne.

Aurelian (Lucius Domitius Aurelianus) (ôré'léan), c 212-275, Roman emperor (270-75). Rising in the ranks, he became consul under Valerian. He succeeded CLAUDIUS II, whose victory over the Goths had begun the territorial rehabilitation of the empire. Aurelian conceded Dacia to the Goths but consolidated the Danubian provinces and held the barbarians beyond the Rhine in check. His most brilliant exploits were in the East—especially in Palmyra, where he captured ZENOBIA and destroyed her kingdom. Aurelian went to Gaul, where he received the submission of the independent "emperor," Tetricus. One of Rome's greatest emperors, Aurelian regained Britain, Gaul, Spain, Egypt, Syria, and Mesopotamia and removed for a while the barbarian threat to the eastern provinces. He fortified Rome with a wall some 12 mi (19 km) in circumference, averaging more than 40 ft (12.2 m) in height. Much of it still remains. Aurelian was murdered, and Marcus Claudius TACITUS succeeded him.

Aurelius, Marcus: see MARCUS AURELIUS.

aureole (ôr'êôl'), in art. see NIMBUS.

aureole, in physics, luminous circle seen when the sun or other bright light is observed through a diffuse medium, i.e., smoke, thin cloud, fog, haze, or mist. It sometimes occurs as a series of concentric circles. The aureole results from the dispersion of light by particles of dust or water. Because of the refraction of the light waves, it exhibits color in varying intensity.

Aureomycin (ôr'êômi'sîn), trade name for chlorotetracycline, a broad spectrum ANTIBIOTIC. See TETRACYCLINE.

Auriga (ôri'gä) [Lat., =the charioteer or wagoner], northern CONSTELLATION traditionally represented as a man, possibly Vulcan, carrying a goat on his shoulder while driving a chariot. It lies E of Perseus and N of Gemini and Taurus. Auriga contains CAPELLA, a bright, yellow giant star, and Epsilon Aurigae, an eclipsing binary in which a small star orbits a cool supergiant star. The constellation reaches its highest point in the evening sky in early February.

Aurignac (ôrënyak'), village (1968 pop. 1,149), Haute-Garonne dept., S France, at the foot of the Pyrenees. Its caves, excavated in 1860, contain relics of prehistoric man of the Aurignacian period (see PALEOLITHIC PERIOD).

Aurigny: see ALDERNEY, island, England.

Aurillac (ôrëyak'), town (1968 pop. 31,143), capital of Cantal dept., 5 central France, in Auvergne, on the Jordanne River. An industrial, communications, and market center, it is noted for its furniture, foot wear, umbrellas, and Cantal cheese. It has an 18th century church and picturesque old houses.

Auriol, Vincent (vân'san' ôryôl'), 1884-1966, French statesman, first president (1947-54) of the Fourth Republic. A Socialist deputy after 1914, he was finance

minister under Leon BLUM (1936–37) and minister of justice in the cabinet of Camille CHAUTEMPS (1937–38). He refused (1940) to vote plenary powers to Marshal PÉTAIN and was held in custody by the Vichy government. Released in 1941, he worked in the French underground and in 1943 left France to join Gen. Charles de Gaulle. A member of the provisional government (1945), he was elected (1946) president of the national assembly. He was president of the republic from 1947 to 1954. In 1958 he aided de Gaulle's return to power, but he later protested (1960) against what he considered de Gaulle's arbitrary rule. He resigned from the Socialist party in 1959.

Aurobindo, Sri: see GHOSE, AUROBINDO

urochs (ô'rôks), extinct European wild ox, *Bos primigenius*, believed to be the chief ancestor of European domestic cattle. Also called urus, it was a large, horned, dark brown animal, standing up to 7 ft (2 m) at the shoulder. It existed in the Pleistocene period and was apparently domesticated by Neolithic (New Stone Age) man. It is mentioned in the writings of Julius Caesar. Hunting and the clearing of forests resulted in its extermination; the last known survivor died in 1627 in Poland. The animal now commonly called aurochs in Europe is actually the WISENT, or European bison. The aurochs is classified in the phylum CHORDATA, subphylum Vertebrata, class Mammalia, order Artiodactyla, family Bovidae.

Aurora, in mythology see EOS

Aurora. 1 City (1970 pop. 74,974), Adams and Arapahoe counties, N central Colo., a residential suburb of Denver, inc. 1903. It is the trade center for a large farming and livestock-raising area. Electrical products, aircraft parts, and oil field equipment are manufactured. Tourism and construction are also important. Nearby are Lowry Air Force Base and Fitzsimmons Army General Hospital. 2 City (1970 pop. 74,182), Kane co., NE Ill., on the Fox River, inc. 1837. It has large railroad yards and a great variety of manufactures, including construction and highway equipment, electric tools, pumps, and heavy steel products. It was one of the first cities to use electricity for street lighting (1881). It is the seat of Aurora College and of a notable historical museum in a 20-room house built in 1857.

aurora borealis (bôr'êäl'is) and **aurora australis** (ôstrâ'l'is), luminous display of various forms and colors seen in the night sky. The aurora borealis of the Northern Hemisphere is often called the northern lights, and the aurora australis of the Southern Hemisphere is known as the southern lights. Each is visible over an area centering around the geomagnetic pole of its own hemisphere. The aurora borealis is said to occur with greatest frequency along a line extending through N Norway, across central Hudson Bay, through Point Barrow, Alaska, and through N Siberia. It is often visible in Canada and the N United States and is seen most frequently at the time of the EQUINOXES. Among the most magnificent of natural phenomena, auroral displays appear in shades of red, yellow, green, blue, and violet and are usually brightest in their most northern latitudes. The aurora is seen in a variety of forms, e.g., as patches of light, in the form of streamers, arcs, bands, rays, or resembling hanging draperies. The aurora occurs between 35 mi and 600 mi (56 km–970 km) above the earth. It is thought to be caused by high-speed electrons and protons from the sun, which are trapped in the Van Allen radiation belt high above the earth and then channeled toward the polar regions by the earth's magnetic field. These electrically charged particles enter the atmosphere and collide with air molecules (chiefly oxygen and nitrogen), thus exciting them to luminosity; near the 600-mile level, the light may be given off by electrons and protons combining to form hydrogen atoms. The auroras coincide with periods of greatest sunspot activity and with magnetic storms (disturbances of the ionosphere which interfere with long-distance radio communication). Much was learned about the aurora during the 1957–58 International Geophysical Year, when it was studied intensively by means of balloons, radar, rockets, and satellites.

Aurungzebe: see AURANGZEB

Ausable Chasm (ôsä'bäl), gorge, 2 mi (3.2 km) long, from 20 to 50 ft (6–15 m) wide, from 100 to 200 ft (30–61 m) deep, NE N.Y. The chasm, with its rapids, waterfalls, and curious rock formations, is a popular tourist attraction. Rainbow Falls, 75 ft (23 m) high, is at the southern end of the gorge. The Ausable, a river rising in the Adirondack Mts. and flowing NE to Lake Champlain, continues to carve out the gorge as it passes over the sandstone bedrock.

Auschwitz: see OŚWIĘCIM, Poland

Ausgleich: see AUSTRO HUNGARIAN MONARCHY

Ausonius (Decimus Magnus Ausonius) (ôsô'nêēs), c. 310–c. 395, Latin poet and man of letters, b. Bordeaux. He tutored Gratian, who, when he ascended the throne, made Ausonius prefect of Gaul, Italy, and Africa, and finally consul (379). When Gratian died, Ausonius returned to Bordeaux. His work gives a detailed picture of contemporary people and places. *Mosella*, a description of his journey on the Moselle River, contains his best verse. Among his other works are *Parentalia*, verse sketches of dead relatives, and *Ordo nobilium urbium*, a description of 20 leading cities of the Roman world. Ausonius was nominally a Christian, although his works reveal many pagan beliefs. See T. R. Glover, *Life and Letters in the Fourth Century* (1901, repr. 1968).

Aussig: see ÚSTÍ NAD LABEM, Czechoslovakia

Aust-Agder (oust'-ag'dar), county (1972 est. pop. 82,000), 3,610 sq mi (9,350 sq km), S Norway, bordering on the Skagerrak in the east. Arendal is the capital. The SETESDAL comprises the county's northern section. The Otra is the main river. Major industries include fishing, shipping, agriculture, tourism, and forestry. The county was formerly called Nedenes.

Austen, Jane, 1775–1817, English novelist. The daughter of a clergyman, she spent the first 25 years of her life at "Steventon," her father's Hampshire vicarage. Here her first novels, *Pride and Prejudice*, *Sense and Sensibility*, and *Northanger Abbey*, were written, although they were not published until much later. On her father's retirement in 1801, the family moved to Bath for several years and then to Southampton, settling finally at Chawton Cottage, near Alton, Hampshire, which was Jane's home for the rest of her life. *Northanger Abbey*, a satire on the GOTHIC ROMANCE, was sold to a publisher for £10 in 1803, but as it was not published, was bought back by members of the family and was finally issued posthumously. The novels published in Austen's lifetime were *Sense and Sensibility* (1811), *Pride and Prejudice* (1813), *Mansfield Park* (1814), and *Emma* (1816). *Persuasion* was issued in 1818 with *Northanger Abbey*. The author's name did not appear on any of her title pages, and although her own friends knew of her authorship, she received little public recognition in her lifetime. Jane Austen's novels are comedies of manners that depict the self-contained world of provincial ladies and gentlemen. Most of her works revolve around the delicate business of providing husbands for marriageable daughters. She is particularly noted for her vivid delineations and lively interplay of character, her superb sense of comic irony, and her moral firmness. She ridicules the silly, the affected, and the stupid, ranging in her satire from light portraiture in her early works to more scornful exposures in her later novels. Her writing was subjected to the most careful polishing. She was quite aware of her special excellences and limitations, comparing herself to a miniaturist. Today she is regarded as one of the great masters of the English novel. Her minor works include her *Juvenilia*, the novel *Lady Susan*, and the fragments *The Watsons* and *Sanditon*. See her letters (ed. by R. W. Chapman, 2d ed. 1965), biographies by Elizabeth Jenkins (1939) and J. A. Hodge (1972), studies by Mary Lascelles (1939), A. H. Wright (1953), A. W. Litz (1965), F. W. Bradbrook (1966), A. M. Duckworth (1971), K. Kroeber (1971), F. B. Pinion (1973), and S. M. Tave (1973).

Austerlitz (ô'stôr'lits, Ger. ou'-), Czech Slavkov u Brna, town, S Czechoslovakia, in Moravia. An agricultural center, the town has sugar refineries and cotton mills. It became a seat of the Anabaptists in 1528. At Austerlitz, in the "battle of the three emperors," Napoleon I won (Dec. 2, 1805) his most brilliant victory by defeating the Russian and Austrian armies under Czar Alexander I and Emperor Francis II. The "sun of Austerlitz" (it was a cloudless day) became synonymous with the peak of Napoleon's fortunes. An armistice with Austria, concluded (Dec. 4) at Nikolsburg (now Mikulov), was followed by the Treaty of Pressburg. Russia continued the war but had to withdraw all troops from Austria. There is a famous description of the battle in Tolstoy's *War and Peace*. The town has an 18th-century castle, a 13th-century church, the Renaissance Church of the Resurrection, and the Monument of Peace (built 1910–11).

Austin, Alfred, 1835–1913, English author, b. Leeds. Originally trained for a legal career, he eventually turned to writing and politics. From 1883–95 he edited the *National Review*. Although in 1896 he succeeded Tennyson as poet laureate, his poetry is negligible, and he was the butt of many critics who attacked his snobishness, tastelessness, and lack of

poetic talent. His best work is *A Garden That I Love* (1894, 1907), a miscellany in diary form. See his autobiography (1911, repr. 1973), study by N. B. Crowell (1953).

Austin, John, 1790–1859, English jurist. He served (1826–32) as professor of jurisprudence at the Univ. of London, and his lectures were published (with additional material) as *The Province of Jurisprudence Determined* (1832, repr. 1967, 3 vol.) and *Lectures on Jurisprudence* (1869, 5th ed. 1911). These books presented a comprehensive analysis of the principles underlying all legal systems. Austin argued that law was the expression of the will of the sovereign authority and was not to be confused with the dictates of religion and ethics. Austin's work—in part stemming from that of Jeremy BENTHAM—had a strong influence on many later legal theorists, including John Stuart MILL. His wife, Sarah Taylor Austin, was a well-known translator. See Jethro Brown, ed., *The Austinian Theory of Law* (1906).

Austin, John Langshaw, 1911–60, British philosopher. A graduate of Oxford, he was a fellow of All Souls (1933–35) and Magdalen (1935–52) colleges before he became White's professor of moral philosophy (1952–60) also at Oxford. He strongly influenced analytic philosophy, urging that the use of words be closely examined and holding that the distinctions of ordinary language are more subtle than is usually realized. His writings include *Philosophical Papers* (1961), *Sense and Sensibilia* (1962), and *How to Do Things with Words* (1962). See studies by Mats Furberg (1971) and Sir Isaiah Berlin et al. (1973).

Austin, Moses, 1761–1821, American pioneer, b. Durham, Conn. After developing lead mines in SW Virginia, he went to inspect (1796–97) prospects in Missouri, then Spanish territory. In 1798 he founded Potosi, Mo. and became a miner and trader there. Hard times caused him to go to Texas in 1820 and get the Spanish governor's permission to settle 300 families in Texas. The grant was confirmed in 1821, but Moses Austin died without realizing his settlement plans. His son, Stephen F. Austin, took up the plans.

Austin, Stephen Fuller, 1793–1836, American leader of colonization in Texas, known as the Father of Texas, b. Wythe co., Va., son of Moses Austin. He grew up in Missouri, studied at Transylvania Univ. in Kentucky, served (1814–20) in the Missouri territorial legislature, and was studying law in New Orleans when his father died. Stephen took up the plans to colonize Texas and on a journey there (1821) selected the area between the Brazos and Colorado rivers. In January, 1822, he planted the first legal settlement of Anglo-Americans in Texas. He later went to Mexico City to have his grant cleared and confirmed by the newly independent Mexican government. Austin's settlements, with the towns of San Felipe de Austin and Brazoria, prospered. Other American colonists poured in. As friction developed over the years with the Mexican government, Austin opposed illegal efforts at Texan independence. He was sent in 1833 to Mexico City to present the settlers' grievances, to ask that Texas be separated from Coahuila, and to get the Mexican immigration law modified. He was accused of treason and imprisoned. On his return to Texas in 1835 he opposed the government of SANTA ANNA and so forwarded the Texas Revolution. He was sent as one of the commissioners (1835–36) of the provisional government to obtain aid in the United States, was defeated (1836) by Samuel HOUSTON for the presidency of Texas, and served briefly until his death as secretary of state. See *The Austin Papers, 1765–1837* (1924–28), biographies by S. Glasscock (1951) and E. G. Barker (1925, repr. 1968).

Austin. 1 City (1970 pop. 25,074), seat of Mower co., SE Minn., on the Cedar River, near the Iowa line, inc. 1868. The industrial and commercial center of a rich farm region, it has a large meat-packing industry. Shipping and metal containers are also made. In Austin are a junior college and an arboretum and nature center. 2 City (1970 pop. 251,808), state capital and seat of Travis co., S central Texas, on the Colorado River and two of the Highland Lakes, inc. 1839. It is the commercial heart of a large ranching, poultry, dairy, cotton, and grain area, with a great variety of manufactures. It is also a major convention city and an educational center—the main campus of the Univ. of Texas, St. Edward's Univ., Huston-Tillotson College, two theological seminaries, and a junior college, as well as numerous electronic and scientific research firms, are located there. The site was selected in 1839 for the capital of the independent Texas republic and named by the legisla-

ture in honor of Stephen F. Austin. Fear of the Mexicans and the Indians drove government officials to Houston in 1842; they returned in 1845 when Texas was admitted to the Union, and in 1870, following a referendum, Austin was made permanent capital. It remained a small commercial, governmental, and educational center until its industrial growth was spurred by the development of power and flood control projects on the Colorado River (beginning in the 1930s) and by the urgencies of World War II. The massive capitol (completed 1888), set on a hill, is the most prominent of the many state buildings; on its grounds are the state library, the old land office (1857), and two state historical museums. Also of interest are the governor's mansion (1856), the old French embassy (1840, dating from the republic), the house in which O. Henry lived, and the former studio of Elisabeth Ney. A state mental hospital is in Austin. In the hills outside the city are many scenic and recreational areas, notably Barton Springs. Bergstrom Air Force Base adjoins the city.

Austin canons: see AUGUSTINIANS

Australasia (ōstrālā'zhā, -shā), islands of the South Pacific, including AUSTRALIA, NEW ZEALAND, NEW GUINEA, and adjacent islands. The term is sometimes used to include all of Oceania.

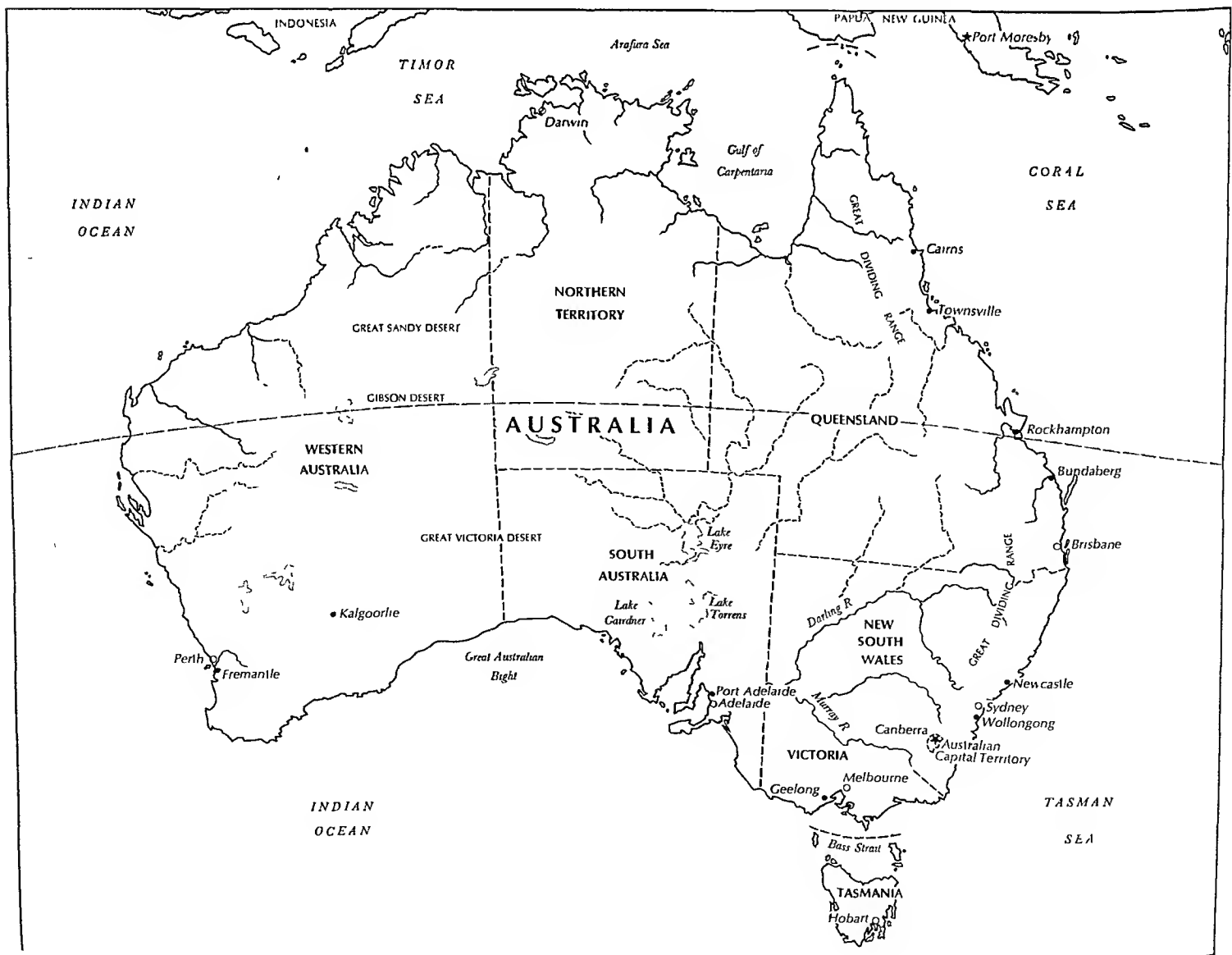
Australia, smallest continent, between the Indian and Pacific oceans. It extends from east to west some 2,400 mi (3,860 km) and from north to south nearly 2,000 mi (3,220 km). With the island state of TASMANIA to the south, the continent makes up the Commonwealth of Australia (1973 est. pop. 13,100,000), 2,967,877 sq mi (7,686,810 sq km). There are five continental states (QUEENSLAND, NEW SOUTH WALES, VICTORIA, SOUTH AUSTRALIA, and WESTERN AUSTRALIA) as well as the NORTHERN TERRITORY and the AUSTRALIAN CAPITAL TERRITORY (an enclave within New South

Wales, containing CANBERRA, the federal capital). Australia's external territories include Norfolk Island, Christmas Island, the Cocos (Keeling) Islands, and the Australian Antarctic Territory.

Geography. The Australian continent is on the whole exceedingly flat and dry. Less than 20 in. (50.8 cm) of precipitation falls annually over 70% of the land area. From the narrow coastal plain in the west the land rises abruptly in what, from the sea, appear to be mountain ranges but are actually the escarpments of a rough plateau that occupies the western half of the continent. It is generally from 1,000 to 2,000 ft (305–610 m) high but several mountain ranges rise to nearly 5,000 ft (1,520 m); there are no permanent rivers or lakes. In the southwest corner of the continent there is a small moist and fertile area, but the rest of Western Australia is arid, with large desert areas. The northern region fronts partly on the Timor Sea, separating Australia from Indonesia; it also belongs to the plateau, with tropical temperatures and a winter dry season. Its northernmost section, Arnhem Land (principally given over to reservations for aborigines), faces the Arafura Sea in the north and the huge Gulf of Carpentaria on the east. On the eastern side of the Gulf is the Cape York Peninsula, which is largely covered by rainforest. Off the coast of NE Queensland is the Great Barrier Reef, the world's largest coral reef. In E Australia are the mountains of the Eastern Highlands, which run down the entire east and southeast coasts. The rivers on the eastern and southeastern slopes run to the Coral Sea and the Tasman Sea through narrow but rich coastal plains; the rivers on the western slopes flow either N to the Gulf of Carpentaria or W and SW to the Indian Ocean. The longest of all Australian river systems, the Murray River and its tributaries, drains the southern part of the interior basin that lies between the mountains and the great pla-

teau. The rivers of this area are used extensively for irrigation and hydroelectric power. Australia, remote from any other continent, has many distinctive forms of plant life—notably species of giant eucalyptus—and of animal life, including the kangaroo, the koala bear, the flying opossum, the wallaby, the wombat, the platypus, and the spiny anteater; it also has many unusual birds. Foreign animals, when introduced, have frequently done well. Rabbits, brought over in 1788, have done entirely too well, multiplying until by the middle of the 19th cent. they became a distinct menace to sheep raising. In 1907 a fence 1,000 mi (1,610 km) long was built from the north coast to the south to prevent the rabbits from invading Western Australia.

Economy and People. Most of the rich farmland and good ports are in the east and particularly the south east, except for the area around PERTH in Western Australia. MELBOURNE, SYDNEY, BRISBANE, and ADELAIDE are the leading industrial and commercial cities. Australia is highly industrialized, and manufactured goods account for about two thirds of the total value of production. The leading manufactures are iron and steel products, transportation equipment, and machinery. Australia is one of the world's great trading nations, with one quarter to one third of its export income derived from the sale of wool, meat, and wheat. Other leading exports are flour, iron ore, and nonferrous ores. The leading imports are metals and metal products, petroleum, machinery, and textiles. The country is self-sufficient in food, and the raising of sheep and cattle and the production of grain have long been staple occupations. Tropical and subtropical produce—citrus fruits, sugarcane, and tropical fruits—are also important, and there are numerous vineyards and dairy and tobacco farms. Some lumbering is done in the east and southeast. Australia has valuable mineral resources, including



coal, iron, bauxite, uranium, and gold. The country is highly urbanized: about three fifths of the population live in cities of more than 100,000. Since World War II the government has been encouraging immigration, and permanent arrivals have been averaging more than 100,000 annually. The population has increased by more than 60% since the end of World War II. In the 19th cent., Australia enacted strong measures to prevent immigration by non-whites. Although laws and attitudes have been liberalized somewhat in recent years, the disposition against nonwhite immigration remains. The indigenous population, the aborigines, estimated to number as many as 350,000 at the time of the Europeans' arrival, now numbers about 100,000, although the decline has been reversed in the past few decades. Most live on reservations. In Tasmania the aboriginal population was wiped out in the 19th cent. There is no state religion in Australia. The largest denominations are the Anglican, Roman Catholic, Methodist, and Presbyterian.

History. The groups comprising the aborigines are thought to have migrated from Southeast Asia c. 20,000 years ago. They spread throughout Australia and remained isolated from outside influences until the arrival of the Europeans. It seems probable that Australia was first sighted by a Portuguese, Manuel Godinho de Eredia, in 1601 and may have been sighted by a Spaniard, Luis Vaez de Torres around 1605-6. It was later visited by the Dutch, who named it New Holland. In 1688 the Englishman William Dampier landed at King Sound on the northwest coast. Little interest was aroused, however, until the fertile east coast was observed when Capt. James Cook reached Botany Bay in 1770 and sailed N to Cape York, claiming the coast for Great Britain. In 1788 the first British settlement was made—a penal colony on the shores of Port Jackson, where Sydney now stands. By 1829 the whole continent was a British dependency. Exploration, begun before the first settlement was founded, was continued by such men as Matthew Flinders (1798), Count Paul Strzelecki (1839), Ludwig Leichhardt (1848), and John McDouall Stuart (first to cross the continent, 1862). Australia was long used as a dumping ground for criminals, bankrupts, and other undesirables from the British Isles. Sheep raising was introduced early, and before the middle of the 19th cent. wheat was being exported in large quantities to England. A gold strike in Victoria in 1851 brought a rush to that region. Other strikes were made later in the century in Western Australia. With minerals, sheep, and grain forming the base of the economy, Australia developed rapidly. By the mid-19th cent. systematic, permanent colonization had completely replaced the old penal settlements. Confederation of the separate Australian colonies did not come until a constitution, drafted in 1897-98, was approved by the British Parliament and was put into operation in 1901, under its terms the colonies of New South Wales, Victoria, Queensland, South Australia, Western Australia, and Tasmania, all of which by then had been granted self-government, were federated. The Northern Territory was added to the federation in 1911. Australia fought on the side of Great Britain in both world wars. Darwin, Port Jackson, and Newcastle were bombed or shelled by the Japanese in World War II. The Allied victory in the battle of the Coral Sea (1942) probably averted a full-scale attack on Australia. After the war Australia became increasingly active in world affairs, particularly in defense and development projects with its Asian neighbors; it furnished troops to aid the U.S. war effort in South Vietnam in the 1960s and early 70s. Australia is a member of the Commonwealth of Nations, the United Nations, and the Southeast Asia Treaty Organization.

Government. The executive power of the Commonwealth is vested in a governor general (representing the British sovereign) and a cabinet, presided over by the prime minister, which represents the party, or a coalition, holding a majority in the lower house of Parliament. The Parliament consists of two houses. The distribution of federal and state powers is roughly like that in the United States. From its early years the federal government has been noted for its liberal legislation, such as woman suffrage (1902), old-age pensions (1909), and maternity allowances (1912). There are four main political parties: Liberal, Labor, Country, and Democratic Labor. The Liberal and Country parties usually form a coalition. In parliamentary elections in 1974, the Labor party under Prime Minister Gough Whitlam won a narrow victory over the Liberal party. Although education is not a federal concern, government grants have aided in the establishment of state universities in-

cluding the Univ. of Sydney (1852), the Univ. of Melbourne (1854), the Univ. of Adelaide (1874), and the Univ. of Queensland (in Brisbane, 1909). See D. J. Mulvaney, *The Prehistory of Australia* (1969), R. M. Crawford, *Australia* (3d rev. ed. 1970), E. H. Feeken et al., *The Discovery and Exploration of Australia* (1970), J. D. Miller and Brian Jinks, *Australian Government and Politics* (4th ed. 1971), Frederick Alexander, *Australia Since Federation* (2d ed. 1972), M. K. Morcombe, *Wild Australia* (1972), Sir Archibald Price, *Island Continent Aspects of the Historical Geography of Australia and its Territories* (1972), A. G. Shaw, *The Story of Australia* (4th ed. 1972), A. M. Larnmonth, *The Australians* (1973).

Australian aborigines, native people of Australia whose origin is uncertain. At present about 125,000 aborigines, 45,000 of pure stock and 80,000 of mixed stock, live on the Australian mainland. In the semi-desert northern region they maintain much of their original culture. The largest reservation is ARNHEM LAND. The dark-skinned aborigines are a physically homogeneous group, with regional variations. They have been classified as a distinct stock, the Australoid, and are related to ethnic groups in S India and Sri Lanka. It is probable that they migrated to Australia from S Asia thousands of years ago. Before the European colonization of Australia, the aboriginal population was about 300,000. Contact with white settlers has led to cultural and genetic change, depopulation, and extinction for some groups of aborigines. Many of the natives have been assimilated into rural and urban Australian society, mostly as low-paid laborers with limited economic and legal rights. The aboriginal material culture is adapted to hunting and gathering food and includes the noted boomerang. The religious and social structure of the aborigines is very complex, involving totemic rituals and an intricate classification system defining kinship relations and regulating marriages. The best-known tribes are the Aranda, or Arunta, the Murngin, and the Kariera. See W. L. Warner, *A Black Civilization* (rev. ed. 1958, repr. 1964), A. P. Elkin, *The Australian Aborigines* (4th ed. 1964), Daisy Bates, *The Passing of the Aborigines* (2d ed. 1967), R. M. and C. H. Berndt, *The World of the First Australians* (1967), A. A. Abbie, *The Original Australians* (1969), N. B. Tinsdale, *Aboriginal Tribes of Australia* (1974).

Australian Alps, chain of mountain ranges, SE Australia, making up the southern part of the Eastern Highlands and forming the watershed between the Murray River system and streams flowing into the Tasman Sea. It is the site of the Snowy Mts. hydroelectric project. Mt. Kosciuszko (7,316 ft/2230 m) in the Australian Alps is the highest peak in Australia.

Australian bear: see KOALA.

Australian Capital Territory (1971 pop. 143,843), 939 sq. mi. (2,432 sq. km), SE Australia, an enclave within New South Wales, containing CANBERRA, capital of Australia. It was called the Federal Capital Territory until 1938. Most of the territory consists of an area formerly known as Yass-Canberra, which was ceded to the commonwealth by New South Wales in 1911. The remainder was added in 1915, when New South Wales ceded a part of the JERVIS BAY area, providing a potential port for Canberra. The federal government is the largest employer in the territory, and nearly all of the population lives in Canberra. The Royal Australian Naval College is located in the territory.

Australian cattle dog, breed of medium-sized herding dog developed in Australia. It stands from 18 to 20 in. (45.7-50.8 cm) high at the shoulder and weighs about 33 lb (15 kg). Its double coat consists of a soft, dense underlayer and a moderately short, straight topcoat that forms a fringe of slightly longer hair on the back of the forelegs and thighs. The coat may be blue, blue mottle, or red speckled in color. Believed to be the product of crosses among the Australian kelpie, the dingo, and the smooth collie, the Australian cattle dog ranks among the world's best herding dogs. It is sometimes called the Australian heeler, a name derived from the dog's habit of nipping at the heels of stray cattle to direct them back to the herd. The breed is exhibited in the miscellaneous class at dog shows sanctioned by the American Kennel Club. See DOG.

Australian football: see under FOOTBALL.

Australian kelpie, breed of medium-sized sheep-herding dog originating in Australia c. 1870. It stands from 17 to 20 in. (43.2-50.8 cm) high at the shoulder and weighs from 25 to 30 lb (11.3-13.6 kg). Its short, dense, straight coat is harshly textured and may be any of a variety of colors, e.g., black, black and tan, red, red and tan, fawn, chocolate, or smoke blue. It has generally been accepted that the border collie

and probably the dingo were ancestors of the kelpie. Trained to respond both to hand signal and whistle, this rugged sheep dog is equally adept in pens or on the open plain and has proven indispensable to the Australian herder. The kelpie is exhibited in the miscellaneous class at dog shows sanctioned by the American Kennel Club. See DOG.

Australian languages, aboriginal languages spoken on the continent of Australia. The Australian languages do not appear to be related to any other linguistic family. The exact number of these languages is not known and has been variously estimated at 100 to 600. Perhaps 200,000 persons speak them. Many of the Australian languages have already died out, and the rest appear to be on the way to extinction. Although their respective grammars exhibit a great degree of variation, the Australian languages show a number of similarities. All of them inflect the noun, some having as many as nine cases. The verb lacks a passive voice. Postpositions are used instead of the prepositions typical of Indo-European languages. Most of the Australian languages have three numbers: singular, dual, and plural. Word order tends to follow a similar pattern in the different tongues. They also show considerable similarity phonetically and have a small common vocabulary. Because of so many shared phonetic and grammatical characteristics some scholars believe that the Australian languages have all evolved from a single ancestor language and therefore belong to the same linguistic family. Others, however, feel that the term "Australian languages" constitutes a geographical rather than a linguistic classification. To date, few of these languages have been studied intensively; classification and other matters remain uncertain. Recent studies seem to indicate that there are six major groups of Australian languages, possibly all branches of a single family. The Australian languages have no writing of their own. See Arthur Capell, *Linguistic Survey of Australia* (1963), S. A. Wurm, *Languages of Australia and Tasmania* (1972).

Australian literature. Australian literary works of the early 19th cent. were colonial offshoots of English literature and were written for an English audience. The work of such early poets as W. C. Wentworth, author of *Australasia, an Ode* (1823), is minor and imitative. Australian literature of some consequence can be said to have begun with the interpretive nature poetry of Charles Harpur (1813-68) and Henry Kendall (1839-82) and with the novels of Henry Kingsley (brother of Charles Kingsley), who wrote about pioneer life. The bush ballad, begun by Adam Lindsay Gordon, flowered in the work of Henry Lawson (1867-1922) and A. B. ("Banjo") Paterson (1864-1941), whose *Man from Snowy River and Other Verses* (1895) is famous and whose song "Waltzing Matilda" was nominated, in 1973, to replace "God Save the Queen" as the Australian national anthem. A classic Australian novel is *For the Term of His Natural Life* (1874), a compelling account of life in a penal colony written by Marcus Clarke. Less powerful, but true to life in the bush, were the novels of Rolfé Boldrewood (pseud. of Thomas A. Browne). Other important 19th-century novelists were Miles Franklin (1879-1954), whose *My Brilliant Career* (1901) is often designated the first authentically Australian novel, and diarist-novelist Tom Collins (pseud. of Joseph Furphy, 1843-1912). Poets of note include Hugh McCrae (1876-1958), and Dame Mary Gilmore (1865-1962). The increasing industrialization of the early 20th cent. rendered the pastoral nature of most Australian literature anachronistic, and it eventually produced greater sophistication and diversity among writers. Probably the most important Australian writer of the early 20th cent. was Henry Handel Richardson (pseud. of Ethel Richardson Robertson), whose autobiographical trilogy *The Fortunes of Richard Mahoney* (1930) presents a compelling portrait of Australian life. Richardson's reputation was matched at mid-century by Patrick White, whose strong, somber novels, Australian in setting yet universal in theme, reveal the author's ambivalence toward his native land. Other notable 20th-century novelists are Brian Penton, Leonard Mann, Christina Stead, Arthur William Upfield (1888-1964), John O'Grady, and Morris West. After emigrating to Australia in 1950, the English novelist Nevil Shute subsequently produced novels with Australian settings and themes. Major Australian poets include C. J. Brennan, R. D. Fitzgerald, Judith Wright, J. P. McAuley, Kenneth Slessor, Vance Palmer, and Max Harris. A controversial Australian with an international reputation as a feminist is Germaine Greer, author of *The Female Eunuch* (1971). The Swedish Academy's awarding of the 1973 Nobel Prize in Literature to Patrick White was

perhaps the best evidence that Australian literature has become worthy of world attention. See H. M. Green, *A History of Australian Literature* (2 vol., 1961, repr. 1968), Charles Higham, ed., *Australian Writing Today* (1968), Grahame Johnston, *Annals of Australian Literature* (1970), T. I. Moore, *Social Patterns in Australian Literature* (1972), Barry Argyle, *An Introduction to the Australian Novel, 1830-1930* (1972).

Australian terrier, breed of small, hardy TERRIER perfected in Australia c 1885. It stands about 10 in. (25.4 cm) high at the shoulder and weighs from 12 to 14 lb (5.5-6.4 kg). Its weather-resistant double coat consists of a soft, short underlayer and a straight, harsh outercoat about 2.5 in. (6.4 cm) long. It is silver black or blue black in color with rich tan markings on the head and legs. The Australian terrier is descended from the now extinct broken-hair, or rough-coated, terrier, a dog of widespread popularity in the early 18th cent. and believed to be the progenitor of many terrier breeds. For show purposes the rough-coated terrier was crossed with several British sporting terriers, probably the cairn, Dandie Dinmont, Irish, and Skye, producing the Australian terrier of today. Originally used to guard mines and herd sheep, it is now primarily raised as a pet. See DOG.

Austral Islands (ô'stral), volcanic island group, South Pacific, part of FRENCH POLYNESIA. They are sometimes known as the Tubuai Islands. The group comprises seven islands, with a total land area of c 115 sq mi (300 sq km). Tubuai, the largest island (c 17 sq mi/44 sq km), was visited by Capt. James COOK in 1777 and was annexed by France in 1880. European diseases and slavers had very nearly wiped out the native Polynesian population of the islands, especially on Rapa, when French authorities imposed strict regulations (1938) on immigration and tourism. Coffee, arrowroot, tobacco, and copra are produced on the islands.

Australopithecus (ô'strâ-'lôpîth'âkas, -pâthê'kas), an extinct genus of the hominid family, generally considered to be a relative or possible ancestor of modern man. *Australopithecus* fossils have been discovered at various sites in South Africa since 1925 by the anthropologists Raymond Dart, Robert Broom, J. T. Robinson and others. Fossils have also been uncovered at several E. African sites since 1959, when the husband and wife team L. S. B. and Mary LEAKEY found a fossil that they termed *Zinjanthropus* at Olduvai Gorge, Tanzania. Fossils that are probably early *Australopithecines* were discovered in the 1960s in the Omo basin of Ethiopia by an international team of anthropologists led by F. C. Howell. Most *Australopithecus* fossils are from 1 million to 2.5 million years old, but remains found in the mid-1960s in Kenya by Bryan Patterson may be 4 million and 5 million years old. The genus *Australopithecus* now generally includes fossil species previously classified *Paranthropus*, *Plesianthropus* and *Zinjanthropus*, but there is some uncertainty and disagreement whether such fossils as *Homo habilis* and *Telanthropus* of Africa and *Meganthropus* of Java should be included with *Australopithecus* or the later genus *Homo erectus*. *Australopithecus* was under 5 ft tall and could stand and walk erect, although with less dexterity than later predecessors of modern man. The skeletal features of *Australopithecus* fossils have many similarities to modern man, but the size and shape of the skull indicate that the *Australopithecine* brain was less developed than in the later genus *Homo*. *Australopithecus* may have used simple stone tools. See MAN, PREHISTORIC. See R. A. Dart, *Adventures with the Missing Link* (1959), W. E. LeGros Clark, *Man-Apes or Ape-Men?* (1967).

Austrasia (ô'strâ'zha), eastern portion of the Merovingian kingdom of the FRANKS in the 6th, 7th, and 8th cent., comprising, in general, parts of E. France, W. Germany, and the Netherlands, with its capital variously at Metz, Rheims, and Soissons. It originated in the partition (511) of the realm of the Frankish king CLOVIS I among his sons. Austrasia was constantly troubled by dynastic rivalries between its rulers and those of the neighboring kingdom of NEUSTRIA. These struggles reached their climax in the fierce fights between Queen BRUNHILDA of Austrasia and Queen FREDEGUNDE of Neustria. During the reigns of CLOTAIRE I, CLOTAIRE II, and DAGOBERT I, Austrasia was temporarily reunited with Neustria. With the decline of the royal power in Austrasia, the office of mayor of the palace developed into the real seat of power and finally became hereditary in the family of the CAROLINGIANS. Austrasia became part of the Carolingian empire.

Austrât (oust'rôt), castle at the mouth of the Trondheimsfjord, central Norway. It was built (1611-74) by Ove Bjelke, chancellor of the kingdom. It is the setting of Henrik Ibsen's historic play *Lady Inger of Ostrat*.

Austria, Ger. *Österreich* [eastern march], federal republic (1973 est. pop. 7,550,000), 32,374 sq mi (83,849 sq km), central Europe. It is bounded by Yugoslavia and Italy in the south, Switzerland and Liechtenstein in the west, West Germany and Czechoslovakia in the north, and Hungary in the east. Its nine provinces (Ger. *Bundesländer*) are: VORARLBERG, TYROL, SALZBURG, CARINTHIA, STYRIA, UPPER AUSTRIA, LOWER AUSTRIA, BURGENLAND, and the capital, VIENNA. The Alps traverse Austria from west to east and occupy three fourths of the country. The highest peak in Austria is the Grossglockner (12,460 ft/3,798 m) in the Hohe Tauern group. The scenic beauty of Tyrol, the Salzkammergut, and Salzburg city, and the attractions of Vienna and other cultural centers have made Austria one of the major tourist centers of Europe. The country is drained by the Danube River and its tributaries, the Inn, the Enns, the Mur, and the Mur. Forestry, cattle raising, and dairying are the main sources of livelihood in the alpine provinces; Vorarlberg has an ancient textile industry. In Upper and Lower Austria and in Burgenland, tillage agriculture predominates; the chief crops are potatoes, sugar beets, barley, wheat, rye, and oats. Manufacturing and mining employ nearly half of the labor force. More than half of the industries are concentrated in the Vienna basin, LINZ, STEYR, GRAZ, LEOBEN, INNSBRUCK, and Salzburg are the other chief industrial centers. Many of the country's industries were nationalized after World War II, together with the largest commercial banks. The chief manufactures are chemicals, foodstuffs, textiles, machinery, iron and steel, and metal goods. Many minerals necessary for industry (graphite, iron, magnesium, copper, zinc, and lignite) are found in Austria. The country also has deposits of natural gas, salt, and uranium, and is rich in hydroelectric power. Austria is governed under the revised 1929 constitution. It has a mixed presidential-parliamentary form of government. The president, elected by popular vote for a six-year term, may issue decrees. The cabinet, headed by the prime minister, is responsible to the lower house (Nationalrat) of parliament, which is popularly elected according to proportional representation. The upper house (Bundesrat) is chosen by the provincial assemblies. The main parties are the People's party and the Socialist party. The population is predominantly Roman Catholic and German-speaking. Since 1945, Austria has received nearly 1.5 million refugees from elsewhere in Europe. There are universities in Vienna, Salzburg, Innsbruck, and Graz.

History During the past 10 centuries, the term Austria has designated a variety of geographic and political concepts. In its narrowest sense Austria has included only the present-day provinces of Upper and Lower Austria, including Vienna, in its widest meaning the term has covered the far-flung domains of the imperial house of Hapsburg. Its present connotation—German-speaking Austria—dates only from 1918. This article deals mainly with the history of German-speaking Austria. For wider historical background, see HOLY ROMAN EMPIRE, HAPSBURG, AUSTRO-HUNGARIAN MONARCHY, HUNGARY, BOHEMIA, and NETHERLANDS, AUSTRIAN AND SPANISH.

The Rise of Austria Austria is located at the crossroads of Europe, Vienna is at the gate of the Danubian plain, and the Brenner Pass in W. Austria links Germany and Italy. From earliest times Austrian territory has been a thoroughfare, a battleground, and a border area. It was occupied by Celts and Suebi when the Romans conquered (15 B.C.-A.D. 10) and divided it among the provinces of Raetia, Noricum, and Upper Pannonia. After the 5th cent. A.D., Huns, Ostrogoths, Lombards, and Bavarians overran

and devastated the provinces. By c 600, Slavs from the east had occupied all of modern Styria, Lower Austria, and Carinthia. In 788, Charlemagne conquered the area and set up the first Austrian (i.e., Eastern) March in the present Upper and Lower Austria, to halt the inroads of the Avars. Colonization was encouraged, and Christianity (which had been introduced under the Romans) was again spread energetically. After Charlemagne's death (814) the march soon fell to the Moravians and later to the Magyars, from whom it was taken (955) by Emperor OTTO I. Otto reconstituted the march and attached it to BAVARIA, but, in 976, Otto II bestowed it as a separate fief on Leopold of BABENBERG, founder of the first Austrian dynasty. Emperor Frederick I raised (1156) Austria to a duchy, and, in 1192, Styria also passed under Babenberg rule. The 11th and 12th cent. saw the height of Austrian feudalism and also witnessed the marked development of towns as the Danube was converted to a great trade route. After the death (1246) of the last Babenberg, King OTTO CAR II of Bohemia acquired (1251-69) Austria, Styria, Carinthia, and CARNIOLA. Fearing his power, the German princes elected (1273) Rudolf of Hapsburg German king. RUDOLF I asserted (1282) his royal prerogative to reclaim the four duchies from Ottocar and incorporate them in his domains. After the murder (1308) of Rudolf's son, ALBERT I, the German princes balked at electing another member of the ambitious family. Albert's ducal successors enlarged the Hapsburg holdings by acquiring Tyrol (1363) and Trieste (1382) and extended their influence over the ecclesiastical states of Salzburg, TRENT, and Brixen (see BRESANONE), which, however, remained independent until 1803. Marriage brought ALBERT II to the position of being elected German king in 1438. Beginning with Albert II, the rulers of the Holy Roman Empire were always chosen from the Hapsburg dynasty. Despite their vast imperial preoccupations, the emperors always considered German Austria the prized core of their dominions. During the long reign of Frederick III (1440-93), the protracted Hapsburg wars with France began. In 1526, Austria, Bohemia, and Hungary were united under one crown (see FERDINAND I, emperor). In the same year Vienna was besieged for two weeks by troops of the Ottoman Empire under Sulayman the Magnificent, who had made a forceful advance into Europe. The Turkish threat to Austria ebbed and then climaxed again in the second siege of Vienna in 1683. The patterns of medievalism were weakening in Austria, especially as a money economy spread, and in the 16th cent. the COMMERCIAL REVOLUTION diminished the importance of Austrian trade routes and of the ancient gold and silver mines of Tyrol and Carinthia. Economic and political instability in the 16th cent. precipitated the spread of the Protestant Reformation, which the Hapsburg rulers attempted to counter by nurturing the Catholic Reformation. The alliance then formed between church and state continued throughout the history of the monarchy. The Austrian peasantry, especially in Tyrol, had gained some advantages in the PEASANTS' WAR of 1524-26, in general, however, the rising, backed by some Protestants but not by Luther, was defeated. Suppression of Protestantism was at first impossible, and, under Maximilian II, Lutheran nobles were granted considerable toleration. Rudolph II and Matthias pursued policies of partial Catholicization, and, under Ferdinand II, anti-Protestant vigor helped to precipitate the THIRTY YEARS' WAR (1618-48). Protestant Bohemia and Moravia, defeated by the Austrians at the White Mt. (1620), became virtual Austrian provinces. Austria proper remained relatively unscathed in the long holocaust, after the Peace of Westphalia the Hapsburg lands emerged as a distinct empire, whereas the Holy Roman Empire drifted into a mere shadow existence.

The Austrian Empire The monarchy, although repressive of free speech and worship, was far from absolute; taxation and other powers rested with the provincial estates for a further century. Emperor CHARLES VI (1711-40), whose dynastic wars had drained the state, secured the succession to the Hapsburg lands for his daughter, MARIA THERESA, by means of the PRAGMATIC SANCTION. Maria Theresa's struggle with FREDERICK II of Prussia in the War of the Austrian Succession (see AUSTRIAN SUCCESSION, WAR OF THE) and the SEVEN YEARS' WAR opened a long struggle for dominance in the German lands. Except for the loss of Silesia, Maria Theresa held her own. The provincial estates were reduced in power, and an efficient centralized bureaucracy was created, as the nobles were attracted to bureaucratic service; their power as a class was weakened. Maria Theresa's husband, FRANCIS I, became emperor in 1745, but his position



was largely titular. The major event of Maria Theresa's later reign was the first partition of Poland (1772, see POLAND, PARTITIONS OF), in that transaction and in the third partition (1795) Austria renewed its eastward expansion. JOSEPH II, who succeeded her, impetuously carried forward the reforms which his mother had cautiously begun. His attempts to further centralize and germanize his scattered and disparate dominions met stubborn resistance, his project to consolidate his state by exchanging the Austrian Netherlands for Bavaria was balked by Frederick II. An exemplar of "benevolent despotism" and a disciple of the ENLIGHTENMENT, Joseph also decreed a series of revolutionary agrarian, fiscal, religious, and judicial reforms, however, opposition, especially from among the clergy and the landowners, forced his successor, LEOPOLD II, to rescind many of them. In Joseph's reign the Austrian bourgeoisie began to emerge as a social and cultural force. Music and architecture (see VIENNA) flourished in 18th-century Austria, and modern Austrian literature (see GERMAN LITERATURE) emerged early in the 19th cent. In the reign of FRANCIS II, Austria was drawn (1792) into war with revolutionary France (see FRENCH REVOLUTIONARY WARS) and with NAPOLEON I. The treaties of CAMPO FORMIO (1797) and Luneville (1801) preluded the dissolution (1806) of the Holy Roman Empire, and in 1804, Francis II took the title "Francis I, emperor of Austria." His rout at Austerlitz (1805) led to the severe Treaty of Pressburg (see PRESSBURG, TREATY OF). An upsurge of patriotism resulted in the renewal of war with Napoleon in 1809, Austria's defeat at Wagram led to the even more humiliating Peace of Schonbrunn (see under SCHONBRUNN). Austria was forced to side with Napoleon in the Russian campaign of 1812, but in 1813 it again joined the coalition against Napoleon, an Austrian, Prince Karl Philipp von Schwarzenberg, headed the allied forces. The Congress of Vienna (1814-15, see VIENNA, CONGRESS OF) did not restore to Austria its former possessions in the Netherlands and in Baden but awarded it Lombardy, Venetia, Istria, and Dalmatia. As the leading power of both the GERMAN CONFEDERATION and the HOLY ALLIANCE, Austria under the ministry of METTERNICH dominated European politics. Conservatism and the repression of nationalistic strivings characterized the age. Nevertheless, the Metternich period was one of great cultural achievement, particularly in music and literature. The REVOLUTIONS OF 1848 shook the Hapsburg empire but ultimately failed because of the conflicting economic goals of the middle and lower classes and because of the conflicting nationalist aspirations that set the revolutionary movements of Germans, Slavs, Hungarians, and Italians against each other. Revolts were at first successful throughout the empire (see RISORGIMENTO, GALICIA, BOHEMIA, HUNGARY), in Vienna the revolutionists drove out Metternich (March, 1848). Emperor FERDINAND granted (April) a liberal constitution, which a constituent assembly replaced (July) with a more democratic one. After a new outbreak Vienna was bombarded, and the revolutionists were punished by troops under General WINDISCHGRATZ. Prince Felix zu SCHWARZENBERG became premier and engineered the abdication of Ferdinand in favor of FRANCIS JOSEPH. Absolutism returned with the dissolution of the constituent assembly. Austrian leadership in Germany was reasserted at the Convention of Olmutz in 1850. Alexander BACH intensified (1852-59) Schwarzenberg's centralizing policy, thus heightening national tensions within the empire. But economic prosperity was promoted by the lowering of internal tariff barriers, and several reforms dating from 1848 were upheld, notably the complete abolition of feudal dues. The military and political weakness of the empire was demonstrated by the Austrian loss of Lombardy in the Italian War of 1859. Attempts to solve the nationalities problem—the "October Diploma" (1860), which created a central legislature and gave increased powers to the provincial assemblies of nobles, and the "February Patent," which transferred many of these powers to the central legislature—failed. Prussia seized the opportunity to drive Austria out of Germany. After involving Austria in the war over SCHLESWIG-HOLSTEIN in 1864, BISMARCK found an easy pretext for attacking. Overwhelmingly defeated by Prussia at Sadowa (Sadowa) in 1866 (see AUSTRO-PRUSSIAN WAR), Austria was forced to cede Venetia to Italy. With this debacle Austria's political role in Germany came to an end. A reorganization of the government of the empire became inevitable, and in 1867 a compromise (Ger. *Ausgleich*) with Hungarian moderate nationalists established a dual state, the AUSTRO-HUNGARIAN MONARCHY. But the realm, a land of diverse peoples ruled

by a German-Magyar minority, increasingly became an anachronism in a nationalistic age. Failure to provide a satisfactory status for the other nationalities, notably the Slavs, played a major role in bringing about WORLD WAR I. Important developments in Austrian society during this period were the continued irresponsibility of the nobility and the backwardness of the peasantry, the growth of a socialist working class, widespread anti-Semitism stimulated by the large-scale movement to Austria of poor Jews from the eastern provinces, and extraordinary cultural creativity in Vienna. The disastrous course of the war led to the breakup of the monarchy. In 1918 CHARLES I renounced power, after a peaceful revolution staged by the Socialist and Pan-German parties, German Austria was proclaimed (Nov. 12) a republic and a part of Greater Germany.

Modern Austria. The Treaty of SAINT-GERMAIN (1919) fixed the present Austrian borders and forbade (as did the Treaty of Versailles) any political or economic union (Ger. *Anschluss*) with Germany. Observation of these clauses was insisted upon by France, Italy, and Czechoslovakia. This left Austria a small country with some 7 million inhabitants, one third of whom lived in a single large city (Vienna) that had been geared to be the financial and industrial hub of a large state. The Dual Monarchy had been virtually self-sufficient economically, its breakup and the consequent erection of tariff walls deprived Austria of raw materials, food, and markets. In the postwar period, starvation and influenza exacted a heavy toll, especially in Vienna. These ills were followed by currency inflation, ended only in 1924 by means of League of Nations aid, following upon chronic unemployment, financial scandals and crises, and growing political unrest. "Red" Vienna, under the moderate socialist government of Karl SEITZ, became increasingly opposed by the "Black" (i.e., clericalist) rural faction, which won the elections of 1921. The cabinet of Social Democrat Karl RENNER was succeeded by Christian Socialist and Pan-German coalitions under SCHOBER, SEIPEL, and others. Unrest culminated, in 1927, in violent riots in Vienna, two rival private militias—the *Heimwehr* of the monarchist leader E. R. von STARHEMBERG and the *Schutzbund* of the socialists—posed a threat to the authority of the state. Economic crisis loomed again in the late 1920s. NATIONAL SOCIALISM, feeding in part on anti-Semitism, gained rapidly and soon absorbed the Pan-German party. Engelbert DOLLFUSS, who became chancellor in 1932, though irreconcilably opposed to *Anschluss* and to National Socialism, tended increasingly toward corporative FASCISM and relied heavily on Italian support. His stern suppression of the socialists precipitated a serious revolt (1934), which was bloodily suppressed by the army. Soon afterward a totalitarian state was set up, and all independent political parties were outlawed. In July, 1934, the National Socialists assassinated Dollfuss but failed to seize the government. Kurt von SCHUSCHNIGG succeeded Dollfuss. German pressure on Austria increased, Schuschnigg was forced to legalize the operations of the National Socialists and to appoint members of that party to cabinet posts. Schuschnigg planned a last-minute effort to avoid *Anschluss* by holding a plebiscite, but Hitler forced him to resign. In March, 1938, Austria was occupied by German troops and became part of the Reich. ARTHUR SEYSS-INQUART became the Nazi governor. In 1943, the Allies agreed to reestablish an independent Austria at the end of World War II. In 1945, Austria was conquered by Soviet and American troops, and a provisional government was set up under Karl Renner. The pre-Dollfuss constitution was restored with revisions, the country was divided into separate occupation zones, each controlled by an Allied power. Economic recovery was hindered by the decline of trade between Western and Eastern Europe and by the division into zones. Austria was formally recognized by the Western powers in 1946, but because of Soviet disagreement with the West over reparations, the occupation continued. On May 15, 1955, a formal treaty between Great Britain, France, the United States, the USSR, and Austria restored full sovereignty to the country. The treaty prohibited the possession of major offensive weapons and required Austria to pay heavy reparations to the USSR. Austria proclaimed its permanent neutrality. In 1955 it was admitted to the United Nations. By the 1960s unprecedented prosperity had been attained. Austria had joined the European Free Trade Association in 1959, but association with the Common Market was held back by Soviet opposition. Politically, a nearly equal balance of power between the conservative People's party and the Socialist party resulted in successive coalitions

until 1966, when the People's party won a clear majority. They were ousted by the socialists in the 1970 elections and Bruno KREISKY became chancellor. A long-standing dispute with Italy over the German-speaking population of the TRENTINO-ALTO ADIGE region of Italy was dealt with in a treaty ratified in 1971. See R. A. Kann, *The Multinational Empire. Nationalism and National Reform in the Habsburg Monarchy, 1848-1918* (1950, repr. 1970); K. R. Stadler, *Austria* (1971); V. L. Tapie, *The Rise and Fall of the Habsburg Monarchy* (tr. 1971); F. R. Bridge, *From Sadowa to Sarajevo* (1972); W. M. Johnston, *The Austrian Mind. An Intellectual and Social History, 1848-1938* (1972); Kurt Steiner, *Politics in Austria* (1972); W. T. Bluhm, *Building an Austrian Nation* (1973); Leo Valiani, *The End of Austria-Hungary* (tr. 1973); Kurt Waldheim, *The Austrian Example* (tr. 1973); Ernest Wangermann, *The Austrian Achievement, 1700-1800* (1973).

Austrian literature. see GERMAN LITERATURE

Austrian Succession, War of the, 1740-48, general European war that broke out when, on the strength of the PRAGMATIC SANCTION of 1713, the Austrian archduchess MARIA THERESA succeeded her father, Holy Roman Emperor Charles VI, as ruler of the Hapsburg lands. The elector of Bavaria, Charles Albert, advanced counterclaims to the succession while PHILIP V of Spain and AUGUSTUS III of Poland and Saxony advanced weak claims of their own. FREDERICK II of Prussia, who on even less tenable grounds claimed part of SILESIA, began the war by invading and rapidly occupying that province. His cynical offer of support to Maria Theresa if she would cede Silesia was rejected. Victorious at Mollwitz (1741), Frederick obtained the alliance of France, Spain, Bavaria, and Saxony. Charles Albert of Bavaria, who was promised the imperial election, advanced on Vienna. In Oct., 1741, however, Prussia agreed to a truce in exchange for most of Silesia. This armistice was soon broken but gave the Austrians an opportunity to regroup their forces. The French were unwilling to permit the Bavarians too much power and ordered them to attack Bohemia, which was relatively unimportant, instead of Vienna. Joined by France and Saxony, Bavaria took Prague (Nov., 1741), and Charles Albert was elected emperor as CHARLES VII. Meanwhile Maria Theresa had obtained full support from the Hungarian diet and the promise of aid from Great Britain, which had been at war with Spain since 1739 (see JENKINS'S EAR, WAR OF). Early in 1742 Austrian troops overran Bavaria and laid siege to Prague, and in July, Maria Theresa made peace with Prussia by ceding most of Silesia (Treaty of Berlin). This ended what is sometimes called the First Silesian War. Saxony also made peace and joined Austria as an ally in 1743. The epic retreat from Prague of the French under Marshal BELLE-ISLE (winter, 1742-43) was followed by the victory of GEORGE II of Britain over the French at Dettingen (1743). In 1744 Frederick II, fearing the rising power of Austria, started the Second Silesian War by invading Bohemia, but he was soon expelled by Austrian and Saxon forces. On the death (1745) of Emperor Charles VII, Bavaria, once more overrun by Austrian troops, was forced out of the war. These Austrian successes were balanced by the great French victory (1745) of Fontenoy, where Maurice de SAXE defeated the British. Anxious for peace, George II concluded (1745) the Convention of Hanover with Frederick II, who promised to support the imperial candidacy of Maria Theresa's husband (shortly afterward elected as Francis I) in return for her cession of Silesia guaranteed by Europe. Defeated at Hohenfriedberg and at Kesselsdorf, Maria Theresa accepted the compromise in the Treaty of Dresden with Prussia (Dec., 1745). The war continued in N. Italy, in the Low Countries, in North America (see FRENCH AND INDIAN WARS), and in India. The chief belligerents (Austria, Britain, Holland, and Sardinia on the one side, France and Spain on the other) grew weary of the war. Although Maria Theresa secured (1748) the alliance of Russia, the other nations were determined to restore peace, and late in 1748 the Treaty of Aix-la-Chapelle (see AIX LA CHAPPELLE, TREATY OF, 2) was signed. Prussia gained Silesia and thus emerged as a major European power, the Hapsburgs thenceforth looked to the east for resources to develop their state. See biography by Edward Crankshaw, *Maria Theresa* (1970); C. A. Macartney, *Maria Theresa and the House of Austria* (1969).

Austro-Hungarian Monarchy or Dual Monarchy, the Hapsburg empire from 1867 until its fall in 1918. The reorganization was made possible by the *Ausgleich* [compromise] of 1867, a constitutional

compromise between Hungarian aspirations for independence and Emperor Francis Joseph's desire for a strong, centralized empire as a source of power after Austria's defeat in the AUSTRO-PRUSSIAN WAR of 1866. The Hungarians gained control of their internal affairs in return for agreeing to a centralized foreign policy and continued union of the Austrian and Hungarian crowns in the Hapsburg ruler. The agreement, which was worked out primarily by the Austrian foreign minister, Count BÜST, and two Hungarians, the elder Count ANDRÁSSY and Francis DEAK, divided the Hapsburg empire into two states: Cisleithania [Lat. = the land on this side of the Leitha River] comprised Austria proper, Bohemia, Moravia, Austrian Silesia, Slovenia, and Austrian Poland; it was to be ruled by the Hapsburg monarchs in their capacity as emperors of Austria. Transleithania [Lat. = the land on the other side of the Leitha River] included Hungary, Transylvania, Croatia, and part of the Dalmatian coast; it was to be ruled by the Hapsburg monarchs in their capacity as kings of Hungary. Croatia was given a special status and allowed some autonomy but was subordinated to Transleithania, which also nominated the Croatian governor. Austria-Hungary was the greatest recent example of a multinational state in Europe, however, of the four chief ethnic groups (Germans, Hungarians, Slavs, and Italians) only the first two received full partnership. The Hapsburg-held crown of Bohemia was conspicuously omitted in the reorganization. Both Cisleithania and Transleithania elected independent parliaments to deliberate on internal affairs and had independent ministries. A common cabinet, composed of three ministers, dealt with foreign relations, common defense, and common finances. It was responsible to the emperor-king and to the delegations of 60 members each (chosen by the two parliaments), which met to discuss common affairs. The regular armed forces were under unified command and currency was uniform throughout the empire, but there were separate customs regimes. The strength of the Dual Monarchy lay in its vastness, its virtual economic self-sufficiency, its opportunities for commercial intercourse from the Swiss border to the Carpathians. Its weakness was less in its ethnic diversity than in the unequal treatment accorded to its minorities in the spirit of the maxim, "Divide and rule." Of the Slavic elements the Czechs and Serbs were the most disaffected. The efforts of the TAAFFE ministry to satisfy Czech demands failed. The Italian minority was won to the Italian nationalist cause (see IRREDENTISM). The Rumanians of Transylvania had bitter grievances against their Hungarian masters. As nationalist movements gained within the empire they enlarged their demands from cultural autonomy to full independence and ultimately broke up the monarchy. These movements existed not only in the oppressed provinces, but also among Hungarian extremists, who desired total independence, and among Austrian Pan-Germans, who advocated the union of German-speaking Austria with Germany. The greatest danger to the monarchy probably was PAN-SLAVISM, spreading from Serbia and encouraged by Russia among the South Slavs. Archduke FRANCIS FERDINAND, heir to the throne, apparently had a project by which Croatia was to become the nucleus of a third, South Slavic, partner in the monarchy, his assassination (1914) at Sarajevo cut short this hope and precipitated World War I. In external policy, Austria-Hungary early became reconciled with Germany and joined the THREE EMPERORS' LEAGUE. At the Congress of Berlin (1878, see BERLIN, CONGRESS OF) Count Andrassy, the foreign minister, secured a mandate over BOSNIA AND HERCEGOVINA. In 1879 he entered an alliance with Germany, joined also by Italy in 1882 (see TRIPLE ALLIANCE AND TRIPLE ENTENTE). The formation of the Triple Entente (France, England, Russia) to oppose this alliance led to the tense diplomatic situation that preceded WORLD WAR I. The foreign policy of Graf von Aehrenthal led to the Bosnian crisis of 1908-9, and the reckless demands that his successor, Graf von BERTHOLD, made on Serbia after the assassination of Francis Ferdinand helped to precipitate the cataclysm. The internal weakness of the empire became immediately obvious. Czech regiments deserted wholesale from the beginning, Italy and Rumania, eyeing their respective minorities in Austria and Hungary, joined the Allies, Croats and Slovenes, won by Serbian propaganda, joined (1917) in agreement with the Serbs to found a South Slavic state (see YUGOSLAVIA). Abroad, the Czechs under Thomas Masaryk were the best known of several legions fighting on the Allied side, and in Oct., 1918, Poland, Czechoslovakia, and Hungary proclaimed their independence. The Austrian defeat

at VITTORIO VENETO was followed by unconditional surrender, on Nov. 11, Emperor CHARLES I abdicated, on Nov. 12, German Austria was proclaimed a republic. The treaties of Versailles, Trianon, and Saint-Germain fixed the boundaries of the successor states. The breakup of the Dual Monarchy fulfilled the 19th-century liberal ideal of national self-determination, at the same time, the creation of small, strongly nationalist states, cut off from each other by tariff walls, has been criticized as representing a "Balkanization of Europe." See O. J. J. Dissolution of the Habsburg Monarchy (1929, repr. 1961), H. Kohn, *The Hapsburg Empire 1804-1918* (1961), A. J. May, *The Passing of the Hapsburg Monarchy, 1914-1918* (2 vol., 1966) and *The Hapsburg Monarchy, 1867-1914* (1951, repr. 1968), Z. A. B. Zeman, *The Twilight of the Hapsburgs* (1970), Leo Valiani, *The End of Austria-Hungary* (1973).

Austronesian (ôs'trônē'zhən, -shən), name sometimes used for the MALAYO-POLYNESIAN LANGUAGES.

Austro-Prussian War or Seven Weeks War, June 15-Aug. 23, 1866, between Prussia, allied with Italy, and Austria, seconded by Bavaria, Württemberg, Saxony, Hanover, Baden, and several smaller German states. It was deliberately provoked by BISMARCK, over the objections of his king, in order to expel Austria from the GERMAN CONFEDERATION as a step toward the unification of Germany under Prussian dominance. The pretext for precipitating the conflict was found in the dispute between Prussia and Austria over the administration of SCHLESWIG-HOLSTEIN. When Austria brought the dispute before the German diet and also decided to convene the Holstein diet, Prussia, declaring that the Gastein Convention (see under GASTEIN) had thereby been nullified, invaded Holstein. When the German diet responded by voting for a partial mobilization against Prussia, Bismarck declared that the German Confederation was ended. With an efficient military machine that amazed Europe, Prussia overran the German states allied with Austria and crushed (July 3) the Austrians at Sadowa (Königgratz), in E. Bohemia. However, Bismarck had no intention of weakening Austria, a potential ally, more than necessary. The preliminary treaty of Nikolsburg (July 26) was followed (Aug. 23) by the Treaty of Prague. Against Italy, the Austrians had won victories on the land, at Custoza, and on the sea, at Lissa. Nevertheless, the peace treaty forced Austria to cede Venetia to Italy. Prussia, satisfied with the exclusion, acknowledged in the treaty, of Austria from German affairs, demanded no territory from Austria, but annexed Hanover, Hesse, Nassau, and Frankfurt, in addition to Schleswig-Holstein. The German Confederation was replaced by the Prussian-led NORTH GERMAN CONFEDERATION. Thus the war paved the way for the establishment (1871) of the German Empire and the reorientation of Austria (reorganized in 1867 as the Austro-Hungarian Monarchy) toward the east. The moderate peace terms facilitated the Austro-German alliance of 1879. See Heinrich Friedjung, *The Struggle for Supremacy in Germany, 1859-1866* (10th ed. abr., tr. 1935, repr. 1966), G. A. Craig, *The Battle of Königgratz* (1964), E. A. Pottinger, *Napoleon III and the German Crisis, 1865-66* (1966).

Auteuil (ôtô'yā), old town between the Seine and the Bois de Boulogne, absorbed (1860) into Paris, France. A favorite resort for writers (Molière, La Fontaine, Boileau) in the 17th cent., it is now the site of a popular steepplechase track.

Authari (ô'thârî), d. 590, Lombard king (584-90). Elected by the Lombard dukes to end the anarchy that prevailed in Italy after the murder (572?) of Alboin (see LOMBARDS), Authari consolidated Lombard power in N. Italy and repelled several Frankish invasions instigated by the popes.

authentic modes: see MODE, in music.

autism (ô'tizəm), in psychology, a form of PSYCHOSIS characterized by an inability to relate to and perceive the environment in a realistic manner. Autistic thinking is characterized by withdrawal and detachment from reality, fantasies, delusions, and hallucinations. Childhood, or infantile, autism, which begins during infancy, is characterized by delay in the acquisition of speech, withdrawal from normal activity, abnormalities in the use of language, resistance to changes of any kind, and obsessive and stereotyped body movements. Authorities do not always agree on the distinction between infantile autism and forms of SCHIZOPHRENIA. Evidence suggests that infantile autism arises in association with a perceptual disorder, frequently a disorder in language comprehension (i.e., thoughts do not correspond to reality). Treatment for autism is still experimental, and relatively few autistic children show

significant remission of symptoms. Shaping the child's behavior by operant conditioning has had some success (see LEARNING).

autobiography: see BIOGRAPHY.

autogiro (ôtôj'irô) or **gyroplane** (jî'rāplān), type of aircraft supported in the air by a horizontally mounted airfoil similar to that of a helicopter but unpowered. Invented by the Spaniard Juan de la Cierva, it was first flown successfully in Jan., 1923, in Spain. Most of the lift is supplied by large airfoils which are mounted horizontally above the craft and rotated by the airflow created by the craft's forward movement. The autogiro has fixed wings that are smaller than those of an ordinary airplane, the body and tail assembly is of conventional design. Thrust is supplied by an ordinary engine and propeller and control is maintained by a rudder, elevators, and ailerons. In one type, fixed wings are absent, and the rotor provides all the lift. Control of pitch and roll are accomplished by tilting the rotor forward, backward, or to either side. Some advantages of the machine are that its descent will be slowed by the turning of the rotor if the engine fails, that it becomes airborne with a very short takeoff run and can land in small areas, and that with a moderate headwind it can virtually hover with zero ground speed. However, it cannot match the vertical climbing performance of the helicopter. Although its development was halted at one point, interest in it has renewed because of its ability to make short takeoffs and landings.

autograft: see TRANSPLANTATION, MEDICAL.

autoimmune disease, any of a number of abnormal conditions caused when the body produces ANTIBODIES to its own substances. In rheumatoid ARTHRITIS, a group of antibody molecules called collectively RF, or rheumatoid factor, is complexed to the individual's own gamma globulin blood proteins, the circulating complex apparently causes tissue inflammation and muscle and bone deformities. In Hashimoto's thyroiditis, an inflammatory disease of the thyroid gland, antibodies are produced against the thyroid protein thyroglobulin. In some blood disorders, antibodies may be produced against the body's own red and white blood cells. Myasthenia gravis, a disease characterized by weakened muscles, is thought to have an autoimmune origin. In systemic lupus erythematosus it has been shown that individuals have antibodies to certain of their own body substances that for some reason are acting as antigens; these substances include the individual's own nucleic acids and cell organelles such as ribosomes and mitochondria. Lupus can cause dysfunction of many organs, including the heart, kidneys, and joints. Because lupus and certain diseases of probable autoimmune origin, e.g., scleroderma and dermatomyositis, result in pathological changes in COLLAGEN, they are often called connective tissue, or collagen, diseases. In rheumatic fever, the individual produces antibodies to antigens of streptococcal bacteria; it is believed that the streptococcal antigens are structurally similar to antigens of the heart and that antistreptococcal antibodies, combining with antigenic sites on the heart, damage the muscle. Diseases of the immune system are currently treated by a variety of nonspecific IMMUNOSUPPRESSIVE DRUGS and STEROIDS.

Autolycus (ôtôl'ikəs), fl. 4th cent. B.C., astronomer and mathematician of Pitane in Aeolis. Of his two extant works, that on the revolving sphere is said to be the oldest completely preserved Greek treatise on a mathematical subject. The other deals with the apparent rising and setting of the fixed stars.

Autolycus, in Greek mythology, celebrated rogue. He was the son of Hermes, from whom he received special powers in thieving and trickery. According to one legend Autolycus stole from Sisyphus, who revenged himself by seducing Autolycus' daughter Anticlea.

automatic direction finder: see RADIO RANGE.

automatic frequency control: see AUTOMATIC TUNING CONTROL.

automatic pilot: see AIR NAVIGATION.

automatic tuning control, method or device applied to a radio or television receiver by means of which it is automatically kept tuned to a desired frequency or channel. Usually the system is called automatic frequency control (AFC) when applied to frequency modulation (FM) receivers and automatic tuning control (ATC) when applied to television receivers. In either case the operation is similar. Assuming that the receiver is at least approximately tuned to the desired frequency, a circuit in the receiver develops an error voltage proportional to the

degree to which the receiver is mistuned. This error voltage is then applied to some component in the tuning circuit whose value depends on applied voltage in such a way that the tuning error is reduced. In most FM detectors an error voltage of this type is easily available, in television receivers extra circuits may be used to develop it. In an FM receiver AFC may make it difficult to receive a weak signal located near in frequency to a strong one. If sufficient care is taken in tuner design, such devices can often be made unnecessary.

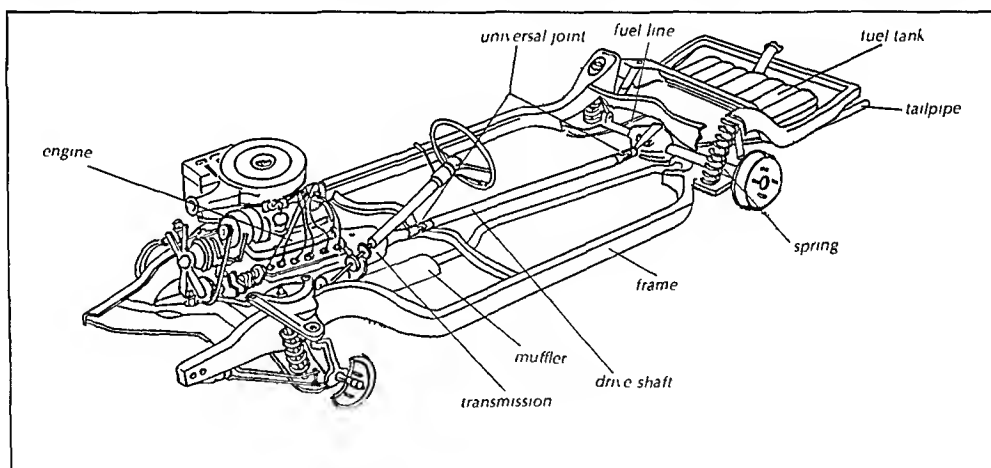
automation, automatic operation and control of machinery or processes by devices that can make and execute decisions without human intervention. The principal feature of such devices is their use of self-correcting CONTROL SYSTEMS that employ FEED-BACK, i.e., they use part of their output to control their input. Human participation involves little more than maintenance and repair of the equipment. In a typical automated manufacturing process, the feeding in of materials, the machine operation, the transfers from one machine to another, the final assembly, the removal, and the packing are all done automatically. At various stages in the operation are inspection devices that reject substandard products and adjust the machinery to correct any malfunction. Since electronic COMPUTERS are able to store, select, record, and present data systematically, they are widely employed to direct automated systems. For example, information recorded on tape and fed to a computer activates a series of tooling operations to produce a complex machined metal part. Automation is applied in industry to the manufacture of foodstuffs, chemicals, and pharmaceuticals and is used in steel mills, automobile plants, and coal mines. Another application is its use in the launching, aiming, and guidance of military rockets. Automation has also been applied to information handling, resulting in automatically prepared bills and reports. It offers high quality products together with great savings in costs. See G. H. Amber and P. S. Amber, *Anatomy of Automation* (1962), E. M. Grabbe et al., ed., *Handbook of Automation: Computation and Control* (3 vol., 1958-61), H. R. Bowen and G. L. Mangum, ed., *Automation and Economic Progress* (1966), Otto Mayr, *The Origins of Feedback Control* (1970).

automaton: see ROBOT

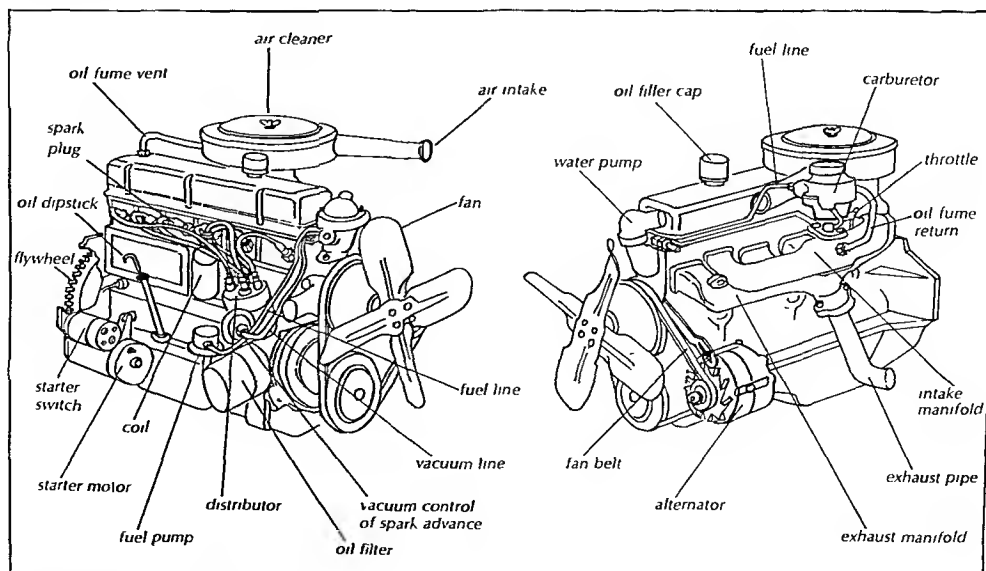
automobile, self-propelled vehicle used for travel on land. The modern automobile is usually driven by the water-cooled, piston-type INTERNAL-COMBUSTION ENGINE, mounted in the front of the vehicle, its power is transmitted to the rear wheels by means of a drive shaft. Some automobiles use air-cooled engines, but these are generally less efficient than the liquid-cooled type. In some models the engine is carried at the rear and in some at the middle of the vehicle. This latter arrangement, while wasteful of space, gives advantages of weight distribution. Diesel engines are employed chiefly for heavy vehicles, i.e., trucks and buses. Other engines are also being studied and developed as possibly superior to the conventional piston type. Steam engines, which were once more common than gasoline engines, are being experimented with now because they give off few noxious emissions. However, the major American auto manufacturers show little enthusiasm for mass producing them, claiming they are too bulky and complicated. Some electric motors have recently been designed for experimental cars. However, these motors restrict the cars to short trips at low speed because of limitations of the storage batteries that power the motors. Also, their widespread use might generate more air pollution than the gasoline engines that they would replace, because additional electric power plants would be needed to recharge their batteries. Two of the most promising replacements for conventional auto engines are the gas turbine and the Wankel engine. The gas turbine has drawn interest because of its low output of noxious emissions. However, problems of excessive fuel consumption, high initial costs, and uncertain durability under stop-and-go driving conditions must be solved before the gas turbine can be mass-produced. A rotary engine developed (c. 1954) by a team of engineers headed by Felix Wankel of Germany appears very promising because of its low exhaust emissions and feasibility for mass production. In this engine a three-sided rotor revolves within an epitrochoidal drum (combustion chamber) in which the free space contracts or expands as the rotor turns. Fuel is inhaled, compressed, and fired by the ignition system. The expanding gas turns the rotor and the spent gas is expelled. The Wankel engine has no valves, pistons, connecting rods, reciprocating parts, or crankshaft. It develops a high horse-

power per cubic inch and per pound of engine weight, and it is essentially vibrationless. Automotive pollutants have begun to pose environmental problems of considerable magnitude. It has been calculated, for example, that 60% to 70% of the air pollution in the United States can be traced directly or indirectly to automobile exhausts. In addition, asbestos, ground from brakes in normal use, and rubber, which wears away from tires, accumulate on roadways and are washed into streams, with effects nearly as serious as those of untreated sewage. A problem also exists in disposing of the automobiles themselves when they are no longer operable. In an effort to improve the situation, the U.S. government has enacted severe regulations on the use of the constituents of automobile exhaust gas that are known to cause air pollution. These constituents fall roughly into three categories: hydrocarbons that pass through the engine unburned and escape from the crankcase, carbon monoxide, also a product of incomplete combustion, and nitrogen oxides, which are formed when nitrogen and oxygen are in contact at high temperatures. Besides their own toxic character, hydrocarbons and nitrogen oxides undergo reactions in the presence of sunlight to form noxious SMOG. Carbon monoxide and hydrocarbons are rather easily controlled by the use of high combustion temperatures, leaner fuel mixtures, and lower compression ratios in engines. Unfortunately, the conditions that produce minimum emission of hydrocarbons tend to raise emission of nitrogen oxides. To some extent this difficulty is solved by adding recycled exhaust gas to the fuel mixture, thus avoiding the oversupply of oxygen that favors formation of nitrogen oxides. The use of reaction chambers external to the engine may provide a technique for burning off hydrocarbon and carbon monoxide emissions. However, effective operation of such reactors appears to depend on the use of expensive catalysts that are easily rendered inactive by the lead compounds used in gasoline to prevent engine knock. The Wankel engine has advantages in

this direction, as it runs easily on low-lead fuel and produces a minimum of nitrogen oxides. However, its fuel consumption is somewhat high under these conditions, although not as high as that of the turbine. The problem of automotive pollution is largely unsolved, progress has been made, but it is still an area requiring much research. Unfortunately, all currently practicable solutions tend to increase consumption of fuel, placing increasing burdens on energy supplies. Fatalities due to automobile accidents have stimulated automotive safety design. Safety design requires a wide-ranging systematic approach, many seemingly obvious solutions to safety problems either compound the problems or move them elsewhere. For example, one approach to passenger safety involves increasing the mass and rigidity of the vehicle, but this makes the vehicle so designed a hazard to light vehicles. The use of heavily padded interiors, collapsing steering columns, and other means of lessening the impact between passengers and the vehicle during a collision have met with some success, but one of the most effective systems, involving seat belts and harnesses to hold occupants in place, is largely ineffective because frequently they are not worn. Therefore attention has been turned to devices that either require no attention or disable the vehicle if they are not correctly deployed. Various systems have been devised whereby electronic sensors indicate if any passenger is not wearing a belt and either sound a warning or prevent the vehicle from starting. Another system simply envelops each passenger in a harness as his door is closed. More controversial is a system in which a sensor detects a collision, and rapidly, in a few hundredths of a second, inflates an air bag in front of each passenger to cushion his impact. Subsequently the bag deflates. The defects in the system are two. The bag, if falsely triggered, may cause an accident where one would not have occurred, and the system does not prevent contact with the vehicle roof in case of a rollover. Other aspects of vehicle safety include making it difficult for a driver to start a car



Automobile chassis



Two views of a six-cylinder automobile engine

while under the influence of alcohol (over half of all vehicle fatalities involve at least one driver who has used alcohol) and designing vehicles so that they are capable of emergency maneuvers. The French engineer Nicolas Joseph Cugnot is generally conceded to have built the first self-propelled vehicle (Paris, 1789), a heavy, three-wheeled, steam-driven carriage with a boiler that projected in front, its speed was c 3 mi per hr (5 km per hr). In 1801 the English engineer Richard Trevithick also built a three-wheeled steam-driven car, the engine drove the rear wheels. Many more vehicles were developed in England, and attempts were made to operate them on regular schedules. However, they were banned from the road, and development was retarded for decades by excessive road and bridge tolls and short-sighted legislation, e.g., speed was limited to 4 mi per hr (6.4 km per hr). In accordance with the Red Flag Act, which was in effect from 1836 to 1896, a man was required to walk in front of a self-propelled vehicle, carrying a red flag by day and a red lantern by night. The development of the automobile was accelerated by the introduction of the internal-combustion engine. Probably the first vehicle of this type was the three-wheeled car built in 1885 by the engineer Karl Benz in Germany. Another German engineer, Gottlieb Daimler, built an improved internal-combustion engine c 1885. The Panhard car, introduced in France by the Daimler company in 1894, had many features of the modern car. In the United States, internal-combustion cars of the horseless buggy type were manufactured in the 1890s by Charles Duryea and J. Frank Duryea, Elwood Haynes, Henry Ford, Ransom E. Olds, and Alexander Winton. Many of the early engines had only one cylinder, with a chain-and-sprocket drive on wooden carriage wheels. The cars generally were open, accommodated two passengers, and were steered by a lever. The Stanley brothers of Massachusetts, the most well-known American manufacturers of steam-driven autos, produced their Stanley Steamers from 1897 until after World War I. The free growth of the automobile industry in the early 20th cent was threatened by the American inventor George Selden's patent issued in 1895. Several early manufacturers licensed by Selden formed an association in 1903 and took over the patent in 1907. Henry Ford, the leader of a group of independent manufacturers who refused to acknowledge the patent, was engaged in litigation with Selden and the association from 1903 until 1911, when the U.S. Circuit Court of Appeals ruled that the patent, although valid, covered only the two-cycle engine, most cars, including Ford's, used a four-cycle engine. For operation and technical features of automobiles, see CARBURETOR, COOLING SYSTEM, DIFFERENTIAL, IGNITION, LUBRICATION, MUFFLER, ODOMETER, SHOCK ABSORBER, SPEEDOMETER, STEERING SYSTEM, SUSPENSION, TACHOMETER, TIRE, TRANSMISSION. See 8 G. Elliott and E. L. Consoliver, *The Gasoline Automobile* (5th ed 1939), F. R. Donovan, *Wheels for a Nation* (1965), J. B. Rae, *The American Automobile: A Brief History* (1965), G. N. Georgano, ed., *The Complete Encyclopedia of Motorcars 1885-1968* (1968), J. J. Flink, *America Adopts the Automobile, 1895-1910* (1970), William Crouse, *Automobile Emission Control* (1971).

automobile racing, sport in which high-speed automobiles are raced on an outdoor or indoor course. Primarily, the sport involves cars of special racing design. Automobile racing originated in France in 1894 and appeared in the United States the following year. It has since grown into one of the most popular spectator sports in the world. There are basically five forms of automobile-racing competition. The most prestigious involves the grand prix automobiles. These are usually hand-made cars with low-slung bodies and very large engines. A number of countries sponsor grand prix races, all of which contribute to the designation of a world champion driver. The grand prix of Monaco, France, Great Britain, Canada, and the United States (held at Watkins Glen, N.Y.) are among those events that make up the championship. In the United States the best-known automobile race is that held at the Indianapolis Speedway and known as the "Indianapolis 500." Although the "500" involves grand prix type cars, strictly speaking it is not a grand prix event because it does not contribute points toward the world championship. First held in 1911, the race attracts from 150,000 to 200,000 spectators annually, making it the largest single sporting event in the United States. The other types of automobile competition are stock car racing (using standard-made cars with special equipment), midget car racing, sports car racing, and drag racing. The racing of sports cars developed after World War II, and the

major races now include Sebring (Florida), Monza (Italy), and the 24-hour endurance event at Le Mans (France). Drag racing, which grew out of the often illegal races held among American teenagers during the mid-20th cent, involves acceleration tests among extremely powerful cars over 1/4-mi (402.5-km) tracks. A number of organizations supervise the various types of automobile competition, including the U.S. Automobile Club, the Sports Car Club of America, and the International Automobile Federation, the governing body for world automobile racing. See studies by Richard Hough (1961 and 1965), Griffith Borgeson (1966), and A. R. Bochroch (1974), Robert Cutter and Bob Fendell, *Encyclopedia of Auto Racing* (1973).

autonomic nervous system: see NERVOUS SYSTEM

autonomy (ôtdn'âmē) [Gr., =self-rule], in a political sense, limited self-government, short of independence, of a political state or, more frequently, of some subdivision of a political state. The term is also used for other self-governing units, such as a parish, a corporation, or a religious sect. The objective test of any autonomy is the recognition that the group may legislate or make the rules governing its internal affairs. Political autonomy is frequently based on cultural and ethnic differences. Autonomy within empires has frequently been a prelude to independence, as in the case of the evolution of the British Empire into the Commonwealth of Nations, containing both autonomous and completely sovereign states. The USSR includes among its political units several "autonomous regions." This autonomy is meant to allow groups along the borders to retain their ethnic and cultural distinctiveness, while at the same time they are brought under the political control of the Soviet government.

autopsy: see POST-MORTEM EXAMINATION

autotroph, in biology, an organism capable of synthesizing its own organic substances from inorganic compounds. Autotrophs produce their own sugars, lipids, and amino acids using carbon dioxide as a source of carbon, and ammonia or nitrates as a source of nitrogen. Organisms that use light for the energy to synthesize organic compounds are called photosynthetic autotrophs, organisms that oxidize such compounds as hydrogen sulfide (H₂S) to obtain energy are called chemosynthetic autotrophs, or chemotrophs. Photosynthetic autotrophs include the green plants, certain algae, and the pigmented sulfur bacteria. Chemotrophs include the iron bacteria, the nitrifying bacteria, and the nonpigmented sulfur bacteria. HETEROTROPHS are organisms that must obtain their energy from organic compounds.

autumn crocus: see MEADOW SAFFRON

Autun (ôtdn'), town (1968 pop 20,002), Saône-et-Loire dept., E central France, on the Arroux River. It is an industrial center producing metals, machinery, leather, cloth, carpets, and timber. An important market town in ancient times, Autun was a residence of the prefects of Gaul and was the seat of an important Gallic university. Between the 5th and 9th cent Autun was often attacked by barbarians. Among the Roman ruins are the remains of the town wall, an amphitheater, and the 3d-century gates of SS. Andre and Arroux. The Hotel Rolin (15th cent.), with the 12th-century sculpture of Eve, is now a museum. The Cathedral of St. Lazare (12th cent.) is also famous for its medieval sculpture. The town has other museums as well as a bishop's palace.

Auvergne (ôvër'nyä), region and former province, S central France. The area is now occupied chiefly by the departments of Puy-de-Dôme and Cantal. The Auvergne mts., a chain of extinct volcanoes (see MASSIF CENTRAL), run north to south forming unusual and beautiful scenery. There are also hot mineral springs, deep river gorges, and rolling pastureland in the region. Auvergne is largely agricultural (cattle, wheat, and grapes), with cheese and many wine manufactures. Industry is concentrated in Clermont-Ferrand, Aurillac, Riom, and Thiers. The Arvernis, an ancient people, occupied Auvergne when the Romans arrived. They had one of the most brilliant civilizations of Gaul, and their chieftain, Vercingetorix, led the resistance to Caesar. Auvergne was a part of Roman Aquitaine. It passed to the English in 1154. In the 14th cent it was divided into the county of Bourbon, and duchy of Auvergne. The duchy and dauphiny, which were united under the dukes of Bourbon, were confiscated (1527) by Francis I after the treason of Constable Charles de Bourbon. The county came into the royal domain in 1615. The reunited region was put under the Parlement of Paris. In some areas a local dialect is still spoken. There are many folk fetes, and much Romanesque architecture remains.

Aux Cayes (ô kä), Cayes, or Les Cayes (lä kä), town (1971 pop 22,065), SW Haiti, on the Caribbean Sea. Haiti's chief southern port, it handles exports, mainly sugar and coffee. There are liquor distilleries in the town.

Auxerre (ôsër'), town (1968 pop 38,066), capital of Yonne dept., N central France, in Burgundy, on the Yonne River. A commercial and industrial center, it has a great variety of manufactures and an important trade in Chablis wines. Auxerre gave its name to the medieval county of Auxerrois. It became part of Burgundy with the Treaty of Arras (1435). St. Germainus of Auxerre was bishop there in the 5th cent. The former abbatical church of St. Germain (13th cent.) is built on crypts dating back to the 6th cent. The abbey (now a hospital) has a fine Romanesque clock tower. The cathedral (13th-16th cent.) is in the Gothic flamboyant style. An air force school was established at Auxerre in 1965.

auxin (ôk'sin), plant hormone that regulates the amount, type, and direction of plant growth. Auxins include both naturally occurring substances and related synthetic compounds that have similar effects. Auxins are found in all members of the plant kingdom. They are most abundantly produced in growth areas (meristem), e.g., root and shoot tips, but are also produced elsewhere, e.g., in the stems and leaves. The method of dispersal throughout the plant body is not yet fully understood. Auxins, through their amount of concentration, affect numerous plant processes, e.g., cell division and elongation, autumnal loss of leaves, and the formation of buds, roots, flowers, and fruit. They are also responsible for many forms of TROPISM. It is known that phototropism is due to the inhibition of auxins by light, the cells on that side of a plant exposed to light do not divide or grow as quickly as those on the shaded side, and thus the plant grows toward the light source. Auxins are widely used commercially to produce more vigorous growth, to promote flowering and fruiting and also root formation in plants not easily propagated by stem cuttings, to retard fruit drop, and to produce seedless varieties (e.g., of tomatoes) by parthenogenetic fruiting. Only minute amounts of auxins occur naturally, and synthetic auxins (e.g., 2,4-D) must be administered in carefully prescribed doses, since excessive concentration produces usually fatal abnormalities. However, different species of plants react to different amounts of auxins, a fact used to advantage as a method of weed control. The principal natural auxin is indoleacetic acid, other common but less frequent plant hormones include the gibberellins, lactones, and kinins.

Ava (ä'vā), in the Bible, unidentified city of Mesopotamia, perhaps the same as IVAH. 2 Kings 17:24. Its inhabitants are called Avites. 2 Kings 17:31.

Ava (a'vā), village, central Burma, on the Irrawaddy River, 10 mi (16 km) S of Mandalay. Founded in 1364, it was the capital of a dynasty of Burmese kings until 1783 (when it was replaced by Amaraapura) and again from 1823 to 1837. Only ruins remain of its former greatness.

Avacha (ävä'cha) or **Avachinskaya Sopka** (ävä'chinskä sôp'kä), active volcano, 8,965 ft (2,733 m) high, Far Eastern USSR, on S Kamchatka peninsula. It has a permanent snow cap.

Avadana: see PALI LITERATURE

Aval: see BAHRAIN

avalanche, rapidly descending mass of snow and ice loosened from mountain slopes. Loose debris, such as soil and rock, and trees or other vegetation may be picked up as the mass roars downslope. Avalanches result from the addition of a heavy snowfall to an insecure mass of ice and snow, from the removal of part of the base of the mass, which is caused by melting and eroding, or from sudden shocks such as those caused by explosions or earth tremors. The action of an avalanche is often destructive, since it is sudden, unanticipated, and violent.

Avalon (äv'älön), in Celtic mythology, the blissful otherworld of the dead. In medieval romance it was the island to which the mortally wounded King Arthur was taken, and from which it was expected he would someday return. Avalon is often identified with Glastonbury in Somerset, England.

Avalon Peninsula, 3,579 sq mi (9,270 sq km), SE N.F., Canada. It is nearly divided at its center by Conception Bay and St. Mary's Bay. The peninsula is the most densely populated part of Newfoundland. St. John's is the chief town. A lighthouse and radio direction-finding station are at Cape Race.

Avalos, Ferdinando Francesco d': see PESCARA, FERDINANDO FRANCESCO D'AVALOS, MARCHESE DI

Avars (ā'vārz), mounted nomad people who in the 4th and 5th cent. dominated the steppes of central Asia. Dislodged by stronger tribes, the Avars pushed west, increasing their formidable army by incorporating conquered peoples into it. Reaching their greatest power in the late 6th cent., they plundered all of present S Russia and the Balkans. Their siege (626) of Constantinople was unsuccessful, but they continued to dominate the Hungarian plain until Charlemagne defeated them. The Avars were not mentioned after the 9th cent. The modern Avars, a pastoral, Muslim people of the Dagestan Autonomous Soviet Socialist Republic, number about 280,000. It is doubted that they are descended from remnants of the old Avars.

avatara (āv'atāra) [Skt., =descent], incarnations of Hindu gods, especially VISHNU. The doctrine of avatara first occurs in the BHAGAVAD GITA, where KRISHNA declares: "For the preservation of the righteous, the destruction of the wicked, and the establishment of dharma [virtue], I come into being from age to age." Vishnu is believed to have taken nine avatara, in both animal and human form, with a tenth yet to come. The avatara of SHIVA are imitations of those of Vishnu.

Avdira, Greece. See ABDERA.

Avebury, John Lubbock, 1st Baron: see LUBBOCK, SIR JOHN.

Avebury (ā'bərē), village, Wiltshire, S central England. The village, with a medieval church and Elizabethan manor house, lies within Avebury Circle, a Neolithic circular group of upright stones that are older and larger than STONEHENGE but not so well preserved. The village and the circle have belonged to the nation since 1943 and are administered by the National Trust.

Aveiro (āvārō), town (1960 pop. 16,430), capital of Aveiro dist., NW Portugal, on the lagoon of Aveiro and at the mouth of the Vouga River, in Beira Litoral. Intersected by numerous canals, one of which connects with the Atlantic, the town is a fishing port and salt-producing center. João Alfonso, one of the discoverers of the Newfoundland fisheries, was born there. A convent (now a museum) contains the tomb of the daughter of Alfonso V, St. Joana.

Avellaneda, Alonso Fernández de (ālōn'sō fārnan'dāth dā avēlyanā'thā), pen name used by the unknown Spanish writer who published a spurious second part of *Don Quixote* in 1614, before Cervantes's own second part appeared (1615). The book is usually referred to as *El Quijote apócrifo* [the spurious *Don Quixote*], and its author is unidentified, although various attributions have been made.

Avellaneda, Gertrudis Gómez de: see GÓMEZ DE AVELLANEDA, GERTRUDIS.

Avellaneda, Nicolás (nēkōlas' āvāyanā'thā), 1837-85, Argentine statesman, president of the republic (1874-80). As minister of justice, religion, and public instruction under Domingo F. SARMIENTO (1868-74), he introduced many reforms. After his election as president, he suppressed a revolt led by Bartolome Mitre, the defeated candidate. His administration was notable for economic growth and for the conquest of the Indian frontier southwest of Buenos Aires. An expedition under Gen. Julio A. Roca (1878-79) drove the Indians beyond the Rio Negro, opening the territory of Patagonia for colonization. Much of the new land, however, went in large tracts to speculators, influential politicians, and the great landowners. Avellaneda was chiefly responsible for the plan, approved in 1880, by which the city of Buenos Aires was federalized, thereby settling the political tensions that had long existed between the city and Buenos Aires prov.

Avellaneda (āvāyanā'thā), city (1970 pop. 337,538), Buenos Aires prov., E central Argentina, across the Riachuelo River from the Buenos Aires federal district. It is one of the most important industrial, commercial, and transportation centers in the country. The city, which grew in the first half of the 19th cent., was formerly called Baracas al Sud but was renamed (1904) after Nicolás Avellaneda, an Argentine president.

Avellino (avāl-lē'nō), city (1971 pop. 52,576), capital of Avellino prov., Campania, S Italy. It is an agricultural and manufacturing center. Although damaged by an earthquake in 1930, the city has retained much of its medieval aspect. Of note are the 12th-century cathedral and the ruins of a castle (9th-10th cent.). Near Avellino is the Benedictine convent and pilgrimage shrine of Monte Vergine (founded early 12th cent.).

Ave Maria (ā'vā mārē'ā) [Latin, =hail, Mary], prayer to the Virgin Mary universal among Roman Catho-

lics, also called the Ave, the Hail Mary, and the Angelic Salutation. The words in English are: "Hail Mary, full of grace, the Lord is with thee, blessed art thou amongst women, and blessed is the fruit of thy womb, Jesus, Holy Mary, Mother of God, pray for us sinners now and at the hour of our death. Amen." The first part is from Luke 1:28, 42. The prayer is much used in private as well as in public devotions, e.g., in the ROSARY. It has many musical settings, the compositions by Franz Schubert and Charles Gounod being especially popular.

Avempace (āv'vāpās, ā'vēmpā'thā), Arabic *Ibn Bajja*, d. 1138, Spanish-Arabian philosopher. Little is known of his life, but he was born in Saragossa and died in Fez, Morocco. He was an outstanding representative of the Islamic Aristotelian-Neoplatonic tradition. This tradition had been established in the east by al-FARABI on whose commentaries Avempace depended. He is important for his influence on AVERROES and for his concept of the solitary mystic as opposed to the more social concept of Islam held by al-GHAZALI.

Aven (ā'vən), in the Bible, abusive name applied to towns to Bethel (see BETH-AVEN), to Heliopolis in Egypt in Ezek. 30:17, and to some other place, traditionally Baalbek, in Amos 1:5.

Avenasar: see FARABI AL-

Avenches (āvānsh'), anc. *Aventicum*, town (1970 pop. 2,235), Vaud canton, W Switzerland. During the 1st and 2d cent. A.D., Avenches flourished under the Romans as the chief town of HELVETIA.

Aventine, hill. See *Rome before Augustus* under ROME.

average, number used to represent or characterize a group of numbers. The most common type of average is the arithmetic MEAN. See MEDIAN, MODE.

Averescu, Alexander (avērēs'kōō), 1859-1938, Rumanian general and political leader. He served as a volunteer in the 1877-78 war against the Ottoman Empire and rose to become minister of war in 1907. He distinguished himself as a commander in World War I, especially in the 1916 Dobruja campaign, and gained a great popular following. In late Jan., 1918, he was chosen to form a cabinet to negotiate peace with the Central Powers. Averescu founded (1918) the People's League (later the People's party), which sought moderate land reform and suppression of the left. He was premier in 1920-21 and again in 1926-27 and was made a marshal in 1930.

Averno (āvēr'nō), anc. *Avernus* (āvūr'nās) [from Gr., =without bird], small crater lake, 6 mi (9 km) wide, Campania, S Italy, between Cuma and Puteoli, near the Tyrrhenian Sea. Its intense sulphuric vapors, caused by volcanic activity (now extinguished), supposedly killed the birds flying over it, hence its name. The ancient Romans, impressed by its vapors and its gloomy aspect, regarded it as the entrance to hell; later the name was used for hell itself. Near the lake its personification, the *deus Avernus*, was worshiped.

Averroes (avēr'ōēz), Arabic *Ibn Rushd*, 1126-98, Spanish-Arabian philosopher. He was far more important and influential in Jewish and Christian thought than in Islam. He was a lawyer and physician of Cordoba and lived for some time in Morocco in favor with the caliphs. He was banished for a period, probably for suspected heresy. Averroes's greatest work was his commentaries on Aristotle. The Averroistic interpretation of Aristotle remained influential long after his death and was a matter of intellectual speculation well into the Renaissance. He attempted to delimit the separate domains of faith and reason, pointing out that the two need not be reconciled because they did not conflict. He declared philosophy the highest form of inquiry. He had the same Neoplatonic cast to his metaphysics as Avempace, to whom he was certainly indebted for his ideas on the intellect. Averroist doctrines on personal immortality and the eternity of matter were condemned by the Roman Catholic Church. St. Thomas Aquinas was respectful of Averroes, but he attacked the Averroist contention that philosophic truth is derived from reason and not from faith. See SCHOLASTICISM. Averroes's works in English translation include *Incoherence of the Incoherence*, ed. by Simon Van Den Bergh (1955), *On Aristotle's De Generatione et Corruptione*, ed. by Samuel Kurland (1958), *Commentary on Plato's Republic*, ed. by E. J. Rosenthal (1956, repr. 1966), and *On the Harmony of Religion and Philosophy*, ed. by G. F. Hourani (1961).

Aversa (āvēr'sā), city (1971 pop. 47,366), Campania, S Italy. It is an agricultural and transportation center, noted for its sparkling white wine. In the early 11th

cent. the county of Aversa became the first possession of the Normans in Italy; it later was made part of the kingdom of Naples.

Avery, Milton, 1893-1965, American painter, b. Altmar, N.Y. Avery moved to New York City in 1925. Bold massing of forms is characteristic of his figurative work, such as *Poetry Reading* (1957, Munson-Williams-Proctor Inst., Utica, N.Y.). His landscapes, including *Green Sea* (1954, Metropolitan Mus.), verge on complete abstraction. Avery's paintings display qualities of fantasy and poetic gaiety within the tradition of Matisse. See study by Hilton Kramer (1962), exhibition catalog ed. by A. D. Breeskin (1969).

Avery Island, salt dome, c. 200 ft (60 m) high and 2 mi (3.2 km) in diameter, S La., in an area of sea marshes and swamps. The island's former owner, Edward Avery McIlhenny, author of *Bird City*, created Jungle Gardens, which contains many rare plants, trees, and flowers. The island also has a bird sanctuary. All the cayenne peppers grown in the United States are produced on Avery Island. Rock salt has been mined there since 1791.

Avesta: see ZOROASTRIANISM.

Avesta (ā'vəstā'), city (1970 pop. 10,191), Kopparberg co., S central Sweden, on the Dalälven River. Aluminum and high quality steel are manufactured there. Formerly a copper mining and refining center, Avesta was the seat of copper mining in Sweden from 1644 to 1831.

Avestan (āvēs'tən), language belonging to the Iranian group of the Indo-Iranian subfamily of the Indo-European family of languages. One of the earliest forms of the Iranian languages to survive, Avestan is also the tongue of the *Avesta*, or scriptures of ZOROASTRIANISM. See INDO-IRANIAN LANGUAGES. See A. V. W. Jackson, *An Avestan Grammar in Comparison with Sanskrit* (1968).

Aveyron (āvārōn'), department (1968 pop. 281,568), S central France, in Guienne. RODEZ is the capital. **aviary** (āvē'ārē), structure for confining birds. It usually refers to an outdoor screened area within which environmental conditions are suitable to the birds. Aviaries must provide food, shelter, perches and flying space, nesting sites and materials, as well as protection against vermin and predators. For tropical species, heated indoor quarters are often provided for the winter. Aviaries are maintained privately as well as for public exhibit, research, and the breeding of wild birds. The construction of aviaries for exhibition, known since early Roman times, was spurred by the collection of unusual bird specimens by 15th-century explorers and the introduction of the canary into Europe. Aviaries are now found chiefly in public gardens, on private estates, and in many zoological parks. Among the aviaries in the United States are the Parrot Jungle, Miami, the Tracy Aviary, Salt Lake City, and the World of Birds, New York Zoological Park, New York City. Wild birds may be observed in their natural habitat in sanctuaries and on wildlife refuges.

aviation, operation of heavier-than-air aircraft and related activities. Aviation can be conveniently divided into military aviation, air transport, and general aviation. Military aviation includes all aviation activity by the armed services, such as combat, reconnaissance, and military air transport. Air transport consists mainly of the operation of commercial airlines, which handle both freight and passengers. General aviation consists of agricultural, business, charter, instructional, and pleasure flying; it includes such activities as the operation of air taxis, as well as aerial surveying and mapping. The detailed observations, explanations, and drawings preserved in the notebooks of Leonardo da Vinci mark the beginning of scientific studies of FLIGHT. Leonardo's work in this field centered around studies of birds, with observations of bats and other flying creatures. Flight was first successfully accomplished (1783) in a lighter-than-air device (see BALLOON). A number of investigators contributed to an early understanding of the principles involved in achieving flight in heavier-than-air machines. Among them were the Englishman W. S. Henson, who patented (1842) a design for a machine that closely foreshadowed the modern monoplane, the Englishman John Stringfellow, who developed a model plane said to be the first power-driven machine to fly, and F. H. Wenham, who in England devised the first wind-tunnel experiments. Alphonse Penaud, in France, made successful flying models of airplanes and wrote on the theory of flight. Clement Ader, a French engineer, achieved flight (over a distance of about 150 ft/46 m in 1890 and about 300 yd/280 m in 1897) in

while under the influence of alcohol (over half of all vehicle fatalities involve at least one driver who has used alcohol) and designing vehicles so that they are capable of emergency maneuvers. The French engineer Nicolas Joseph Cugnot is generally conceded to have built the first self-propelled vehicle (Paris, 1789), a heavy, three-wheeled, steam-driven carriage with a boiler that projected in front, its speed was c 3 mi per hr (5 km per hr). In 1801 the English engineer Richard Trevithick also built a three-wheeled steam-driven car, the engine drove the rear wheels. Many more vehicles were developed in England, and attempts were made to operate them on regular schedules. However, they were banned from the road, and development was retarded for decades by excessive road and bridge tolls and short-sighted legislation, e.g., speed was limited to 4 mi per hr (6.4 km per hr). In accordance with the Red Flag Act, which was in effect from 1836 to 1896, a man was required to walk in front of a self-propelled vehicle, carrying a red flag by day and a red lantern by night. The development of the automobile was accelerated by the introduction of the internal-combustion engine. Probably the first vehicle of this type was the three-wheeled car built in 1885 by the engineer Karl Benz in Germany. Another German engineer, Gottlieb Daimler, built an improved internal-combustion engine c 1885. The Panhard car, introduced in France by the Daimler company in 1894, had many features of the modern car. In the United States, internal-combustion cars of the horseless buggy type were manufactured in the 1890s by Charles Duryea and J. Frank Duryea, Elwood Haynes, Henry Ford, Ransom E. Olds, and Alexander Winton. Many of the early engines had only one cylinder, with a chain-and-sprocket drive on wooden carriage wheels. The cars generally were open, accommodated two passengers, and were steered by a lever. The Stanley brothers of Massachusetts, the most well-known American manufacturers of steam-driven autos, produced their Stanley Steamers from 1897 until after World War I. The free growth of the automobile industry in the early 20th cent. was threatened by the American inventor George Selden's patent issued in 1895. Several early manufacturers licensed by Selden formed an association in 1903 and took over the patent in 1907. Henry Ford, the leader of a group of independent manufacturers who refused to acknowledge the patent, was engaged in litigation with Selden and the association from 1903 until 1911, when the U.S. Circuit Court of Appeals ruled that the patent, although valid, covered only the two-cycle engine, most cars, including Ford's, used a four-cycle engine. For operation and technical features of automobiles, see CARBURETOR, COOLING SYSTEM, DIFFERENTIAL, IGNITION, LUBRICATION, MUFFLER, ODOMETER, SHOCK ABSORBER, SPEEDOMETER, STEERING SYSTEM, SUSPENSION, TACHOMETER, TIRE, TRANSMISSION. See B. G. Elliott and E. L. Consoliver, *The Gasoline Automobile* (Sth ed. 1939), F. R. Donovan, *Wheels for a Nation* (1965), J. B. Rae, *The American Automobile: A Brief History* (1965), G. N. Georgano, ed., *The Complete Encyclopedia of Motorcars 1885-1968* (1968), J. J. Flink, *America Adopts the Automobile, 1895-1910* (1970), William Crouse, *Automobile Emission Control* (1971).

automobile racing, sport in which high-speed automobiles are raced on an outdoor or indoor course. Primarily, the sport involves cars of special racing design. Automobile racing originated in France in 1894 and appeared in the United States the following year. It has since grown into one of the most popular spectator sports in the world. There are basically five forms of automobile-racing competition. The most prestigious involves the grand prix automobiles. These are usually hand-made cars with low-slung bodies and very large engines. A number of countries sponsor grand prix races, all of which contribute to the designation of a world champion driver. The grand prix of Monaco, France, Great Britain, Canada, and the United States (held at Watkins Glen, N.Y.) are among those events that make up the championship. In the United States the best-known automobile race is that held at the Indianapolis Speedway and known as the "Indianapolis 500." Although the "500" involves grand prix type cars, strictly speaking it is not a grand prix event because it does not contribute points toward the world championship. First held in 1911, the race attracts from 150,000 to 200,000 spectators annually, making it the largest single sporting event in the United States. The other types of automobile competition are stock car racing (using standard-made cars with special equipment), midget car racing, sports car racing, and drag racing. The racing of sports cars developed after World War II, and the

major races now include Sebring (Florida), Monza (Italy), and the 24-hour endurance event at Le Mans (France). Drag racing, which grew out of the often illegal races held among American teenagers during the mid-20th cent., involves acceleration tests among extremely powerful cars over $\frac{1}{4}$ -mi (4025-km) tracks. A number of organizations supervise the various types of automobile competition, including the U.S. Automobile Club, the Sports Car Club of America, and the International Automobile Federation, the governing body for world automobile racing. See studies by Richard Hough (1961 and 1965), Griffith Borgeson (1966), and A. R. Bochroch (1974), Robert Cutter and Bob Fendell, *Encyclopedia of Auto Racing* (1973).

autonomic nervous system: see NERVOUS SYSTEM
autonomy (ōtōn'ōmē) [Gr., =self-rule], in a political sense, limited self-government, short of independence, of a political state or, more frequently, of some subdivision of a political state. The term is also used for other self-governing units, such as a parish, a corporation, or a religious sect. The objective test of any autonomy is the recognition that the group may legislate or make the rules governing its internal affairs. Political autonomy is frequently based on cultural and ethnic differences. Autonomy within empires has frequently been a prelude to independence, as in the case of the evolution of the British Empire into the Commonwealth of Nations, containing both autonomous and completely sovereign states. The USSR includes among its political units several "autonomous regions." This autonomy is meant to allow groups along the borders to retain their ethnic and cultural distinctiveness, while at the same time they are brought under the political control of the Soviet government.

autopsy: see POST-MORTEM EXAMINATION

autotroph, in biology, an organism capable of synthesizing its own organic substances from inorganic compounds. Autotrophs produce their own sugars, lipids, and amino acids using carbon dioxide as a source of carbon, and ammonia or nitrates as a source of nitrogen. Organisms that use light for the energy to synthesize organic compounds are called photosynthetic autotrophs, organisms that oxidize such compounds as hydrogen sulfide (H_2S) to obtain energy are called chemosynthetic autotrophs, or chemotrophs. Photosynthetic autotrophs include the green plants, certain algae, and the pigmented sulfur bacteria. Chemotrophs include the iron bacteria, the nitrifying bacteria, and the nonpigmented sulfur bacteria. HETEROTROPHS are organisms that must obtain their energy from organic compounds.

autumn crocus. see MEADOW SAFFRON

Autun (ōtōn'), town (1968 pop. 20,002), Saône-et-Loire dept., E central France, on the Arroux River. It is an industrial center producing metals, machinery, leather, cloth, carpets, and timber. An important market town in ancient times, Autun was a residence of the prefects of Gaul and was the seat of an important Gallic university. Between the 5th and 9th cent. Autun was often attacked by barbarians. Among the Roman ruins are the remains of the town wall, an amphitheater, and the 3d-century gates of SS. Andre and Arroux. The Hotel Rolin (15th cent.), with the 12th-century sculpture of Eve, is now a museum. The Cathedral of St. Lazare (12th cent.) is also famous for its medieval sculpture. The town has other museums as well as a bishop's palace.

Auvergne (ōvēr'nyā), region and former province, S central France. The area is now occupied chiefly by the departments of Puy-de-Dôme and Cantal. The Auvergne mts., a chain of extinct volcanoes (see MASSIF CENTRAL), run north to south forming unusual and beautiful scenery. There are also hot mineral springs, deep river gorges, and rolling pastureland in the region. Auvergne is largely agricultural (cattle, wheat, and grapes), with cheese and many wine manufactures. Industry is concentrated in Clermont-Ferrand, Aurillac, Riom, and Thiers. The Arvernis, an ancient people, occupied Auvergne when the Romans arrived. They had one of the most brilliant civilizations of Gaul, and their chieftain, Vercingetorix, led the resistance to Caesar. Auvergne was a part of Roman Aquitaine. It passed to the English in 1154. In the 14th cent. it was divided into the countyship, dauphiny, and duchy of Auvergne. The duchy and dauphiny, which were united under the dukes of Bourbon, were confiscated (1527) by Francis I after the treason of Constable Charles de Bourbon. The countyship came into the royal domain in 1615. The reunited region was put under the Parlement of Paris. In some areas a local dialect is still spoken. There are many folk fetes, and much Romanesque architecture remains.

Aux Cayes (ō kā), Cayes, or Les Cayes (lā kā), town (1971 pop. 22,065), SW Haiti, on the Caribbean Sea. Haiti's chief southern port, it handles exports, mainly sugar and coffee. There are liquor distilleries in the town.

Auxerre (ōsēr'), town (1968 pop. 38,066), capital of Yonne dept., N central France, in Burgundy, on the Yonne River. A commercial and industrial center, it has a great variety of manufactures and an important trade in Chablis wines. Auxerre gave its name to the medieval county of Auxerrois. It became part of Burgundy with the Treaty of Arras (1435). St. Germainus of Auxerre was bishop there in the 5th cent. The former abbatial church of St. Germain (13th cent.) is built on crypts dating back to the 6th cent. The abbey (now a hospital) has a fine Romanesque clock tower. The cathedral (13th-16th cent.) is in the Gothic flamboyant style. An air force school was established at Auxerre in 1965.

auxin (ōk'sin), plant hormone that regulates the amount, type, and direction of plant growth. Auxins include both naturally occurring substances and related synthetic compounds that have similar effects. Auxins are found in all members of the plant kingdom. They are most abundantly produced in growth areas (meristem), e.g., root and shoot tips, but are also produced elsewhere, e.g., in the stems and leaves. The method of dispersal throughout the plant body is not yet fully understood. Auxins, through their amount of concentration, affect numerous plant processes, e.g., cell division and elongation, autumnal loss of leaves, and the formation of buds, roots, flowers, and fruit. They are also responsible for many forms of TROPISM. It is known that phototropism is due to the inhibition of auxins by light, the cells on that side of a plant exposed to light do not divide or grow as quickly as those on the shaded side, and thus the plant grows toward the light source. Auxins are widely used commercially to produce more vigorous growth, to promote flowering and fruiting and also root formation in plants not easily propagated by stem cuttings, to retard fruit drop, and to produce seedless varieties (e.g., of tomatoes) by parthenogenetic fruiting. Only minute amounts of auxins occur naturally, and synthetic auxins (e.g., 2,4-D) must be administered in carefully prescribed doses, since excessive concentration produces usually fatal abnormalities. However, different species of plants react to different amounts of auxins, a fact used to advantage as a method of weed control. The principal natural auxin is indoleacetic acid, other common but less frequent plant hormones include the gibberellins, lactones, and kinins.

Ava (ā'vā), in the Bible, unidentified city of Mesopotamia, perhaps the same as IVAH. 2 Kings 17:24. Its inhabitants are called Avites. 2 Kings 17:31.

Ava (ā'vā), village, central Burma, on the Irrawaddy River, 10 mi (16 km) S of Mandalay. Founded in 1364, it was the capital of a dynasty of Burmese kings until 1783 (when it was replaced by Amarapura) and again from 1823 to 1837. Only ruins remain of its former greatness.

Avacha (āvā'chā) or **Avachinskaya Sopka** (āvā'chinskā sōp'kā), active volcano, 8,965 ft (2,733 m) high, Far Eastern USSR, on S Kamchatka peninsula. It has a permanent snow cap.

Avadana. see PALI LITERATURE

Aval. see BAHRAIN

avalanche, rapidly descending mass of snow and ice loosened from mountain slopes. Loose debris, such as soil and rock, and trees or other vegetation may be picked up as the mass roars downslope. Avalanches result from the addition of a heavy snowfall to an insecure mass of ice and snow, from the removal of part of the base of the mass, which is caused by melting and eroding, or from sudden shocks such as those caused by explosions or earth tremors. The action of an avalanche is often destructive, since it is sudden, unanticipated, and violent.

Avalon (āv'ālōn), in Celtic mythology, the blissful otherworld of the dead. In medieval romance it was the island to which the mortally wounded King Arthur was taken, and from which it was expected he would someday return. Avalon is often identified with Glastonbury in Somerset, England.

Avalon Peninsula, 3,579 sq mi (9,270 sq km), SE N.F., Canada. It is nearly divided at its center by Conception Bay and St. Mary's Bay. The peninsula is the most densely populated part of Newfoundland. St. John's is the chief town. A lighthouse and radio direction-finding station are at Cape Race.

Avalos, Ferdinando Francesco d'. see PESCARA, FERDINANDO FRANCESCO D' AVALOS, MARCHESE DI

Avars (a'varz), mounted nomad people who in the 4th and 5th cent. dominated the steppes of central Asia. Dislodged by stronger tribes, the Avars pushed west, increasing their formidable army by incorporating conquered peoples into it. Reaching their greatest power in the late 6th cent., they plundered all of present S Russia and the Balkans. Their siege (626) of Constantinople was unsuccessful, but they continued to dominate the Hungarian plain until Charlemagne defeated them. The Avars were not mentioned after the 9th cent. The modern Avars, a pastoral, Muslim people of the Dagestan Autonomous Soviet Socialist Republic, number about 280,000. It is doubted that they are descended from remnants of the old Avars.

avatara (āv'atāra) [Skt., =descent], incarnations of Hindu gods, especially VISHNU. The doctrine of avatara first occurs in the BHAGAVAD-GITA, where KRISHNA declares: "For the preservation of the righteous, the destruction of the wicked, and the establishment of dharma [virtue], I come into being from age to age." Vishnu is believed to have taken nine avatara, in both animal and human form, with a tenth yet to come. The avatara of SHIVA are imitations of those of Vishnu.

Avidra, Greece. See ABDERA.

Avebury, John Lubbock, 1st Baron: see LUBBOCK, SIR JOHN.

Avebury (ā'vērē), village, Wiltshire, S central England. The village, with a medieval church and Elizabethan manor house, lies within **Avebury Circle**, a Neolithic circular group of upright stones that are older and larger than STONEHENGE but not so well preserved. The village and the circle have belonged to the nation since 1943 and are administered by the National Trust.

Aveiro (avā'rō), town (1960 pop. 16,430), capital of Aveiro dist., NW Portugal, on the lagoon of Aveiro and at the mouth of the Vouga River, in Beira Litoral. Intersected by numerous canals, one of which connects with the Atlantic, the town is a fishing port and salt-producing center. João Alfonso, one of the discoverers of the Newfoundland fisheries, was born there. A convent (now a museum) contains the tomb of the daughter of Alfonso V, St. Joana.

Avellaneda, Alonso Fernandez de (alōn'sō fārnān'dāth dā avēlyanā'tha), pen name used by the unknown Spanish writer who published a spurious second part of *Don Quixote* in 1614, before Cervantes's own second part appeared (1615). The book is usually referred to as *El Quijote apócrifo* [the spurious *Don Quixote*], and its author is unidentified, although various attributions have been made.

Avellaneda, Gertrudis Gómez de: see GÓMEZ DE AVELLANEDA, GERTRUDIS.

Avellaneda, Nicolás (nēkōlas' avāyanā'tha), 1837-85, Argentine statesman, president of the republic (1874-80). As minister of justice, religion, and public instruction under Domingo F. Sarmiento (1868-74), he introduced many reforms. After his election as president, he suppressed a revolt led by Bartolome Mitre, the defeated candidate. His administration was notable for economic growth and for the conquest of the Indian frontier southwest of Buenos Aires. An expedition under Gen. Julio A. Roca (1878-79) drove the Indians beyond the Rio Negro, opening the territory of Patagonia for colonization. Much of the new land, however, went in large tracts to speculators, influential politicians, and the great landowners. Avellaneda was chiefly responsible for the plan, approved in 1880, by which the city of Buenos Aires was federalized, thereby settling the political tensions that had long existed between the city and Buenos Aires prov.

Avellaneda (avāyanā'tha), city (1970 pop. 337,538), Buenos Aires prov., E central Argentina, across the Riachuelo River from the Buenos Aires federal district. It is one of the most important industrial, commercial, and transportation centers in the country. The city, which grew in the first half of the 19th cent., was formerly called Baracas al Sud but was renamed (1904) after Nicolás Avellaneda, an Argentine president.

Avellino (avāl-lē'nō), city (1971 pop. 52,576), capital of Avellino prov., Campania, S Italy. It is an agricultural and manufacturing center. Although damaged by an earthquake in 1930, the city has retained much of its medieval aspect. Of note are the 12th-century cathedral and the ruins of a castle (9th-10th cent.). Near Avellino is the Benedictine convent and pilgrimage shrine of Monte Vergine (founded early 12th cent.).

Ave Maria (ā'vā marē'ā) [Latin, =hail, Mary], prayer to the Virgin Mary universal among Roman Catho-

lics, also called the Ave, the Hail Mary, and the Angelic Salutation. The words in English are "Hail Mary, full of grace, the Lord is with thee, blessed art thou amongst women, and blessed is the fruit of thy womb, Jesus. Holy Mary, Mother of God, pray for us sinners now and at the hour of our death. Amen." The first part is from Luke 1:28, 42. The prayer is much used in private as well as in public devotions, e.g., in the ROSARY. It has many musical settings, the compositions by Franz Schubert and Charles Gounod being especially popular.

Avempace (ā'vəmpās, ā'vəmpā'thā), Arabic *Ibn Bajja*, d. 1138, Spanish-Arabian philosopher. Little is known of his life, but he was born in Saragossa and died in Fez, Morocco. He was an outstanding representative of the Islamic Aristotelian-Neoplatonic tradition. This tradition had been established in the east by al-FARABI on whose commentaries Avempace depended. He is important for his influence on AVERROES and for his concept of the solitary mystic as opposed to the more social concept of Islam held by al-GHAZALI.

Aven (ā'vən), in the Bible, abusive name applied to towns to Bethel (see BETH AVEN), to Heliopolis in Egypt in Ezek. 30:17, and to some other place, traditionally Baalbek, in Amos 1:5.

Avenasar: see FARABI, AL-

Avenches (avā'nsh'), anc. *Aventicum*, town (1970 pop. 2,235), Vaud canton, W Switzerland. During the 1st and 2d cent. A.D., Avenches flourished under the Romans as the chief town of HELVETIA.

Aventine, hill. See *Rome before Augustus* under ROME.

average, number used to represent or characterize a group of numbers. The most common type of average is the arithmetic MEAN. See MEDIAN, MODE.

Averescu, Alexander (avērēs'kōō), 1859-1938, Rumanian general and political leader. He served as a volunteer in the 1877-78 war against the Ottoman Empire and rose to become minister of war in 1907. He distinguished himself as a commander in World War I, especially in the 1916 Dobruja campaign, and gained a great popular following. In late Jan., 1918, he was chosen to form a cabinet to negotiate peace with the Central Powers. Averescu founded (1918) the People's League (later the People's party), which sought moderate land reform and suppression of the left. He was premier in 1920-21 and again in 1926-27 and was made a marshal in 1930.

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Aversa (avēr'sa), city (1971 pop. 47,366), Campania, S Italy. It is an agricultural and transportation center, noted for its sparkling white wine. In the early 11th

cent. the county of Aversa became the first possession of the Normans in Italy, it later was made part of the kingdom of Naples.

Avery, Milton, 1893-1965, American painter, b. Altmar, N.Y. Avery moved to New York City in 1925. Bold massing of forms is characteristic of his figurative work, such as *Poetry Reading* (1957, Munson-Williams-Proctor Inst., Utica, N.Y.). His landscapes, including *Green Sea* (1954, Metropolitan Mus.), verge on complete abstraction. Avery's paintings display qualities of fantasy and poetic gaiety within the tradition of Matisse. See study by Hilton Kramer (1962), exhibition catalog ed. by A. D. Breeskin (1969).

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Avesta: see ZORASTRIANISM.

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Avestan (āvēs'tān), language belonging to the Iranian group of the Indo-Iranian subfamily of the Indo-European family of languages. One of the earliest forms of the Iranian languages to survive, Avestan is also the tongue of the *Avesta*, or scriptures of ZORASTRIANISM. See INDO-IRANIAN LANGUAGES. See A. V. W. Jackson, *An Avestan Grammar in Comparison with Sanskrit* (1968).

Aveyron (avārō'n'), department (1968 pop. 281,568), S central France, in Guienne. RODEZ is the capital.

aviary (ā'vēārē), structure for confining birds. It usually refers to an outdoor screened area within which environmental conditions are suitable to the birds. Aviaries must provide food, shelter, perches and flying space, nesting sites and materials, as well as protection against vermin and predators. For tropical species, heated indoor quarters are often provided for the winter. Aviaries are maintained privately as well as for public exhibit, research, and the breeding of wild birds. The construction of aviaries for exhibition, known since early Roman times, was spurred by the collection of unusual bird specimens by 15th-century explorers and the introduction of the canary into Europe. Aviaries are now found chiefly in public gardens, on private estates, and in many zoological parks. Among the aviaries in the United States are the Parrot Jungle, Miami, the Tracy Aviary, Salt Lake City, and the World of Birds, New York Zoological Park, New York City. Wild birds may be observed in their natural habitat in sanctuaries and on wildlife refuges.

aviation, operation of heavier-than-air aircraft and related activities. Aviation can be conveniently divided into military aviation, air transport, and general aviation. Military aviation includes all aviation activity by the armed services, such as combat, reconnaissance, and military air transport. Air transport consists mainly of the operation of commercial airlines, which handle both freight and passengers. General aviation consists of agricultural, business, charter, instructional, and pleasure flying; it includes such activities as the operation of air taxis, as well as aerial surveying and mapping. The detailed observations, explanations, and drawings preserved in the notebooks of Leonardo da Vinci mark the beginning of scientific studies of FLIGHT. Leonardo's work in this field centered around studies of birds, with observations of bats and other flying creatures. Flight was first successfully accomplished (1783) in a lighter-than-air device (see BALLOON). A number of investigators contributed to an early understanding of the principles involved in achieving flight in heavier-than-air machines. Among them were the Englishman W. S. Henson, who patented (1842) a design for a machine that closely foreshadowed the modern monoplane, the Englishman John Stringfellow, who developed a model plane said to be the first power-driven machine to fly, and F. H. Wenham, who in England devised the first wind-tunnel experiments. Alphonse Penaud, in France, made successful flying models of airplanes and wrote on the theory of flight. Clement Ader, a French engineer, achieved flight (over a distance of about 150 ft/46 m in 1890 and about 300 yd/280 m in 1897) in

his power-driven monoplane fashioned after a bat. In 1894 a plane built in England by Sir Hiram S. Maxim, operated by steam engines and carrying a crew of three, rose into the air from the track on which it was being tested. In the United States, S. P. Langley, Octave Chanute, and Otto Lilienthal made notable contributions to the early development of the airplane. The first successful flight in a man-carrying airplane powered by a motor was near Kitty Hawk, N.C., on Dec. 17, 1903, by Orville Wright, later on the same day his brother Wilbur bettered the length of flying time. Glenn H. Curtiss made improvements in the design of airplanes and engines and constructed the first successful flying boat or seaplane (1911-12). Stimulated by awards of trophies and prizes of money, aviators demonstrated, during the early 1900s, the feasibility of air travel to various parts of the world. World War I provided additional motivation for aviation research and development (see AIR FORCES and AIR POWER). During the first decade after the war, progress in air transport in Europe far outstripped that in the United States, but later the United States forged ahead. The cessation of hostilities made available a large number of aircraft that could be bought cheaply. This surplus occasioned a great deal of aviation activity, barnstorming and stunt-flying were the order of the day. The result was a more airplane-conscious public. Private companies in America were permitted to contract for carrying AIRMAIL after 1925, they thus obtained funds for expansion. During the 1930s aviation continued to expand. Technological improvements in wind-tunnel testing, engine and airframe design, and maintenance equipment combined to provide faster, larger, and more durable airplanes. The transportation of passengers became profitable, and routes were extended to include several foreign countries. Transpacific airmail service, begun by the Pan American Airways (later Pan American World Airways) system in 1934, was followed by the first transoceanic aviation service for passengers, on the *China Clipper*, from San Francisco to Manila (to Hong Kong in 1937). In 1939 the first transatlantic service to carry both mail and passengers was inaugurated. World War II interrupted much commercial air service, but with the cessation of the war air transportation was gradually resumed until air routes penetrated to all parts of the globe. The late 1940s saw the development of JET PROPULSION and a corresponding major change in aviation development. In the United States, design and construction of jet aircraft was speeded up by the Korean War, during which a majority of combat missions were flown by jet aircraft. The application of jet propulsion to commercial air transportation began in 1952 when British Overseas Airways Company opened the world's first regular jet passenger service with a flight from London to Johannesburg. Despite the fact that this service was short-lived, several major airlines began to show interest in commercial jet aircraft and today virtually all long-distance commercial air routes are flown by jet-powered aircraft. While jet propulsion has been a boon to the aviation industries it has created some major problems. The jet plane uses more fuel than conventional aircraft and requires longer runways, and its speed makes necessary more durable construction materials and creates special problems of air-traffic control. In addition, the takeoff and landing of jet aircraft over populated areas has created locally dangerous levels of noise POLLUTION. See AIR NAVIGATION, AIRPLANE, AIRSHIP, AIR, LAW OF THE. See Antoine de Saint Exupéry, *Wind, Sand, and Stars* (tr. 1939), J. L. Naylor, *Aviation: Its Technical Development* (1965), J. W. Benkert, *Introduction to Aviation Science* (1971), N. D. van Sickle, ed., *Modern Airman-ship* (1971), Enzo Angelucci, *Airplanes from the Dawn of Flight to the Present Day* (1973), J. W. R. Taylor and Kenneth Munson, *History of Aviation* (1973).

aviation medicine, scientific study of the biological effects of aviation, especially on human beings. Although aviation medicine is concerned with such problems as the spread of diseases by persons traveling by air and the harmful effects of noise and air pollution, its principal concern is with stresses applied to the passengers or crew of aircraft in flight. These stresses can include exposure to extreme temperatures, large inertial forces occurring when an aircraft undergoes acceleration, oxygen deprivation, and air sickness, as well as pilot fatigue and psychological disturbances. As the biological problems of space flight exceed considerably those of atmospheric flight, aviation medicine has become a special branch of SPACE MEDICINE, the latter study having largely absorbed the former.

Avicenna: see IBN GABIROL, SOLOMON BEN JUDAH

Avicenna (āvisēn'a), Arabic *Ibn Sina*, 980-1037, Islamic philosopher and physician, of Persian origin, b. near Bukhara. He was the most renowned philosopher of medieval Islam and the most influential name in medicine from 1100 to 1500. His medical masterpiece was the *Canon of Medicine*. Avicenna's interpretation of Aristotle followed to some extent that of the Neoplatonists. He saw God as emanating the universe from himself in a series of triads formed of mind, soul, and body. This process terminated in the Aristotelian "active intellect," which governs directly all earthly regions and transmits to all things their appropriate forms. Man's soul is also derived from it and is immortal. He was not an absolute pantheist as he believed matter to exist independently of God. Avicenna fixed the classification of sciences used in the medieval schools of Europe. See S. M. Afnan, *Avicenna, His Life and Works* (1958), Henry Corbin, *Avicenna and the Visionary Recital* (tr. 1960), Parviz Morewedge, *The Metaphysics of Avicenna* (1973).

Avignon (avēnyōn'), city (1968 pop. 88,958), capital of Vaucluse dept., SE France, on the Rhône River. It is a farm market with a wine trade and a great variety of manufactures. Located in (but never a part of) the Comtat Venaissin, it was the papal see during the Babylonian captivity, from 1309 to 1378 (see PAPACY), and the residence of several antipopes from 1378 to 1408 (see SCHISM, GREAT). Pope Clement VI bought (1348) full title to Avignon from the countess of Provence. After the Great Schism, Avignon was nominally ruled by papal legates, but the citizens actually governed themselves. The city became an archiepiscopal see in 1475. In 1791, after a plebiscite, it was incorporated into France. One of the loveliest of French cities, Avignon is surrounded by ramparts (12th and 14th cent.) and has many old churches. The beautiful Gothic papal palace was built (14th cent.) atop a hill to serve as residence, fortress, and church. A fragment of a 12th-cent. bridge across the Rhône remains. Avignon was celebrated by Petrarch, who resided at the court of Clement VI.

Ávila, Gil González de: see GONZÁLEZ DE ÁVILA

Ávila (a'vêla), town (1970 pop. 30,983), capital of Ávila prov., central Spain, in Old Castile, on the upper Adaja River. It attracts many tourists. One of the great religious centers of Spain, Ávila has preserved much medieval architecture. Up against its turreted wall (built 11th cent.) is the imposing Cathedral of San Salvador. The Basílica of San Vicente is one of the finest Romanesque buildings in Spain. In the convent of Encarnación lived St. Theresa, who was born at Ávila.

Ávila Camacho, Manuel (manwél' a'vêla kama'chō), 1897-1955, president of Mexico (1940-46). As a young man, Ávila Camacho joined the revolutionary forces. Later he became brigadier general. Under Lázaro Cárdenas he became (1938) minister of national defense. As president he followed a middle-of-the-road policy based on the agricultural, industrial, and educational reforms begun by Cárdenas. During World War II, he cooperated with the United States in programs of hemisphere defense, reciprocal trade, and agricultural labor exchange and sent (1945) a token Mexican air squadron to fight in the Pacific.

Avilés (avēlās'), town (1970 pop. 81,710), Oviedo prov., NW Spain, in Asturias, on the Bay of Biscay. Coal is exported, and there are metalworks and textile mills.

Avim (ā'vīm), unidentified town of Benjamin. Joshua 18:23.

Avims (ā'vīmz), the same as AVITES 1.

Avites (ā'vīts) 1. People of SW Palestine, probably assimilated by the Philistines. Joshua 13:3. Avims. Deut. 2:23. 2. People of AVA.

Avith (ā'vīth), city of unknown site, E of the Dead Sea. Gen. 36:35, 1 Chron. 1:46.

Avitus (āvītās), d. 456?, Roman emperor of the West (455-56). He was proclaimed emperor in Gaul with the support of the Visigoths but was deposed by RICIMER. He was elected bishop of Placentia but died soon afterward.

Aviz (avēzh'), village, Portalegre dist., central Portugal, in Alentejo. The Castilian order of the Knights of Calatrava assisted in driving the Moors from Portugal and in 1166 settled at EVORA. Alfonso II granted (1211) them Aviz, and this branch of the order became separate and was known as the Order of Aviz, a strictly Portuguese organization. The knights played an important part in Portuguese history. After the death of Ferdinand I in 1383, his illegitimate brother, John, who was master of the Order of Aviz, led a revolution to prevent the crown from going to Beatriz of Castile. He himself became king as John I. Thus the house of Aviz was established on the throne. It was the most distinguished of Portuguese dynasties, reigning until 1580, when Portugal passed for a time under Spanish rule (see PORTUGAL). Aviz is sometimes spelled Avis.

Avoca or Ovoca (both āvō'kə), river, c. 15 mi (24 km) long, formed by the union of the Avonmore and Avonbeg rivers, in Co. Wicklow, E. Republic of Ireland. It flows SE to the Irish Sea at Arklow. The river is celebrated by Thomas Moore's poem "Meeting of the Waters."

avocado (ā'vəka'do, āv'-), tropical American broad-leaved evergreen tree of the genus *Persea* of the family Lauraceae (LAUREL family). The fruit, called avocado, alligator pear, or, in Spanish, aguacate, has a high oil content. It is eaten fresh, chiefly in salads. The avocado was cultivated by the Aztecs. Avocados are classified in the division MAGNOLIOPHYTES, class Magnoliopsida, order Magnoliales, family Lauraceae.

avocet (āv'əsēt), common name for a long-legged wading bird about 15 to 18 in. (37 S.-45 cm) long, related to the snipe and belonging to the same family as the stilt. The American avocet, *Homantopus mexicanus*, and the Australian avocet have black and white bodies and brown heads, the African and Eurasian species are black and white and are strikingly visible at distances. Avocets, like stilts, are wetland inhabitants. By sweeping their long, thin, upwardly curved bills through shallow water and mud, they capture small water animals, such as crustaceans, mollusks, amphibians, fishes, and insects; other insects are caught on the wing. Avocets have shrill calls, but also have a soft flute-like song. They breed gregariously. The female lays from three to five eggs per clutch in a shallow depression in the ground, which may be lined with small stones and grass. Avocets are classified in the phylum CHORDATA, subphylum Vertebrata, class Aves, order Charadriiformes, family Recurvirostridae.

Avogadro, Amadeo, conte di Quaregna (amadā'ō kōn'tā dē kwārā'nya avōga'drō), 1776-1856, Italian physicist, b. Turin. He became professor of physics at the Univ. of Turin in 1820. In 1811 he advanced the hypothesis, since known as Avogadro's law, that equal volumes of gases under identical conditions of pressure and temperature contain the same number of molecules. Since then, through the work of other physicists, the number of molecules in the gram molecular volume has been determined and found to be the same for all gases. This number (6.02 × 10²³) has been called AVOGADRO'S NUMBER. Avogadro's hypothesis, though not accepted for some fifty years after its introduction, is now one of the fundamental concepts of the atomic theory of matter.

Avogadro's number [for Amedeo Avogadro], number of particles contained in one MOLE of any substance, it is equal to 602,252,000,000,000,000,000, or in scientific notation, 6.02252 × 10²³. For example, 12.011 grams of carbon (one mole of carbon) contains 6.02252 × 10²³ carbon atoms, and 180.16 grams of glucose, C₆H₁₂O₆, contains 6.02252 × 10²³ molecules of glucose. Avogadro's number is determined by calculating the spacing of the atoms in a crystal line solid through X-ray methods and combining this data with the measured volume of one mole of the solid to obtain the number of molecules per molar volume.

avoirdupois weights (āv'ərdəpōiz') see ENGLISH UNITS OF MEASUREMENT.

Avon, 1st earl of: see EDEN, SIR ANTHONY.

Avon, nonmetropolitan county (1972 est. pop. 902,000), SW England, created under the Local Government Act of 1972 (effective 1974). It is composed of the county boroughs of BATH and BRISTOL and parts of the former counties of Gloucestershire and Somerset.

Avon (ā'vən, āv'ən) [Celtic, = river], name of several rivers in England. 1. Also called Bristol Avon or Lower Avon, rising in SW England at Tetbury, Gloucestershire, and flowing 75 mi (121 km) E, S, and then NW through Bath and Bristol to the Severn River at Avonmouth. It is navigable for large vessels to Bristol, an important port. 2. Also called East Avon, rising at Devizes, Wiltshire, S. England, and flowing 48 mi (77 km) S past Salisbury to the English Channel at Christchurch. It is navigable for small craft below Salisbury. 3. Also called Upper Avon, the most famous of the Avon rivers, sometimes known as Shakespeare's Avon. It rises near Naseby, Northamp-

tonshire, S central England, and flows 96 mi (154 km) SW to the Severn River near Tewkesbury, passing Rugby, Warwick, and Stratford-upon-Avon

Avon Lake, city (1970 pop 12,261), Lorain co., NE Ohio, on Lake Erie, inc 1917 It is chiefly a residential suburb of the Cleveland-NE Ohio industrial area The city has an electric power plant and factories that make plastics and aluminum castings Several beaches are there

Avranches (āv'rāNsh'), town (1968 pop 11,102), Manche dept., NW France, in Normandy, on the English Channel Because of its proximity to the rocky island of MONT-SAINT-MICHEL, Avranches has a large tourist trade A Roman town, it became an intellectual center in the early Middle Ages, Lanfranc taught there It was devastated in the Hundred Years War, the Wars of Religion, and World War II

Awaji-shima (āwā'jē-shē'mā), island, 32 mi (52 km) long and from 3 to 17 mi (4.8-27 km) wide, Hyogo prefecture, Japan, in the Inland Sea Sumoto, on Osaka Bay, is the chief city and port A relatively flat, fertile island, it produces grain and flowers and has commercial fisheries It was to Awaji-shima that the Empress Shotoku banished (764) the Emperor Junnin

Awami League, political organization in Pakistan and Bangladesh It was founded in 1949 as an opposition party in Pakistan and had a moderately socialist ideology The Awami [people's] League, with co-founder Sheikh MUJIBUR RAHMAN as its leader from 1953, called in 1966 for a federation of East and West Pakistan, an arrangement that would have given much greater autonomy to East Pakistan The league's candidates won a majority in the 1970 elections, but the central government in West Pakistan banned the league after war between East and West Pakistan erupted in early 1971 When Bangladesh (formerly East Pakistan) won its independence in late 1971, the league was the nation's dominant political force

Awe, Loch (lōkh ō), lake, 25 mi (40 km) long, Argyllshire, W Scotland, 118 ft (36 m) above sea level The hydroelectric power facility at Cruachan (completed 1967) has a 400,000-kw capacity

awl: see DRILL

Awolowo, Obafemi (ōbāfā'mē āwōlō'wō), 1909-, Nigerian statesman, a Yoruba chief, commonly known as "Awo" His first political activity (1940) was in the Nigerian Youth Movement, and he was one of the founders (1943) of the Nigerian Trades Union Congress In 1950 he founded a new political party, the Action Group Elected (1959) to the house of representatives of Nigeria, he became leader of the opposition Awolowo and other Action Group officials were placed (1962) under restriction but he later regained influence and became chancellor of the Univ of Ife and commissioner of finance

Axel: see ABSALON

Axel Heiberg Island (āk'sal hīb'arg), 13,583 sq mi (35,180 sq km), in the Arctic Ocean, N Northwest Territories, Canada, W of Ellesmere Island It was named by the Norwegian explorer Otto Sverdrup (who explored it 1898-1902) for one of his patrons The island's plateau surface (3,000-5,000 ft/915-1,830 m high) is deeply indented by fjords A McGill University expedition has carried out glaciological studies there since 1959

axiom, in mathematics and logic, general statement accepted without PROOF as the basis for logically deducing other statements (theorems) Examples of axioms used widely in mathematics are those related to equality (e.g., "Two things equal to the same thing are equal to each other," "If equals are added to equals, the sums are equal") and those related to operations (e.g., the ASSOCIATIVE LAW and the COMMUTATIVE LAW) A postulate, like an axiom, is a statement that is accepted without proof, however, it deals with specific subject matter (e.g., properties of geometrical figures) and thus is not so general as an axiom It is sometimes said that an axiom or postulate is a "self-evident" statement, but the truth of the statement need not be evident and may in some cases even seem to contradict common sense Moreover, a statement may be an axiom or postulate in one deductive system and may instead be derived from other statements in another system A set of axioms on which a system is based is usually assumed to be independent, i.e., no one of its members can be deduced from any combination of the others (Historically, the development of non-Euclidean geometry grew out of attempts to prove or disprove the independence of the parallel postulate of Euclid) The axioms should also be consistent, i.e., it should not be possible to deduce contradic-

tory statements from them Completeness is another property sometimes mentioned in connection with a set of axioms, if the set is complete, then any true statement within the system described by the axioms may be deduced from them

Axis, coalition of countries headed by Germany, Italy, and Japan, 1936-45 (see WORLD WAR II) The expression "Rome-Berlin axis" originated in Oct., 1936, with an accord reached by HITLER and MUSSOLINI The Axis was solidified by an Italo-German alliance in May, 1939 This was extended (Sept., 1940) by a military alliance among Germany, Italy, and Japan—the so-called Berlin Pact, to which Hungary, Rumania, Bulgaria, Slovakia, and Croatia adhered later The related Anti-Comintern Pact (see COMINTERN), originally concluded between Germany and Japan in 1936, later had as adherents, besides the Berlin Pact nations, Spain, Denmark, Finland, and the puppet governments of Manchukuo and Nanking

axolotl (āk'sālōt'əl), a SALAMANDER, *Siredon mexicanum*, found in certain lakes in the region of Mexico City, which reaches reproductive maturity without losing its larval characteristics This phenomenon is called neoteny, in salamanders it is apparently caused by certain environmental conditions, particularly a low level of iodine in the water, which affect the functioning of the thyroid gland Axolotls are permanently aquatic, never undergoing the metamorphosis to a terrestrial form characteristic of amphibians They grow larger than ordinary larval salamanders and develop sexually, but they retain external gills and a well-developed tail The axolotl was not recognized as a salamander until 1865, when several specimens at the Jardin des Plantes in Paris suddenly underwent metamorphosis After some experimentation it was discovered that when their pools were dried up most of the animals changed into the adult form Axolotls will also mature normally if fed thyroid gland extract The related North American tiger salamander, *Amphistoma tigrinum*, often exhibits neoteny in the Rocky Mts., where the iodine content of the water is low The axolotl has a broad head and bushy gills, its skin is a black-speckled dark brown It may grow as long as 13 in (33 cm) In Mexico City, axolotls are sometimes cooked and eaten as delicacies They are classified in the phylum CHORDATA, subphylum Vertebrata, class Amphibia, order Urodela, family Ambystomidae

axon: see NERVOUS SYSTEM, SYNAPSE

Axum, Ethiopia see AKSUM

Ayabe (āyā'bā), city (1970 pop 44,983), Kyoto prefecture, W central Honshu, Japan, on the Yura River It is an agricultural and communications center where raw silk and silk fabrics are manufactured

Ayacucho (āyākōō'chō), city (1969 est pop 27,900), capital of Ayacucho dept., S central Peru It is a commercial center in a rich mining region that produces gold, silver, and nickel Tourism is also important, and there is some agricultural production On the plains of Ayacucho, near the city, Antonio Jose de SUCRE crushingly defeated (Dec 9, 1824) Spanish forces under Viceroy José de la SERRA The battle not only secured Peruvian independence from Spain but also marked the triumph of the revolutionary forces in all South America Known as Huamanga since the 16th cent., the city was renamed after the battle It has a university and many fine examples of Spanish colonial architecture

Ayala, Pedro López de: see LÓPEZ DE AYALA

Ayala, Ramón Pérez de: see PÉREZ DE AYALA

Aydın (īdün'), city (1970 pop 50,551), capital of Aydın prov., W Turkey, on the Büyük Menderes River It is the trade center for a farm region where olives, figs, cotton, and tobacco are grown The city was destroyed by fire in 1922 and has been completely rebuilt Nearby are the ruins of the ancient Greek city of Tralles

aye-aye (ī'ī), name for an aberrant primate, *Daubentonia madagascariensis*, related to the LEMURS but distinguished by its specialized teeth and fingers A nocturnal, arboreal animal, it is found in dense bamboo forests in two isolated regions of Madagascar The aye-aye is about the size of a house cat It has silver and black fur with reddish underparts, a long, bushy tail, and a small, round head with large eyes and rounded, naked ears Its fingers and toes are extremely long and end in claws, the thumb and big toes are opposable The aye-aye uses its exceedingly slender third finger to dig into bark for wood-boring insect larvae, which it detects by means of its acute hearing It feeds on larvae, other small animals, eggs, and fruit, as well as on bamboo and sugarcane Its teeth are adapted for

gnawing and it was formerly thought to be a rodent because of its large, chisel-shaped, continuously growing incisors The aye-aye has no fear of humans and will strike at them if annoyed It has been the object of superstitious fear It is classified in the phylum CHORDATA, subphylum Vertebrata, class Mammalia, order Primates, family Daubentonidae

Ayer, Sir Alfred Jules, 1910-, British philosopher, b London, grad Oxford, 1932 From 1933 to 1944 he was lecturer and research fellow at Oxford's Christ Church College and then was fellow (1944-45) and dean (1945-46) of Wadham College From 1946 to 1959 Ayer was Grote professor of the philosophy of mind and logic at the Univ of London, and in 1959 he became Wykeham professor of logic at Oxford His extremely influential *Language, Truth, and Logic* (1936) brought LOGICAL POSITIVISM to the attention of British and American philosophers Among his other works are *The Foundations of Empirical Knowledge* (1940), *Philosophical Essays* (1954), *The Problem of Knowledge* (1956), and *The Concept of a Person* (1963) He was knighted in 1970 See studies by F M Bak (1970) and Suresh Chandra (1970)

Ayesha: see AISHA

Aylesbury (ālz'barē), city (1971 pop 41,288), Buckinghamshire, central England It is an agricultural market for the upper Thames valley and is famous for its ducks There are printing works and other light industries, developed under a government program undertaken to disperse London's population and industry to surrounding counties The radical John Wilkes represented Aylesbury in Parliament during the late 18th cent

Ayllón, Lucas Vázquez de (lōō'kās vās'kāth dā īlyōn'), c 1475-1526, Spanish explorer He emigrated in 1502 to Santo Domingo, where he became a public official In 1521, Francisco Gordillo, sent by Ayllón to explore northward, seems to have landed in either Florida or South Carolina Ayllón secured title and permission to colonize In 1526 he sailed with three ships and about 500 settlers, landing probably in North Carolina, though some authorities claim it was on the site of the later Jamestown, Va Fever and other hardships plagued the settlers, and when Ayllón died of fever, the survivors returned to Santo Domingo

Aylmer, John (āl'mər), 1521-94, bishop of London His name is also spelled Elmer or Elmer He was briefly chaplain to the duke of Suffolk and tutor to his daughter, Lady Jane Grey In 1553 he was deprived of his church preferments for opposing the doctrine of transubstantiation, and he fled to Switzerland There he aided John Foxe in making a Latin translation of the *Book of Martyrs* and wrote *An Harborowe for Faithfull and Trewe Subjects* (1559) in answer to a tract by John Knox Returning to England after the accession of Elizabeth I, he rose in the Church of England to be (1577) bishop of London Though he was a man of great learning, his harsh treatment of his foes made him generally disliked

Aymara (īmārā'), South American Indians inhabiting the Lake Titicaca basin in Peru and Bolivia They are believed to have been the originators of the great culture represented by the ruins of TIAHUANACO Although subjugated by the INCA in the 15th cent after a long struggle, the Aymara continue to dominate the region The Aymara languages make up a separate unit; they are spoken in Peru and Bolivia in the Titicaca region The Aymara, conquered (1538) by Hernando and Gonzalo Pizarro, retained their pastoral and agricultural civilization In general, social organization was, and still is, based on the patrilineal family unit Contemporary Aymara and the related Quechua peasant culture is a blend of aboriginal, Spanish colonial, and modern elements See Harold Osborne, *Indians of the Andes, Aymaras and Quechuas* (1952), Julian Steward, ed., *Handbook of South American Indians*, Vol II (1963), Hans and Judith-Maria Buechler, *The Bolivian Aymara* (1971)

Aymé, Marcel (mārsēl' āmā'), 1902-67, French writer. Aymé's *La Table aux crevés* (1929), a story of peasant life, typifies the satirical tone of his works *La Jument verte* (1933, tr *The Green Mare*, 1955) and *Les Tiroirs de l'inconnu* (1960, tr *The Conscience of Love*, 1962) contain elements of fantasy and biting commentary on modern values Aymé wrote several superb volumes of tales for children, including *Les Contes du chat perché* (1934, tr *The Wonderful Farm*, 1951) Among his plays are *Clerambard* (1949, tr 1952) and *La Tête des autres* (1952) Two collections of his short stories are *Across Paris* (tr 1958) and *The Proverb* (tr 1961) See study by D R Brodin (1968)

Aymer of Valence (ā'mər, valēns', vālāns'), d 1260, bishop of Winchester, son of Isabella (widow of

King John of England) and Hugh X, count of La Marche. He was thus half brother of King Henry III of England. He is sometimes called Æthelmar. With his French brothers he went to England in 1247. Henry forced the chapter of Winchester to elect Aymer bishop in 1250, but his youth and ignorance, combined with his disinclination to assume the responsibilities along with the revenues of office, delayed his consecration. He was one of the king's 12 delegates in formulating the PROVISIONS OF OXFORD. However, he refused to swear to them, and hostility toward him and his brothers was an important factor in the BARONS' WAR. Later he and his brothers had to flee to the Continent. But although the Winchester chapter had chosen a new candidate, Aymer was consecrated by the pope in 1260 and was on his way back to England when he died in Paris.

Aymer of Valence, earl of Pembroke: see PEMBROKE, AYMER DE VALENCE, EARL OF

Ayolas, Juan de (hwan dā ayō'las), d. 1537?, Spanish conquistador, explorer of the Rio de la Plata country. He accompanied Pedro de MENDOZA on his expedition of 1535-36. Sent to look for provisions, he sailed up the Parana River and founded a fort called Corpus Christi. Later, leaving Domingo Martinez de Irala at a port called Candelaria, he went up the Paraguay River in search of a route to Peru. He fought the Guarani Indians, possibly at the site of Asunción, crossed the Chaco plain to the mountains, and is said to have been killed by the Indians on his return to Candelaria.

Ayr (ār), burgh (1971 pop 47,884), county town of Ayrshire, SW Scotland, at the mouth of the Ayr River on the Firth of Clyde. Ayr is a sea resort and a port for fishing and the export of coal. It manufactures farm and mining machinery, carpets, asphalt, and shoes. Oliver CROMWELL built a 12-acre (5-hectare) fort around St. John's Church when he garrisoned Ayr in 1652. In the heart of the Robert BURNS country, Ayr has various Burns memorials, as well as associations with Sir William WALLACE and Robert I of Scotland. In 1975, Ayr became part of the new Strathclyde region.

Ayrshire (ār'shīr, -shər) or **Ayr**, county (1971 pop 361,074, 1,132 sq mi (2,932 sq km), SW Scotland, on the Firth of Clyde. Ayr is the county town. N Ayrshire, lying in the midland industrial belt, has iron and oil deposits and varied industries. There is a nuclear power station at Hunterston. Farming is pursued in central and S Ayrshire, where potatoes and the famous Ayrshire cattle are raised. Ayrshire belonged to the kingdoms of STRATHCLYDE and NORTHUMBRIA and was the scene of the early exploits of the Scots leaders Sir William WALLACE and ROBERT I. The poet Robert Burns was born in Alloway, now part of Ayr. Under the Local Government Act of 1973, Ayrshire became (1975) part of the Strathclyde region.

Ayrshire cattle (ār'shēr, -shər), breed of dairy cattle originated in Scotland in the latter part of the 18th cent.; they are of medium size and vary in body color from almost pure white to nearly solid cherry-red or brown, as well as any combination of these colors. Ayrshires have excellent grazing qualities, are good, uniform producers of milk, and rank high among the dairy breeds as veal and beef producers. They are raised in Canada, the NE United States, Europe, South Africa, Australia, New Zealand, and Central America. First imported in 1837, there are now an estimated 150,000 registered Ayrshire cattle in the United States.

Ayton or Aytoun, Sir Robert (both ā'tən), 1570-1638, English poet and courtier. He was private secretary to the queens of James I and Charles I, besides holding other posts of honor. He wrote poems in French, Greek, and Latin, of which only the latter are preserved. His verse in English is marked by courtly elegance and delicacy.

Aytoun, William Edmonstone (ā'tōn), 1813-65, Scottish poet. He was (1845-64) professor of belles-lettres at Edinburgh Univ. The *Bon Gaultier Ballads* (written with Sir Theodore Martin, 1845) parodied poems by Macaulay, Tennyson, and others. His best-known poem, *Firmilian* (1854), burlesqued the chaotic, bombastic poetry being written in his day.

Ayub Khan, Muhammad (māhām'īd ā'yōōb kan), 1907-74, military leader and president (1958-69) of Pakistan. He was commissioned in the British Indian army in 1928 and saw active service as a battalion commander in World War II. After 1947, when the state of Pakistan was created, he assumed command of military forces in East Pakistan (now Bangladesh), and in 1951 he became commander in chief of the Pakistan army. He served (1954-56) as defense minister. In 1958, after a military coup d'état and the

abrogation of the constitution, Ayub Khan became president; he was confirmed in office by a referendum (Feb., 1960). Ayub Khan launched a vigorous program of land reform and economic development. He also inaugurated a system of what he called "basic democracies," tiers of local government councils that also served as electoral colleges. Martial law was lifted in 1962, and a new constitution of that year gave the executive enormous powers. Ayub Khan was reelected in 1965, defeating Fatimah Jinnah, daughter of the founder of Pakistan. In the same year he led the nation in war with India, but the conflict was ended by the Tashkent Declaration of Jan., 1966. Despite considerable economic growth, continuing economic and social inequalities, the disadvantaged position of East Pakistan, and limitation of civil liberties provoked increasing discontent with Ayub Khan's regime. Early in 1969, Ayub Khan apparently bowed to the pressure of opposition in announcing that he would not seek reelection in 1970. Unrest continued, however, and in March, 1969, he resigned power to a martial law government headed by Gen. Muhammad Yahya Khan. See his *Speeches and Statements* (8 vol., 1959-66) and *Friends, Not Masters: A Political Autobiography* (1967), study by Lawrence Ziring (1971).

Ayuthia: see AYUTTHAYA, Thailand

Ayutla (ayōōt'la), town (1970 pop 23,668), Guerrero state, S Mexico. Its full name is Ayutla de los Libres [Ayutla of the free]. It is the commercial center for an agricultural, cattle-raising, and lumbering area. The Plan of Ayutla, drawn up in 1854, was a reform program directed toward removing the dictator Santa Anna and convening a constituent assembly to frame a federal constitution. Preparing the way for the War of Reform (1856-61), the plan and the subsequent Revolution of Ayutla (which exiled Santa Anna and established a liberal government) was initially supported by Juan Álvarez, Ignacio Comonfort, Miguel and Sebastian Lerdo de Tejada, and Benito Juárez.

Ayutthaya (ayōōt'ā) or **Phra Nakhon Si Ayutthaya** (pra nakōn' sē), city (1965 est. pop 40,000), capital of Ayutthaya prov., S central Thailand, on the Chao Phraya River. It is the trade center for a prosperous rice-growing region. Ayutthaya was the capital of a Thai kingdom founded c 1350 and was located on the site of a Khmer settlement. Destroyed by the Burmese in 1559, it was rebuilt by the Siamese in the late 16th cent. but was again devastated by the Burmese in 1767, after which the capital was moved to Thon Buri and then to Bangkok. Ayutthaya has some of the few monuments of early Siamese civilization, notably the royal palace (16th cent.) and numerous temples and pagodas.

Azal (ā'zāl), name of uncertain meaning in an apocalyptic passage. Zech 14:5

azalea (azāl'yə) [Gr., = dry], any species of the genus *Rhododendron*, North American and Asian shrubs of the family Ericaceae (HEATH family) that are distinguished by the usually deciduous leaves. Azaleas are handsome shrubs with large clusters of pink, red, orange, yellow, purple, or white flowers. The better-known native American azaleas, often cultivated, include the flame azalea (*R. calendulacea*) of the Appalachians, the pinxter flower (*R. nudiflora*) and the fragrant white azalea, or swamp honeysuckle (*R. viscosa*), of the E United States, and the Western azalea (*R. occidentalis*) of California and Oregon. Most azaleas grow in damp, acid soils of hills or mountains. The rose-purple *R. canadense*, a rare species with an unusually northerly range (from Pennsylvania to Newfoundland) is the rhodora immortalized by Emerson. Many of the brilliantly flowered garden varieties are native to China and Japan, where the genus is most abundantly represented. The popular Ghent azaleas are hybrids. Dwarf azaleas are grown by florists as pot plants. Azaleas are classified in the division MAGNOLIOPHYTES, class Magnoliopsida, order Ericales, family Ericaceae.

Azaliah (āzāl'ā), father of SHAPHAN. 1 Kings 22:3, 2 Chron 34:8

Azaña, Manuel (manwēl' athā'nyā), 1880-1940, Spanish statesman. An author and critic, he gained prominence as president (1930) of the Madrid Ateneo, a literary and political club, and came to the fore as a revolutionary political leader in 1931. He was minister of war in the first republican cabinet, and premier (1931-33) under President Alcalá Zamora. While premier, he pressed for social, military, and educational reforms. After the victory of the Popular Front in the Feb., 1936, elections, he again became premier, and in May, 1936, after the ousting of Alcalá Zamora, he was elected president. He headed the Loyalist government through the civil war, in which

he did not, however, play an important role. In Feb., 1939, he fled to France just before organized Loyalist resistance in Spain collapsed.

Azaniah (āz'ān'ī), Levite. Neh 10:9

Azanah, Miguel José de (mēgēl' hōsā' dā āthan'tha), 1746-1826, Spanish general and colonial administrator. After brief service in the cabinet of Charles IV, he was sent to the colonies and became viceroy of Mexico (1798-1800). He returned to Spain, served under Joseph Bonaparte, and fled to France after the fall of the Bonaparte regime.

Azarel (āzār'āēl), musician. Neh 12:36

Azareel (āzār'ēēl). 1 One of David's warriors. 1 Chron 12:6. 2 Musician. 1 Chron 25:18. Uzziel. 1 Chron 25:4. 3 Prince. 1 Chron 27:22. 4 Jew married to a foreign wife. Ezra 10:41. 5 Priest. Neh 11:13

Azariah (āzār'ī), common name in ancient Israel, especially among the priests. The following are not necessarily all different persons. 1 Chief officer under Solomon. 1 Kings 4:2, 1 Chron 6:9. 2 Chief officer under Solomon. 1 Kings 4:5. 3,4 Judahites. 1 Chron 2:8,38,39. 5 Kohathite Levite. 1 Chron 6:36. Uziah. 1 Chron 6:24. 6 High priest. 1 Chron 6:10,11. 7 Father of SERAIAH. 2 Chron 6:13,14. 8 Prophet who stirred King Asa to reform. 2 Chron 15:9. King of Judah. see UZZIAH. 10 Same as AHAZI. AH. 2. 11 High priest who withstood King Uziah. 2 Chron 26:17-20. 12 High priest under Hezekiah. 2 Chron 31:10-13. 13,14 Levites. 2 Chron 29:12. 15,16 Sons of King Jehoshaphat. 2 Chron 21:2. 17,18 Aides of Jehoiada in the conspiracy against Athaliah. 2 Chron 23:1. 19 Ephraimite leader. 2 Chron 28:12. 20 Worker on the wall of Jerusalem. Neh 3:23,24. 21 Same as SERAIAH. 7. 22 Interpreter of the law. Neh 8:7. 23 Sealer of the covenant. Neh 10:2. 24 Priest in postexilic Jerusalem. 1 Chron 9:11. Seraiah. Neh 11:11. 25 See JAAZANIAH. 26 One of the THREE HOLY CHILDREN. Azarias is the Greek form of his name.

azathioprine: see METABOLITE

Azay-le-Rideau (azā'-lā-rēdō'), village (1968 pop 2,755), Indre-et-Loire dept., N central France, in Touraine. It is the center of a wine-producing area and has a canning industry. Its famous Renaissance château (1518-29), set in a beautiful park on the Indre River, now houses a museum of Renaissance furniture and art.

Azaz (ā'zāz), descendant of Reuben. 1 Chron 5:8. **Azazel** (āzā'zēl, āz'āzēl), in the Bible, an obscure term of the ritual of the scapegoat. Lev 16:RSV. Azazel may be the name of the scapegoat or of a desert demon to whom the scapegoat was sent. The name was later applied to one of the fallen angels. KJV translates Azazel as "the scapegoat."

Azaziah (āz'āz'ī), 1 Musician. 1 Chron 15:21. 2 Ephraimite. 1 Chron 27:20. 3 Overseer of the Temple. 2 Chron 31:13. Azbuk (āz'bək), father of Nehemiah. Neh 3:16

Azbuk (āz'bək), father of Nehemiah. Neh 3:16

Azacapotzalco (askapōtsal'kō), city (1970 pop 545,513), S Mexico, in the Federal District. An important rail center, with railroad yards, it is the terminus of mail and cargo traffic. Cereals and beans are grown in the area. Azcapotzalco's cattle industry supplies the bulk of Mexico City's dairy products. Other industries include auto assembling, oil refining, and the manufacture of textiles, paper, and records. The city was a leading cultural center in the pre-Columbian period. During Mexico's War of Independence, it was the site (1821) of a major battle in which loyalist troops were forced to retreat by the revolutionary soldiers. Azcapotzalco is noted for its baroque colonial architecture and its 18th-century churches.

Azeglio, Massimo Taparelli, marchese d' (mas'sēmō taparēl'lē markā'zā dadzā'lyō), 1798-1866, Italian premier and author, b. Turin. He studied painting, then turned to literature and wrote two historical novels, *Ettore Fieramosca* (1833) and *Niccolo de Lapi* (1841). In 1845 he became a leader of the movement for national liberation. He urged a more unified policy but strongly opposed secret conspiracies and violent outbreaks. In his pamphlets he denounced the papal government and condemned Austria's ruthless repression of Italian liberals. He influenced King Charles Albert of Sardinia and fought (1848) against Austria, being wounded at Vicenza. In 1849 the new king, Victor Emmanuel II, made him premier, a post he held until 1852, when he was succeeded by the more radical Cavour. His autobiography throws much light on the Risorgimento.

Azekah (azē'ka), ancient city of Palestine, lying W of Jerusalem. Joshua 10:10,11, 1 Sam 17:1, 2 Chron 11:9, Neh 11:30, Jer 34:7

Azel (ā'zēl), descendant of Saul 1 Chron B 37,38, 9 43,44

Azem (ā'zēm), unidentified town of S Palestine Joshua 15 29, 19 3 Ezem 1 Chron 4 29

Azerbaijdzhan: see AZERBAIJAN SOVIET SOCIALIST REPUBLIC, USSR

Azerbaijan (ā'zēbījan', ā'zār-), region, c 41,160 sq mi (106,600 sq km), NW Iran, divided into the provinces of East Azerbaijan (1966 pop 2,596,439) and West Azerbaijan (1966 pop 1,087,182). The chief cities include TABRIZ (the capital of East Azerbaijan), REZAIYEH (the capital of West Azerbaijan), ARDEBIL, MARAGHEH, and KHOY. The region is bounded in the N by the Armenian and Azerbaijan Soviet Socialist Republics (from which it is separated by the Aras River) and in the W by Turkey and Iraq. Azerbaijan, which includes Lake Rezaieyeh, is mountainous, with deep valleys and fertile lowlands. Grains, fruits, cotton, and tobacco are grown, and wool is produced. The region has deposits of copper, lead, and iron. There is little modern industry. In ancient times Azerbaijan was dominated by the kings of Van and Urartu (in ARMENIA). By the 8th cent B C it had been settled by the Medes (see MEDIA), and it later formed the province of Media Minor in the Persian Empire. Azerbaijan is the traditional birthplace (7th cent B C) of Zoroaster, the religious teacher and prophet. After Alexander the Great conquered Persia, he appointed (328 B C) as governor the Persian general Atropates, who eventually established an independent dynasty. Later, the region, which came to be called Atropatene or Media Atropatene, was much disputed. In the 2d cent B C it was taken by the Parthian Mithradates I, and c 226 A D it was captured by the Sassanian Ardashir I. Shapur II enlarged Azerbaijan by adding territory in the north. Heraclius, the Byzantine emperor, briefly held the region in the 7th cent, just before the Arabs conquered it, and he converted most of its people to Islam and made it part of the caliphate. The Seljuk Turks dominated the region in the 11th and 12th cent, and the Mongols under Hulagu Khan established (13th cent) their capital at Maragheh. After being conquered by Tamerlane in the 14th cent, Tabriz became an important provincial capital of the Timurid empire. It was out of Ardebil that the Safavid dynasty arose (c 1500) to renew the state of Persia. There was fierce fighting between the Ottoman Empire and Persia for Azerbaijan. After brief Ottoman control, Abbas I, shah of Persia, regained control of the region in 1603, it remained entirely in the possession of the shahs until the northern part was ceded to Russia in the treaties of Gulistan (1813) and Turkmanchay (1828). The remainder was organized as a province of Persia, in 1938 the province was divided into two parts. In 1941, Soviet troops occupied Iranian Azerbaijan, they were withdrawn (May, 1946) after a Soviet-supported autonomous local government had been created. Iranian troops occupied the region in Nov, 1946, and the autonomous movement was suppressed. The majority of the people of Azerbaijan are Turkic-speaking Azers, or Azerbaijanis, who are Shiite Muslims. There are also some Armenians, Kurds, Jews, and Persians.

Azerbaijan Soviet Socialist Republic or Azerbaijdzhan (both ā'zārbījan', ā'zār-, Rus. azīrbījan'), constituent republic (1970 pop 5,111,000), 33,428 sq mi (86,579 sq km), SE European USSR, in Transcaucasia. BAKU is the capital, other major cities include KIROVABAD and SUMGAIT. Strategically situated at the USSR's gateway to SW Asia, Azerbaijan is bounded by Iran on the south, where the Aras (Araks) River divides it from Iranian Azerbaijan, by the Caspian Sea on the east, by the Dagestan Autonomous Republic on the north, and by the Armenian Republic on the west. The republic includes the Nakhichevan Autonomous Republic (separated from Azerbaijan proper by Armenia) and the Nagorno-Karabakh Autonomous Oblast. Azerbaijan occupies the western ranges of the Greater and Lesser Caucasus and the Kura River valley, which is the region's chief agricultural zone. Wheat, barley, corn, fruits, wine grapes, and potatoes are the leading food crops, and cotton, silk, and tobacco the foremost industrial crops. The subtropical Lenkoran lowland supports tea and rice. The Apsheron peninsula is one of the richest oil regions of the world. The republic's other mineral resources include natural gas, iron, copper, lead, zinc, limestone, pyrites, cobalt, and alunite. Widespread salt springs have enabled health resorts to flourish. Among the republic's chief manufactures are machinery, electrical equipment, building materials (especially cement), steel, aluminum, chemicals, and textiles. The old craft of carpet weaving is still practiced. The Azerbaijanis, a Turkic-speaking, Shiite

Muslim people of Persian culture, make up more than half the republic's population, Russians and Armenians are the largest minorities. The Azerbaijan SSR comprises the Transcaucasian or northern part of the historic region called AZERBAIJAN. Known to the ancients as Albania, the area was linked to the history of Armenia and Persia, particularly after its conquest (4th cent) by Shapur II. Overrun later by Mongols, it was divided after the fall (15th cent) of Tamerlane into several principalities (notably Shirvan). The territory of the present Azerbaijan SSR was acquired by Russia from Persia through the treaties of Gulistan (1813) and Turkamanchay (1828). Soon after the Bolshevik Revolution of 1917, Russian Azerbaijan joined Armenia and Georgia to form the anti-Bolshevik Transcaucasian Federation. After its dissolution (May, 1918), Azerbaijan proclaimed itself independent but was conquered by the Red Army in 1920 and made into a Soviet republic. In 1922, Azerbaijan joined the USSR as a member of the Transcaucasian Soviet Federated Republic. With the administrative reorganization of 1936, it became a separate republic. Immediately after World War II, Azerbaijan was used as a base for Communist rebels in Iranian Azerbaijan. The republic's educational institutions include Baku Univ and the Azerbaijan Academy of Sciences.

Azgad (āz'gād), family in the return to Palestine Ezra 2 12, B 12, Neh 7 17, 10 15

Aziel (āz'ēēl), in the Bible, shorter form of JAIZIEL.

Azikiwe, Benjamin Nnamdi (nam'dē azēk'wā), 1904-, Nigerian statesman, popularly known as Zik. He undertook (1925) advanced studies in the United States and eventually returned to Nigeria, where he founded a chain of newspapers and became one of the country's leading Ibo nationalists. He led a general strike in 1945 and later held a number of important posts, including the premiership (1954-59) of E Nigeria. Always a controversial figure, he was involved in financial and political scandals. During the 1959 elections he made an alliance with the National Peoples Congress, and, although the coalition won, he was appointed (1960) to the largely honorary office of governor general. In 1963 he became the first president of the republic of Nigeria, serving until his retirement in 1966.

Azilian: see MESOLITHIC PERIOD

azimuth (āz'əmāth), in astronomy, one coordinate in the HORIZON COORDINATE SYSTEM. It is the angular distance of a body measured westward along the celestial horizon from the observer's south point.

azine (āz'ēn), IUPAC name for PYRIDINE.

Aziza (āzī'zā), Jew who had a foreign wife Ezra 10 27

Azizia: see AL AZIZIYAH, Libya

Azmaveth (āzmā'vēth) 1 One of David's mighty men 2 Sam 23 31, 1 Chron 11 33 2 David's treasurer, perhaps the same as 1 1 Chron 27 25 3 Father of two of David's warriors 1 Chron 12 3 He may be the same as 1 or 2, or the name may refer to 5 4 Descendant of Saul 1 Chron 8 36, 9 42 5 Town, 5 Palestine Ezra 2 24, Neh 12 29 Beth-azmaveth Neh 7 28

Azmon (āz'mōn), town of 5 Palestine Num 34 4,5, Joshua 15 4

Aznoth-tabor (āz'nōth-tā'bār), place, on the boundary of Naphtali, probably N of Mt Tabor Joshua 19 34

Azor (āz'ōr), man in the Gospel genealogy Mat 1 13

Azores (āzōrz', āz'ōrz'), Port Açores [Port. =haws], islands (1970 est pop 336,100), 905 sq mi (2,344 sq km), in the Atlantic Ocean, c 900 mi (1,448 km) W of mainland Portugal. Administratively a part of Portugal, they are divided into three districts named after their capitals: Ponta Delgada (on São Miguel), Angra do Heroísmo (on Terceira), and Horta (on Fayal). The nine main islands are São Miguel (the largest) and Santa Maria in the southeast, Terceira, Pico, Fayal, São Jorge, and Graciosa in the center, and Flores and Corvo in the northwest. Ponta Delgada is the largest city. The fertile soil yields many crops and supports vineyards. The islands are also a resort area. The Azores may have been known to the ancients and were included on a map in 1351. Portuguese sailors reached them in 1427 or 1431, but colonization did not begin until 1445 under Diogo de Sevilha or Gonçalo Velho Cabral (who may have been there in 1431). The islands were used as a place of exile and were also the site of naval battles between the English and the Spanish. In the 19th cent they were used by supporters of Maria II against Dom Miguel. The United States maintains air bases on the islands.

Azorin: see MARTINEZ RUIZ JOSÉ

Azov (āzōf'), city (1970 pop 59,000), SE European USSR, a port on the Don River delta near the Sea of Azov. It is a rail junction and a fishing center and has fish-processing plants. Founded as the Greek colony of Tanais (3d cent B C), it was a trading center and fortress. It came under Kievan Russia in the 10th cent, was taken by the Cumans in the 11th cent, became a Genoese colony in the 13th cent, and passed to the Turks in 1471. The Don Cossacks held the city (1637-42), but were driven out by the Turks. Peter the Great won the city in 1696 and thus opened southern routes for Russia, he was forced to cede it back to Turkey in 1711. Russia took it again in 1736, but was forced by the Treaty of Belgrade to dismantle the fortress in 1739. Russia secured Azov definitively by the Treaty of Kuchuk-Kainarji in 1774.

Azov, Sea of, Gr *Maotris*, Lat *Palus Maeotis*, ancient Rus *Surozhskoye*, northern arm of the Black Sea, c 14,000 sq mi (36,300 sq km), 5 European USSR, in SE Ukraine. The shallow sea (maximum depth 50 ft/15 m) is connected with the Black Sea by the Kerch Strait. Its chief arms are the Gulf of Taganrog (in the northeast) and the Sivash Sea (in the west), which is nearly isolated from the Sea of Azov by Arabat Tongue, a narrow sandspit. The Don and Kuban rivers flow into the sea, supplying it with an abundance of fresh water but also depositing much silt that tends to make the sea more shallow. The Sea of Azov has important fisheries and accounts for a large portion of the Soviet freshwater catch. The major ports are Rostov-na-Donu, Taganrog, Zhdanov, Kerch, and Berdyansk. The sea's importance increased with the opening of the Volga-Don Canal, the Manych Canal connects the Sea of Azov with the Caspian Sea.

Azrael (āz'rāēl) [Heb. =help of God], in the Koran, angel of death, who severs the soul from the body. The name and the concept were borrowed from Judaism.

Azriel (āz'rēēl) 1 Manassite 1 Chron 5 24 2 Naphtalite 1 Chron 27 19 3 Father of SERIAH 9

Azrikam (āz'rīkām) 1 Man of the house of David 1 Chron 3 23 2 Descendant of Saul 1 Chron 8 38, 9 44 3 Levite 1 Chron 9 14, Neh 11 15 4 Chief of the royal household 2 Chron 28 7

Aztec (āz'tēk'), Indian people dominating central Mexico at the time of the Spanish conquest. Their language belonged to the Nahuatl subfamily of Uto-Aztecan languages. They arrived in the Valley of Mexico from the north toward the end of the 12th cent and until the founding of their capital, TENOCHTITLÁN (c 1325) were a poor, nomadic tribe absorbing the culture of nearby states. For the next century they maintained a precarious political autonomy while paying tribute to neighboring tribes, but by alliance, treachery, and conquest during the 15th and early 16th cent they became a powerful political and cultural group. To the north they established hegemony over the HUASTEC, to the south over the MIXTEC and ZAPOTEC and even ventured as far as Guatemala. Their subjugation of the people of Tlaxcala in the mountains to the east was bloody but only intermittent, and the Tlaxcala people later became allies of the Spanish against the Aztec. Only in the west, where the TARASCAN Indians severely defeated them, did the Aztec completely fail to conquer. By absorption of other cultural elements and by conquest the Aztec achieved a composite civilization, based on the heritage of TOLTEC and Mixteca-Puebla. They attained a high degree of development in engineering, architecture, art, mathematics, and astronomy. The Aztec calendar utilized a 260-day year and a 52-year time cycle. Aztec skill in engineering was evident in the fortifications of their island capital. The Aztec further developed sculpture, weaving, metalwork, ornamentation, music, and picture writing for historical records. Agriculture was well advanced and trade flourished. The political and social organization was based on three castes—nobility, priesthood, and military and merchant. The priesthood was a powerful political as well as religious force. Aztec government was relatively centralized, although many conquered chiefs retained political autonomy, they paid tribute and kept commerce open to the Aztec. The Aztec had a large and efficient army. Prisoners of war were used for human sacrifice to satisfy the many gods of the Aztec pantheon, notably HUITZILOPOCHTI, the chief god, who was god of war. When the Spaniards, under Hernán Cortés, arrived in 1519, the Aztec civilization was at its height. However, many subject Indian groups, rebellious against Aztec rule, were only too willing to join the Spanish. Initially, the invaders were aided by the fact that the Aztec believed them

to be descendants of the god QUETZALCOATL MONTEZUMA II, the last of the independent Aztec rulers, received Cortes, who made him prisoner and attempted to rule through him. The Aztec revolted, Montezuma was killed, and Tenochtitlan was razed (1521). CUAUHTÉMOC, last of the emperors, was murdered (1525) and the Spanish proceeded to subjugate Mexico. See Bernal Diaz del Castillo, *The Discovery and Conquest of Mexico* (tr. by A. P. Maudslayi, 1928, repr. 1965), Alfonso Caso, *The Aztecs, People of the Sun* (tr. 1958, repr. 1967), Laurette Sejourne, *Burning Water Thought and Religion in Ancient Mexico* (1961), Jacques Soustelle, *The Daily Life of the Aztecs on the Eve of the Spanish Conquest* (tr. 1961, repr. 1970), G. C. Vaillant, *The Aztecs of Mexico* (rev. ed. 1962), B. C. Brundage, *A Rain of Darts The Mexican Aztecs* (1973).

Aztec Ruins National Monument, 27 acres (11 hectares), NW N Mex., near Farmington, est. 1923. The ruins there of a 12th-century PUEBLO INDIAN town contain interesting KIVAS, one of which has been completely restored. Pueblo Indian culture reached a high level of achievement in this area. The ruins were named by early settlers who mis-

takenly believed that they were built by the Aztec Indians.

Azubah (əzyōō'bə) 1 Wife of Caleb 1 Chron 2 18 2 Mother of Jehoshaphat 1 Kings 22 42, 2 Chron 20 31

Azueta, Mariano (maryā'nō aswā'la), 1873-1952, Mexican novelist. Azueta began his medical practice in 1899, writing short stories and novels in his spare time. In 1915 he joined Francisco Villa's revolutionary forces as a surgeon. From this experience came his modern classic, *Los de abajo* (1915, tr. *The Underdogs*, 1929), which depicts the military exploitation of the Indian. The novel is composed of linked sketches that are starkly realistic. After Villa's defeat Azueta took refuge in Texas. Returning to Mexico in 1916, he resumed his medical practice and his writing, taking little interest in politics. Among his later novels are *María Luisa* (1907), *Los fracasados* [the defeated] (1908), *Malá yerba* (1909), *Los caciques* (1917, tr. *The Bosses*, 1956), *Las moscas* (1918, tr. *The Flies*, 1956), and *San Gabriel de Valdivias* (1938).

Azur (ā'zər) 1 Father of HANANIAH 2 2 Father of JAAZANIAH 4

azurite (āzh'ərīt), blue mineral, the basic carbonate of copper, occurring in monoclinic crystals or masses that range from transparent to translucent and opaque. It is usually associated with MALACHITE, which it resembles except in color, when the two minerals are very closely associated, the stone is called azurmalachite. Beautiful crystals of azurite are found in the United States in Arizona and New Mexico and in France at Chessy (for which the mineral is sometimes called chessylite), they are used for ornamental purposes. The mineral is an important ore of copper.

Azusa (əzōō'sə), city (1970 pop. 25,217), Los Angeles co., S Calif., in the San Gabriel valley, inc. 1898. It is a residential and industrial city in a citrus-fruit growing area. Its manufactures include aircraft components, electronic equipment, chemicals, lawn mowers, bicycles, and beer. Azusa has a large Mexican-American population. Azusa Pacific College and Citrus College are in the city.

Azzah (āz'ə), variant of GAZA

Azzan (āz'ān), man of Issachar Num 34 26

Azzur (āz'ər), sealer of the covenant Neh 10 17

B, second letter of the ALPHABET Its Greek correspondent is named beta It is a usual symbol for a voiced bilabial stop In MUSICAL NOTATION it is used to represent a note in the scale In chemistry B is the symbol of the element BORON

Ba, chemical symbol of the element BARIUM

Baade, Walter (val'tar ba'də), 1893–1960, German astronomer From 1919 to 1931 he was on the staff of the Hamburg observatory, from 1931 to 1958, at the Mt Wilson observatory He presented evidence for the existence of two different STELLAR POPULATIONS of older and newer stars After observations through the 200-in reflecting telescope at the Mt Palomar Observatory, his recalculations showed that it was necessary to double the cosmic-distance scale, i.e., the distances between extragalactic bodies and the MILKY WAY but not the distances within the Milky Way itself

Baal (bā'āl), plural **Baalim** (bā'ālīm) [Semitic, = possessor], name used throughout the Old Testament for the deity or deities of Canaan The term was originally applied to various local gods, but by the time of the Ugarit tablets (14th cent B.C., see UGARIT), Baal had become the ruler of the universe The Ugarit tablets make him chief of the Canaanite pantheon He is the source of life and fertility, the mightiest hero, and the lord of war There were many temples of Baal in Canaan, and the name Baal was often added to that of a locality, e.g., Baal-peor, Baal-hazor, Baal-hermon The Baal cult penetrated Israel and at times led to a syncretism The practices of holy prostitution and child sacrifice were especially abhorrent to the Hebrew prophets, who denounced the cult and its "high places" (temples) This abhorrence probably explains the substitution of Ish-bosheth for Esh-baal, of Jerubbesheth for Jerubbaal (a name of Gideon), and of Mephibosheth for Merib-baal The substituted term probably means "shame" The final detestation of the term is seen in the use of the name Beelzebub (see SATAN), probably the same as Baal-zebub 1 Kings 11 4–8, 2 Kings 1 The Baal of 1 Chron 4 33 is probably the same as RAMAH 3 As cognates of Baal in other Semitic languages there are Bel (in Babylonian religion) and the last elements in the Tyrian names Jez-ebe, Hasdrubal, and Hannibal

Baalah (bā'ālā) [Heb, fem of Baal] 1 The same as BILHAH 2 The same as KIRJATH-JEARIM 3 Unidentified mountain, in the vicinity of Jamnia Joshua 15 11

Baalath (bā'ālāth) [Heb, fem of Baal] 1 Town of Dan Joshua 19 44 2 Unidentified city 1 Kings 9 18, 2 Chron 8 6

Baalath-beer (bā'ālāth-bē'er), apparently the same as RAMAH 3

Baalbek (bal'bēk), ancient city, now in Lebanon, 35 mi (56 km) NW of Damascus Originally it was probably devoted to the worship of Baal or Bel, the Phoenician sun god, although no traces of an early Phoenician settlement have survived The Greeks called the city Heliopolis [city of the sun] It became very prominent in Roman days and was made a separate colony by Augustus Both Greek and Roman architects employed their genius on Baalbek's buildings Among the most imposing Roman remains are the temple of Bacchus and the temple of Jupiter The city was sacked by invaders and was destroyed by an earthquake in 1759

Baal-berith (bā'āl-bē'rīth), local god of Shechem Judges 8 33, 9 4 Berith Judges 9 46

Baale (bā'ālē) [Heb, fem of Baal], the same as KIRJATH-JEARIM

Baal-gad (bā'āl-gād'), place at the foot of Mt Hermon It represented the northern limit of Joshua's conquest Gad apparently refers to a god of fortune Joshua 11 17, 12 7, 13 5

Baal-hamon (bā'āl-hāmōn), location of Solomon's vineyard Song 8 11

Baal-hanan (bā'āl-hā'nān) 1 King of Edom Gen 36 38, 39, 1 Chron 1 49, 50 2 One of David's officers 1 Chron 27 28

Baal-hazor (bā'āl-hā'zōr), holy place where Absalom's servant killed Amnon 2 Sam 13 23

Baal-hermon (bā'āl-hūr'mān) see HERMON, MOUNT

Baali (bā'ālī), title of God that is to be used no longer by Israel Hosea 2 16, 17

Baalim (bā'ālīm), plural of BAAL

Baalis (bā'ālīs), king of the Ammonites, contemporary with Jeremiah Jer 40 14

Baal-meon: see BETH-BAAL-MEON

Baal-peor (bā'āl-pē'ōr), local divinity of Peor One of the apostasies of Israel involved this god, apparently the cult was orgiastic, and the name became symbolic of all shameful apostasies Num 25, Deut 4 3, Ps 106 28, Hosea 9 10 Peor Num 25 18, 31 16, Joshua 22 17 The god's name appears in BETH-PEOR Under the form Belphegor, the name became that of a devil in the Middle Ages, Machiavelli used it in his *Belfagor*

Baal-perazim (bā'āl-pēr'azīm), unidentified place where David defeated the Philistines 2 Sam 5 20, 1 Chron 14 11 Perizim of Isa 28 21 is probably the same

Baal-shalisha (bā'āl-shāl'ishā), place perhaps in SHALISHA 2 Kings 4 42

Baal-Shem-Tov (bal-shēm-tōv), c 1698–1760, Jewish founder of modern HASIDISM, b Russia His life is the subject of many legendary tales, which circulated even before his death and which may be based in part upon a fictional collection of tales published in Yiddish in the 17th cent Originally named Israel ben Elezer, he is said to have been born of elderly, poor parents and to have been orphaned at an early age He later supported himself variously as an assistant in a heder (Hebrew religious school), as a synagogue watchman, as a quarry worker, and as an innkeeper He gained a reputation as a miracle healer, hence the name Baal-Shem-Tov [Heb, = master of the good name, i.e., the Name of God] Central to his teachings was the notion that one must worship and adhere to God in all activities, both in acts of prescribed religious observance and in the affairs of daily life He further held that not in sorrow but in joy must one worship God, and that repentance is always possible It appears that his reputation as a miracle healer and his basic orientation to religious life, which allowed the unschooled as well as the scholar to experience a sense of his redemption, gained for him a large circle of followers, out of which developed the several communities of contemporary Hasidim See Martin Buber, *Legend of the Ba'al Shem* (tr 1955, repr 1969) and *Tales of the Hasidim* (tr, 2 vol, 1947–48, repr 1961), D Ben Amos and J R Mintz, ed., *In Praise of the Baal Shem Tov* (tr 1970)

Baal-tamar (bā'āl-tā'mar), unidentified place near Gibeah Judges 20 33

Baal-zebub (bā'āl-zē'bāb), god of Ekron see BAAL and SATAN

Baal-zephon (bā'āl-zē'fōn), place near the Israelites' crossing of the Red Sea Ex 14 2, 9, Num 33 7

Baana or **Baanah** (both bā'anā) 1 Murderer of Ish-bosheth 2 Sam 4 1–12 2 Father of HELEB 3 Officer under Solomon 1 Kings 4 12 4 Officer under Solomon 1 Kings 4 16 5 One who returned with Zerubbabel, apparently the father of ZADOK 6 Ezra 2 2, Neh 7 7, 10 27

Baara (bā'ārā), wife of SHAHARAIM

Baarle-Hertog (bar'lā-hēr'tōkh), Fr *Baerle-Duc*, town (1970 pop 2,146), Antwerp prov, N Belgium A Belgian possession since 1479, it is now an enclave (3 sq mi/7.8 sq km) in S Netherlands The sovereignty of its outlying districts was disputed by the Dutch, but was settled (1959) in favor of Belgium by the International Court of Justice

Baaseiah (bā'āsē'yā), Levite 1 Chron 6 40

Baasha (bā'āshā), king of Israel He made himself king by the murder of King Nadab and the royal family According to the Bible he was a wicked man, he fought against ASA of Judah, who won with the

aid of Benhadad of Syria Baasha was succeeded by his son Elah 1 Kings 15 27–34, 16 1–13, 2 Chron 16

Ba'ath party (ba'ath), Arab political party, in Syria and Iraq Its main ideological objectives are socialism and pan-Arab union Founded in Damascus in 1941 and reformed, with the name Ba'ath, in the early 1950s, it rapidly achieved political power in Syria In 1958—with one of its founders, Salah al-Din Bitar, as foreign minister—it led Syria into the ill-fated United Arab Republic (UAR) with Egypt The Ba'athists, like most other Syrians, quickly came to resent Egyptian domination, and the Ba'athist members of the union government resigned in Dec., 1959 Syria withdrew from the UAR in 1961 In 1963 a military coup d'état restored the Ba'ath to power, and it embarked on a course of large-scale nationalization From 1963 the Ba'ath was the only legal political party in Syria, but factionalism and splintering within the party led to a succession of governments and new constitutions In 1966 a military junta representing the more radical elements in the party displaced the more moderate wing in power, purging from the party its original founders, Michel Aflaq and Bitar Subsequently the main line of division was drawn between the so-called progressive faction, led by Nureddin Atassi, which gave priority to the firm establishment of a one-party state and to neo-Marxist economic reform, and the so-called nationalist group, led by Gen Hafez al-ASSAD, which was less doctrinaire about socialism but favored a militant posture on Arab union and hostility toward Israel Despite constant maneuvering and government changes, the two factions remained in an uneasy coalition of power until 1970, when, in another coup, Assad succeeded in ousting Atassi as prime minister In Iraq the Ba'athists first came to power in the coup d'état of Feb., 1963, when Abdal Salem Arif became president Interference from the Syrian Ba'athists and disputes between the moderates and extremists, culminating in an attempted coup by the latter in Nov., 1963, served to discredit the extremists However, the moderates continued to play a major role in the succeeding governments In July, 1968, a bloodless coup brought to power the Ba'athist general Ahmad Hassan al-BAKR Wranglings within the party continued, and the government periodically purged its dissident members Relations between the Ba'athist regimes of Syria and Iraq have frequently been strained See IRAQ, SYRIA

Bab: see BABISM

Babar: see BABUR

Babbage, Charles (bāb'ij), 1792–1871, English mathematician and inventor He devoted most of his life and expended much of his private fortune and a government subsidy in an attempt to perfect a mechanical calculating machine that foreshadowed present-day machines He was a founder of the Royal Astronomical Society He wrote *Tables of Logarithms* (1827) and an autobiography (1864) See biographies by Maboth Moseley (1970) and Dan Halacy (1970)

Babbitt, Irving, 1865–1933, American scholar, b Dayton, Ohio At Harvard as professor of French literature from 1912 until his death, he was a vigorous critic of romanticism, deprecating especially the influence of Rousseau on modern thought and art He and Paul Elmer MORE initiated a movement, called New Humanism, that advocated a forceful doctrine of moderation and restraint, looking to classical traditions and literature for inspiration His works include *Literature and the American College* (1908), *The New Laokoon* (1910), *The Masters of Modern French Criticism* (1912), and *On Being Creative* (1932) See F E McMahon, *The Humanism of Irving Babbitt* (1931), *Irving Babbitt* (ed by Frederick Manchester and Odell Shepard, 1941, repr 1969)

Babbitt, Milton, 1916–, American composer, b Philadelphia Babbitt turned to music after having begun the study of mathematics He was a composition pupil of Roger Sessions at Princeton Babbitt has attempted to apply 12-tone principles to all the elements of composition dynamics, timbre, and

rhythm, as well as melody and harmony. He calls this "total serialization" (see SERIAL MUSIC). In 1959, Babbitt became one of the directors of the new Columbia-Princeton Electronic Music Center in New York City. His works include *Three Compositions for Piano* (1947), three string quartets (1942, 1954, 1969-70), *Composition for Synthesizer* (1961), and *Philomel* (1964) for soprano, taped soprano, and synthesizer.

Babbitt metal, an antifriction metal first produced by Isaac Babbitt in 1839. In present-day usage the term is applied to a whole class of silver-white bearing metals, or "white metals." These alloys usually consist of relatively hard crystals embedded in a softer matrix, a structure important for machine bearings. They are composed primarily of tin, copper, and antimony, with traces of other metals added in some cases and lead substituted for tin in others.

babbler, common name for some members of the large, diversified family Timaliidae, passerine birds found primarily in wooded areas of Asia, Africa, and Australia. Babblers have soft, fluffy plumage and vary in coloring, various species resemble other birds, and five of the seven groups of babblers are named on this basis—the wren babblers, the tit babblers, the laughing thrushes, and the crow tits, or parrotbills. The wrenbills, the only American babbler (found W of the Rockies), is believed to be an offshoot of the crow tits. Other groups are called ground babblers, found in Australia, jungle babblers, distributed in the Philippines, and rock fowl, found in W Africa. Babblers are insectivorous and, as their name suggests, are noisy birds. They are classified in the phylum CHORDATA, subphylum Vertebrata, class Aves, order Passeriformes, family Timaliidae.

Babcock, Stephen Moulton, 1843-1931, American agricultural chemist, b. Bridgewater, N.Y., grad Tufts College (B.A., 1866), Univ. of Göttingen (Ph.D., 1879). He was, from 1887 to 1913, professor of agricultural chemistry at the Univ. of Wisconsin and chief chemist of the Wisconsin Agricultural Experiment Station. He is known chiefly for the Babcock test (perfected in 1890) for determining the percentage of butterfat in milk. The test advanced the modern dairy industry since it permits the rapid and accurate grading of milk at markets, discourages adulteration and thinning practices, and, by making practical the testing of the milk of individual cows, promotes the development of better dairy strains. His experimental studies in the food requirements of animals paved the way for the work of the American chemist E. V. McCollum on vitamin A. He invented an apparatus to determine the viscosity of liquids. The last two decades of his life were spent in basic research on the nature of matter and its relation to energy.

Babel, Isaac Ermanuvelovich (é'sak émanuél'vich ba'bal), 1894-1941, Russian short-story writer and playwright. Babel won fame with *Odessa Tales* (1923-24), written in a Russo-Jewish jargon, and *Red Cavalry* (1926, tr. 1929), dramatic stories based on his life in the army and employing the racy slang of the Kuban Cossacks. A brilliant stylist, he combined stringent Jewish irony with Russian caricature. He turned to drama in *Sunset* (1928) and *Maria* (1935) and in the novel *Benia Krak* (1927, tr. 1935) about a famous Jewish bandit. He was criticized during the 1930s by the Communist party and was arrested in 1938. A victim of Stalin's purges, Babel died in a concentration camp. After Stalin's death, some of his works were republished in censored form in the Soviet Union. Translations of his best stories appear in *Collected Stories* (1955) and *You Must Know Everything* (1969).

Babel (bā'bal), in the Bible, Babylonian city where Noah's descendants (who spoke one language) tried to build a tower to reach to heaven. For this presumption their words were made incomprehensible. Gen. 11:1-9. Some see in this an etiological story on the diversity in speech and also a reminiscence of the ziggurats in Mesopotamia.

Bab el Mandeb (bāb ɛl mǎn'dēb) [Arabic, = gate of tears], strait, 17 mi (27 km) wide, linking the Red Sea with the Gulf of Aden and separating the Arabian Peninsula from E. Africa. It is an important passage on the Indian Ocean-Mediterranean Sea shipping route via the Suez Canal. Control of the strategically located strait was long contested by Britain and France. The island of Barim is in the strait.

Babenberg (ba'bānbērk), ruling house of Austria (976-1246). It possibly descended from, or succeeded, a powerful Franconian family of the 9th

cent. from whose castle the city of Bamberg probably took its name. Holy Roman Emperor Otto II created Count Leopold of Babenberg margrave of the Eastern March (i.e., Austria). Among Leopold's successors were LEOPOLD III, Leopold IV and Henry II, also dukes of Bavaria (1139-56), and Henry II, called Jasomirgott ("if God will") for his favorite phrase. Henry II became (1156) the first duke of Austria. In 1192 the Babenbergs inherited Styria. Duke Leopold V took part in the Third Crusade and later made RICHARD I of England a prisoner. Leopold VI, called the Glorious, brought the house to its greatest power. His son, Frederick II, called the Quarrelsome, died childless in 1246, and Austria passed (1251) to OTTOCAR II of Bohemia, who married Frederick's sister. Under Babenberg rule Austria was extended through eastward colonization, and relative peace was maintained through intermarriage with the ruling families of Bohemia and Poland. As a result the Babenbergs were in part responsible for the multinational character of the later Hapsburg empire.

Baber: see BABUR.

Babeuf, François Noel (fra'nswa' nōēl' babōf'), 1760-97, French revolutionary, organizer of a communist uprising against the DIRECTORY. Of petty bourgeois origin, he was an enthusiastic supporter of the French Revolution. He settled in Paris in 1794 and founded a political journal, the *Journal de la liberté de la presse* (later the *Tribun du peuple*). In it he argued that the Revolution had not gone far enough merely by establishing political equality. He was imprisoned (Feb.-Sept., 1795) for his writings, but emerged an even more violent enemy of economic injustice. Calling himself Gracchus Babeuf, he organized an egalitarian group that included discontented artisans and soldiers. The Directory halted his journal and banned the organization. He then formed a secret society that plotted to overthrow the government; it became known as the Conspiracy of the Equals. It distributed propaganda and announced a program of economic equality—common ownership of the land and the right of all men to work and to share in the products of the economy. The form of communism desired by the conspirators referred mainly to the distribution of goods rather than to means of production. The plot was betrayed to the government, and after a long trial Babeuf was executed. His doctrines, however, known as Babouvism, were kept alive, largely by secret revolutionary societies. See his *Defense of Gracchus Babeuf before the High Court of Vendôme*, tr. and ed. by I. A. Scott with an essay by H. Marcuse (1967), studies by D. Thomson (1947), F. M. Buonarroti (tr. 1965), and E. B. Bax (1911, repr. 1971).

Babington, Anthony (bāb'īngtən), 1561-86, English conspirator. A member of the Roman Catholic gentry, he served as a youth in the household of the earl of Shrewsbury at Sheffield Castle, where MARY QUEEN OF SCOTS was imprisoned. In 1586 he became involved in a plot to murder Queen Elizabeth I, to free Mary, and to make England a Catholic realm. The plot was discovered; Babington was executed, and the evidence against him was also used to convince Elizabeth that it was necessary to behead Mary.

Babism (ba'bīzəm), system of doctrines of a Muslim sect of 19th-century Persia. In 1844 the disciples of a movement within Shiite Islam recognized Sayyid Ali Muhammad of Shiraz as a prophet and thus the successor of Moses, Christ, and Muhammad. They granted Sayyid the title of Bab [gate], and missionaries were sent throughout Persia. Babism took its beliefs especially from Sufism, Gnosticism, and Shiite Islam. It advocated the abrogation of some Koranic laws. The movement placed special emphasis on the coming of the Promised One, who would embody all the tenets of the new religion. In 1845 oppression of Babism began, and in 1848 the movement declared its complete secession from Islam and all its rites. Upon the accession of a new shah in 1848, the Bab's followers, rising in insurrection, were defeated. Many of the leaders were killed, and the Bab was executed at Tabriz in 1850. Two years later, after an attempt had been made on the life of the shah, there were more persecutions. In 1863 the Babists were removed to Constantinople and later to Adrianople and Cyprus. After 1868 a division had its center in Acre under the leadership of BAHÁ ULLAH, the originator of BAHÁISM, who had declared himself the Promised One. See E. G. Browne, ed. and tr., *A Traveller's Narrative Written to Illustrate the Episode of the Bab* (1891) and *Materials for the Study of Babi Religion* (1918), H. M. Balyuzi, *The Bab* (1973).

Babol (baból'), town (1971 est. pop. 52,000), N Iran, near the Caspian Sea, NE of Tehran. It is the region's chief commercial center and was once the major trading center of N Iran. Processed food and textiles are produced, and fruits, tobacco, and cotton are raised nearby. Founded in the 16th cent., it was built on the site of the ancient city of Mamter. Ruins of a palace of Abbas I are there. Located in the Caspian littoral, the city receives abundant rainfall. It was formerly called Barfrush.

baboon, any of the large, powerful, ground-living MONKEYS of the genus *Papio*, also called dog-faced monkeys. Baboons are found in Africa, with one species extending into Asia. They have close-set eyes under heavy brow ridges, long, heavy muzzles, powerful jaws, and sharp, tusklike upper canine teeth. Their fur is thick, and in some species there is a mane about the head and shoulders. The heavy tail is of moderate length. The buttock pads, or ischial callosities, are thick and brightly colored. Baboons have cheek pouches for storing food. They live in grassland, brush, or rocky country, foraging on the ground and sleeping in trees or on rock outcroppings. They travel in troops of up to 100 individuals, led by a dominant male and having a highly developed social structure. They feed on roots, fruits, insects, and small animals, including other monkeys. Powerful fighters, baboons show little fear of larger animals, including humans, and can successfully battle leopards, their worst enemies. They can be nuisances in villages and suburbs, where they sometimes conduct foraging raids into houses. They are considered among the most intelligent of monkeys. The hamadryas baboon (*Papio hamadryas*) of NE Africa and SW Arabia was the sacred baboon of Egypt. It has silvery brown fur and an impressive mane. Several other species, differing in size and color, are found in different parts of sub-Saharan Africa. The gelada (*Theropithecus gelada*) of Ethiopia is closely related to the baboon. It has olive-brown fur, a bright pink face and buttock pads, an enormous mane, and a tufted tail. Also closely related are the fantastically colored MANDRILL and the drill, both forest-dwellers. Baboons are classified in the phylum CHORDATA, subphylum Vertebrata, class Mammalia, order Primates, family Cercopithecidae.

Babrius (bā'brēās), fl. 2d cent.?, Greek fabulist, versifier of the fables of AESOP. Many of the medieval prose collections of Aesop were based on Babrius. He may have been a Hellenized Roman.

Babson, Roger Ward, 1875-1967, American businessman and statistician, b. Gloucester, Mass. In 1904 he founded the Babson Statistical Organization, Inc., whose business and financial statistics, published in *Babson's Washington Service*, are widely sold in the United States, Great Britain, and Canada. In 1919 he established Babson Institute (now Babson College), in Massachusetts, and in 1927 he founded Webber College, in Florida. He was the Prohibition party's 1940 presidential candidate, polling 57,812 votes. He was the author of many books on finance and investment, among the best known of which are *Business Barometers* (1909, 10th ed. 1961), *Investment Fundamentals* (1930, 4th ed. 1948), and *If Inflation Comes* (1937). See his autobiography, *Actions and Reactions* (1937, rev. ed. 1949).

Babur (ba'bār) [Turk. = lion], 1483-1530, founder of the MOGUL empire of India. His full name was Zahir ud-Din Muhammad. A descendant of Tamerlane and of Jenghiz Khan, he succeeded (1494) to the principality of Fergana in central Asia. His early life was spent in an ultimately unsuccessful struggle to retain his inheritance and to recover Samarkand (Tamerlane's capital) from the Uzbeks. In 1504, however, he captured Kabul and established a kingdom in Afghanistan. After the failure of his final attempt (1512) on Samarkand, Babur began raids southward into India. In 1525, responding to an invitation from the governor of the Punjab to overthrow the sultan of Delhi, Babur launched a serious invasion. Although his force was small, he defeated the sultan at Panipat in 1526 and captured Agra and Delhi. He finally conquered nearly all of N India. Babur was also a distinguished poet. His autobiography (tr. by A. S. Beveridge, 1922) is his most important work. His son Humayun succeeded him. Babur's name is also transliterated Baber and Babar. See biography by Fernand Grenard (tr. 1930, repr. 1971), study by R. D. Palsokar (1971).

Babylon (bāb'ālōn), ancient city of Mesopotamia. One of the most important cities of the ancient Near East, it was on the Euphrates River and was north of the cities that flourished in S Mesopotamia.

in the 3d millennium B.C. It became important when HAMMURABI made it the capital of his kingdom of BABYLONIA. The patron god of Babylon, Marduk (identical with Bel), became a leading deity in the Neo-Babylonian pantheon. The city was destroyed (c. 689 B.C.) by the Assyrians under SENNACHERIB, and its real splendor belongs to the later period of Babylon after the city was rebuilt. The brilliant color and luxury of Babylon became legendary from the days of Nebuchadnezzar (d. 562 B.C.). The Hanging Gardens were one of the SEVEN WONDERS OF THE WORLD. The walls of Babylon, its palace, and the processional way with the famous Ishtar Gate were decorated with colorfully glazed brick. Among the Hebrews (who suffered the BABYLONIAN CAPTIVITY under Nebuchadnezzar) and the later Greeks the city was famed for its sensual living. Under the rule of Nabonidus the city was captured (538 B.C.) by Cyrus the Great and was used as one of the administrative capitals of the Persian Empire. In 275 B.C. its inhabitants were removed to SELEUCIA, which replaced Babylon as a commercial center.

Babylon, residential and resort village (1970 pop. 12,588), Suffolk co., SE N.Y., on Long Island, on Great South Bay, settled 1689, inc. as a village 1893.

Babylonia (bābīlō'nēā), ancient empire of Mesopotamia. The name is sometimes given to the whole civilization of 5 Mesopotamia, including the states established by the city rulers of Lagash, Akkad (or Agade), Erech, and Ur in the 3d millennium B.C. Historically it is limited to the first dynasty of Babylon established by HAMMURABI (c. 1750 B.C.), and to the Neo-Babylonian period after the fall of the Assyrian Empire. Hammurabi, who had his capital at BABYLON, issued the code of laws for the management of his large empire—for he was in control of most of the Tigris and Euphrates region even before he defeated the Elamites. Babylonian CUNEIFORM writing was derived from the Sumerians. The quasi-feudal society was divided into classes—the wealthy landowners and merchants and the priests, the less wealthy merchants, peasants, and artisans, and the slaves. The Babylonian religion (see MIDDLE EASTERN RELIGIONS) was inherited from the older Sumerian culture. All these Babylonian institutions influenced the civilization of ASSYRIA and so contributed to the later history of the Middle East and of Western Europe. The wealth of Babylonia tempted nomadic and seminomadic neighbors, even under Hammurabi's successor. Babylonia was having to stave off assaults. Early in the 18th cent. B.C. the Hittites sacked Babylon and held it briefly. The nomadic Kassites (Cassites), a tribe from Elam, took the city shortly thereafter and held it precariously for centuries. Babylonia degenerated into anarchy c. 1180 B.C. with the fall of the Kassites. As a subsidiary state of the Assyrian Empire (after the 9th cent. B.C.), Babylonia flourished once more. It was the key area in the attempted uprising against the Assyrian king, SENNACHERIB, and Babylon was sacked (c. 689 B.C.) in his reign. After the death of Assurbanipal, the last great Assyrian monarch, Nabopolassar, the ruler of Babylonia, established (625 B.C.) his independence. He allied himself with the Medes and Persians and helped to bring about the capture of Nineveh (612 B.C.) and the fall of the Assyrian Empire. He established what is generally known as the Chaldean or New Babylonian Empire. Under his son, NEBUCHADNEZZAR, the new empire reached its height (see BABYLON). The recalcitrant Hebrews were defeated and punished with the BABYLONIAN CAPTIVITY. Egypt had already been defeated by Nebuchadnezzar in the great battle of Carchemish (605) while Nabopolassar was still alive. The empire seemed secure, but it was actually transitory. The steady growth of Persian power spelled the end of Babylonia, and in 538 B.C. the last of the Babylonian rulers surrendered to CYRUS THE GREAT (see also BELSHAZZAR). Babylonia became an important region of the Persian Empire. See R. W. Rogers, *A History of Babylonia and Assyria* (6th ed. 1915); D. D. Luckenbill, *Ancient Records of Assyria and Babylonia* (1926-27); G. R. Driver, et al., *The Babylonian Laws* (1952-55); H. W. F. Saggs, *Everyday Life in Babylonia and Assyria* (1965); J. A. Brinkman, *A Political History of Post-Kassite Babylonia* (1968); L. W. King, *A History of Babylonia* (1915, repr. 1969); James Wellard, *Babylon* (1972).

Babylonian art: see SUMERIAN AND BABYLONIAN ART. **Babylonian captivity**, in the history of Israel, the period from the fall of Jerusalem (586 B.C.) to the reconstruction in Palestine of a new Jewish state (after 538 B.C.). After the capture of the city by the Babylonians some thousands, probably selected for their prosperity and importance, were deported to

Mesopotamia. The number of those who remained is disputed by scholars. Such deportations were commonplace in Assyrian and Babylonian policy. The exiles maintained close links with their kinsmen at home, as is clear from Ezekiel, the prophet of the early years of the Exile. In 538 B.C., Cyrus the Great, the new master of the empire, initiated a new attitude toward the nations and decreed the restoration of worship at Jerusalem. The century following this decree was critical in the history of the Jews, for it is the time of their reintegration into a national and religious unit. For parts of the period, Ezra and Nehemiah are the best sources. The prophesied 70 years of captivity were fulfilled when the new Temple was completed in 516 B.C. (Jer. 25:11, Dan. 9:2, Zech. 7:5). For the papal captivity at Avignon, which is also called the Babylonian Captivity, see PAPACY.

Babylonian religion: see MIDDLE EASTERN RELIGIONS. **baby's breath**, name for a plant of the family Caryophyllaceae (PINK family) and for several other flowers, e.g., white bedstraw of the family Rubiaceae (MADDER family) and grape hyacinth of the family Liliaceae (LILY family). The pink and madder families are classified in the division MAGNOLIOPHYTES, class Magnoliopsida, orders Caryophyllales and Rubiales, respectively. The lily family is classified in the class Liliatae, order Liliales.

Baca (bā'ka), allegorical name of a valley. Ps. 84:6. The English expression "vale (or valley) of tears" may be a translation of this, through the Vulgate.

Bacabal (bakābāl'), city (1970 pop. 69,384), Maranhão state, NE Brazil, on the Mearim River. Babassu nuts, rice, and cotton are its principal products.

Bacău (bākū'ōō), city (1969 est. pop. 66,000), E Rumania, in Moldavia, on the Bistrita River. The administrative and industrial center of an oil-producing region, Băcău has industries that manufacture oil-field equipment. Other important products include textiles, leather and wood items, and light machinery. Although probably settled in the 5th cent., Băcău did not become important until oil was discovered there in the 20th cent. It has a regional museum and ruins of a 15th-century princely court.

Baccaloni, Salvatore (sālvātō'rā bāk-kālō'nē), 1900-70, Italian operatic bass, b. Rome. Baccaloni studied architecture before he made his singing debut in Rome in 1921. In 1926 he joined La Scala in Milan under Arturo Toscanini. In 1940 he joined the Metropolitan Opera Company, where he specialized in comic roles such as Bartolo in *The Barber of Seville*. Known for his large repertory, Baccaloni sang nearly 170 roles in five languages.

baccarat (bāk'arā', bāk'-, fr. bākārā'), French card game formerly widely played in European casinos but now supplanted in popularity by CHEMIN DE FER. The banker plays against the hands he deals to two other players called punters. The winning hand is the one whose point total has the number closest to 9 as its last digit, face cards and tens counting nothing. Two cards are dealt to a hand with the privilege of a one-card draw. The term *baccarat* is supposed to mean "nothing" and is applied to hands whose point total ends with a cipher.

bacchae: see MAENADS.

Bacchanalia (bākānāl'ēā), in Roman religion, festival in honor of Bacchus, god of wine. Originally a religious ceremony, like the LIBERALIA, it gradually became an occasion for drunken, licentious excesses and was finally forbidden by law (186 B.C.).

bacchantes: see MAENADS.

Bacchus (bāk'as), in Greek and Roman mythology, god of wine, identified with Dionysus. He was also a god of vegetation and fertility, and his worship was orgiastic. He was the protector of vines. Many legends connected with Dionysus were also used in the cult of Bacchus.

Bacchylides (bākīl'idēz), fl. c. 470 B.C., Greek lyric poet, b. Ceos, nephew of Simonides of Ceos. A contemporary of Pindar, he was patronized by Hiero I. Although a competent craftsman capable of elegant lyrics, Bacchylides lacked the inspiration of Pindar. A number of Bacchylides' epinicia and dithyrambs were among the verses recovered from an Egyptian papyrus (text published by F. G. Kenyon, *The Poems of Bacchylides*, 1897). See R. C. Jebb, *Bacchylides: The Poems and Fragments* (1905).

Bach (bākh), German family of distinguished musicians who flourished from the 16th through the 18th cent., its most renowned member being Johann Sebastian Bach (see separate article). Johannes, or Hans, Bach, 1580-1626, was a Thuringian carpetweaver and a musical performer at festivals. His sons and descendants were noted organists and

composers. One of his grandsons was Johann Ambrosius Bach, 1645-95, violinist, town musician at Eisenach, and father of Johann Sebastian Bach. Johann Sebastian's eldest brother, Johann Christoph Bach, 1671-1721, was organist at Ohrdruf. When his parents died he took his youngest brother, Johann Sebastian, into his home and taught him. Of the 20 children of Johann Sebastian, several were well known as musicians. The eldest son, Wilhelm Friedemann Bach, 1710-84, was made organist at the Sophienkirche in Dresden in 1733 and later (1746-64) organist and musical director at the Liebfrauenkirche in Halle. He was a brilliant organist and well-known composer, but he did not live up to his father's hopes and, after a dissolute life, he died in misery. A younger son was Carl Philipp Emanuel Bach (see separate article), and the youngest son was Johann Christian Bach (see separate article). See Karl Geiringer and I. S. Geiringer, *The Bach Family* (1954); Percy Young, *The Bachs* (1970).

Bach, Alexander, 1813-93, Austrian politician. A well-known lawyer and liberal, he took part in the REVOLUTION OF 1848 in Vienna, but after its suppression he joined the forces of reaction. He became minister of justice (1848) and of the interior (1849-59), and after the death (1852) of Prince Schwarzenberg was the chief figure in the ministry. He was created baron in 1854. Bach instituted the Bach system of bureaucratic control of the Hapsburg lands. Centralization and Germanization were its chief aims, stringent control by secret police was the method of enforcing them. This program was accompanied, however, by measures promoting economic prosperity, notably the abolition of internal tariff barriers, and by agricultural reforms implementing the emancipation of the serfs. Through the Concordat of 1855 the Roman Catholic Church gained wide powers. The Bach system met with opposition, especially in Hungary, and after the Austrian defeat in the Italian War of 1859 its author was dismissed and new systems introduced.

Bach, Carl Philipp Emanuel (fē'līp ēmā'nōō'ēl), 1714-88, German composer, second son of J. S. Bach, his only teacher. While harpsichordist at the court of Frederick the Great, where his chief duty for 28 years (1738-67) was to accompany the monarch's performances on the flute, he wrote an important work on technique, *Essay on the True Art of Playing Keyboard Instruments* (1753, tr. 1949). After this artistically unsatisfying service with Frederick, Bach succeeded his godfather, Georg Philipp Telemann, as musical director at Hamburg. His 2 volumes of sonatas (1742-43) and his 12 symphonies established the typical classical forms of such works and powerfully influenced both Haydn and Beethoven. He also composed other keyboard music and sacred choral music. His craftsmanship was outstanding in the period between the baroque and classical periods.

Bach, Johann Christian (krīs'tyān), 1735-82, German musician and composer, son of J. S. Bach. He went to Italy in 1754, became a Roman Catholic, and composed church music and operas. In 1760 he became organist of the Milan Cathedral. Two years later he went to England, where he became music master to the royal family. A popular and highly prolific composer in the rococo style, he influenced the young Mozart.

Bach, Johann Sebastian (sābās'tyān), 1685-1750, German composer and organist, b. Eisenach, one of the greatest and most influential composers of the Western world. He brought polyphonic baroque music to its culmination, creating masterful and vigorous works in almost every musical form known in his period. Born into a gifted family (see separate article), Bach was devoted to music from childhood, he was taught by his father and later by his brother Johann Christoph, and was a boy soprano in Lüneberg. His education was acquired largely through independent studies, he had an insatiable curiosity about music and sometimes walked great distances to hear the organists Johann Adam Reincken (at Hamburg) and Buxtehude (at Lübeck). In 1703 he became violinist in the private orchestra of the prince at Weimar but left within a year to become organist at Arnstadt. He went to Mühlhausen as organist in 1707. There he married his cousin Maria Barbara Bach, who was to bear him seven children. In 1708 he was made court organist and chamber musician at Weimar, and in 1714 he became concert master. Prince Leopold of Anhalt engaged him as musical director at Cöthen in 1717. Three years later his wife died, and in 1721 he married Anna Magdalena Wülfen, a woman of considerable musical cultivation who eventually bore him 13 children. In

1723 he left Weimar to take the important post of music director of the church of St Thomas, Leipzig, and of its music school, he remained in Leipzig until his death. Since few of Bach's many works were published in his lifetime, exact dates cannot be fixed for all of them, but most can be placed with some certainty in the periods of his life. At Arnstadt and Muhlhausen he began a series of organ compositions that culminated in the great works of the Weimar period: the *Passacaglia* and *Fugue in C Minor*, most of the great preludes and fugues, and the 45 chorale-preludes gathered in *Das Orgelbuchlein* [the little organ book]. At Cothen he concentrated on instrumental compositions, especially keyboard works: the *Chromatic Fantasy* and *Fugue*, the *English Suites*, the *French Suites*, the *Two-Part* and *Three-Part Inventions*, written for the education of his son Wilhelm Friedemann, and Book I of the celebrated *The Well-Tempered Clavier*. He also wrote several unaccompanied violin sonatas and cello suites, and the *Brandenburg Concertos*, recognized as the best concerti grossi ever composed. The *St John Passion* was performed (1723) at Leipzig, when Bach was a candidate for the position of musical director at St Thomas. His *Magnificat* was presented shortly after he assumed that post. Many more of his superb religious compositions followed: the *St Matthew Passion* (1729), the *Christmas Oratorio*, the sonorous *Mass in B Minor*, and the six motets. The principal keyboard works of this period were Book II of *The Well-Tempered Clavier* and the four books of clavier pieces in the *Clavierübung*, which includes six partitas (1726-31), the Italian Concerto and the Partita in B Minor (1735), the *Catechism Preludes*, the *Prelude and Fugue* (St Anne) in E Flat (1739), and four duets, and the *Goldberg Variations* (more formally *Aria with Thirty Variations*, 1742). His last notable compositions were the *Musical Offering* composed (1747) for Frederick the Great and *The Art of the Fugue* (1749). In all his positions as choir director, Bach composed sacred cantatas—a total of some 300, of which nearly 200 are extant. There are also over 30 secular cantatas, composed at Leipzig, among them *Phoebus and Pan* (1731). The bulk of his work is religious—he made four-part settings of 371 Lutheran chorales, also using many of them as the bases of organ preludes and choral works. In addition, he composed an astonishing number of instrumental works, many of them designed for the instruction of his numerous pupils. In his instrumental and choral works he perfected the art of polyphony, displaying an unmatched combination of inventiveness and control in his great, striding fugues. During his lifetime, Bach was better known as an organist than as a composer. For decades after his death his works were neglected, but in the 19th cent his genius came to be recognized, particularly by romantic composers such as Mendelssohn and Schumann. Since that time his reputation has grown steadily. The classic study of his life and music is that by Phillip Spitta (tr 1884-85, repr 1972), and Albert Schweitzer's study (tr 1911, repr 1962) has attracted much attention. See also biographies by C S Terry (1928, repr 1962), Imogen Holst (1965), and Karl and Irene Geiringer (1966), studies by J N Forkel (tr 1920, repr 1970) and R L Marshall (2 vol, 1972), H T David and Arthur Mendel, *The Bach Reader* (1945).

Bacharach, Burt (băk'ərăk'), 1929-, American composer, b Kansas City, Mo. He began his career playing piano in nightclubs. With the lyricist Hal David, Bacharach has produced a number of popular songs, they include "Don't Make Me Over," "What the World Needs Now," and "Do You Know the Way to San Jose." The team also provided words and music for the successful Broadway musical *Promises, Promises* (1968) and the film *Butch Cassidy and the Sundance Kid* (1969). Bacharach's music utilizes Latin, rock, and gospel styles and is marked by unexpected chord changes.

Bache, Benjamin Franklin (bäch), 1769-98, American journalist, b Philadelphia, son of Richard Bache and grandson of Benjamin Franklin. In 1790 he founded the *Philadelphia General Advertiser* (later the *Aurora*). As the champion of the Jeffersonians, Bache's paper denounced the Federalists bitterly, and he was arrested under the Sedition Act (see ALIEN AND SEDITION ACTS) but was released on parole. He died soon afterward of yellow fever.

Bache, Jules Semon, 1861-1944, American banker and art collector, b New York City. He made an immense fortune on Wall St, organized the banking firm of J S Bache and Company, and was director of 12 other firms. In 1937 he opened his magnificent art collection to the public, and in 1944 the collection

was given permanently to the Metropolitan Mus. It includes famous works by Raphael, Titian, Rembrandt, Velazquez, and other masters.

Bache, Richard, 1737-1811, American merchant, b Yorkshire, England. He came to New York City in 1765 to join an older brother in the mercantile business. Bache soon moved to Philadelphia in the interest of the firm, which had built up a large West Indian trade. In 1767 he married Sarah, daughter of Benjamin Franklin. He served on many committees in the American Revolution, including the Board of War. He succeeded Franklin as Postmaster General in 1776 and held office until 1782.

Bachelard, Gaston (gastōN' bashlar'), 1884-1962, French philosopher. He held degrees in physics, mathematics, and philosophy and taught at Dijon (1930-40) and the Univ of Paris (1940-54). Bachelard regarded knowing as a result of the interaction between reason and experience. Disagreeing with the Cartesian concept of scientific truths as immutable elements of a total truth, he also rejected the notion of the empirical world as random or senseless. He characterized his position as a "philosophy of saying no" because scientific insights are, as he saw it, always open to reformulation on the basis of new experience. This reformulation does not involve the rejection but the recasting of previous positions as resulting from the dialectic of reason and experience. Bachelard was not, despite his scientific orientation, a thorough-going rationalist; he considered imagination and reverie as well as reason to be creative forces in knowing. Among his books are *La Psychanalyse du feu* (1932, tr *Psychoanalysis of Fire*, 1964), *Lautremon* (1939), *La Philosophie du non* (1940, tr *The Philosophy of No*, 1968), and *On Poetic Imagination and Reverie* (tr 1971).

Bacheller, Irving, 1859-1950, American novelist, b Pierpont, N.Y., grad St Lawrence Univ, 1882. In 1884 he founded the first newspaper syndicate in the United States. His novels, chiefly concerned with early American life, include *Eben Holden* (1900), *Dr. and I* (1901), and *A Man for the Ages* (1919). See his autobiographical works.

bachelor's-button, popular name for several plants usually characterized by rounded flowers, such as the CORNFLOWER and globe AMARANTH.

Bache Peninsula (bäch), on E Ellesmere Island, in N Northwest Territories, Canada. U.S. explorer Robert Peary proved this area to be a peninsula when he explored (1898) the region. From 1926 to 1933 the Royal Canadian Mounted Police had a post there, c 800 mi (1,290 km) from the North Pole, that was the most northerly habitation in the world.

Bachrites (băk'rīts), descendants of BECHER 2.

Bach system: see BACH, ALEXANDER.

Baciccio, Il: see GAULLI, GIOVANNI BATTISTA.

bacillus (băsil'as) see BACTERIA.

bacitracin (băs'tră'sin), ANTIBIOTIC produced by a strain of the bacterial species *Bacillus subtilis*. It is widely used for topical therapy such as for skin and eye infections; it is effective against gram-positive bacteria including strains of staphylococcus that are resistant to PENICILLIN (see GRAM'S STAIN). Bacitracin is toxic to humans and therefore it is used internally only in severe illness where the infecting bacteria are resistant to other drugs.

Back, Sir George, 1796-1878, British explorer in N Canada. He accompanied Sir John Franklin on arctic expeditions in 1818, 1819-22, and 1824-27. On an expedition (1833-35) to search for the missing John Ross, Back explored the Great Fish River (now Back River) and Montreal Island in the present Northwest Territories. His *Narrative of the Arctic Land Expedition* appeared in 1836. On a later journey (1836-37) he explored the arctic coast of Canada.

Back, river, c 600 mi (970 km) long, rising in Lakes E Mackenzie dist., Northwest Territories, Canada, and flowing northeast across the tundra to Chantry Inlet. There are numerous lakes along its course. It is named for Sir George Back, the first person to descend the river (1834).

backbone see SPINAL COLUMN.

Backbone Mountain, peak, 3,360 ft (1,024 m) high, NW Md., in the Allegheny Mts., highest elevation in the state.

backgammon (băk'găm'an, băk'găm'an), game of chance and skill played by two persons upon a specially marked board divided by a space called the bar into two tables (inner table and outer table), each of which has 12 alternately colored points, or triangular spaces. The moves permitted each player are dictated by the throws of two dice, and the object is to remove one's 15 pieces, or disks, from the board first according to the rules. The game was

played by the ancients, a backgammon board with dice and pieces was found in Babylonian excavations. Backgammon was also played in Greece and Rome, and after the 10th cent A.D. it became popular in Europe. In England the game was known as tables. Parcheesi, which probably originated in India, is a form of backgammon that permits four to play. See Oswald Jacoby and J R Crawford, *The Backgammon Book* (1970).

Backhuysen or Bakhuyzen, Ludolf (lōō'dōlf bak'hīzan), 1631-1708, Dutch marine painter. He is best known for his scenes of stormy seas. Peter the Great is said to have been instructed by him in drawing. In later years Backhuysen also did some etching and engraving of marine views. He was the foremost follower of Willem van de Velde II, but his works lack his master's poetic vision.

backshore: see BEACH.

backswimmer, common name for WATER BUGS of the cosmopolitan family Notonectidae, so named because they swim upside down, usually near the surface of the water. They resemble the upright-swimming water boatmen, having oval bodies and long, oarlike hind legs, with which they swim rapidly, but their backs are more convex than those of the water boatmen. The exposed belly is yellowish to black. Backswimmers, $\frac{1}{8}$ to $\frac{1}{2}$ in (3-12 mm) long, feed on small crustaceans, insect larvae, snails, and sometimes on small fish and tadpoles from which they suck the body juices. They can inflict a painful bite on a human being. Most of the 50 North American species overwinter as adults. The eggs are usually laid on submerged plants or rocks and development to the adult stage takes 40 to 60 days. Backswimmers are classified in the phylum ARTHROPODA, class Insecta, order Hemiptera, family Notonectidae.

Backus, Isaac, 1724-1806, American clergyman, leader among New England Baptists and a champion of religious freedom, b Norwich, Conn. Converted in the Great Awakening, he joined the separatists or "New Light" faction. He became pastor in 1748 of a Congregational church in Middleboro, Mass., after his adherence to the Baptist faith, he organized and became minister of a Baptist church there, which he served from 1756 until his death. According to his calculations, Backus traveled over 68,000 mi (109,435 km) on his evangelistic tours, mostly on horseback. His *History of New England with Particular Reference to the Baptists* (3 vol, 1777-96) is a major source for the religious history of the region and the period.

Bacolod (bakō'lōd, -lōth), city (1970 est pop. 165,000), capital of Negros Occidental prov, NW Negros island, the Philippines. It is an important seaport, the shipping and processing center of the country's major sugarcane-producing area. The Univ of Negros Occidental-Recoletos is there.

Bacon, Francis, 1561-1626, English philosopher, essayist, and statesman, b London, educated at Trinity College, Cambridge, and at Gray's Inn. He was the son of Sir Nicholas Bacon, lord keeper to Queen Elizabeth I. Francis Bacon was a member of Parliament in 1584 and his opposition to Elizabeth's tax program retarded his political advancement, only the efforts of the earl of Essex led Elizabeth to accept him as an unofficial member of her Learned Council. At Essex's trial in 1601, Bacon, putting duty to the state above friendship, assumed an active part in the prosecution—a course for which many have condemned him. With the succession of James I, Bacon's fortunes improved. He was knighted in 1603, became attorney general in 1613, lord keeper in 1617, and lord chancellor in 1618; he was created Baron Verulam in 1618 and Viscount St Albans in 1621. In 1621, accused of accepting bribes as lord chancellor, he pleaded guilty and was fined £40,000, banished from the court, disqualified from holding office, and sentenced to the Tower of London. The banishment, fine, and imprisonment were remitted. Nevertheless, his career as a public servant was ended. He spent the rest of his life writing in retirement. Bacon belongs to both philosophy and literature. He projected a large philosophical work, the *Instauratio Magna*, but completed only two parts, *The Advancement of Learning* (1605), later expanded in Latin as *De Augmentis Scientiarum* (1623), and the *Novum Organum* (1620). Bacon's contribution to philosophy was his application of the inductive method of modern science as opposed to the a priori method of medieval scholasticism. He urged full investigation in all cases, avoiding theories based on insufficient data. He has been widely censured for being too mechanical, failing to carry his investigations to their logical ends, and not

staying abreast of the scientific knowledge of his own day. In the 19th cent., Macaulay initiated a movement to restore Bacon's prestige as a scientist. Today his contributions are regarded with considerable respect. In *The New Atlantis* (1627) he describes a scientific utopia that found partial realization with the organization of the Royal Society in 1660. His *Essays* (1597-1625), largely aphoristic, are his best-known writings. They are noted for their style and for their striking observations about life. See his works (14 vol., 1857-74, repr. 1968), studies by F. H. Anderson (1948, repr. 1971), A. W. Green (1966), and J. G. Crowther (1960), D. W. Davies and E. S. Wrigley, eds., *Concordance to the Essays of Francis Bacon* (1973).

Bacon, Francis, 1910-, English painter, b. Dublin. A self-taught artist, Bacon became the center of a storm of controversy with his *Three Studies* for the base of *Crucifixion* (1944, Tate Gall., London). He painted a series of variations on diverse themes, e.g., *Van Gogh Goes to Work*, *Velázquez's Innocent X*. Bacon's works are satirical, emphasizing the repulsive, the terrible, and the hallucinatory in human life. See study by John Russell (1974).

Bacon, Henry, 1866-1924, American architect, b. Watseka, Ill. He began his professional career with the firm of McKim, Mead, and White, but after 1903 he practiced independently. Among the important structures designed by him are the Lincoln Memorial at Washington, D.C. (completed 1917), and the World War Memorial at Yale Univ.

Bacon, Leonard, 1802-81, American Congregational minister, b. Detroit, Mich. He served for 41 years as pastor of the First Church of New Haven, one of the leading Congregational churches in the country. Bacon was a noted antislavery leader, although not an abolitionist. His *Slavery Discussed in Occasional Essays* (1846) made a great impression upon Lincoln. He was a founder and editor of the *Independent* and author of the widely known *Pilgrim Hymn* (1833) and *The Genesis of the New England Churches* (1874). See biography by T. D. Bacon (1931).

Bacon, Nathaniel, 1647-76, leader of BACON'S REBELLION in colonial Virginia. An aristocrat (he was kin to Francis Bacon, had been educated at Cambridge and Gray's Inn, and was a member of the governor's council), Bacon nevertheless became the champion of the discontented frontiersmen after only two years' residence in the colony. When he died suddenly from the effects of malaria, the revolt collapsed.

Bacon, Sir Nicholas, 1509-79, English jurist. Called to the bar in 1533, he was made attorney of the court of wards and liveries in 1546 and, although a staunch Protestant, held this office through the reign of Mary I. On the accession (1558) of Elizabeth I, he was appointed lord keeper of the privy seal, possibly through the influence of William Cecil, later Lord Burghley (whose wife's sister Bacon married). In 1559 he was authorized to exercise the jurisdiction of the lord chancellor. He regarded Mary Queen of Scots as a menace to English peace and opposed any measure of compromise with her. He was the father of Francis Bacon.

Bacon, Peggy, 1895-, American illustrator, caricaturist, and etcher, b. Ridgefield, Conn. Bacon has illustrated more than 60 books including works by George Ade, Carl Sandburg, and Louis Untermeyer, as well as her own poems and her stories for children. Her shrewd and caustic observations have found expression in her writings and in her graphic work. *Socialist Meeting* (Metropolitan Mus.) is characteristic. Among her published works are *Off with Their Heads* (1934), *Cat-Calls* (1935), a volume of light verse, and, for children, *The Ghost of Opalina* (1967) and *Magic Touch* (1968). Bacon was married (1920-40) to the painter Alexander BROOK.

Bacon, Robert, 1860-1919, American banker and government official, b. Jamaica Plain, Mass. He embarked upon a career in business and in 1894 accepted a partnership with J. P. Morgan and Company. He participated in the formation (1901) of the U. S. Steel Corp. and the Northern Securities Company. Bacon later served (1905-9) as Assistant Secretary of State under President Theodore Roosevelt, and was briefly (1909) Secretary of State. He was (1909-12) also ambassador to France. An outspoken proponent of U. S. entry into World War I, he served (1917-19) in the U. S. army. He wrote *For Better Relations with Our Latin American Neighbors* (1915). See biography by J. B. Scott (1923).

Bacon, Roger, c. 1214-1294?, English scholastic philosopher and scientist, a Franciscan. He studied at Oxford as well as at the Univ. of Paris and became

one of the most celebrated and zealous teachers at Oxford. Bacon was learned in Hebrew and in Greek and stressed the value of knowing the original languages in the study of Aristotle and of the Bible. He may also have known Arabic, his own philosophy drew upon Arabian Aristotelianism as well as upon St. Augustine. He had an interest far in advance of his times in natural science, in controlled experiments, and in the accurate observation of phenomena. "It is the intention of philosophy," he said, "to work out the natures and properties of things." He declared that mathematics was the gateway to science, and experience, or verification, the only basis of certainty. This belief in experience as a guide to the outer world was, however, not divorced from theology, wisdom and faith were to him one. His writings were numerous. Three of his most important works were written for Pope Clement IV in one year (1267-68)—the *Opus majus* (tr. 1928), the *Opus minor*, and the *Opus tertium*. He was deeply interested in alchemy, an interest that may account for his being credited by his contemporaries with great learning in magical practices. He was long credited with the invention of gunpowder (because of a formula for gunpowder that appeared in a work attributed to him). A manuscript in cipher, discovered in the 20th cent. and attributed to him, would make Bacon the first man to have observed spiral nebulae through a telescope and to have examined cells through a microscope, but considerable doubt has been cast on the original date and the authenticity of the manuscript. Earlier editions of his major works were supplemented by an edition of his hitherto unedited works in various fascicles by Robert Steele and others (1909-35). See A. G. Little, ed., *Roger Bacon Essays* (1914, repr. 1972), biography by F. Winthrop Woodruff (1938), studies by Theodore Crowley (1950) and Stewart C. Easton (1952, repr. 1971).

bacon, flesh of hogs—especially from the sides, belly, or back—that has been preserved by being salted or pickled and then dried with or without wood smoke. In early agricultural communities the curing of meat was an important household industry, the process consisted of soaking the pork in brine or rubbing it in a salt mixture by hand, then smoking the sides in smoke from an open chimney. It sometimes took three or four months. From ancient times bacon has been a major part of the diet of poor people, and many references to it are found in proverbs and phrases. Bacon is still home cured in some rural communities, but the bulk of its manufacture is carried on in large industrial meat-packing plants equipped to slaughter, dress, cure, smoke, and sell on a large scale. Bacon refers to different cuts in different countries. In the United States it usually means the side between the fifth rib and the hip-bone. In Europe, the word *bacon* generally refers to one half of a fattened pig. The high fat content of bacon makes it a valuable energy food.

Bacon's Rebellion, popular revolt in colonial Virginia in 1676, led by Nathaniel BACON. High taxes, low prices for tobacco, and resentment against special privileges given those close to the governor, Sir William BERKELEY, provided the background for the uprising, which was precipitated by Berkeley's failure to defend the frontier against Indian attacks. Bacon commanded two unauthorized but successful expeditions against the Indians and was then elected to the new house of burgesses, which Berkeley had been forced to convene. When he attempted to take his seat, Berkeley had him arrested. Soon released, Bacon gathered his supporters, marched on Jamestown, and coerced Berkeley into granting him a commission to continue his Indian campaigns. A circumspet assembly then passed several reform measures. The governor, having failed to raise a force against Bacon, fled to the Eastern Shore. He gathered enough strength to return to Jamestown, where he proclaimed Bacon and his men rebels and traitors. After a sharp skirmish Bacon recaptured the capital (Berkeley again took flight) but, fearing that he could not hold it against attack, set fire to the town. Bacon now controlled the colony, but he died suddenly (Oct., 1676), and without his leadership the rebellion collapsed. After a few months Berkeley returned to wreak a bloody vengeance before he was forced to return to England. Berkeley's removal and the end of Indian attacks were the only benefits the yeomen had won in the rebellion, and the tidewater aristocracy long maintained its power. See T. J. Wertenbaker, *Torchbearer of the Revolution* (1940, repr. 1965) and *Bacon's Rebellion, 1676* (1957), W. E. Washburn, *The Governor and the Rebel* (1957, repr. 1967).

bacteremia: see SEPTICEMIA

bacteria [pl. of bacterium], microscopic unicellular organisms classified either as plants of the class Schizomycetes of the division SCHIZOPHYTA of the thallophytes or as a separate phylum (Schizomycophyta) comprised of heterogeneous types most nearly resembling the blue-green algae. Three forms are typical—rod-shaped (bacillus), round (coccus, e.g., streptococcus), and spiral (spirillum). The cytoplasm and plasma membrane of most bacterial cells is surrounded by a cell wall, the nucleus contains the universal genetic agent DNA (see NUCLEIC ACID) but lacks the nuclear membrane typical of higher plants and animals. Many, chiefly the bacillus and spirillum forms, are motile, swimming about by whiplike movements of flagella. Reproduction is chiefly by transverse fission, but bacteria are also capable of specialized types of sexual reproduction and genetic RECOMBINATION involving the transfer of nucleic acid by individual contact (conjugation), by exposure to nucleic acid remnants of dead bacteria (transformation), or by a viral agent, the BACTERIOPHAGE (transduction). Under unfavorable conditions some bacteria form highly resistant spores with thickened coverings, within which the living material remains dormant in altered form until conditions improve. Some bacteria (those known as aerobic forms) can function metabolically only in the presence of free or atmospheric oxygen, others (anaerobic bacteria) cannot grow in the presence of free oxygen but obtain oxygen from compounds, and a third group, called facultative anaerobes, can grow with or without free oxygen. By their metabolic processes, different types of bacteria are capable of innumerable chemical, metabolic transformations involving enzyme production, including photosynthesis and the conversion of free nitrogen and sulfur into amino acids, organic compounds that can then be used by other plants and animals to synthesize proteins for their own protoplasm. Bacteria are remarkably adaptable to diverse environmental conditions; they are found in the bodies of all living organisms and on all parts of the earth—in land terrains and ocean depths, in arctic ice and glaciers, in hot springs, and even in the stratosphere. There are more bacteria, as separate individuals, than any other type of organism, there may be as many as 100 million bacteria in one gram of fertile soil. Harmless and beneficial bacteria far outnumber harmful varieties. Because they are capable of producing so many enzymes necessary for the building up and breaking down of organic compounds, bacteria are employed extensively by man—for soil enrichment with leguminous crops (see NITROGEN CYCLE), for preservation by pickling, for fermentation (as in the manufacture of alcoholic beverages, vinegar, and certain cheeses), for decomposition of organic wastes (in septic tanks, in some sewage disposal plants, and in agriculture for soil enrichment), and for curing tobacco, retting flax, and many other specialized processes. Bacteria frequently make good objects for genetic study. Large populations grown in a short period of time facilitate detection of MUTATIONS, or rare variations. Bacterial parasites that cause disease are called pathogenic forms, or pathogens. Among bacterial plant diseases are leaf spot, fire BLIGHT, and wilts, animal diseases caused by bacteria include TUBERCULOSIS, CHOLERA, SYPHILIS, TYPHOID FEVER, and TETANUS. Some bacteria attack the tissues directly, others produce poisonous substances called toxins. Natural defense against harmful bacteria is provided by antibodies (see IMMUNITY). Certain bacterial diseases, e.g., tetanus, can be prevented by injection of ANTITOXIN or of serum containing antibodies against specific bacterial antigens, immunity to some can be induced by VACCINATION, and certain specific bacterial parasites are killed by ANTIBIOTICS. Bacteria were first observed by Leeuwenhoek in the 17th cent., bacteriology as an applied science began to develop in the late 19th cent. as a result of research in medicine and in fermentation processes, especially by Louis Pasteur and Robert Koch. See Kenneth Thimann, *The Life of Bacteria* (2d ed. 1963), William Hayes, *The Genetics of Bacteria and their Viruses* (1964).

bacteriophage (bakter'ēofāj'), VIRUS that infects bacteria and sometimes destroys them by lysis, or dissolution of the cell. Bacteriophages, or phages, have a head composed of protein, an inner core of NUCLEIC ACID, either deoxyribonucleic acid (DNA) or ribonucleic acid (RNA), and a hollow protein tail. A particular phage can usually infect only one or a few related species of bacteria, for example, coliphages are DNA-containing viruses that infect only the bacterium *Escherichia coli*. A virus infects a bacterial

cell by first attaching to the bacterial cell wall by its tail. In coliphages the tail is a complex protein structure consisting of a hollow contractile sheath, with a plate at the base that contains long protein fibers. The tail fibers fix the base plate to the specific receptor site on the bacterial cell wall, and the tail sheath contracts like a syringe, forcing the DNA that is inside the virus through the cell wall and cell membrane. The entire virus protein coat remains outside the bacterium. The injected nucleic acid is the viral genetic material, it makes use of the bacterium's chemical energy and biosynthetic machinery to produce viral enzymes that an uninfected bacterium does not make, as well as more phage nucleic acid. The viral proteins and nucleic acid molecules within the bacterial host assemble spontaneously into up to a hundred new phage particles. Eventually the bacterium lyses, and the particles are released. Lysis can be readily observed in bacteria growing on a solid medium, where groups of lysed cells appear as clear areas, or plaques. Some DNA phages, called temperate phages, have a more complex relationship with the host than simple lysis. Temperate phages only lyse a small fraction of bacterial cells, in the remaining majority of the bacteria, the phage DNA becomes integrated into the bacterial chromosome and replicates along with it. In this state, known as lysogeny, the information contained in the viral nucleic acid is not expressed. A lysogenic culture, i.e., a bacterial culture infected with temperate phages, can be treated with radiation or mutagens, either of which induces the cells to begin producing viruses and lyse. Lysogenic phages resemble bacterial genetic particles known as EPI-SOMES. The bacteriophage was discovered independently by the microbiologists F. W. Twort (1915) and Felix d'Herelle (1917). The phages have been much used in the study of bacterial genetics and cellular control mechanisms largely because the bacterial hosts are so easily grown and infected with phage in the laboratory. There have also been unsuccessful attempts to use phages to destroy such pathogenic bacteria as those causing typhoid and cholera.

Bactria (băk'trēə), ancient Greek kingdom in central Asia. Its capital was Bactra, present-day Balkh in N Afghanistan. Before the Greek conquest, the region had been taken by the Persians and was an eastern province of the Persian Empire. It became prosperous as the area for transmitting Siberian and Indian metals and goods to the Persians. When Alexander the Great invaded the Persian Empire, the defeated Darius III fled to Bactria, where he was murdered (330 B.C.) by the Bactrian satrap, Bessus. The Bactrians, under Bessus, resisted Alexander stoutly, but they were subdued in 328 B.C. Bactria took on Greek culture and became quasi-independent. Theoretically it remained part of the Seleucid empire. In 256 B.C., Diodotus I was made satrap, and a little later he assumed complete independence. His successor, Euthydemus, successfully resisted the attempts (208–206 B.C.) of Antiochus III to bring Bactria back into the empire. Euthydemus' son Demetrius made Bactria a powerful state. He was overlord of part of Chinese Turkistan and carried his conquests deep into N India, taking Patna. The Seleucid ruler, Antiochus IV, sent Eucratidas into Bactria, and Eucratidas in 167 B.C. brought about the death of Demetrius but was himself slain in 159 B.C. Menander, Demetrius' general, continued to exercise power until his death in 145 B.C. A little later (c. 130 B.C.) Bactria fell to the nomadic Sakas and did not rise again as a state. See H. G. Rawlinson, *Bactria: The History of a Forgotten Empire* (1912, repr. 1969), W. W. Tarn, *The Greeks in Bactria and India* (2d ed. 1951), A. K. Narain, *The Indo-Greeks* (1957, repr. 1962).

Badagri (badă'grē), town, SW Nigeria, on a lagoon off the GULF OF GUINEA. Jute bags are made there. Badagri was founded c. 1730 and became an important shipping point for black African slaves. In the 1840's it became a center for British Christian missionaries, and in 1863 it was annexed by Britain. Badagri declined with the end of the slave trade.

Badajoz (bădă'hōzh'), city (1970 pop. 101,710), capital of Badajoz prov., SW Spain, in Estremadura, on the Guadiana River. It is situated in a fertile agricultural region where food processing is the main industry. Strategically located near the border of Portugal, it has an active trade with that country. Badajoz was an ancient fortress city that rose to prominence under the Moors as the seat (1022–94) of a vast independent emirate. Alfonso IX of Leon liberated it in 1228. Thereafter Badajoz was repeatedly attacked by the Portuguese and was consequently strongly fortified. The city has often been besieged, in the Peninsular War the French failed to

take it in a long siege (1808–9) and succeeded in 1811 only to be driven out by Wellington. In 1812 after bitter fighting. In the civil war of 1936–39 the capture (1936) of Badajoz by the Insurgents after a bloody battle was followed by hundreds of executions. Notable landmarks are the massive cathedral (begun in the 13th cent.) and the remains of the Moorish citadel. Charles IV's favorite, Manuel de Godoy, and the painter Luis de Morales were born in Badajoz.

Badakhshan (badakhshān'), province (1970 est. pop. 344,500), 16,844 sq mi (43,626 sq km), extreme NE Afghanistan, between the Hindu Kush Mts. and the Amu Darya River. The capital is FAIZABAD. Renowned for its mineral wealth, it is the world's chief source of lapis lazuli, a semiprecious stone. The deposits have been worked for more than 3,000 years. Rubies, emeralds, amethysts, and gold have also been mined in Badakhshan. Mountain goats and the famed Marco Polo wild sheep are hunted in the province (Marco Polo visited the area in 1272). Some agriculture and sheep and goat herding are also practiced. Badakhshan, part of the ancient Greek kingdom of Bactria, may once have been ruled by Alexander the Great. Its strategic location astride the trade routes from Europe and the Middle East to China and from central Asia and the Indian subcontinent made Badakhshan an international pawn for centuries. In 1859 it became an integral part of Afghanistan. Many of its inhabitants are Tadzhiks who speak an archaic form of Persian.

Badakhshan* see GORNO-BADAKHSHAN AUTONOMOUS OBLAST, USSR

Badalona (bathălô'nă), city (1971 pop. 162,888), Barcelona prov., NE Spain, in Catalonia. It is a Mediterranean port and an important industrial suburb of Barcelona, with textile, chemical, and glass manufactures. Nearby there are ancient tombs, possibly Phoenician, and the 15th-century monastery of San Jeronimo de la Murtra.

Bad Blankenburg: see BLANKENBURG, East Germany

Bade, Josse: see BADIUS, JODOCUS

Bad Ems, West Germany: see EMS

Baden (bə'dən), former state, SW West Germany. KARLSRUHE was the capital. Stretching from the Main River in the northeast across the lower Neckar valley and along the right bank of the Rhine to the Lake of Constance (Bodensee), the former state of Baden bordered on France and the Rhenish Palatinate in the west, Switzerland in the south, Hesse in the north, and Bavaria and Württemberg in the east. It included the cities of Mannheim, Pforzheim, Heidelberg, Baden-Baden, Freiburg, and Rastatt and, in the south, most of the Black Forest. Until the French Revolution the area was a confusing jigsaw puzzle of petty margraviates and ecclesiastical states (the bishoprics of Mainz, Speyer, Strasbourg, and Konstanz). The BREISGAU belonged to the Hapsburgs, the Mannheim-Heidelberg area to the Rhenish PALATINATE. In 1771 the margraviates of Baden-Baden and Baden-Durlach were united as Baden under the same branch of the house of ZAHRINGEN. Margrave Charles Frederick of Baden, raised to the rank of elector at the beginning of the 19th cent., joined the Confederation of the Rhine in 1806 with the title of grand duke and by 1810 had acquired, with the aid of Napoleon I of France, the entire state of Baden. Despite the liberal constitution of 1818 the grand duchy was severely shaken by the Revolution of 1848, which was suppressed with the help of Prussian troops. Among the revolutionary leaders in Baden was Friedrich Hecker. Baden sided with Austria in the Austro-Prussian War (1866), but joined the German Empire in 1871. It became a republic in 1918 and joined the Weimar Republic. After World War II, Baden was divided into two parts—in the south, the state of Baden (3,842 sq mi/9,951 sq km), occupied by France, and in the north, the state of Württemberg-Baden (1,984 sq mi/5,139 sq km), including part of Württemberg, occupied by U.S. armed forces. In 1952 the two states were merged with Württemberg-Hohenzollern to form the new state of BADEN WÜRTTEMBERG.

Baden (bə'dən) or **Baden-bei-Wien** (-bī-vēn'), city (1971 pop. 22,600), Lower Austria province, E Austria, on the Schwechat River, near Vienna. The hot sulfur springs of this picturesque city have been frequented since Roman times. From 1945 to 1955, Baden served as the Soviet military headquarters for Austria.

Baden, anc. *Aquae Helveticae*, town (1970 pop. 14,115), Aargau canton, N Switzerland, on the Limmat River. A noted spa since ancient times, the town has hot sulfur springs. It is also a manufacturing center known for aluminum ware and electrical ma-

chinery. The Swiss diet met at Baden from c. 1425 to 1712. The Treaty of Baden (1714) complemented the Peace of Utrecht (see UTRECHT, PEACE OF). Baden was the capital (1798–1803) of Baden canton under the HELVETIC REPUBLIC. The castle of Stein, now in ruins, was once a Hapsburg residence.

Baden-Baden (bə'dən-bă'dən), city (1970 pop. 37,537), Baden-Württemberg, SW West Germany, in the Black Forest. It is one of Europe's most fashionable spas. The city has many parks and a large casino (built 1821–24). Baden-Baden was founded as a Roman garrison in the 3d cent. Its hot mineral springs were used by the Romans, and remains of Roman baths have been found in the city. It was the residence of the margraves of Baden until the early 18th cent.

Badenoch (bad'anōkh'), highland district, 45 mi (72 km) long and 19 mi (31 km) wide, Inverness-shire, N central Scotland. It is a wild, densely wooded, mountainous region, cut by the river Spey. Loch Laggan is there. Kingussie is the main town and tourist center.

Baden-Powell of Gilwell, Robert Stephenson Smyth Baden-Powell, 1st Baron (bə'dən-pō'al), 1857–1941, British soldier, founder of the BOY SCOUTS. He saw much active service in India and Africa prior to the South African War, in which he defended Mafeking for seven months (1899–1900) and subsequently organized the South African constabulary. For his enduring work in organizing (1908) the Boy Scout and Girl Guide movements, he received a peerage in 1929. His writings include *Scouting for Boys* (1908), *Rovering to Success* (1922), and *Scouting and Youth Movements* (1929). See biographies by E. E. Reynolds (1942, 2d ed. 1957) and William Hillcourt and O. S. Baden-Powell (1964).

Baden-Württemberg (bə'dən-wūrt'tembūrg, Ger. wūrt'tembērk'), state (1970 pop. 8,895,000), 13,803 sq mi (35,750 sq km), SW West Germany. STUTTGART is the capital. It was formed in 1952 by the merger of WÜRTTEMBERG-BADEN, WÜRTTEMBERG-HOHENZOLLERN, and postwar Baden, all of which came into being after 1945. It includes the historic states of Baden and Württemberg, the former principality of HOHENZOLLERN, and the former district of LINDAU, Bavaria. The state borders on Switzerland in the south, France and the Rhineland-Palatinate in the west, Hesse in the north, and Bavaria in the east. Drained by the Rhine (which forms its border on the west), the upper Danube, and the Neckar, Baden-Württemberg includes the Black Forest in the southwest, the Lake of Constance in the south, and the Swabian Jura in the southeast. Although it is a forested and fertile land (the Rhine plain is one of the most fertile areas in Germany), industry is the main occupation. Industries (chiefly the manufacture of electrical power, chemicals, textiles, and machinery and the assembly of motor vehicles) are centered at Stuttgart, Mannheim, Karlsruhe, Heidelberg, Freiburg, and Ulm. Agriculture, forestry, and livestock raising are also important. One of the largest and most varied tourist areas of Germany, Baden-Württemberg has the picturesque Neckar valley, the idyllic forests and lakes of the south, and the famous spas of Baden-Baden and Wildbad. Freiburg and Heidelberg have noted universities. The history of Baden-Württemberg is the history of BADEN and of WÜRTTEMBERG.

Badger, Joseph, 1708–65, American painter, b. Charlestown, Mass. By trade a glazier and house and sign painter, he turned his hand to portraiture. Generally uninspired, his work appears at its best in his numerous portrayals of young children, such as Jeremiah Belknap (Mus. of Art, Cleveland). See Cuthbert Lee, *Early American Portrait Painters* (1929).

badger, name for several related members of the WEASEL family. Most badgers are large, nocturnal, burrowing animals, with broad, heavy bodies, long snouts, large, sharp claws, and long, grizzled fur. The Old World badger, *Meles meles*, is found in Europe and in Asia. N of the Himalayas, it is about 3 ft (90 cm) long, with a 4-in. (10-cm) tail, and weighs about 30 lb (13.6 kg). Its unusual coloring, light above and dark below, is unlike that of most mammals but is found in some other members of the family. The head is white, with a conspicuous black stripe on each side. European badgers live, often in pairs, in large burrows called sets, which they usually dig in dry slopes in woods. They emerge at night to forage for food; their diet includes rodents, young rabbits, insects, and plant matter. The American badger, *Taxidea taxus*, is about 2 ft (60 cm) long, with a 5-in. (13-cm) tail and weighs 12 to 24 lb (5.4–10.9 kg); it is very short-legged, which gives it its body

a flattened appearance. The fur is yellowish gray and the face black, with a white stripe over the forehead and around each eye. It is found in open grasslands and deserts of W and central North America, from N Alberta to N Mexico. It feeds largely on rodents, an extremely swift burrower, it pursues ground squirrels and prairie dogs into their holes, and may construct its own living quarters 30 ft (9.1 m) below ground level. American badgers are solitary and mostly nocturnal, in the extreme north they sleep through the winter. Several kinds of badger are found in SE Asia, these are classified in a number of genera. Badgers are classified in the phylum CHORDATA, subphylum Vertebrata, class Mammalia, order Carnivora, family Mustelidae.

Bad Godesberg (bāt gō'dasbērk), part of BONN, North Rhine-Westphalia, W West Germany, on the Rhine River. It is the site of numerous foreign embassies and government agencies as well as residences of diplomats and government officials. It is also a resort noted for its radioactive mineral springs. In Sept., 1938, Adolf Hitler and British Prime Minister Neville Chamberlain met there (see MUNICH PACT). Bad Godesberg was incorporated into Bonn in 1969.

Bad Homburg vor der Höhe (bāt hōm'bōrk fōr dēr hō'a), **Bad Homburg**, or **Homburg**, city (1970 pop. 41,598), Hesse, central West Germany, at the foot of the Taunus mts. It is a famous spa and resort. Manufactures include foodstuffs and machinery. Chartered in the early 14th cent., Bad Homburg was from 1622 to 1866 the capital of the landgraviate of Hesse-Homburg.

Badia y Leblich, Domingo (dōmēng'gō bāthē'a ē lāblēk'), 1766-1818, Spanish traveler, known as Ali Bey. Posing as a Muslim, he set out from Cadiz (1803) and traveled through N Africa, Syria, and Arabia, reaching Mecca, of which he fixed the position astronomically. He wrote *Voyage d'Ali Bey en Asie et en Afrique* (1814). See D. G. Hogarth, *The Penetration of Arabia* (1904, repr. 1967).

Badings, Henk (hēngk bā'dīngz), 1907-, Dutch composer, b. Bandung, Java (now Indonesia). Badings studied with Willem Pijper after working as a mining engineer. An extremely prolific composer, he started writing electronic music in the 1950s. Some of his music utilizes scales of alternating whole and half steps and pluritonicity. Badings's first symphony was written in 1930, other works are the electronic ballet *Evolutions* (1958) and the opera *Salto Mortale* for voices and electronic accompaniment.

Bad Ischl (bāt īsh'əl) or **Ischl**, city (1971 pop. 12,700), in Upper Austria prov., W Austria, in the center of the SALZKAMMERGUT. It is a famous spa. After 1822 it was the summer residence of the Austrian imperial family. Emperor Francis Joseph signed (1914) his declaration of war on Serbia there.

Badius, Jodocus (jōdō'kas bā'dēās), 1462-1535, French printer, b. Asche, near Brussels. His original name was Josse Bade, and he is sometimes called for his birthplace Jodocus Badius Ascensius. He taught Greek and edited classics in Lyons before he became a printer, gaining recognition as a scholar and as an author, his writings include a life of Thomas a Kempis. In 1503 he went to Paris where he established the Ascensian press, which printed over 400 books, mainly Greek and Latin texts. His printer's marks are early pictures of a printing press. See A. F. Johnson, *French Sixteenth Century Printing* (1928).

Bad Kreuznach (bāt kroit's'nakh), city (1970 pop. 42,146), Rhineland-Palatinate, W West Germany, on the Nahe River. Its manufactures include precision instruments, tires, glass, and leather. Bad Kreuznach was probably settled in the Stone Age. Its radioactive salt baths have been frequented since Roman times, when it was a garrison town.

badlands, area of severe erosion, usually found in semi-arid climates and characterized by countless gullies, steep ridges, and sparse vegetation. Badland topography is formed on poorly cemented sediments that have few deep-rooted plants because short, heavy showers sweep away surface soil and small plants. Depressions gradually deepen into gullies. The term *badlands* was first applied to the arid, dissected plateau region of SW South Dakota by Indians and fur trappers who found the area difficult to cross. South Dakota's Big Badlands, also known as the Badlands of the White River, are the world's best and most extensive (c. 2,000 sq mi/5,180 sq km) example of this topography. Gullies have cut as deep as 500 ft (152 m) below the plateau's surface, and differences in rock type have created colorful and spectacular formations. The Big Badlands are famous for fossils of prehistoric animals. Badlands Na-

tional Monument occupies most of the region (see NATIONAL PARKS AND MONUMENTS, table).

badminton (bād'mīntən), game played by volleying a shuttlecock (called a "bird")—a small, cork hemisphere to which feathers are attached—over a net. Light, gut-strung rackets are used. Badminton, which is generally similar to tennis, is played by two or four persons. A badminton court for singles play measures 17 ft (5.18 m) by 44 ft (13.40 m) and for doubles 20 ft (6.10 m) by 44 ft (13.40 m). The net is 5 ft (1.52 m) high at the center and 5 ft 1 in. (1.55 m) at the posts. The game probably originated in India (where it was called *poona*), although it may have been known earlier in China. It was popular in the 1870s in England, taking its name from Badminton, the Gloucestershire estate of the duke of Beaufort. The game was introduced into the United States in the 1890s and grew in popularity in the 1930s. The International Badminton Association (founded 1934) sponsors the Thomas Cup for men's teams and the Woer Cup for women's teams, the world championships of badminton.

Bad Nauheim (bat nou'hīm), town (1970 pop. 14,242), Hesse, central West Germany, in the Taunus mts. It is a world-famous resort, noted for its salt springs, which are used to treat heart and nerve diseases.

Badoglio, Pietro (pyā'trō bādō'lyō), 1871-1956, Italian soldier and public official. After serving in World War I, he was governor of Libya (1929-33) and succeeded Gen. Emilio de Bono as commander in chief in the Ethiopian conquest, which he brought (1936) to a victorious end. Created duke of Addis Ababa, he was briefly viceroy of Ethiopia, then chief of the Italian general staff until 1940. After the fall of Mussolini, he was made (1943) premier by King Victor Emmanuel III. He negotiated an armistice with the Allies, whom he joined in the war against Germany. Meeting with much opposition in Italy, he resigned in 1944. He wrote *Italy in the Second World War* (tr. 1948).

Bad Reichenhall (bat rī'khānhāl) or **Reichenhall**, town (1970 pop. 13,042), Bavaria, SE West Germany, on the Saalach River, near the Austrian border. It is a year-round health resort. Salt has been mined there since Roman times.

Badrinath (būd'rīnāt), peak, 23,210 ft (7,074 m) high, in the central axis of the Himalayas, Uttar Pradesh state, N India. The peak has several glaciers. At a height of c. 10,000 ft (3,050 m), is an 8th-century monastery and a temple to the Hindu god Shiva, a popular pilgrimage center built by the great Indian scholar and teacher Śāṅkaracharya.

Baduila: see TOTIA.

Baeck, Leo (lā'ō bēk), 1873-1956, German rabbi and scholar. He studied at the conservative Jewish Theological Seminary of Breslau and then at the liberal Hochschule für die Wissenschaft des Judentums in Berlin, also attending the universities of Breslau and Berlin, at Berlin he studied philosophy under Wilhelm Dilthey. He held positions as rabbi in Oppeln (1897-1907), Düsseldorf (1907-12), and Berlin (1912-43). In 1943 he was sent to the Theresienstadt concentration camp. After being liberated in 1945, he moved to London, becoming president of the World Union for Progressive Judaism, he also taught on occasion at the Hebrew Union College in Cincinnati. Baeck's works in English translation include *The Essence of Judaism* (1905, tr. 1936), *The Pharisees and Other Essays* (1947), and *Judaism and Christianity* (1958). In *This People Israel* (1955, tr. 1965), he propounded his belief in the eternal dialectical polarity between "mystery" and "command," the latter being the divine instructions that give concrete expression to the "mystery" in terms of man's obligations to others, which he defined as piety. See A. H. Friedlander, *Leo Baeck, Teacher of Theresienstadt* (1968).

Baeda: see BEDE, SAINT.

Baedeker, Karl (bā'dēkər), 1801-59, German publisher, founder of the Baedeker guidebooks. His printing establishment was at Koblenz, but his son Fritz, who continued the business, moved it to Leipzig. Printed in several languages, the guidebooks provided valuable historical information and ran into many editions, especially for European countries. Although the firm's files were destroyed during World War II, the business was revived after the war by a great-grandson of Baedeker. In 1950 the firm began publishing automobile touring guides.

Baekeland, Leo Hendrik (bāk'lānd), 1863-1944, American chemist, b. Belgium, grad. Univ. of Ghent, 1882. In 1889 he emigrated to the United States. He founded (1893) and conducted, until 1899, when he

sold the rights to Eastman, a company for producing a photographic paper of his own invention. In 1909 he announced his invention of *BAKELITE*, and from 1910 to 1939 he served as president of the Bakelite Corp. He wrote *Some Aspects of Industrial Chemistry* (1914).

Baer, George Frederick (bār), 1842-1914, American financier, b. Somerset co., Pa. Baer became legal adviser to J. Pierpont Morgan and held many posts as a key figure in the railroad-and-coal empire. He is remembered for his refusal to arbitrate in the strike of the anthracite-coal miners in 1902.

Baer, Karl Ernst von, 1792-1876, Estonian biologist. He was a professor at Würzburg and Königsberg and from 1834 at St. Petersburg. Considered a founder of modern embryology, he discovered the notochord as well as the mammalian ovum. In his *History of the Development of Animals* (2 vol., 1828-37) he presented the theory of embryonic germ layers (the development of body tissues and organs from definite layers of cells formed in the early embryonic stages) and showed that the development of the embryo in different animals is similar in its early stages. He made these ideas a basis for a general evolutionary theory.

Baerle-Duc: see BAARLE-HERTOG, Belgium.

Baeyer, Adolf von (Johann Friedrich Wilhelm Adolf von Baeyer) (ā'dōlf fən bā'yər, yō'hān' frē'drīkh vīl'hēlm), 1835-1917, German chemist. He taught at Berlin and Strasbourg and in 1875 succeeded Liebig at Munich. For his work in organic chemistry, especially that on organic dyes and the hydroaromatic compounds, he received the 1905 Nobel Prize in Chemistry. His discovery of the molecular structure of indigo and his research on many other organic substances did much to develop the chemical industry of Germany. His collected works were published in German (1905).

Báez, Buenaventura (bwā'navāntō'rā bā'ās), c. 1810-1884, president of the Dominican Republic (1849-53, 1856-58, 1865-66, 1868-73). Like his bitter rival, SANTANA, Báez was unscrupulous and selfish, he gained and lost the presidency by revolution and counterrevolution. With his country in a condition of financial ruin and recurrently gripped by anarchy, he negotiated (1869) a treaty with the United States providing for U.S. annexation of the Dominican Republic. A Dominican plebiscite (1870) confirmed the treaty, but the U.S. Senate, ignoring President Grant's wishes, failed to ratify it. Báez lost his popular support and was overthrown.

Baez, Joan (ba'ēz, bīz), 1941-, American folk singer and political activist, b. New York City. Baez began singing folk ballads, blues, and spirituals in Cambridge, Mass., coffeehouses, singing traditional folk songs such as "Donna, Donna," "Mary Hamilton," and "All My Trials" in a clear soprano voice with a three-octave range. She made folk music popular where it had been largely ignored. Baez's folk records were the first complete albums to become best-sellers. Her later albums include several of her own compositions, e.g., "Song for David" and "Blessed Are." Among the first performers to urge social protest, she sang and marched for civil and student rights and peace. Since the late 1960s she has devoted most of her time to her school for nonviolence in California. See her autobiography, *Day-break* (1968).

Baffin, William, c. 1584-1622, British arctic explorer. He was pilot on two expeditions (1615-16) sent out to search for the NORTHWEST PASSAGE under command of Robert Bylot, who was formerly with Henry Hudson. The first expedition vainly tried to find a channel in Hudson Bay N of Southampton Island. The second attempt, NW through Davis Strait, led to exploration of what was later called Baffin Bay and the northeast shore of Baffin Island. The existence of Baffin Bay was discredited until 1818 when Sir John Ross confirmed Baffin's discovery and observations. Baffin's conviction that the Northwest Passage did not exist discouraged arctic exploration for a time. His narratives were edited by Sir Clements Markham in 1881.

Baffin Bay, ice-clogged body of water, c. 700 mi (1,130 km) long, between Greenland and NE Canada. It connects with the Arctic Ocean to the north and west and with the Atlantic Ocean to the south by way of Davis Strait. Although more than 9,000 ft (2,740 m) deep, navigation in the bay is made hazardous by many icebergs brought there by the Labrador Current. In the 1800s the bay was an important whaling station. The British explorer John Davis was first (1585) to enter the bay, which is named for William Baffin, who explored it in 1616.

Baffin Island, 183,810 sq mi (476,068 sq km), c 1,000 mi (1,610 km) long and from 130 to 450 mi (210–720 km) wide, in the Arctic Ocean, E Northwest Territories, Canada. It is the fifth-largest island in the world and the easternmost member of the Arctic Archipelago. Baffin Island is geographically and geologically a continuation of Labrador, from which it is separated by Hudson Strait. The western side of the island is covered largely by tundra. There are many freshwater lakes, including Nettilling (1,956 sq mi/5,066 sq km) and Amadjuak. In the east, snow-covered mountain ranges rise more than 8,000 ft (2,440 m). Baffin Island has a deeply indented coastline with many fjords. Most of the island's inhabitants are Eskimos who live mainly at coastal trading posts. Whaling, fur trading, and fishing are the chief occupations. The posts have stores, post offices, police stations, schools, and occasionally hospitals. Martin Frobisher visited the island between 1576 and 1578, and Frobisher Bay, in the southeast, is the principal town. The island is named for William Baffin, the British explorer who explored the Arctic in 1616.

Baffin Island National Park, c 8,290 sq mi (21,470 sq km), SE Franklin dist., Northwest Territories, Canada, on E Baffin Island near Pangnirtung, est. 1972. Located on the Cumberland Peninsula, it was the first Canadian national park to be created N of the Arctic Circle. The park includes scenic fjords, glaciated mountains, numerous glaciers, and the extensive Penny Ice Cap.

Bagdad: see BAGHDAD, Iraq

Bagshot, Walter (bā'ŷŏt), 1826–77, English social scientist. After working in his father's banking firm, he edited (1860–77) the *Economist* (which had been founded by his father-in-law) and helped establish its high reputation as a financial journal. From these activities came his noted study of the English banking system, *Lombard Street* (1873). Bagshot's classic *English Constitution* (1864) distinguished between the effective institutions of government and those, like the House of Lords, that had entered decay. His other important books include *Literary Studies* (1879) and *Economic Studies* (1880). In *Physics and Politics* (1875) he made a pioneer analysis of the interrelationship between the natural and the social sciences. Bagshot was also a noted literary critic of his day. See his collected works (10 vol., 1915), biography by William Irvine (1939, repr. 1970), studies by Alistair Buchan (1960) and Norman St John-Stervas (1963).

Baggesen, Jens (yēns bag'əsen), 1764–1826, Danish poet and satirist, b. Zealand. Although a Germanophile, Baggesen was considered the leading Danish poet of his day. His elegant, imaginative poems include *Comic Tales* (1785) and the satirical *The Ghost and Himself*, or, *Baggesen on Baggesen*. *The Labyrinth* (2 vol., 1792–93), his outstanding prose work, is a vivid and witty account of his journeys.

Baghdad or **Bagdād** (both bāg'dād, bagdad'), city (1970 est. pop. 2,183,760), capital of Iraq, central Iraq, on both banks of the Tigris River. Most of Iraq's industries are in Baghdad, they include the making of carpets, leather, textiles, cement, and tobacco products and the distilling of arrack. The present city was founded (762) on the west bank of the Tigris by the Abbasid caliph MANSUR, who made it his capital. Its commercial position became generally unrivaled and under the caliph HARUN AR-RASHID it rose to become one of the greatest cities of Islam. Baghdad was the home of eminent scholars and artists and enjoyed great wealth from the sale of its silks and tiles. Its many gardens gave added justification to its claim to be the "Abode of Peace." This period of its greatest glory is reflected in the *Thousand and One Nights*, in which many of the tales are set in Baghdad. After the death (809) of Harun the seat of the caliph was moved to Samarra, when the caliphate was returned later in the century, Baghdad had already been weakened by internal struggles. In 1258 the Mongols sacked the city and destroyed nearly all of its splendor. It revived but was captured again by Tamerlane (1400) and by the Persians (1524). It was repeatedly contested by Persians and Turks until 1638, when it definitively became part of the Ottoman Empire. By that time the city's population had dwindled from a peak of about 2,000,000 to only a few thousand. Baghdad was captured by the British in 1917. In 1920 it became the capital of the newly constituted kingdom of Iraq. The city was the scene of a coup in 1958 that overthrew the monarchy and established the Iraqi republic. Baghdad is rich in archaeological remains and has several museums. There are three universities in Baghdad, the largest is the Univ. of Baghdad (1958).

Baghdad Pact: see CENTRAL TREATY ORGANIZATION

Baghdad Railway, railroad of international importance linking Europe with Asia Minor and the Middle East. The line runs from Istanbul, Turkey, to Basra, Iraq. The railroad was initially financed chiefly by German capital, its Anatolian sections were completed in 1896. The ambitious project was then formed to extend the railroad to Baghdad, and a company, again backed chiefly by German capital, was organized for the purpose. Immediate protests were made to Turkey by France, Russia, and, particularly, Great Britain, which saw in the projected line a direct threat to its empire in India. Operations were held up for several years by these international representations and by engineering difficulties, but in 1911 work was resumed. By playing on imperialistic rivalries, the construction of the railroad was a factor in bringing about World War I. By the end of the war only a stretch between Mosul and Samarra remained to be completed on the main line. See E. M. Earle, *Turkey, the Great Powers, and the Baghdad Railway* (1923, repr. 1966), J. B. Wolf, *The Diplomatic History of the Baghdad Railroad* (1936, repr. 1973).

Baghlan (bag'lan), city (1971 pop. 105,944), N Afghanistan, on the Kunduz River. A center of beet sugar production, it has industries producing cotton and fabrics.

Bagley, William Chandler, 1874–1946, American educator and editor, b. Detroit, grad. Michigan State College, 1895, M.S. Univ. of Wisconsin, 1898, Ph.D. Cornell Univ., 1900. He taught in elementary schools before becoming (1908) professor of education at the Univ. of Illinois. He was professor of education at Teachers College, Columbia, from 1917 to 1940. An opponent of pragmatism and progressive education, Bagley insisted on the value of knowledge for its own sake, not merely as an instrument, and he criticized his colleagues for their failure to emphasize systematic study of academic subjects. Of his many works, *Education and Emergent Man* (1934) contains the clearest exposition of his educational philosophy. His other writings include *The Educative Process* (1905), *Educational Values* (1911), and *Determinism in Education* (1925). Bagley was editor in chief of the *Journal of the National Education Association* (1920–25) and *School and Society* (1939–46), which he founded in 1915. See biographies by F. B. Stratemeyer (1939) and I. L. Kandel (1961).

Bagnères-de-Luchon (banyēr'-dā-lushōn'), town (1968 pop. 4,139), Haute-Garonne dept., S France, at the foot of the Maladetta Mts. It is an important resort in the Pyrenees. Its warm sulfur springs have been known since Roman times.

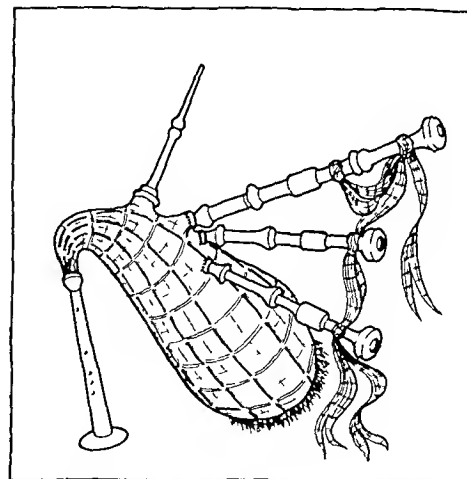
Bagnold, Enid, 1889–, English novelist and playwright, b. Rochester, Kent, England. She was a nurse in a military hospital in World War I. In 1920 she married Sir Rodenck Jones, head of Reuters news agency. Bagnold's works combine wit, charm, sophistication, and wisdom. Her best-known novel is *National Velvet* (1935), the story of a teenage girl who wins a horse in a raffle and rides it to victory in the famed Grand National race. Bagnold's other works include the novels *Serena Blandish* (1924) and *The Loved and the Envid* (1951), and the plays *The Chalk Garden* (1955) and *The Chinese Prime Minister* (1964). See her autobiography (1969).

Bagot, Sir Charles (bāg'ŏt), 1781–1843, British diplomat. As minister to the United States (1815–20) he negotiated the RUSH-BAGOT CONVENTION, which limited armaments along the U.S.-Canadian border. As governor general of Canada (1841–43), he was instructed by the British cabinet to resist Canadian demands for responsible government along the lines proposed by the earl of DURHAM. Bagot, however, allowed Robert BALDWIN and Sir Louis LAFontaine to form a ministry on the basis of their parliamentary majority. See G. P. Glazebrook, *Sir Charles Bagot in Canada* (1929).

Bagotville (bāg'ŏvil), town (1971 pop. 6,041), S Que., Canada, on Ha Ha Bay, an arm of the Saguenay River. It is the port for the area's industries.

bagpipe, musical instrument whose ancient origin was probably in Mesopotamia from which it was carried east and west by Celtic migrations. It was used in ancient Greece and Rome and has been long known in India. Some form of bagpipe was later used in nearly every European country, it was particularly fashionable in 18th-century France, where it was called the musette. Its widest use and greatest development was in the British Isles, particularly Northumberland, Ireland, and Scotland. The island of Skye was the home of a school for pipers.

The Highland pipe of Scotland, the most well-known type, was a martial instrument and from it comes the modern great pipe, but at least six other



Scottish bagpipe

types were once used in the British Isles. The basic construction of a bagpipe consists of a bag, usually leather, which is inflated either by mouth through a tube or by a bellows worked by the arm, one or two chanters (or chaunters), melody pipes having finger holes and fitted usually with double reeds, and one or more drones, which produce one sustained tone each and usually have single reeds, though the musette drones have double reeds (see REED INSTRUMENT). Associated with folk and military music, it has been neglected by composers, possibly because of its short range. See Anthony Baines, *Bagpipes* (1960), T. H. Podnos, *Bagpipes and Tunings* (1974).

Bagration, Piotr Ivanovich, Prince (pyō'tar ēva'-navy'ich bāgratēōn'), 1765–1812, Russian general in the French Revolutionary and Napoleonic Wars. He fought under Field Marshal SUVOROV in the Italian and Swiss campaigns of 1798–99 and at Austerlitz, Eylau, and Friedland. In 1808 he captured the Åland Islands from Sweden, in 1809 he fought against the Turks in the Russo-Turkish War of 1806–12, and in 1812 he commanded an army against Napoleon and was mortally wounded at Borodino.

Bagrationovsk (bāgrŭ'tyēō'nafsk), town, NW European USSR, formerly in East Prussia, on the Polish border. Its German name was Eylau or Preussisch Eylau. It is a rail terminus and has meat-processing and dairy industries. The town was founded in 1336. In Feb. 1807, it was the site of a bloody, indecisive battle between Napoleon I and the allied Russian and Prussian forces that checked Napoleon's movement toward the Russian frontier. The town is named in honor of Gen. P. I. Bagration, who distinguished himself during the battle.

Baguio (bā'gēō, Sp. bagyō'), city (1970 pop. 84,538), Mountain prov., NW Luzon, the Philippines. Baguio is the summer capital of the country, with many government buildings. It is also a noted mountain resort situated in beautiful pine forests and is the center of a major gold-producing area. The city is noted for the wood carvings of its Igorot aborigines. Nearby, at Lepanto, are important copper mines, and there is a major hydroelectric development on the Agno River. Originally settled by the Spanish, Baguio developed only after the American occupation, when a modern city was laid out (1909) by Daniel H. Burnham and roads were built (the first in 1913) to connect it with the main highways. The city was captured early (Dec., 1941) in World War II by Japanese land forces. U.S. Camp John Hay is now maintained there by the U.S. military for recreational purposes. Baguio is the seat of the national Philippine Military Academy, the Univ. of Baguio, and St. Louis Univ.

bagworm, common name for the larva of small moths of the family Psychidae. The larva spins a silken cocoon as it travels, hence the term bagworm. When fully grown, the bagworm fastens its covering to a twig and pupates within it. Some species weave bits of leaves or twigs into their bags. During mating season the wingless, footless adult female perforates the lower end of the bag, crawls in, and soon after laying about a thousand overwintering eggs, dies. The larvae develop slowly, requiring several months to reach maturity. Bagworms prefer arborvitae and juniper trees, but practically all trees are attacked. The best known of these small moths is *Thyridop-*

teryx ephemeraeformis, occurring throughout the E United States and regions adjacent to the Gulf of Mexico. Control of the pests is through use of insecticides or by handpicking the cocoons before the eggs hatch at the end of May. Bagworms are classified in the phylum ARTHROPODA, class Insecta, order Lepidoptera, family Psychidae.

Bahadur Shah II (baha'dōr sha), 1775–1862, last Mogul emperor of India (1837–57). A political figurehead, he was completely controlled by the British East India Company, who found it convenient to maintain the fiction of Mogul rule. He was an old man of 82 at the time of the INDIAN MUTINY (1857–58), but implicated by rebel proclamation he was convicted of complicity and exiled to Rangoon for life.

Bahaism (ba'haizəm, baha'izəm), religion founded by BAHÁ ULLAH and promulgated by his eldest son, Sir Abdul Baha Bahai (1844–1921). It is a doctrinal outgrowth of BABISM, with Baha Ullah as the Promised One of the earlier religion. Bahaism holds that God can be made known to man through manifestations, which have come at various stages of human progress, the prophets include Abraham, Moses, Christ, Muhammad, the Bab, and Baha Ullah. Bahaists believe in the unity of all religions, in universal education, in world peace, and in the equality of men and women. An international language and an international government are advocated. Emphasis is laid upon simplicity of living and upon service to suffering fellow men. The teachings spread across the world in the 20th cent. The center of the faith in the United States is the great house of worship at Wilmette, Ill. The administrative center of the world faith is in Haifa, Israel, and in recent years the movement has made progress throughout the world, particularly in Africa.

Bahama Islands, officially **Commonwealth of the Bahamas** (baha'məz), country (1970 pop 168,209), 4,403 sq mi (11,404 sq km), in the Atlantic Ocean, consisting of some 700 islands and islets and about 2,400 cays, beginning c 50 mi (80 km) off SE Florida and extending c 600 mi (970 km) SE almost to Haiti. The country does not include the TURKS AND CAICOS ISLANDS, to the southeast, which, although geo-



graphically part of the archipelago, have been separately administered by Great Britain since 1848. Until 1973, when they became independent, the Bahamas were administered as a British crown colony. The capital and principal city is NASSAU, on New Providence island. Other chief islands, known as "out islands," are Grand Bahama, Great and Little Abaco (see ABACO AND CAYS), the Bimini, Andros, Eleuthera, Cat Island, SAN SALVADOR, Great and Little Exuma (Exuma and Cays), Long Island, Crooked Island, Acklins Island, Mayaguana, and Great and Little Inagua (see INAGUA). The islands, composed mainly of limestone and coral, rise from a vast submarine plateau. Most of the islands are generally low and flat, riverless, with many mangrove swamps, brackish lakes (connected with the ocean by underground passages), and coral reefs and shoals. Fresh water is obtained from rainfall and from the desalination. Navigation is hazardous, and many of the outer islands are uninhabited and undeveloped, although in recent years steps have been taken to improve transportation facilities. Hurricanes occasionally cause severe damage, but the climate is generally excellent. The islands' vivid subtropical atmosphere—brilliant sky and sea, lush vegetation, flocks of bright-feathered birds, and submarine gardens where multicolored fish swim among white, rose, yellow, and purple coral—as well as rich local color and folklore, has made the Bahamas one of the most fashionable and popular winter resorts in the hemisphere. Tourism, which has grown rapidly

since the end of World War II, is by far the country's most important industry, employing a large portion of the population and accounting for most of the foreign exchange. Crawfish, lumber, cement, salt, agricultural products, and handicraft curios are exported. Sugar and oil refining industries have been introduced to diversify the economy and to increase the Bahamas' export trade. The country's population is about 85% black and mulatto. English is the official language. The Bahamas have a relatively low illiteracy rate. The government provides free education through the secondary level, there is a branch of the Univ of the West Indies at Nassau. The Bahamas are governed by the constitution of 1973 and have a parliamentary form of government. There is a bicameral legislature consisting of a 16-seat Senate and a 38-seat House of Assembly. The prime minister is the head of government, and the monarch of the United Kingdom, represented by an appointed governor-general, is the titular head of state.

History Christopher Columbus first set foot in the New World in the Bahamas (1492), presumably at San Salvador, and claimed the islands for Spain. Although the aborigines, a gentle people called the Lucayos, were soon exterminated, the Spanish did not in fact colonize the islands. The first settlements were made in the mid-17th cent by the English, who later imported blacks to work cotton plantations. In 1670 the islands were granted to the lords proprietors of Carolina, who did not relinquish their claim until 1787, although Woodes ROGERS, the first royal governor, was appointed in 1717. Under Rogers the pirates and buccanniers, notably Blackbeard, who haunted the Bahama waters, were driven off. The Spanish attacked the islands several times, and an American force held Nassau for a short time in 1776. After the American Revolution many Loyalists settled in the Bahamas. In 1781 the Spanish captured Nassau and took possession of the whole colony, but under the terms of the Treaty of Paris (1783) the islands were ceded to Great Britain. Plantation life gradually died out after the emancipation of slaves in 1838. Blockade-running into Southern ports in the U.S. Civil War enriched some of the islanders, and during the prohibition era in the United States the Bahamas became a base for rum-running. The United States leased areas for bases in the Bahamas in World War II and in 1950 signed an agreement with Great Britain for the establishment of a proving ground and a tracking station for guided missiles. In the 1950s black Bahamians, through the Progressive Liberal party (PLP), began to oppose successfully the ruling white-controlled United Bahamian party, but it was not until the 1967 elections that they were able to win control of the government. The Bahamas were granted limited self-government in 1964, broadened (1969) through the efforts of Prime Minister Lynden O. PINDLING. The PLP, campaigning on a platform of immediate independence, won an overwhelming victory in the 1972 elections, and negotiations with Britain were begun, and on July 10, 1973, the Bahamas became a sovereign state within the Commonwealth of Nations. See W. A. Roberts, *The Caribbean* (1940, repr 1969), Timothy Severin, *The Golden Antilles* (1970), H. P. Mitchell, *Caribbean Patterns* (2d ed 1970).

Baharampur (baha'rəmpōr) or **Berhampore** (būr'əmpōr), town (1971 pop 73,380), West Bengal state, E central India. Jute and rice are traded. Its industries include silk weaving, ivory carving, and the production of bell metal. An early uprising in the INDIAN MUTINY occurred there.

Baharumite (baha'rəmit) see **BAHURIM**.

Bahasa Indonesia (baha'sa), another name for Indonesian, one of the MALAYO-POLYNESIAN LANGUAGES.

Baha Ullah or **Baha Allah** (baha' ōl'a), 1817–92, Persian religious leader originally named Mirza Husayn Ali Nuri. One of the first disciples of the Bab (see BABISM), he and his half-brother Subhi Azal became the leaders of the Babi faith. In 1863, shortly before being exiled to Constantinople, he declared himself the manifestation of God, the Promised One, as foretold by the Bab. He then founded BAHAIISM and wrote its fundamental book, *Kitabi-Ikan* (tr *The Book of Certitude*, 1943). He spent most of his adult life in prison or under close surveillance. He died in Acre, his tomb there is one of the monuments of the Bahai faith. See J. E. Esslemont, *Bahau'llah and the New Era* (3d rev ed 1970).

Bahawalpur (baha'wəlpōr), city (1969 est pop 146,800), capital of Bahawalpur division, Punjab prov., E central Pakistan, on the Sutlej River. It is a commercial center, trading in wheat, rice, dates, and cotton. Major manufactures are textiles, machinery,

and pharmaceuticals. Formerly the capital of the princely state of Bahawalpur, which was founded in the late 18th cent and acceded to Pakistan in 1947, the city has several palaces and fine buildings, notably the Gulzar Mahal. The city is also known as Baghdad-ul-Jadid.

Bahia (ba'e'ya), state (1970 pop 7,508,779), 216,612 sq mi (559,921 sq km), E Brazil, on the Atlantic Ocean. SALVADOR (also called Bahia) is the capital.

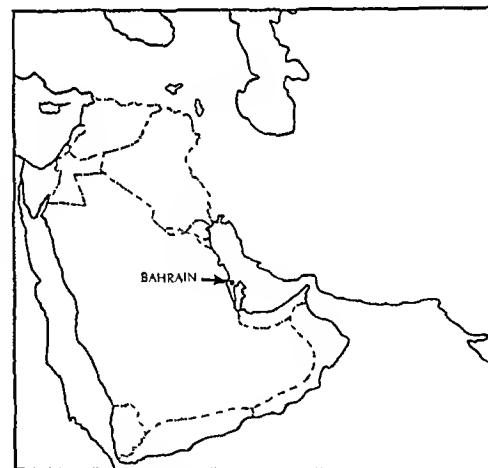
Bahia, city, Brazil see **SALVADOR**, Brazil.

Bahia Blanca (ba'e'a blang'ka), city (1970 pop 191,624), Buenos Aires prov., SE Argentina, a port near the head of the Bahia Blanca, an inlet of the Atlantic Ocean. It is the main commercial center and principal shipping point of the southern Pampa, as well as a rail terminus and an industrial city. A huge import and export trade is also carried on. Founded as a fortress town in 1828, Bahia Blanca grew with the economic expansion of the southern Pampa in the early 20th cent. The Bernardino Rivadavia library, founded in 1882, is a city landmark.

Bahr, Hermann (hēr'man bar), 1863–1934, Austrian dramatist and critic. His essay *Zur Kritik der Moderne* (1890) established *modernism* as a literary term, and his study *Expressionismus* (1916, tr 1925) defined that literary trend. Bahr's plays include the comedies *Das Konzert* (1909, tr 1910) and *Der Meister* (1914, tr 1918).

Bahraich (bar'ich), town (1971 pop 73,925), Uttar Pradesh state, NE India, on the Saryu River. A district administrative center, Bahraich also carries on a trade in rice, maize, sugar, jute, timber, and herbs. The mausoleum of Saiyud Salar Masud (d c 1050), a famous Muslim soldier and teacher, is in the town.

Bahrain or **Bahreïn** (both bar'ān, bā-), sheikhdom and archipelago (1973 est pop 225,000), 231 sq mi (598 sq km), in the Persian Gulf. The two main islands are Bahrain, or Aval, and Al Muharraq, connected by a causeway. The capital and chief port is AL MANAMA, on Bahrain. The islands are flat and sandy, with a few low hills. The climate is hot and humid. There is intensive cultivation of dates and alfalfa, cereals, fruits, and vegetables are also grown, and there are poultry and dairy industries. Oil was found in 1931, and oil revenues have financed extensive modernization projects, particularly in



health and education. However, Bahrain is expected to be the first Persian Gulf nation to run dry of oil, and steps are being taken to diversify the nonagricultural sector of the economy. Ship-repair, aluminum, and turbine-manufacturing industries have been started or planned. The population is predominantly Arabic. Bahrain was ruled in the 16th cent by Portugal and intermittently from 1602 to 1783 by Persia. The Persians were expelled by an Arabian family that established the presently ruling dynasty of sheikhs. In 1861, Bahrain became a British protectorate. There were demonstrations and strikes in the 1950s and 60s demanding greater popular participation in government. Iran claimed the islands in 1970 after the UN reported that the inhabitants desired independence. In 1971, after Britain withdrew from the Persian Gulf area, Bahrain became independent. Bahrain is a member of the United Nations and the Arab League. A council of state, constituting the executive, was appointed by the sheikh in 1970. In June, 1973, a constitution was adopted limiting the powers of the sheikh and granting women the right to vote. See Fereyduh Adamiyat, *Bahrain Islands* (1955), A. M. Abu Hakima, *History of Eastern Arabia, 1750–1800. The Rise and Development of Bahrain and Kuwait* (1965).

Bahr al Hulah: see HULA, LAKE

Bahrein Islands: see BAHRAIN

Bahr-el-Abiad, river, Sudan see WHITE NILE

Bahr-el-Azrak, river, Sudan see BLUE NILE

Bahr-el-Ghazal (bar-él-gazal'), region and province, SW Sudan The region takes its name from a river that flows E to the Bahr-el-Jebel to form the White Nile. An area of swamps and ironstone plateaus, the region is inhabited mainly by pagan tribes, notably the Nilotic-speaking Dinka. Subsistence agriculture, cattle raising, and game hunting are carried on. Turco-Egyptian and European penetration of the region in the 19th cent. was followed by the development of slave trading. With the suppression of the slave trade in 1864 by the Egyptian Khedive, European traders withdrew and local merchant-princes, independent of the Khedive's authority, took over the trade. In 1873, al-Zubayr, the most powerful of the native merchant-princes defeated a Turco-Egyptian force sent to reinforce the ban on slave trading. The Khedive then made Bahr-el-Ghazal a nominal province of Egypt, with al-Zubayr as governor. A Mahdist force captured the region in 1884 but failed to maintain control. Anglo-Egyptian troops occupied Bahr-el-Ghazal in 1900.

Bahr el-Huleh: see HULA, LAKE

Bahr-el-Jebel (ba'här-él-jēb'ēl), river, 594 mi (956 km) long, section of the White Nile, S Sudan, Africa. The name is usually used for the White Nile between Nimule, where it enters the Sudan (as the Albert Nile), and Lake No, where it joins with the Bahr-el-Ghazal to form the Bahr-el-Abiad, also a section of the White Nile. As the river passes through the Sudd swamps it loses much of its volume through evaporation and dispersal. The river is navigable to Juba.

Bahurim (bāhyōō'rīm), town, NE of Jerusalem. 2 Sam 3:16, 16 S, 17:18, 19:16, 1 Kings 2:8. Azmaveth of Bahurim is called once a Baharumite, once a Barhumite. 1 Chron 11:33, 2 Sam 23:31.

Baia (bi'a), Lat. *Baiae*, village, in Campania, S Italy, on the Bay of Naples. In Roman times it was a celebrated spa and a favorite imperial residence, with sumptuous villas (1st cent. B.C.). There are remains of the huge Roman baths.

Baia-Mare (bi'a-ma'rē), Hung. *Nagybánya*, city (1969 est. pop. 51,000), NW Rumania, in Crișana-Maramureș. It is a mountain resort and the industrial center of a region that mines copper, lead, zinc, gold, and silver. The city has smelting works and produces sulfuric acid and synthetic fibers. Baia-Mare, founded by Saxons in the 12th cent., was long held by Hungary. In the city are a college of mines, remains of 16th-century fortifications, and an old wooden church. There is a large Hungarian minority in Baia-Mare.

Baie Comeau (bā kō'mō), town (1971 pop. 12,109), E Que., Canada, on the St. Lawrence River near the mouth of the Manicouagan River. It is a port and has an aluminum smelter and a large pulp and paper industry.

Baif, Jean Antoine de (zhaN aNtwan' də baēf'), 1532-89, French poet of the Pléiade. He wrote sonnets, didactic and satirical poems, and plays.

Baikal: see BAYKAL

Baikie, William Balfour (bā'kē), 1825-64, British explorer in Africa, b. Kirkwall, the Orkneys. He was the surgeon of a Niger expedition in 1854 and succeeded to the command on the death of the leader. In 1856 he published an account of the expedition. Returning to Nigeria as leader of a second expedition, he established himself (1859) at LOKOJA. Under his leadership the town became an unofficial British settlement and thriving commercial center. He compiled valuable information about N. Nigeria, including vocabularies of nearly 50 African dialects.

bail, in law, procurement of release from prison of a person awaiting trial or an appeal, by the deposit of security to insure his submission at the required time to legal authority. The monetary value of the security—known also as the bail, or, more accurately, the bail bond—is set by the court having jurisdiction over the prisoner. The security may be cash, the papers giving title to property, or the bond of private persons of means or of a professional bondsman or bonding company. Failure of the person released on bail to surrender himself at the appointed time results in forfeiture of the security. Bail is usually granted in a civil ARREST. Courts have greater discretion to grant or deny bail in the case of persons under criminal arrest, e.g., it is usually refused when the accused is charged with homicide. The Eighth Amendment to the Constitution of the United States provides that "excessive bail shall not

be required," but it does not provide any absolute right to bail.

Baile Átha Cliath: see DUBLIN, county borough, Republic of Ireland

Bailén (bilān'), city (1970 pop. 13,233), Jaén prov., S Spain, in Andalusia. In 1808, early in the Peninsular War, a French army was surrounded and forced to surrender near Bailén by the Spanish under Castaños, who was made duke of Bailén.

Bailey, Anne, 1742-1825, American frontier heroine, b. Anne Hennis in Liverpool, England. She emigrated to Virginia c. 1761. After her first husband, Richard Trotter, was killed at the battle of Point Pleasant (1774), she donned male attire and became a noted scout and messenger. At that time she married John Bailey. According to legend, Indians besieged Fort Lee, on the present site of Charleston, W. Va., in 1791, and Anne Bailey rode 100 mi (161 km) through the mountain wilderness to Fort Savannah (Lewisburg) and returned with enough ammunition to raise the siege. See biography by V. A. Lewis (1891).

Bailey, Gamaliel, 1807-59, American abolitionist editor, b. Mt. Holly, N.J. In 1837 he succeeded James Birney as editor and publisher of the *Philanthropist* at Cincinnati. Three times his office was attacked by proslavery mobs, and once the entire establishment was destroyed. From 1847 until his death Bailey ably edited the influential *National Era*, an abolitionist weekly published in Washington, D.C. Harriet Beecher Stowe's *Uncle Tom's Cabin* first appeared in that journal.

Bailey, Liberty Hyde, 1858-1954, American botanist and horticulturist, b. South Haven, Mich., grad. Michigan Agricultural College (now Michigan State College of Agriculture and Applied Science), 1882. At Cornell Univ. he was professor of horticulture (1888-1903) and dean of the agricultural college and director of the agricultural experiment station (1903-13). Through numerous writings and as chairman of President Theodore Roosevelt's Commission on Country Life (1908), he worked for the improvement of rural life. Bailey was influential in establishing horticulture as a respected science. He wrote many basic works on botany and horticulture, edited *The Standard Cyclopaedia of Horticulture* (6 vol., 1914-17, new ed. 1935) and *Cyclopaedia of American Agriculture* (4 vol., 1907-9), and compiled (with E. Z. Bailey) *Hortus* (1930, rev. ed. 1935) and *Hortus Secundus* (1941). See biographies by Philip Dorf (1956) and A. D. Rodgers (1949, repr. 1965).

Bailly, Jean Sylvain (zhaN sēlvāN' bayē'), 1736-93, French astronomer and politician. His works on astronomy and on the history of science (notably the *Essai sur la théorie des satellites de Jupiter*) were distinguished both for scientific interest and literary elegance and earned him membership in the French Academy, the Academy of Sciences, and the Academy of Inscriptions. He was elected (1789) from Paris to the States-General and was chosen president of the National Assembly. Mayor of Paris from 1789 to 1791, he lost favor with the popular elements that pushed the French Revolution onward. He permitted the national guard to fire upon a demonstrating crowd (July 17, 1791). Bailly retired from Paris, but in 1793 he was seized, taken to Paris, convicted of having contrived the July massacre, and guillotined. His lengthy *Essai sur l'origine des fables et des religions anciennes* was published in 1799.

Baily, Edward Hodges, 1788-1867, English sculptor. He studied under Flaxman. One of his best works is the statue of Admiral Nelson in Trafalgar Square, London. Other works include decorations for Buckingham Palace, numerous portrait busts and statues, and *Eve at the Fountain*, *Psyche*, and *Helen and Paris*.

Bailyn, Bernard, 1922-, U.S. historian, b. Hartford, Conn. After receiving his Ph.D. from Harvard in 1953, he taught (1953-) U.S. colonial history there, becoming full professor in 1961. His most noted work, the Pulitzer Prize winning *Ideological Origins of the American Revolution* (1967), challenged long-standing interpretations of the causes of the American Revolution. His other books include *The New England Merchants in the Seventeenth Century* (1955), *Education in the Forming of American Society* (1960), *The Origins of American Politics* (1968), and *The Ordeal of Thomas Hutchinson* (1974).

Baily's beads: see ECLIPSE

Bain, Alexander, 1818-1903, Scottish philosopher and psychologist. He was educated at Marischal College, Aberdeen, where he later taught for three years. He taught one year (1845) at Anderson's Univ., Glasgow, but resigned to do free-lance work

in London. There he joined a brilliant circle including George Grote and John Stuart Mill, with whom he already had close literary relationships. From 1860 to 1880 he held the chair of logic and English at the Univ. of Aberdeen (which had absorbed Manschal College), where he worked for educational reform. After his retirement he was twice elected lord rector of the university. His major contributions were in the field of psychology. Although he remained firmly in the associationist tradition of the Mills and shared their distrust of metaphysics, he nevertheless developed the current psychology in several directions. The most important of these was toward a greater recognition of the importance of the will and emotions. He considered physiological factors but refused to make any materialistic assumptions. Besides being the founder of the first psychological journal, *Mind*, in 1886, Bain was the author of *The Senses and the Intellect* (1855), *The Emotions and the Will* (1859), *Mental and Moral Science* (1868), *Education as a Science* (1879), *James Mill* (1882), *John Stuart Mill* (1882), and an autobiography (pub. posthumously with a bibliography of his works, 1904).

Bainbridge, William, 1774-1833, American naval officer, b. Princeton, N.J. An experienced sea captain, he joined (1798) the navy when war with France threatened. His ship, the *Retaliator*, was captured by two French frigates, and he and his crew were imprisoned on Guadeloupe. Released, he returned to America and in 1800, as commander of the *George Washington*, he carried U.S. tribute money to the dey of Algiers (see TRIPOLITAN WAR). The dey forced him to proceed under the Turkish flag to Constantinople—an insult that contributed to the American decision to declare war against the BARBARY STATES. In 1803, assigned to the troubled Mediterranean area, Bainbridge's ship, the *Philadelphia*, ran aground in the harbor of Tripoli and was captured. He was freed at the end of the Tripolitan War. In the war of 1812, as commander of the *CONSTITUTION*, Bainbridge captured the British frigate *Java* off the Brazilian coast in Dec., 1812. In 1815, a commodore, he went out in the *Independence* to aid Stephen Decatur in the operations against Algiers, but he arrived after the fighting was over. See his biography written in 1816 by H. A. S. Dearborn (ed. by James Barnes, 1931).

Bainbridge, city (1970 pop. 10,887), seat of Decatur co., SW Ga., on the Flint River, inc. 1829. It grew up around the site of an Indian trading post and is now a trade and industrial center as well as an inland port and barge terminal. Its manufactures include machinery, clothing, automotive parts, mobile homes, aluminum windows, and molded plastic items. Fertilizers are also produced, and salt is processed there. Bainbridge is in the vicinity of Lake Seminole, a fishing, hunting, and boating center.

Bainville, Jacques (zhak bāNvēl'), 1879-1936, French historian and journalist. A nationalist and a royalist, he was one of the founders and the foreign editor of the royalist daily, *Action française*. His brilliant and concise *History of France* (1924, tr. 1926), although highly debatable in its nationalist thesis, is an eloquent apology for the monarchic tradition in France. His other writings include *Napoleon* (tr. 1934), *The French Republic, 1870-1935* (tr. 1936), and *Dictators* (tr. 1937, repr. 1967).

Baird, John Logie, 1888-1946, Scottish inventor. In 1926 he gave the first demonstration of true television with a televisior of his own invention that differed from later instruments in being partially mechanical rather than wholly electronic. He accomplished transatlantic television in 1928 and demonstrated color television in the same year. He also invented (1926) the noctovisor, an instrument for making objects visible in the dark or through fog by means of infrared light.

Baird, Spencer Fullerton, 1823-87, American zoologist, b. Reading, Pa., grad. Dickinson College, 1840. He was professor of natural history at Dickinson from 1846 to 1850. While at the Smithsonian Institution (from 1850, as secretary from 1878) he supervised the building of a museum to house the great collection of North American fauna that had been amassed under his guidance. In 1871, Congress established the U.S. Fish Commission with Baird as its head. Baird set up the Marine Biological Station at Woods Hole, Mass., organized the expeditions of the research ship *Albatross*, and initiated valuable studies on wildlife preservation. His publications (over 1,000 titles) show a phenomenal range of scientific work. His books on birds inaugurated the so-called Baird school of ornithological description,

emphasizing accurate observation of each individual. Among other major studies were the *Catalogue of North American Reptiles* (with Charles Girard, 1853) and the *Catalogue of North American Mammals* (1857). See biography by W. H. Dall (1915).

Bairnsfather, Bruce (bârnz'fâthər), 1888–1959, English illustrator and author, b. India. He served with the British forces in World War I and created the cartoon character "Old Bill" to typify the spirit of the British infantryman. During World War II, Bairnsfather was cartoonist with the U.S. forces in Europe. His works include *Fragments from France* (1916), *Bullets and Billets* (1917), and *Jeeps and Jest* (1943).

Baius (bâ'yās) or **Bajus** (bâ'jās), **Michael**, 1513–89, Flemish Roman Catholic theologian, also known as Michel de Bay. He was chancellor of the Univ. of Louvain and was sent to the Council of Trent. Baius was the center of a subtle controversy on GRACE, in which he is said to have been the forerunner of Jansenism (see under JANSEN, CORNELIUS). His position was peculiar in giving original sin an important place while at the same time making man partly instrumental in his own redemption. His doctrines were condemned several times (especially by the bull of St. Pius V, *Ex omnibus afflictionibus*, 1567), but Baius abjured, or recanted, each time, and he died in the church.

Baixada Fluminense (bîshă'dă flōōmēnēN'n'sa), coastal lowland region, Rio de Janeiro state, SE Brazil. It extends c. 250 mi (400 km) from Sepetiba Bay to the Paraíba River between the Serro do Mar and the Atlantic Ocean. Intensive farming, especially near Rio de Janeiro, is practiced there. Formerly marshy and disease breeding, much of the region was drained in the 1930s.

Baja (bă'yō), city (1970 pop. 34,360), S Hungary, on the Danube River. It is a river port and a road and rail hub, where agricultural products of the surrounding region are traded. Baja has textile, wood-working, and agricultural-processing industries. A fine 18th-century town hall is in the city.

Baja California (Span. bā'hā kālēfōr'nyā) or **Lower California**, peninsula, c. 760 mi (1,220 km) long and from 30 to 150 mi (48–241 km) wide, NW Mexico, separating the Gulf of California from the Pacific Ocean. The peninsula is divided at lat. 28° N into the state of **Baja California** (1970 pop. 856,773), 27,655 sq mi (71,626 sq km), in the north, and the state of **Baja California Sur** (1970 pop. 123,786), 27,979 sq mi (72,466 km), in the south. The capitals of the states are, respectively, MEXICALI and LA PAZ. Except for two large coastal plains on the Pacific side, the peninsula consists largely of rugged mountain ranges averaging 5,000 ft (1,524 m), with one peak, San Pedro Martir, more than 10,000 ft (3,048 m) high. The land is generally desolate and arid. The only naturally cultivable areas are isolated mountain valleys. The mineral yield is considerable, especially silver, lead, gold, and copper. The state is by far more commercially advanced than the territory, and its population has increased rapidly. Irrigation systems on the Colorado River have made possible the development of a rich farming area around Mexicali. Baja California is a leading national producer of cotton and wheat. Fruits and vegetables are also important. There are fisheries and fish canneries at Ensenada, which is also developing as a resort. Wealthy Mexicans, who have bought large estates and established resort ranches on the scenic coasts, have done much to stir tourist interest in regions other than the border towns and to open up hitherto inaccessible areas. Hunting and deep-sea fishing are favorite sports. Communications are generally poor, particularly in the south. Baja California Sur is not economically prosperous, although there is pearl fishing around La Paz and the city itself is very popular with Mexican vacationers. Indians constitute a sizable percentage of Baja California's population. The coasts were first explored by Francisco de Ulloa and other Spaniards in the 1530s. Attempts to colonize the forbidding interior, even those made by the intrepid mission fathers, were largely unsuccessful. U.S. forces occupied (1847–48) Baja California during the Mexican War, and William Walker attempted (1853–54) to wrest it from Mexico in his first disastrous filibustering expedition. In 1911 the area was the scene of an abortive uprising against Porfirio Díaz—the so-called desert revolution led by Ricardo Flores Magón, a liberal anarchist, who was a precursor of Francisco Madero and Emiliano Zapata. The state of Baja California was created in 1952. The peninsula and surrounding waters are a paradise for naturalists and archaeolo-

gists, offering unparalleled opportunities for the study of marine life, plants and animals, and Indian artifacts. In 1962 remarkable mural paintings were discovered in a steep coastal cliff. See John Steinbeck, *The Log from the Sea of Cortez* (1951), Leonard Wibberley, *Yesterday's Land* (1961), Joseph Wood Krutch, *Baja California and the Geography of Hope* (1969), F. J. Clavijero, *The History of Lower California* (tr. 1937, repr. 1971).

Bajah (bajə') or **Béja** (bāzhə'), town (1966 pop. 28,145), N Tunisia. It is on the site of ancient Vacca or Vaga, a Punic town and later a Roman colony. It became a military and administrative center under the Turks. The town has a sugar refinery.

Bajazet: For Ottoman sultans and princes thus named, see BEYAZID.

Bajer, Fredrik (frāth'rik bī'ər), 1837–1922, Danish pacifist and writer. He helped found the International Peace Bureau at Berne in 1891, and he shared the 1908 Nobel Peace Prize with K. P. Arnoldson.

Bajith (bā'jīth), term of unknown significance. Isa 15:2.

Bajus, Michael. see BAIUS, MICHAEL.

Bakacs, Thomas: see BAKOCZ, THOMAS.

Bakbakkar (bākbāk'ər), Levite. 1 Chron. 9:15.

Bakbuk (bāk'bək), family that returned with Zerubbabel. Ezra 2:51, Neh. 7:53.

Bakbukiah (bāk'bak'īə), 1 Levite with Zerubbabel. Neh. 11:17, 12:9. 2 Porter. Neh. 12:25.

Bakelite (bā'kalīt) [for its inventor, L. H. Baekeland], synthetic thermosetting RESIN. It is widely used both alone, to form whole objects, and in combination with other materials, as a laminate or a surface coating. It is used as a substitute for hard rubber, amber, or celluloid, for insulating electrical apparatus (since it is a nonconductor), and for the manufacture of certain machinery gears, phonograph records, and many other articles useful and ornamental and as diverse in character as buttons, billiard balls, pipestems, and umbrella handles. Bakelite is a condensation POLYMER of FORMALDEHYDE and PHENOL. In practice, the phenol and formaldehyde are first polymerized to a small extent by using the proper choice of catalyst and temperature. The resulting prepolymer, called a resol, is a low-melting, soluble material, which can then be combined with a filler (usually cotton linters or wood fibers) and a pigment and heated under pressure in a mold to yield an object of the desired shape. The pure resin is colorless or amber-colored and very brittle; the various fillers and other additives give it the desired properties depending on its application. Heating of the prepolymer results in extensive cross-links between the polymer chains, resulting in a tightly bound three-dimensional network. A Bakelite-type resin can also be formed using FURFURAL in place of the formaldehyde.

Baker, Sir Benjamin, 1840–1907, English civil engineer. He helped build London's underground railway, Tower Bridge, and the Blackwall Tunnel, and with Sir John Fowler he designed and built the bridge over the Firth of Forth in Scotland. In Egypt he assisted with the first Aswan dam. Baker also designed the cylindrical ship used to carry the obelisk Cleopatra's Needle from Egypt to London.

Baker, George Fisher, 1840–1931, American financier and philanthropist, b. Troy, N.Y. Baker was one of the founders of the First National Bank of New York in 1863 and became (1877) its president and then (1909) chairman of its board of directors. Largely through his efforts this bank became one of the strongest financial institutions in the United States. Baker was closely associated with the interests of the house of Morgan; he helped finance James J. Hill in building his railroad empire and backed him in the fight to control the Northern Pacific RR. Baker himself became a leading figure in the world of railroad organization and finance and gained a commanding influence in insurance, utilities, and the steel and rubber industries. His philanthropic bequests were many. The most notable were \$6 million to found and support the Harvard graduate school of business administration, \$2 million to Cornell Univ., \$1 million to build the Baker Memorial Library at Dartmouth, and the money for Baker Field of Columbia.

Baker, George Pierce, 1866–1935, American educator, b. Providence, R.I., grad. Harvard, 1887. He taught (1888–1924) in the English department at Harvard and there conceived and instituted (1906) the 47 Workshop, a class on playwriting techniques and a laboratory of experimental productions. The first

of its kind, the workshop was an inspiration to many young dramatists and gave impetus to the movement toward campus theater. In 1925 he went to Yale, where as professor of the history and technique of drama and director of the university theater he continued his work. Baker wrote *The Development of Shakespeare as a Dramatist* (1907, repr. 1965) and *Dramatic Technique* (1919) and edited the works of his students. See memorial by John Mason Brown and others (1939), W. P. Kinne, *George Pierce Baker and the American Theatre* (1954, repr. 1968).

Baker, Janet, 1933–, English mezzo-soprano. She made her singing debut in 1956 with the Glyndebourne Chorus. In 1966 she made her American debut at Town Hall in New York City, winning critical acclaim for the sensitivity, style, and intelligence of her singing. Baker was for many years regarded as primarily an oratorio and lieder singer. However, in 1969 she made a triumphal appearance as Dido in the Scottish Opera's production of Berlioz's *The Trojans*, repeating her performance later that year at Covent Garden in London. She soon was regarded as a great interpreter of Berlioz and began to take on more operatic roles.

Baker, Newton Diehl, 1871–1937, U.S. Secretary of War (1916–21), b. Martinsburg, W. Va. He practiced law and politics in Cleveland as a protégé of Tom L. Johnson. As city solicitor (1902–12) he opposed the powerful public utilities, as mayor (1912–16) he instituted notable tax reforms. Woodrow Wilson appointed him Secretary of War in March, 1916, just before the United States sent a punitive expedition into Mexico to oppose Francisco VILLA. An avowed pacifist, Baker suffered merciless criticism of his conduct of the War Dept. during the early months of World War I and was subjected to a congressional investigation in late 1917. His devotion to his task and the achievements of his department were later praised by all. He retired (1921) to private law practice in Cleveland but remained a public figure. An ardent advocate of peace, he urged U.S. entry into the League of Nations as late as 1924; in 1928, Coolidge appointed him to the Permanent Court of Arbitration (Hague Tribunal). See biographies by Frederick Palmer (1931, repr. 1969) and C. H. Cramer (1961), study by D. R. Beaver (1966).

Baker, Oliver Edwin, 1883–1949, American economic geographer, grad. Heidelberg College, Tiffin, Ohio. He studied forestry at Yale and agriculture and economics at the Univ. of Wisconsin (Ph.D., 1921). He served (1912–42) with the U.S. Dept. of Agriculture, largely in research on land utilization. Besides many articles and reports, he wrote with V. C. Finch *Geography of the World's Agriculture* (1917), and he edited the *Atlas of American Agriculture*.

Baker, Ray Stannard, pseud. **David Grayson**, 1870–1946, American author, b. Lansing, Mich., grad. Michigan State College, 1889. At first a Chicago newspaper reporter, he joined the staff of *McClure's Magazine* in 1897, for which he wrote some famous muckraking articles. With other *McClure's* contributors he purchased the *American Magazine* in 1906 and helped edit it. The first book of quiet country sketches by "David Grayson," *Adventures in Contentment*, appeared in 1907; the series continued with *Great Possessions* (1917), *The Countryman's Year* (1936), and others. An intimate of Woodrow Wilson, Baker was sent to Europe in 1918 as one of the President's special agents to study the war situation. At the peace conference at Versailles, Baker was director of the press bureau of the American peace commission. Afterward he wrote *Woodrow Wilson and World Settlement* (3 vol., 1922), a history of the peace conference based largely on the Wilson papers. With W. E. Dodd he edited Wilson's *Public Papers* (6 vol., 1925–26). His authoritative biography of Wilson (8 vol., 1927–39), for which he used the President's personal papers, won the Pulitzer Prize for biography in 1940 for the last two volumes. See his autobiographical works, *Native American: The Book of My Youth* (1941) and *American Chronicle* (1945).

Baker, Sir Samuel White, 1821–93, English explorer in Africa. He explored the Nile tributaries in Ethiopia in 1861–62. Going up the Nile from Cairo, he reached Gondokoro in 1863. He continued his journey southward in spite of the opposition of Arab slave traders and discovered Albert Nyanza, or Lake Albert, on March 14, 1864. In 1869, with the authority of the khedive of Egypt, he returned to the region and, creating an administration in the Lado En-

clave, he suppressed the slave trade and opened up the lake areas to commerce

Baker Island, uninhabited island (1 sq mi/2.6 sq km), central Pacific, near the equator, c.1,650 mi (2,660 km) SW of Honolulu The arid coral island was discovered in 1832 by Capt Michael Baker, an American, and was claimed by the United States in 1856 Like JARVIS ISLAND and HOWLAND ISLAND, Baker was worked for guano by both American and British companies during the 19th cent In 1935 it was colonized by Americans from Hawaii in order to establish U.S. control against British claims The colonists were removed during World War II Baker Island is administered under the U.S. Dept of the Interior

Baker Lake, c.1,000 sq mi (2,590 sq km), Keewatin dist., Northwest Territories, Canada, W of Chesterfield Inlet of Hudson Bay It has a post of the Royal Canadian Mounted Police at its western end

Bakersfield, city (1970 pop. 69,515), seat of Kern co., S central Calif., at the southern end of the San Joaquin valley, inc. 1898 It is an oil, mining, and agricultural center Almost all of the major oil companies have refineries in Bakersfield Cotton, citrus fruits, potatoes, and roses are grown in the area Among the city's manufactures are plastics, pharmaceuticals, and processed foods Gold was discovered in the region in 1855 and petroleum in 1899 Silver, borax, and tungsten mines are also in the vicinity A branch of California State College and a junior college are there Kern River State Park is nearby

Baker vs. Carr, case decided in 1962 by the U.S. Supreme Court Tennessee had failed to reapportion the state legislature for 60 years despite population growth and redistribution Charles Baker, a voter, brought suit against the state (Joe Carr was a state official in charge of elections) in Federal district court, claiming that the dilution of his vote as a result of the state's failure to reapportion violated the equal protection clause of the Fourteenth Amendment to the Constitution The court dismissed the complaint on the grounds that it could not decide a political question Baker appealed to the Supreme Court, which ruled that a case raising a political issue would be heard This landmark decision opened the way for numerous suits on LEGISLATIVE APPOINTMENT

Bakewell, Robert, 1725-95, English livestock breeder and agriculturist He successfully bred livestock for meat rather than appearance, developing new breeds, which included the Leicestershire sheep and the Dishley, or New Leicestershire, long-horn cattle He introduced the progeny test for selective breeding and also improved methods of housing stock, cultivating grass, and manuring

Bakhchisaray (bakh'chēsār') [Turkish, =garden palace], city, SE European USSR, in the Ukraine From the early 15th cent. until 1783 it was the capital of the khanate of Crimea, or Little Tatar The palace of the khans, celebrated by Pushkin and Mickiewicz for its beauty, notably for its white marble fountains, was built in the 16th cent. and is now a museum In the city are many mosques and the tombs of the khans Nearby are the ruins of Chufut-Kale

Bakhtegan (bākh'tēgān'), salt lake, c.60 mi (100 km) long, in the Zagros mts., 5 Iran, fed by the Kur River The town of Niriz was once on its shores, but because of the lake's shrinkage is now to the south-east Ancient accounts of the region do not refer to the lake, suggesting that it is of relatively recent origin The lake is also called Niriz

Bakhtiari (bakh'tē'ārē, -arē', bākh'-), ethnic group (1966 est. pop. 400,000), living in SW Iran, in a mountainous region (c.25,000 sq mi/64,750 sq km) located in Khuzistan and Esfahan provs They herd sheep and cattle and grow wheat and barley In the past they were chiefly nomadic, but today only about one third are nomads The Bakhtiari are Shiite Muslims and are famed for their courage and independence Women enjoy a high position in their patrilineal society The group can be divided into two large branches, the Haftlang, with about 55 tribes, and the Charlang, with about 25 The Bakhtiari originally migrated (10th cent.) from Syria to Iran, and until the 15th cent. were known as the Great Lurs In the early 20th cent., after the discovery of oil in the region they inhabit, their chiefs were courted by the British and were paid to protect oil pipelines The Bakhtiari played a decisive part in the deposition of Muhammad Ali Shah in 1908-9 Reza Shah Pahlavi forced many of them to abandon their nomadic ways and to settle in permanent communities, after his deposition in 1941, however, some Bakhtiari returned to nomadism Muhammad Reza

Shah was married (1951-58) to Soraya, the daughter of a Bakhtiari chieftain

Bakhuyzen, Ludolf: see BACKHUYSEN, LUDOLF

baking soda: see SODIUM BICARBONATE

Bakocz or Bakacs, Thomas (bō'kōts, bū'kōch), Hung. Bakócz or Bakács Tamás (tō'mash'), c.1442-1521, Hungarian politician, cardinal of the Roman Catholic Church He is often called the Hungarian Wolsey Of unbounded ambition, he rose from servile origin, was secretary to King Matthias Corvinus, and under Uladislav II, whom he dominated, became chancellor, archbishop of Esztergom, and papal legate Although he was expected by many to succeed Julius II as pope, Leo X was elected Leo in 1514 charged him as primate of Hungary with a crusade against the Turks The nobles did not heed Bakocz's call, and the peasants who had volunteered revolted against the aristocracy The rebellion was crushed with great cruelty by John Zapolya (see JOHN I), and the few remaining liberties of the peasants were abolished After Uladislav's death Bakocz retired to Esztergom, where he died, leaving an enormous fortune

Bakr, Ahmad Hasan al- (akhmad' hasan' al-bak'ar), 1914-, president of Iraq He served as an officer in the Iraqi army but was forced to retire (1958) because of his participation in revolutionary activities A member of the 8a'ath party, an ultranationalist left-wing group, he became prime minister after the Ba'athists seized power in 1963 He left the government later in that same year when conservative military leaders forced the Ba'athists from power Bakr became president in 1968 after leading another 8a'athist coup d'état

Bakst, Lev Nikolayevich (lyēf nyīkāl'yēvīch bakst), 1868-1924, Russian scene designer and painter His original, imaginative style and brilliant color exerted a wide influence on costume, stage setting, and the decorative arts His set and costume designs made for Diaghilev's ballets *Cleopatra* and *Scheherazade* from 1910 to 1912 gained him considerable fame He was also a fine portrait painter, including among his subjects Diaghilev and Ida Rubinstein See study by Charles Spencer (1973)

Baku (bakōō', Rus. bakōō'), city (1970 pop. 1,261,000), capital of the Azerbaijan Soviet Socialist Republic, SE European USSR, on the Caspian Sea Greater Baku includes almost the whole Apsheron peninsula, on which Baku proper is situated The city is a leading Soviet industrial and cultural center and until World War II was the country's chief petroleum center It handles one of the greatest volumes of freight (mainly oil and oil products) of any Soviet port Oil drilling (especially on the Apsheron peninsula and offshore) is the major economic activity, and Baku has many oil refineries and factories that produce oilfield equipment Other important industries include shipbuilding and the processing of food and tobacco Most of Baku's people are Azerbaijani, Russians, and Armenians The city was first mentioned in a 9th-century chronicle, but as early as the 6th cent. B.C. oil and gas wells in the area were worshipped, and shrines were made of constantly burning fires Baku was a great medieval trade and craft center It flourished in the 15th cent. under the independent Shirvan shahs and from 1509 to 1723 under Persian rule Captured by Peter I in 1723, it was returned to Persia in 1735 Russia annexed it definitively in 1806 Oil production began in the late 19th cent. Taken by the Bolsheviks in 1917, the city was occupied during the next two years by the White Army and its foreign allies (mainly Britain) From 1918 to 1920, Baku belonged to the independent, anti-Bolshevik Azerbaijan republic The Old City, comprising the 13th-century fortress of Bad-Kube, has narrow, winding streets, several mosques, and the 17th-century palace of the khans of Baku, who were vassals of the Persian shahs The mosque of Synyk-Kala dates from the 11th cent. and the Maiden's Tower from the 12th In the European-style New City are the university (est. 1920), the Azerbaijan Academy of Sciences, and many other educational and cultural institutions

Bakunin, Mikhail (mēkhayēl' bakōō'nyīn), 1814-76, Russian revolutionary and leading exponent of ANARCHISM He came from an aristocratic family but entered upon revolutionary activities as a young man He took part (1848-49) in the revolutions in France and Saxony and was sent back to Russia and exiled to Siberia Escaping (1861), he went to London, where he worked with Aleksandr Herzen In 1868, Bakunin became active in the First INTERNATIONAL, where, with his militant anarchist doctrines, he had great influence These doctrines, however,

brought him into conflict with Karl MARX, and he was expelled (1872) Bakunin believed that man is inherently virtuous and deserving of absolute freedom obtained through extreme individualism He advocated violent overthrow of existing states and institutions as a necessary step to achieving such freedom His writings include *God and the State* (1882, tr. 1893) See biography by E. H. Carr (1937, repr. 1961), studies by G. P. Maximoff (1953) and G. Alfred (1971)

Bakwanga, Zaire: see MBUJI-MAYI

Balaam (bā'lam), prophet hired by Balak, king of Moab, to curse the Jews, encamped in the Jordan valley For a recounting of the way every curse became a blessing see Num. 22-24 Later, Balaam seduced the Israelites to evil practices, an act for which he was killed See Num. 31 8,16, Micah 6,5, 2 Peter 2,15,16, Jude 11, Rev. 2,14

Balac (bā'lāk), Greek form of BALAK

Baladan: see MERODACH-BALADAN

Baladhuri, al- (al-bala'hūrē), d. c.892, Arab historian One of the most important Arab historians, he spent most of his life in Baghdad and enjoyed great influence at the court of the caliph al-Mutawakkil He traveled in Syria and Iraq, compiling information for his major works He is regarded as a reliable source for the history of the early Arabs and the history of Muslim expansion See his major work, *The Origins of the Islamic State* (tr., 2 vol., 1916-24)

Balaguer, Joaquín (hwakēn' balagār'), 1907-, president of the Dominican Republic (1960-62, 1966-) A lawyer, he held many important government posts under the dictator Rafael TRUJILLO MOLINA He served as vice president (1957-60) and assumed the presidency (1960) upon the resignation of President Hector Trujillo (the dictator's brother) Real power rested, however, with Rafael Trujillo until his assassination in May, 1961 Balaguer ruled during the chaos that followed and exiled members of the Trujillo family Unable to pacify opposing factions, he was ousted by the military in Jan., 1962 He lived in exile until 1965 Elected president in 1966, he was reelected in 1970 and 1974 His administration restored financial stability and promoted economic development, but political chaos, terrorism, and guerrilla activity led him to resort to repressive measures His 1974 victory climaxed a violent campaign characterized by strikes and bloody clashes A scholar and poet, Balaguer is the author of numerous books on a wide range of subjects

Balah (bā'la), the same as BILHAH 2.

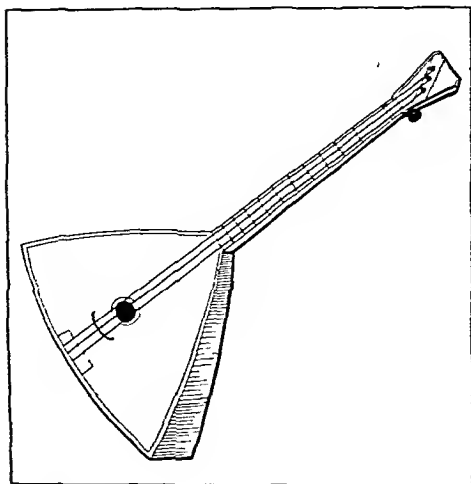
Balak (bā'lāk), king of Moab who hired Balaam to curse Israel Num. 22-24 Balac is a Greek form Rev. 2,14

Balakirev, Mili Alekseyevich (mē'lyī ālyīksyā'yāvīch balakē'ryēf), 1837-1910, Russian composer and conductor, leader of the group called the FIVE He founded (1862) the Free School of Music in St. Petersburg and conducted (1867-69) the Russian Music Society and (1883-94) the Imperial Chapel Choir and Imperial Music Society His works include the symphonic poems *Tamara* and *Russ* (or *Russia*), a piano fantasy, *Islamey*, incidental music for *King Lear*, and songs His music combined romanticism with Russian and Oriental folk songs See M. O. Zetlin, *The Five* (tr. 1959)

Balaklava (balakla'va), section of the city of SEVASTOPOL, SE European USSR, in the Ukrainian Republic, on the Crimean peninsula Fishing and limestone quarrying are carried on In ancient times it was an important Greek commercial city In the Middle Ages it belonged to the Genoese until it was taken (1475) by the Turks, who gave it its present name In the CRIMEAN WAR, Balaklava became famous for an allied victory (Oct., 1854) over the Russians and particularly for the charge of the Light Brigade, celebrated by Tennyson On Oct. 25, through a disputed error in orders, the earl of CARDIGAN led an English light cavalry brigade of some 670 in a hopeless charge on a heavily protected Russian position, and more than two thirds of his men were killed or wounded Balaklava was the capital of the former Balaklava dist. in the Crimean oblast until 1957, when it was incorporated into Sevastopol There are ruins of a Genoese fortress (14th-15th cent.) in Balaklava

balalaika (bālalī'ka), Russian stringed musical instrument, with a triangular body and a long fretted neck (see FRETTED INSTRUMENT) Usually there are three strings, which are generally plucked with a pick The balalaika is made in various sizes, and several may be combined to make a band or orchestra A similar instrument, the bandura, is found in the Ukraine and Russia, and other types are to be found in the

countries of the Middle East, where the balalaika almost certainly originated. The instrument did not appear in Russia until c 1700. Like the guitar, it has



Balalaika

been much used to accompany folk songs and country dances.

balance, instrument used in laboratories and pharmacies to measure the mass or weight of a body. A balance functions by measuring the force of gravity that the earth exerts on an object, i.e., its weight. Since the mass of an object is directly proportional to its weight, a balance can also be used to measure mass. The simplest type of balance, the equal-arm, or beam, balance, is an application of a LEVER. A uniform bar, the beam, is suspended at its exact center upon a knife-edge set at right angles to it. The point of support is called the fulcrum. Two pans of equal weight are suspended from the beam, one at each end, at points equidistant from the fulcrum. Since the center of gravity of a uniform bar is at its midpoint, the beam supporting the pans will be in equilibrium, i.e., will balance upon the knife-edge. A long pointer attached at right angles to the beam at the fulcrum indicates zero on a scale when the beam is at rest parallel to a level surface. It shows also the extent of swing of the beam on one side or the other, acting somewhat as a pendulum, when the beam is coming to rest. The object to be weighed is placed upon one pan and standard weights are added to the other until the balance of the beam is established again. The unknown weight can then be determined by adding up the standard weights in the pan. One balance of this type, the analytical balance, is used for delicate weighing in quantitative chemical analysis and in preparing pharmaceutical prescriptions. It is kept in a glass case, since its accuracy is easily affected by dust and moisture. The platform balance is a form of equal-arm balance in which two flat platforms are attached to the top side of the beam, one at each end. Such a balance has a rider, or weight, mounted upon a bar which has a calibrated scale, is parallel to the beam, and connects the supports of the two platforms. This rider is moved along the bar, its edge marking decimal fractions of the unit weight. On the unequal-arm balance the beam is suspended at a point a very short distance from one of its ends. The object to be weighed is placed on this end, and a small known weight is moved out along the longer arm until balance is obtained. The unknown weight is then determined by using a formula involving the known weight and the distance of each weight from the fulcrum. One example of this type of balance is the Roman steelyard. A spring balance consists of a coiled spring fixed to a support at one end, with a hook at the other to which the body to be weighed is applied. Within the spring's limit of elasticity, the distance through which it is stretched is directly proportional to the weight of the applied body. A pointer and graduated scale attached to the spring convert this distance into a weight reading. Such a balance does not retain its accuracy permanently, for no matter how carefully it is handled, the spring very gradually uncoils even though its limit of elasticity has not been exceeded. Although extremely accurate results can be obtained in measuring the weights of minute objects, it is physically impossible to construct any balance perfect enough to yield absolutely accurate determinations. For ordinary purposes the errors are so small that they are consid-

ered insignificant, but in chemical analysis it has been necessary to develop methods by which they can be further minimized. A so-called TORSION BALANCE, which depends upon the twisting of a wire or thread, is employed for weighing, but the term is commonly used to indicate a device for measuring minute electrical and magnetic forces. See SCALE.

Balance, The, English name for LIBRA, a CONSTELLATION, also called The Scales.

balance of payments, relations between all payments out of a country within a given period and all payments into the country. The concept of the balance of payments is an outgrowth of the mercantilist one of BALANCE OF TRADE. Balance of payments includes all payments between a country and its trading partners and includes the balance of trade (known as the current account), private foreign loans and their interest, loans and grants by governments or international organizations, and movements of gold. An unfavorable balance of payments (that is, when remittances exceed receipts), if serious and chronic, may affect the stability of the nation's currency. After World War II the INTERNATIONAL MONETARY FUND was established to deal with problems relating to the balance of payments, particularly with foreign exchange. Since the late 1950s the United States has generally experienced an unfavorable balance of payments due to sizable U.S. investment in Europe, foreign spending by American tourists, large-scale foreign aid, and large expenditures on U.S. military forces abroad. In the early 1970s the United States took action to create a more favorable balance of payments by twice announcing (1971, 1973) a DEVALUATION of the U.S. dollar with respect to other currencies. However, the increase in the cost of petroleum from the Arab states in 1973-74 had a deleterious effect on the U.S. balance of payments, as it did on those of most countries of Western Europe. See R. M. Stern, *The Balance of Payments Theory and Economic Policy* (1973); H. R. Heller, *International Monetary Economics* (1974).

balance of power, system of international relations in which nations seek to preserve international order by maintaining an approximate equilibrium of power among many rivals, thus preventing the preponderance of any one state. Crucial to the system is a willingness on the part of individual national governments to change alliances as the situation demands in order to maintain the balance. Intimations of this idea can be found in Thucydides' description of Greece in the 5th cent. B.C. and Guicciardini's description of 15th-century Italy. Its modern development began in the mid-17th cent., when it was directed against the France of Louis XIV. Balance of power was the stated British objective for much of the 18th and 19th cent., and it characterized the European international system, for example, from 1815-1914. After World War I the balance of power system was attacked by those who sought a system characterized by cooperation and a community of power. International relations were changed radically after World War II by the predominance of two superpowers, the United States and the Soviet Union, with major ideological differences between them. However, in the 1960s the revival of Europe and the emergence of China as a potential great power seemed to indicate a possible return to the traditional balance of power system. See H. J. Morgenthau, *Politics Among Nations* (1960); Ludwig Dehio, *The Precarious Balance* (tr. 1962); Herbert Butterfield and Martin Wright, eds., *Diplomatic Investigations* (1966).

balance of trade, relation between the merchandise exports and imports of a country. The concept first became important in the 16th and 17th cent. with the growth of MERCANTILISM. Mercantilist theorists believed that a country should have an excess of exports over imports (i.e., a favorable balance of trade) to bring money, which they confused with wealth, into the country. They urged legislation to restrict the use of foreign goods, encourage exports, and—in some cases—prohibit the export of bullion. The importance of a favorable balance of trade remained unchallenged until David Hume, Adam Smith, David Ricardo, and John Stuart Mill concerned themselves with the theories of the international adjustment of the balance of trade. The classical theory of the adjustment mechanism is that a country whose exports fall short of its imports must export part of its stock of gold, thereby affecting its price structure and its ability to compete on the world market. Today the balance of trade is regarded as only one of several elements that make up the BALANCE OF PAYMENTS of a nation. See Imanuel

Wexler, *Fundamentals of International Economics* (2d ed. 1972).

Balanchine, George (bāl'anchēn'), 1904–, American choreographer and ballet dancer, b. Russia as Georgi Balanchivadze. Balanchine attended the Imperial Ballet School, St. Petersburg, and performed in Russia. In 1924 he toured Europe and joined Diaghilev's Ballet Russe as a principal dancer and choreographer (1924-28). After moving to the United States (1933), he became director of ballet for the Metropolitan Opera House (1934-37) and a founder of the School of American Ballet (1934). Since 1948 he has been artistic director and principal choreographer for the New York City Ballet. Balanchine's choreography of more than 90 compositions includes *Serenade*, *Concerto Barocco*, *Bourrée Fantasque*, *Seven Deadly Sins*, *Agon*, and *Don Quixote*. He has done choreography for films, operas, and musicals; he created the original *Slaughter on Tenth Avenue* in the musical *On Your Toes*. Most of his works emphasize patterns of pure dance rather than plot. See study by Bernard Taper (1963, rev. ed. 1974).

Balasore (bū'lasōr), town (1971 pop. 46,279), Orissa state, E. central India, near the Bay of Bengal. Settled by the British in 1651, it was the first British settlement in what was then known as Bengal. Goods were unloaded there for transport up the Hooghly River. Balasore was a resort in the 18th cent., with French, Dutch, and Danish, as well as British, settlements. The Dutch and Danish areas were ceded to Great Britain in 1846. A French settlement remained until the French administration of Chandernagore was relinquished to the Indians in 1947. It is a district administrative center and a mining and rice-trading town.

balata (bāl'atā), nonelastic natural RUBBER obtained as a LATEX from the South American tree *Manikara bidentata* and from related trees. Its properties are similar to those of GUTTA PERCHA, and its processing and uses are essentially the same. It is sometimes called gutta balata.

Balaton (bā'latōn, Hung. bō'lōtōn), lake 230 sq mi (596 sq km), W. central Hungary, at the foot of the Bakony Forest. The Zala River is its main tributary; the lake is drained by the Sió River. It is the largest lake in Central Europe with many tourist and health resorts. Its shallow waters abound in fish, and along the shores are fine vineyards.

Balbo, Cesare (chā'zārā bāl'bō), 1789-1853, Italian premier, historian, and author. He held various posts during the Napoleonic occupation of Italy and became involved in the liberal revolution of 1821 in Piedmont. He joined with Count Cavour in founding (1847) the review the *Risorgimento*. King Charles Albert of Sardinia made (1848) him premier of his first constitutional cabinet, but Balbo resigned after three months. His works include *Sommario della storia d'Italia* (1846), *Le Speranze d'Italia* (1844), and a life of Dante (2 vol., 1839, tr. 1852).

Balbo, Italo (ē'tālō), 1896-1940, Italian Fascist leader and aviator. After serving in World War I, he joined the Fascist movement and in 1922 was one of the four top leaders of the March on Rome, which brought Mussolini to power. A general of the Fascist militia, he held several cabinet posts and was (1929-33) minister of aviation. He efficiently developed aviation in Italy and led mass flights, the most notable being Rome-Rio de Janeiro and Rome-Chicago (1933). As governor general of Libya (1933-40) he attempted to gain Muslim support for Fascism. He was killed when his plane was brought down over Tobruk, Libya, apparently shot down accidentally by Italian antiaircraft artillery.

Balboa, Vasco Núñez de (bālbō'ā, Span. vā'skō nōō'nyāth dā bālbō'ā), c. 1475-1519, Spanish conquistador, discoverer of the Pacific Ocean. After sailing with BASTIDAS in 1501, Balboa probably went to Hispaniola. In 1510, fleeing from creditors, he hid on the vessel that took ENCISO to Panama. After reaching DARIEN, Balboa took command, deposed the incompetent Enciso, and sent him to Spain as a prisoner. Balboa showed only rarely the rapacity and cruelty characteristic of the conquistador. He won the friendship of the Indians, who accompanied him on his epic march across the isthmus. Toward the end of Sept., 1513, he discovered the Pacific and claimed it and all shores washed by it for the Spanish crown. His discovery came too late to offset Enciso's complaints at the court of Spain. Balboa was replaced by Pedro ARIAS DE AVILA, and while preparing an expedition to Peru, he was summarily seized, accused of treason and beheaded. See C. L. G. Anderson, *Life and Letters of Vasco Núñez de Balboa* (1941, repr. 1971).

Balboa, town (1970 pop., including Balboa Heights, 2,801), Panama Canal Zone, on the Gulf of Panama. The port for Panama City, Balboa is the largest town in the Canal Zone and the administrative headquarters of the zone and the canal. It is also the site of a U.S. navy base.

Balbus (Lucius Cornelius Balbus) (bāl'bəs), fl. 1st cent. B.C., Roman statesman, b. Gades (now Cádiz, Spain). He won notice for brilliant service against Sertorius, and Pompey brought him to Rome and had him made a citizen. Balbus helped to bring about the creation of the First Triumvirate (Pompey, Caesar, and Crassus) in 60 B.C. and thereafter was a friend and protégé of Julius Caesar. In 56 B.C. the conservative party, to embarrass Pompey and Crassus in Caesar's absence, charged Balbus with obtaining citizenship illegally. When the case came to trial, CICERO at Pompey's request made a brilliant oration in Balbus' defense and secured an acquittal. Balbus at first was neutral, then openly favored Caesar in the struggle with Pompey. After Caesar's death he supported Octavian (later Augustus) and in 40 B.C. was made the first foreign-born Roman consul.

Balch, Emily Greene (bōlch), 1867-1961, American economist and sociologist, b. Jamaica Plain, Mass., grad. Bryn Mawr, 1889. International secretary of the Women's International League for Peace and Freedom (1919-22), she shared with John R. Mott the 1946 Nobel Peace Prize.

Balchen, Bernt (bānt bal'kən), 1899-1973, Norwegian-American aviator. He headed one of the search expeditions for Amundsen and Ellsworth in 1925 and was a member of their 1926 expedition to the Arctic. Richard E. Byrd, meeting Balchen at Spitsbergen in 1926, brought him to the United States. He was second pilot on Byrd's transatlantic flight in 1927 and was the hero of the forced night landing of Byrd's plane in the surf on the Normandy coast. He was the chief pilot on Byrd's expedition to Antarctica (1928-30), which included the first flight (1929) over the South Pole. Serving in the U.S. air force during World War II, Balchen again distinguished himself. See his autobiography, *Come North With Me* (1958).

Balch Springs, town (1970 pop. 10,464), Dallas co., NE Texas, a residential suburb of Dallas, inc. 1953.

bald cypress, common name for members of the Taxodiaceae, a small family of deciduous or evergreen conifers with needlelike or scalelike leaves and woody cones. Most species of the family are trees of the Far East, almost all are cultivated for ornament (and are often erroneously called firs or pines). The big trees and redwoods (see SEQUOIA) and the bald cypresses are the only species native to North America. The bald cypresses (genus *Taxodium*) were widely distributed in earlier times (as were the other trees in the family) but are now restricted to the SE United States and Mexico. They are called "bald" because of their deciduous character, unusual in conifers. The common bald cypress (*T. distichum*) forms dense forests in the southeastern swamplands and is a common tree of the Everglades. It produces "knees" which project from the root system upward above water level. Because its wood is resistant to wood-rotting fungi, it is valued as softwood lumber for shingles, trim, and especially for greenhouse benches and racks. *T. mucronatum*, the big cypress or Mexican bald cypress, is a larger tree with a more western range. The true CYPRESSES belong to a separate family. The bald cypress family is classified in the division PINOPHYTES, class Pinopsida, order Coniferales.

Balder (bōl'dər, bal-), Norse god of light, son of Odin and Frigg. He was the most beautiful and gracious of the gods of Asgard. His mother extracted oaths from all things in nature not to harm her son, but neglected the mistletoe. According to one legend, Loki gave a dart of mistletoe to the blind god Hoder and aimed it for him at Balder, who was killed by it. The gods grieved inconsolably over his death. It was prophesied, however, that after RAGNAROK (the doom of the gods) Balder would return to heaven. See GERMANIC RELIGION.

Baldinucci, Abate Filippo-(aba'tā fēl'ip'pō baldēnōō'tchē), 1624-96, Italian art historian and philologist. Baldinucci was a pioneer in research techniques and among the first to emphasize the aesthetic importance of the print. An artistic adviser to the Medici court, he also wrote the first dictionary of art terminology. His three-volume lives of the artists from Cimabue to the 17th-century masters remains a valuable historical source.

baldness, thinning or loss of hair as a result of illness, functional disorder, or hereditary disposition,

also known as alopecia. Male pattern baldness, a genetic trait, is the most common cause of baldness among white males. It is caused by females, but they are rarely susceptible inasmuch as it develops under the influence of testosterone, a male sex hormone. Hair loss begins at the forehead and crown and is slowly progressive. It is irreversible but may be cosmetically disguised by hair-follicle transplants. Diseases characterized by high fever (e.g., scarlet and typhoid fevers), malnutrition, drug poisoning, and glandular disorders can all cause balding. Treatment of the disease or dysfunction will usually halt the loss of hair, and if the scalp and hair follicles are not severely damaged, hair will usually regrow spontaneously. Scalp infection, oiliness or dirtiness of the scalp and hair, and excessive teasing and lacquering of hair are also conducive to baldness. Alopecia areata is a disease of unknown origin characterized by noninflamed bald patches in the scalp hair and beard. It is recurrent but is usually of short duration.

Baldovineti, Alesso (ālās'sō baldōvēnētē), c. 1425-1499, Italian painter and decorative artist of the early Florentine Renaissance. He was probably trained in the workshop of Domenico Veneziano, whose influence is evident in his early works. These paintings include an altarpiece for the Medici villa at Cafaggiolo and an *Annunciation* (both Uffizi). In 1462 he completed the *Nativity* in the Annunziata. This scene and his decoration of the Portuguese chapel in San Miniato have deteriorated because of Baldovineti's unfortunate experiments with the technique of fresco. He painted several Madonnas (Louvre and Uffizi) in a serene, rather mellow style. Baldovineti was considered the foremost designer in mosaics of his day. He also worked in other media such as stained glass, inlaid wood, shields, and coats of arms. See study by R. W. Kennedy (1938).

Baldung or Baldung-Grien, Hans (hans bal'dōng-grēn), c. 1484-1545, German painter and printmaker, active mainly at Strasbourg. He was nicknamed Grien or Grun because of his fondness for the color green. Although he probably studied with Dürer, he evolved a personal style revealing his interest in brilliant color, effects of light, and expressively contorted forms. He is best known as a painter of such disturbing subjects as *Death and the Maiden* (Basel) and for drawings and prints of witches and allegorical or mythological scenes. The high altar of the cathedral at Freiburg in Breisgau, with depictions of the *Coronation of the Virgin*, the *Crucifixion*, and other subjects (c. 1515) is his most famous work. Baldung was also esteemed as a portrait painter and designer for stained glass.

Baldwin I, 1171-1205, 1st Latin emperor of Constantinople (1204-5). The count of Flanders (as Baldwin IX), he was a leader in the Fourth Crusade (see CRUSADES). After the seizure of Constantinople (1204), the Crusaders elected him emperor (see CONSTANTINOPLE, LATIN EMPIRE OF). He was captured (1205) in battle by the Bulgarians and died in captivity, probably by poison. He was succeeded by his brother, Henry of Flanders.

Baldwin II, 1217-73, last Latin emperor of Constantinople (1228-61), brother and successor of ROBERT OF COURTENAY. He began his personal rule only after the death (1237) of his father-in-law, JOHN OF BRIENNE. Baldwin traveled in Western Europe seeking financial and military aid for his precarious throne (see CONSTANTINOPLE, LATIN EMPIRE OF). To obtain funds he sold a large part of the True Cross and other sacred relics to Louis IX of France and at one time pawned his son to the Venetians. In 1261, MICHAEL VIII, Greek emperor of Nicaea, stormed Constantinople. Baldwin escaped to Italy and ultimately transferred his claims on the throne to CHARLES I of Naples.

Baldwin I (Baldwin of Boulogne), 1058?-1118, Latin king of Jerusalem (1100-1118), brother and successor of GODFREY OF BOUILLON, whom he accompanied on the First Crusade (see CRUSADES). Separating from the main army after the successful siege of Nicaea, Baldwin followed TANCRED into Cilicia and seized (1097) Tarsus from him. He wrested (1097) Edessa from the Muslims and as count of Edessa defended the city until elected ruler of Jerusalem. His election marked the triumph of the military faction of the Crusaders over the ecclesiastical faction. Taking the title of king, he consolidated the Latin states of the East. With the help of crusading fleets from the West and, more important, the Genoese and the Venetians, to whom he made large concessions, he gained possession of the chief ports of Palestine. He helped the Latin rulers of Antioch, Edessa, and Tripoli against the Muslims and fought against the Egypt-

ians. He died on his return from an expedition into Egypt. His cousin, Baldwin II, succeeded him.

Baldwin II (Baldwin of Le Bourg), d. 1131, Latin king of Jerusalem (1118-31), count of Edessa (1100-1131), cousin and successor of Baldwin I. He accompanied Godfrey of Bouillon on the First Crusade and was captured (1104) by the Muslims. He was released in 1108. As king of Jerusalem, he spent most of his reign warring with the Turks in N. Syria. He was a prisoner from 1123 to 1124, Eustace Garnier, his regent during his captivity, captured Tyre. In Baldwin's reign the Latin principality of Antioch was reduced to dependence on the kingdom of Jerusalem. Baldwin's daughter Melisende married (1129) FULK of Anjou, who succeeded Baldwin.

Baldwin III, 1130-62, Latin king of Jerusalem (1143-62), son and successor of Fulk. Until 1152 he ruled with his mother, Melisende. In his reign began the decay of Latin power in the East. Edessa fell to the Muslims (1144), the Second Crusade (see CRUSADES) failed, and Sultan NUR AD-DIN seized (1154) Damascus and N. Syria. Baldwin in 1153 took Ashkelon and foolishly directed his policy against the Egyptians rather than the Turks. His brother succeeded as Amalric I.

Baldwin IV (Baldwin the Leper), c. 1161-1185, Latin king of Jerusalem (1174-85), son and successor of Amalric I. RAYMOND, count of Tripoli, was regent from 1174 to 1176. Baldwin was constantly engaged, except for a truce (1180-82), in defending his kingdom against SALADIN. In 1183 his leprosy began to spread very rapidly, he appointed GUY OF LUSIGNAN as his regent, but in the same year he withdrew the commission and had his five-year-old nephew crowned king as Baldwin V (d. 1186). Raymond was regent for Baldwin V, who was succeeded as king by Guy of Lusignan.

Baldwin, Abraham, 1754-1807, American political leader, b. Guilford, Conn. After serving as a chaplain in the American Revolution, he studied law and in 1784 was admitted to practice in Georgia. He was a member (1785-88) of the Continental Congress and the leading Georgia delegate to the U.S. Constitutional Convention in 1787. His change of vote in that convention on the issue of the mode of representation in Congress brought about a tie between the large and small states. Baldwin served on the committee appointed to solve this problem. The compromise system of representation that it proposed (by population in the House of Representatives and by states in the Senate) was adopted. Baldwin was elected to the first House of Representatives and served until 1799. He then served in the Senate until his death. He was an industrious member of many committees and supported Jeffersonian policies. Earlier, while in the Georgia assembly, Baldwin wrote the charter of Franklin College, which later developed into the Univ. of Georgia. See biography by H. C. White (1926).

Baldwin, James, 1924-, American author, b. New York City. He spent an impoverished boyhood in Harlem and at 14 became a preacher in the Fireside Pentecostal Church. After graduating from high school he decided to become a writer, and the receipt of several grants enabled him to live in France for nine years. His first novel, *Go Tell It on the Mountain* (1953), which reflects his experience as a storefront preacher, was well received. Also critically acclaimed was *Another Country* (1962), a bitter novel about sexual relations and race relations. With the publication of the perceptive essays in *The Fire Next Time* (1963), Baldwin was recognized as an extremely articulate spokesman for the feelings and attitudes of American Negroes. His other works include the play *Blues for Mr. Charlie* (1964), a volume of short stories, *Going to Meet the Man* (1964), the novels *Giovanni's Room* (1956), *Tell Me how Long the Train's Been Gone* (1968), and *If Beale Street Could Talk* (1974), collections of essays, including *Notes of a Native Son* (1955), *Nobody Knows My Name* (1961), and *No Name in the Street* (1972). See studies by Stanley Macebuh (1973), and Kenneth Kinamon, ed. (1974).

Baldwin, James Mark, 1861-1934, American psychologist, b. Columbia, S.C., grad. Princeton (B.A., 1884, Ph.D., 1889). He taught philosophy at the Univ. of Toronto (1889-93), psychology at Princeton (1893-1903), and philosophy and psychology at Johns Hopkins (1903-9) and the National Univ. of Mexico (1909-13). Internationally known as a philosopher and psychologist, he was the author of numerous works in these fields, many of which were translated into European languages. Among his books are *Elements of Psychology* (1893), *Story of*

the *Mind* (1898), and *Dictionary of Philosophy and Psychology* (1901-6)

Baldwin, Matthias William, 1795-1866, American industrialist and philanthropist, b. Elizabethtown (now Elizabeth), N.J. After earlier business successes, Baldwin became interested in steam-engine production and completed in 1832 the locomotive *Old Ironsides*—one of the first successful American models—for the Philadelphia, Germantown, and Norristown RR. The Baldwin Locomotive Works subsequently prospered and maintained a leading position in the industry. Baldwin made many contributions to the Franklin Institute for the Promotion of Mechanical Arts, of which he was a charter member.

Baldwin, Robert, 1804-58, Canadian statesman, leader of the movement for representative government in Canada, b. York (now Toronto), Ont. His father, William Warren Baldwin (1775-1844), was a leader of the Reform party and a supporter of the principle of responsible (i.e., cabinet) government in the colonies. In 1836, as a recognized leader of reform in Upper Canada, Robert Baldwin was appointed by Sir Francis Bond Head to the executive council, but he resigned in a few weeks when it became apparent that the governor had no intention of acceding to the demands of the reformers. In England, in 1836, Baldwin sent to the colonial secretary a memorandum that was the first clear enunciation of the tenet of responsible government for Canada. Shortly after his return to Canada in 1837, he served as mediator between Head and the rebels, as a moderate reformer, he had opposed the faction of William Lyon Mackenzie in the rebellion of that year. Again (1841) he hopelessly accepted appointment to the executive council under Lord Sydenham, only to resign when the governor showed no disposition to grant responsible government. As a member of the assembly, Baldwin led the opposition group and increased his influence, particularly by effecting an alliance with the French in Lower Canada, whom Sydenham had ignored in forming his council. After the reunion of Upper and Lower Canada in 1841, Baldwin and Louis Hippolyte LaFontaine were allowed to form their first coalition government (1842) under Sir Charles Bagot. With Bagot's death and the arrival (1843) of Sir Charles Metcalfe as governor, the first Baldwin-LaFontaine government resigned, but in the elections of Dec., 1847, the reformers won an overwhelming vote. As a consequence, the second Baldwin-LaFontaine ministry (1847-51) was formed, it is often called "the great ministry." Outstanding among its accomplishments were the Municipal Corporations Act, commonly called the Baldwin Act, for the reformation of local government in Ontario, an act to revise the judicial system, and an act to transform King's College into the nonsectarian Univ. of Toronto (over the violent opposition of Bishop John Strachan). See biography by G. E. Wilson (1933), Stephen Leacock, *Mackenzie, Baldwin, LaFontaine, Hincks* (rev. 1926), R. W. Langstone, *Responsible Government in Canada* (1931).

Baldwin, Simeon Eben, 1840-1927, American jurist and politician, b. New Haven, Conn., grad. Yale, 1861. He taught at Yale from 1869 to 1919, serving as a professor of law after 1872. His teaching and financial aid helped to increase the prestige and quality of the law school. He was appointed (1893) associate justice of the supreme court of Connecticut and in 1907 became chief justice. In the year of his compulsory retirement from judicial office (1910) he was elected governor of Connecticut and was reelected in 1912. See biography by Frederick H. Jackson (1955).

Baldwin, Stanley, 1867-1947, British statesman, cousin of Rudyard Kipling. The son of a Worcester-shire ironmaster, he was educated at Harrow and at Trinity College, Cambridge, and entered the family business. In 1908 he was elected to Parliament as a Conservative. In 1916 he became parliamentary private secretary to Andrew Bonar Law, who made him (1917) joint financial secretary to the treasury. He was made president of the Board of Trade in 1921 but in 1922 played an important role in the decision of the Conservative party to withdraw from David Lloyd George's coalition government. When the Conservatives won the ensuing election, Baldwin became chancellor of the exchequer and in 1923 succeeded Bonar Law as prime minister. His government fell (1924) when he failed to obtain support for a protectionist tariff policy, but he returned to office within the year. Baldwin's second period of office (1924-29) was marked by rising unemployment and by a general strike (1926), following which

he secured passage of the Trade Disputes Act (1927) to restrict the power of the labor unions. In 1931, Baldwin became lord president of the council in the National government. Although under the nominal leadership of Ramsay MacDonald, the coalition was dominated by Baldwin, and in 1935 he again became prime minister. Although he won the general election of 1935 on a platform of support for the League of Nations, Baldwin approved the Hoare-Laval pact (see TEMPLEWOOD, SAMUEL JOHN GURNEY HOARE, 1st Viscount), which greatly discredited his government. As international relations continued to deteriorate, with the German reoccupation of the Rhineland and the beginning of the Spanish civil war, Britain finally began to rearm. Baldwin steadfastly opposed the proposed marriage of Edward VIII to Wallis Warfield Simpson and secured the king's abdication (1936). He retired in 1937 and shortly thereafter was created Earl Baldwin of Bewdley. Although an able politician, Baldwin has been much criticized for his indolence and particularly for his apparent complacency in the face of the mounting threats to peace in Europe. See biographies by G. M. Young (1952), A. W. Baldwin (1956), and Keith Middlemas and John Barnes (1969).

Baldwin, 1. Uninc. city (1970 pop. 34,525), Nassau co., SE N.Y., on the south shore of Long Island, on Baldwin Bay, settled 1640s. A fishing center and summer resort, it has varied manufactures. 2. Borough (1970 pop. 26,729), Allegheny co., SW Pa., a suburb just S of Pittsburgh, on the Monongahela River, in a bituminous coal region, inc. 1952. Tools, wood products, flooring, and metal goods are manufactured.

Baldwin of Bewdley, Stanley Baldwin, 1st Earl: see BALDWIN, STANLEY

Baldwin Park, city (1970 pop. 47,285), Los Angeles co., S Calif., a residential suburb of Los Angeles, in the fertile San Gabriel valley, settled 1870, inc. 1956. It has varied manufactures.

Bale, John, 1495-1563, English dramatist and clergyman. An ardent proponent of the Reformation, he used the stage as a vehicle for his views. His most famous play, *King John* (written c. 1535), shows the transition from the medieval morality play to the Renaissance historical drama by allegorical treatment of the fate of England rather than of the fate of man's soul. Bale's *Illustrium Scriptorum* (1548) is one of the first bibliographies of English literature. See Honor McCusker, *John Bale, Dramatist and Antiquary* (1942, repr. 1971).

Bäle, Switzerland: see BASEL

Balearic Islands (baläär'ik), Span. *Baleares* (baläär-räs), archipelago, off Spain, in the W Mediterranean, forming Balearic prov. (1970 pop. 558,287) of Spain. Palma is the capital. The chief islands are Majorca, Minorca, and Ibiza. Noted for their scenery and their mild climate, the Balearics are a major tourist center. After tourism, agriculture and fishing are the chief economic activities; fruit, wine, olive oil, majolica ware, and silver filigree are exported. Inhabited since prehistoric times—there are numerous Cyclopean remains—the islands were occupied by Iberians, Phoenicians, Greeks, Carthaginians, Romans, and Byzantines. The Moors, who first came in the 8th cent., established (11th cent.) an independent kingdom, which became the seat of powerful pirates, harassing Mediterranean coastal cities and trade. James I of Aragon conquered (1229-35) the islands. They were included (1276-1343) in the independent kingdom of Majorca and reverted to the Aragonese crown under Peter IV. At the outbreak of the Spanish civil war (1936), Majorca and Ibiza were seized by insurgent forces—Majorca becoming a base of the Italian fleet—while Minorca remained in the hands of the Loyalists until 1939.

baleen: see WHALE

Balen, Hendrik van (hên'drik van ba'län), 1575-1632, Flemish painter, b. Antwerp. Van Balen usually provided the figures for scenes in which another painter, frequently Jan Brueghel, designed the landscape settings. A minor artist, van Balen is noted mainly for his mythological scenes, of which *Landscape with Two Nymphs* (Munich) is typical.

Balenciaga, Cristóbal: see under FASHION

baler: see HAY BALER

Balewa, Alhaji Sir Abubakar Tafawa (alha'jé abôô'bäkar' tafä'wa balä'wä), 1912-66, Nigerian political leader. He was born Mallam Abubakar. After studying to become a teacher, he held a series of posts in education and then became a member of the Northern Region house of assembly in 1947. Later (1951), he was elected to the federal house of representatives. He was appointed the first prime

minister of the Federation of Nigeria in 1957. When the federation became independent (1960), he retained his office. He was a founder and deputy president general of the country's largest political party, the Northern People's Congress. He was knighted by Queen Elizabeth II. In 1966, he was killed in a military coup d'état.

Balfe, Michael William, 1808-70, Irish composer. Of his many operas, very popular in their time, the best known was *The Bohemian Girl* (1843).

Balfour, Arthur James Balfour, 1st earl of (bäl'föör), 1848-1930, British statesman, nephew of the 3d marquess of Salisbury. He entered parliament as a Conservative in 1874 and served as secretary to his uncle at the Congress of Berlin (1878). Although associated with the "Fourth Party" of Lord Randolph Churchill, he remained close to Salisbury, serving as president of the Local Government Board (1885-86) and secretary for Scotland (1886). As chief secretary for Ireland (1887-91) Balfour was a resolute opponent of the Home Rule movement and suppressed riots, but he worked for agrarian reform. In 1891 he became Conservative leader in the House of Commons and served (1891-92, 1895-1902) as first lord of the treasury. He succeeded his uncle as prime minister in 1902. His government achieved educational reform (1902), passed the Irish Land Purchase Act (1903), created the Committee of Imperial Defence (1904), and inaugurated the Franco-British Entente (1904). However, the Conservative party split over tariff protection advocated by Joseph Chamberlain. Balfour resigned in 1905, and his party was overwhelmingly defeated in the 1906 election. He continued as leader of the Conservatives during the disputes over the 1909 budget and the reform of the House of Lords but resigned in 1911. Balfour was first lord of the admiralty (1915-16) in Herbert Asquith's coalition government and became (1916) foreign secretary under David Lloyd George. In this capacity he issued the Balfour Declaration (1917), pledging British support to the Zionist hope for a Jewish national home in Palestine, with the proviso that the rights of non-Jewish communities in Palestine would be respected (see ZIONISM). He attended the Versailles peace conference and, as lord president of the council (1919-22), represented Britain at the first meeting of the League of Nations in 1920 and at the Washington Conference on limiting naval armaments in 1921-22. Created earl of Balfour in 1922, he was again lord president of the council (1925-29). Balfour was a brilliant intellectual and an effective public official, devoted to the cause of international peace. His philosophical writings, which explore the problems of modern religion, include *The Foundations of Belief* (1900), *Theism and Humanism* (1915), *Theism and Thought* (1923), and *Opinions and Arguments* (1927). See biographies by Blanche Dugdale (2 vol., 1936), Kenneth Young (1963), and S. H. Zebel (1973).

Balfour, Francis Maitland, 1851-82, Scottish embryologist, brother of A. J. Balfour. He was an early exponent of RECAPITULATION. His *Treatise on Comparative Embryology* (2 vol., 1880-81) is a classic treatment of the evolution of the egg and embryo. Professor of animal morphology at Cambridge Univ., Balfour did research there and at the zoological station at Naples.

Balfour, Sir James, d. 1583, Scottish judge and politician. Captured (1547) at St. Andrews after the murder of Cardinal Beaton, he served a sentence in the French galleys and on his release (1549) abjured Protestantism. He became an adviser to MARY QUEEN OF SCOTS and was deeply involved in the murder of Lord Darnley. He was made governor of Edinburgh Castle, but when the Scottish lords rose against the queen, he surrendered it to them. Balfour repeatedly changed his political allegiance in the conflicts of the succeeding years. Eventually he withdrew to France, but he returned to Scotland (1580) to help secure the conviction of the earl of Morton for Darnley's murder. He was long a jurist, but, despite its name, the early law text, *Balfour's Practicks of Scots Law*, is only partially of his authorship.

Bali (ba'le), island and (with two offshore islets) province (1970 est. pop. 2,247,000, c. 2,200 sq. mi. (5,700 sq. km)), E Indonesia, westernmost of the Lesser Sundaes, just E of Java across the narrow Bali Strait. The capital is Denpasar. Although Bali is relatively small, it is densely populated and culturally and economically one of the most important islands of Indonesia. Largely mountainous, with active volcanoes, it rises to 10,308 ft (3,142 m) at Mt. Agung; there is a great fertile plain to the south. Fauna include tigers and deer. Bali is known for its giant waringin trees, sacred to the inhabitants. The Balinese

(a Malayan group closely related to the Javanese) are skillful farmers, rice, the chief crop, is grown with the aid of elaborate irrigation systems. Vegetables, fruits, coffee, and coconuts are also produced. Livestock is important, pigs and cattle are major export items. Industries include food processing, tourism, and handicrafts. The people are noted for their artistic skill (especially wood carving), their physical beauty, and their high level of culture, which includes advanced forms of music, folk drama, dancing, and architecture. They are Hindu in a nation that is overwhelmingly Muslim, their unique ritualistic culture, as well as the island's scenic beauty, has made Bali one of the great tourist attractions of the Far East. An international airport was opened in 1969. Bali was converted to Hinduism in the 7th cent, and was under Javanese rule from the 10th to the late 15th cent. It was a refuge (1513-28) for the Hindus of Java fleeing the advance of Islam. The Dutch first landed in 1597 and the Dutch East India Company began its trade with the island in the early 17th cent. Dutch sovereignty was not firmly established until after a series of colonial wars (1846-49), and the entire island was not occupied until 1908, after the quelling of two rebellions. Klungkung, NE of Denpasar, was the capital of the native rulers from the 17th cent. until 1908. Bali was particularly hard hit during the nationwide purge of Communists in 1965, more than 40,000 people were killed, and entire villages were destroyed. A state univ. is in Denpasar. See *Bali* (Vol. V and VIII of *Selected Studies on Indonesia*, publ. by W. van Hooft, 1960 and 1970), Jane Belo, *Trance in Bali* (1960) and *Traditional Balinese Culture* (1970).

Balikesir (balük'ësör'), city (1970 pop. 85,032), capital of Balikesir prov., NW Turkey. It is a rail junction and the center of a fertile agricultural region.

Balikpapan (ba'lekpa'pan), city (1961 pop. 91,706), E Borneo (Kalimantan), Indonesia, on an inlet of Makassar Strait. An important seaport and oil center with refineries, it is connected by pipeline with the oil fields of Samarinda. Timber is also exported.

Balinese music represents, to a large extent, a survival of the pre-Islamic music of Java. It was taken to Bali by Hindu Javanese in the 15th cent. and uses the tonal systems of JAVANESE MUSIC, of which *pelog* is by far the more important in Bali. Balinese music sounds impetuous and noisy, in contrast to the soft, tranquil music heard currently in Java. Few *gamelans*, the orchestras of tuned percussion instruments, play in Java today but they flourish, their archaic forms preserved, in modern Bali. The *gamelans* of the princes are no longer important in Bali, but have left their influence on the village societies for music making. There are also the ceremonial *gamelans* of the temples. The most important instruments are xylophones, which may be made of bronze or bamboo. Bronze xylophones are of two basic types—*gangsa*, whose keys are supported over a wooden resonance box, and *g'ndér*, whose keys have individual bamboo resonators. These instruments sometimes play the melody and sometimes they provide a brilliant figuration. Gongs, suspended singly, are used for metrical accentuation, there are also gong chimes, which are of two types. The *trompong*, a set of 10, is a solo instrument, and the *reyong*, a set of 12, is played by four men, supplying figuration. Flutes, in two sizes, are made of bamboo and are used in theatrical music. Although the name of the *rebab*, a two-string spike fiddle, is Persian-Arabic, the instrument probably originated in S China and is used in the music of the *gambuh* play. Cymbals, bell rattles, and drums supply the all-important, elaborate rhythmic background. The *anklung* is an archaic, tuned bamboo rattle. It is not known in all parts of Bali, but gives its name to the *anklung gamelan*, a ceremonial *gamelan* which may at one time have always included *anklungs*. The instrumentation and the repertoire of a particular *gamelan* depend on its function. Each of the various forms of dance and drama has a *gamelan* which specializes in its music. The most recent musical development is *kebyar*, a restless, explosive music which discards the highly developed, balanced forms of the older music. *Kebyar* clubs compose their own music, often taking themes from older music. The wealthier clubs include a dancer—a young man who performs seated on the ground, dancing from the waist up. Balinese notation was invented by the Javanese who brought the music to Bali. It gives no indication of the rhythm and is little used. Music is learned by rote, it is not improvisation, however, but a sophisticated, composed art form. See D. A. Lentz, *The Gamelan Music of Java and Bali* (1965), C. McPhee, *Music in Bali* (1965).

Baliol, Edward de (bäl'yäl), d. 1363, king of Scotland, son of John de Baliol (d. 1315). Having secured English support for his claim to the Scottish throne, he invaded Scotland in 1332 and was crowned at Scone. He was soon driven out, but EDWARD III of England came to his active support, and together they defeated forces of the young DAVID II at Halidon Hill in 1334. Baliol then ceded several southern Scottish counties to Edward. He was driven out again, and David, who had been in France, returned in 1341 as king. In 1356 Baliol retired on an English pension, surrendering his title as king to Edward.

Baliol, John de, 1249-1315, king of Scotland (1292-96), son of John de Baliol (d. 1269). He became head of the family after the death of his elder brothers in 1278. At the death of Margaret Maid of Norway (1290), he claimed the Scottish throne through his grandmother, eldest daughter of David of Huntingdon, brother of King William the Lion. His principal rival was Robert the Bruce, of the celebrated BRUCE family, son of David of Huntingdon's second daughter and hence one generation closer to his royal ancestor, although through a younger line. The laws of succession not being firmly established, the question was referred to EDWARD I of England, who first demanded and secured (1291) recognition as feudal overlord of Scotland. Edward decided in favor of Baliol, who was then crowned king (1292) and did homage to Edward for the kingdom. Baliol, after some hesitation, accepted Edward's asserted right to hear appeals from Scottish courts. However, when he attended Edward's Parliament at Westminster in late 1293, he refused to answer such an appeal. The Scottish council subsequently disregarded Edward's summons for help against France and formed (1295) an alliance with Philip IV of France. Early in 1296 the Scots invaded England, and as Edward marched north to take Berwick, Baliol renounced his oath of fealty to the English king. However, after defeat in a brief campaign, in which he took no active part, Baliol surrendered to Edward. He was imprisoned in England until 1299 and ended his days on his estates in France, ignoring the continuing struggle for Scottish independence.

Baliol, John de, d. 1269, nobleman with lands in both England and Scotland, founder of Balliol College, Oxford. The name is also spelled Balliol. In 1249 he became a member of the Scottish council of regency and a guardian of Alexander III. However, he was apparently disliked by the young king and was discharged and heavily fined in 1255. He fought for Henry III of England in the BARONS' WAR and was taken prisoner at the battle of Lewes (1264). His third son, another John, became king of Scotland.

Balkan Entente, loose alliance formed in 1934 by Yugoslavia, Rumania, Greece, and Turkey to safeguard their territorial integrity against Bulgarian revisionism. It thus was in harmony with the LITTLE ENTENTE (formed by Yugoslavia, Rumania, and Czechoslovakia chiefly against Hungarian revisionism). The events of World War II caused the dissolution of the Balkan Entente.

Balkan Peninsula, southeasternmost peninsula of Europe, c. 200,000 sq mi (518,000 sq km), bounded by the Black Sea, Sea of Marmara, Aegean Sea, Mediterranean Sea, Ionian Sea, and Adriatic Sea. Although there is no sharp physiographic separation between the peninsula and Central Europe, the line of the Sava and Danube rivers is commonly considered as the region's northern limit, it therefore includes Albania, continental Greece (including the Peloponnese), Bulgaria, European Turkey, most of Yugoslavia, and SE Rumania. These six countries, successors to the Ottoman Empire, are called the Balkan States. Historically and politically the region extends north of this line to include all of Yugoslavia and Rumania. The peninsula is very mountainous, the main ranges are the Dinaric Alps, the Balkans, the Rhodope Mts., and the Pindus. Except for the barren Karst plateau of Yugoslavia and the eroded highlands of Greece, the mountains are densely forested. The Morava, Vardar, Strmon, Mesta, and Maritsa are the largest rivers. The Morava and Vardar river valleys form the chief corridor across the peninsula. The mild Mediterranean-type climate, with its dry summer period, is limited to the southern and coastal areas. Covering a greater area are the humid subtropical climate in the northwest and the harsher humid continental climate in the northeast. The region as a whole is largely agricultural, fruits, grains, and grazing are important. A variety of mineral deposits are found there, including iron ore, coal, manganese, copper, lead, and zinc. The peoples of the Balkan Peninsula make up several racial groups. However, linguistic and religious

differences are more distinct than the racial divisions. The peninsula, at the crossroads of European and Asian civilizations, has a long history, Ancient Greece, the Byzantine Empire, and the Ottoman Empire flourished there.

Balkans, Bulg. *Stara Planina* (sta'ra pla'nëna'), major mountain range of the Balkan Peninsula and Bulgaria, extending c. 350 mi (560 km) from E Yugoslavia through central Bulgaria to the Black Sea. It rises to 7,794 ft (2,376 m) at Botev, the highest peak. The Balkans are a continuation of the Carpathian Mts. The forested range is sparsely populated and rich in a variety of minerals. It acts as a climatic barrier, preventing the inland penetration of Mediterranean influences. There are numerous trans-Balkan passes including Shipka Pass (alt. c. 4,000 ft/1,220 m).

Balkan Wars, 1912-13, two short wars, fought for the possession of the European territories of the Ottoman Empire. The outbreak of the Italo-Turkish War for the possession of Tripoli (1911) encouraged the Balkan states to increase their territory at Turkish expense. Serbia and Bulgaria accordingly concluded (1912), with the aid of Russian secret diplomacy, a treaty of alliance. In a secret annex, the treaty provided for joint military action and the division of prospective conquests. The outbreak of the war (Oct., 1912), in which Greece and Montenegro joined the original allies, was followed by the speedy expulsion of the Turks from all of European Turkey, except the Constantinople area. After the conclusion of hostilities Serbia showed intentions of annexing a large part of Albania, in order to gain an outlet on the Adriatic, but this step toward a "Greater Serbia" was opposed by Austria-Hungary and Italy and by the Albanians, who had proclaimed their independence. Conferences of the ambassadors of the Great Powers at London created (1913) an independent Albania of fair size, thus cutting Serbia off from the sea. Dissatisfied with these terms, Serbia demanded of Bulgaria a greater share of Macedonia. Bulgaria thereupon attacked (June, 1913) Serbia, only to be attacked by Rumania, Greece, and Turkey. As a result of this Second Balkan War, Bulgaria lost territory to all her enemies by the Treaty of Bucharest (Aug., 1913). The Balkan Wars prepared the way for World War I by satisfying some of the aspirations of Serbia and thereby giving a great impetus to the Serbian desire to annex parts of Austria-Hungary, by alarming Austria and stiffening Austrian resolution to crush Serbia, and by giving causes of dissatisfaction to Bulgaria and Turkey. See George Young, *Nationalism and War in the Near East* (1915, repr. 1970), E. C. Helmreich, *The Diplomacy of the Balkan Wars, 1912-1913* (1938, repr. 1969).

Balkar, see KABARDINO-BALKAR AUTONOMOUS SOVIET SOCIALIST REPUBLIC.

Balkh (balkh), town (1967 pop. 15,000), N Afghanistan, on a dried-up tributary of the Amu Darya River. One of the world's oldest cities, it is the legendary birthplace of the prophet ZOROASTER. Alexander the Great reputedly founded a Greek colony at the site c. 328 B.C. The city later attained great wealth and importance as Bactra, capital of the independent kingdom of Bactria. In the early centuries A.D., Balkh, a prominent center of Buddhism, was renowned for its Buddhist monasteries and stupas. Conquered by the Arabs in 653, it became important in the world of Islam as the original home of the Barmecides (see HARUN AR-RASHID). Under the Abbasid caliphate its fame as a center of learning earned Balkh the title "mother of cities." The city was sacked in 1221 by Jenghiz Khan and lay in ruins until Tamerlane rebuilt it (early 16th cent.). It passed to the Uzbeks and then briefly to the MOGUL empire before falling (18th cent.) to Nadir Shah. In 1850, Balkh became part of the unified kingdom of Afghanistan. The old city, sections of whose walls remain, is now mostly in ruins, the new city, some distance away, is an agricultural and commercial center, inhabited chiefly by Uzbeks. Excavations in the area have uncovered some objects of the early Muslim period.

Balkhash (bal-khash'), city (1969 est. pop. 77,000), W Central Asian USSR, in Kazakhstan, on the north shore of Lake Balkhash. A railroad terminus, port, and copper-smelting center, it was founded as Bertys in 1929 and was renamed in 1936.

Balkhash, lake, 6,562 sq mi (16,996 sq km), c. 350 mi (560 km) long, maximum width c. 45 mi (70 km), Kazakhstan, Central Asian USSR. The lake, which has an average depth of 20 ft (6 m), stretches from the Kazakh Hills in the northeast to desert steppes in the southwest. The eastern half of the lake is saline, the

western half, separated from the eastern section by a sandbar and fed by the Ili River, is fresh Lake Balkhash, which has no outlet, is slowly shrinking from evaporation. There are valuable copper deposits along the northern shore, and the city of Balkhash has a large copper smelter.

Ball, George Wildman, 1909–, American lawyer and diplomat, b. Des Moines, Iowa. Admitted to the bar in 1934, he served (1942–44) as counsel in the Lend Lease Administration and the Foreign Economic Administration. An expert on foreign economic policy, Ball became (1961) Undersecretary of State for Economic Affairs and then served (1961–66) as Undersecretary of State. During that period he played a major role in formulating U.S. foreign aid and foreign trade policy and was the chief architect of the Trade Agreements Act of 1962. A persistent critic of U.S. military involvement in Vietnam, Ball left the State Department to become (1966–68) chairman of Lehman Brothers, a major investment banking firm. After briefly serving (1968) as U.S. representative to the United Nations, he returned to Lehman Brothers as a senior partner. Ball is the author of *The Discipline of Power* (1968).

Ball, John, d. 1381, English priest and social reformer. He was one of the instigators of the Peasants' Revolt of 1381 (see under TYLER, WAT). He was an itinerant for many years, acting independently of the influence of John Wyclif and advocating ecclesiastical poverty and social equality. Excommunicated in 1376, he was in prison at Maidstone when the rebels released him in 1381. After the dispersal of the rebels, Ball was captured at Coventry. He was taken to St. Albans, where he was hanged, drawn, and quartered. He is perhaps best remembered for giving currency to the couplet "When Adam delved and Eve span/Who was then the gentleman?" William Morris wrote one of his works on utopian socialism under the title *The Dream of John Ball*. See Charles Oman, *The Great Revolt of 1381* (1906).

Ball, Thomas, 1819–1911, American sculptor, b. Charlestown, Mass., son of a house and sign painter. Thomas Ball was also a singer of reputation, the first in the United States to sing the title role in Mendelssohn's *Elijah*. Although he lived many years in Florence, Ball's work remained distinctly American. He made portrait busts of many distinguished people. Among his works are the mounted figure of Washington in the Boston Public Gardens and a statue of Daniel Webster in Central Park, New York. His autobiography, *My Three Score Years and Ten*, appeared in 1890.

ballad, in literature, short, narrative poem usually relating a single, dramatic event. Two forms of the ballad are often distinguished—the folk ballad, dating from about the 12th cent., and the literary ballad, dating from the late 18th cent. The first form, the anonymous folk ballad (or popular ballad), was composed to be sung. It was passed along orally from singer to singer, from generation to generation, and from one region to another. During this progression a particular ballad would undergo many changes in both words and tune. The medieval or Elizabethan ballad that appears in print today is probably only one version of many variant forms. Primarily based on an older legend or romance, this type of ballad is usually a short, simple song that tells a dramatic story through dialogue and action, briefly alluding to what has gone before and devoting little attention to depth of character, setting, or moral commentary. It uses simple language, an economy of words, dramatic contrasts, epithets, set phrases, and frequently a stock refrain. The familiar stanza form is four lines, with four or three stresses alternating and with the second and fourth lines rhyming. For example:

It was in and about the Martinmas time,
When the green leaves were a falling,
That Sir John Graeme, in the West Country,
Fell in love with Barbara Allan

"Bonny Barbara Allan"

It was in the 18th cent. that the term *ballad* was used in England in its present sense. Scholarly interest in the folk ballad, first aroused by Bishop Percy's *Reliques of Ancient English Poetry* (1765), was significantly inspired by Sir Walter Scott's *Minstrelsy of the Scottish Border* (1802). Francis Child's collection, *English and Scottish Popular Ballads* (5 vol., 1882–98), marked the high point of 19th-century ballad scholarship. More than 300 English and Scottish folk ballads are extant, dating from the 12th to the 16th cent. Although the subject matter varies considerably, five major classes of the ballad can be distinguished—the historical, such as "Otterburn" and "The Bonny Earl o' Moray", the romantic, such

as "Barbara Allan" and "The Douglas Tragedy", the supernatural, such as "The Wife of Usher's Well", the nautical, such as "Henry Martin", and the deeds of folk heroes, such as the Robin Hood cycle. Ballads, however, cannot be confined to any one period or place, similar subject matter appears in the ballads of other peoples. Indigenous American ballads deal mainly with cowboys, folk heroes such as Casey Jones and Paul Bunyan, the mountain folk of Kentucky and Tennessee, the Southern Negro, and famous outlaws, such as Jesse James.

Jesse had a wife to mourn for his life,
Three children, they were brave,
But the dirty little coward that shot Mister
Howard
Has laid Jesse James in his grave

"Ballad of Jesse James"

During the mid-20th cent. in the United States there was a great resurgence of interest in folk music, particularly in ballads. Singers such as Joan Baez and Pete Seeger included ballads in their concert repertoires, composer-performers like Woody Guthrie and Bob Dylan wrote their own ballads. The literary ballad is a narrative poem created by a poet in imitation of the old anonymous folk ballad. Usually the literary ballad is more elaborate and complex, the poet may retain only some of the devices and conventions of the older verse narrative. Literary ballads were quite popular in England during the 19th cent. Examples of the form are found in Keats's "La Belle Dame sans Merci," Coleridge's "The Rime of the Ancient Mariner," and Oscar Wilde's "The Ballad of Reading Gaol." In music a ballad refers to a simple, often sentimental, song, not usually a folk song. See D. C. Fowler, *A Literary History of the Popular Ballad* (1968), B. H. Bronson, *The Ballad as Song* (1969), James Kinsley, ed., *The Oxford Book of Ballads* (1971), T. F. Henderson, *The Ballad in Literature* (1912, repr. 1973).

ballade (bălăd'), in literature, verse form developed in France in the 14th and 15th cent. The ballade usually contains three stanzas of eight lines with three rhymes and a four-line envoy (a short, concluding stanza). Also popular was the ten-line stanza with four rhymes and a five-line envoy. The envoy is used primarily as a summary or as a dedication or direct address to an important person. The ballades of Charles d'Orleans, François Villon, and Geoffrey Chaucer are well known.

ballad opera, in English drama, a play of comic, satiric, or pastoral intent, interspersed with songs, most of them sung to popular airs. First and best was *The Beggar's Opera* (1728) by John Gay. The vogue for these operas lasted until c. 1750.

Ballanche, Pierre-Simon (pyër-sēmôn' bälänsh'), 1776–1847, French philosopher. A frequenter of Mme Récamier's salon, he was elected to the Académie française in 1842. He is regarded as the precursor of both liberal Catholicism and Romanticism. In *Palingénésie* (1827–32) he historically documents his belief in cyclical cultural rebirth. In addition to essays, Ballanche wrote didactic fiction, including a Christianized Antigone (1813) and *L'Homme sans nom* (man without a name) (1820).

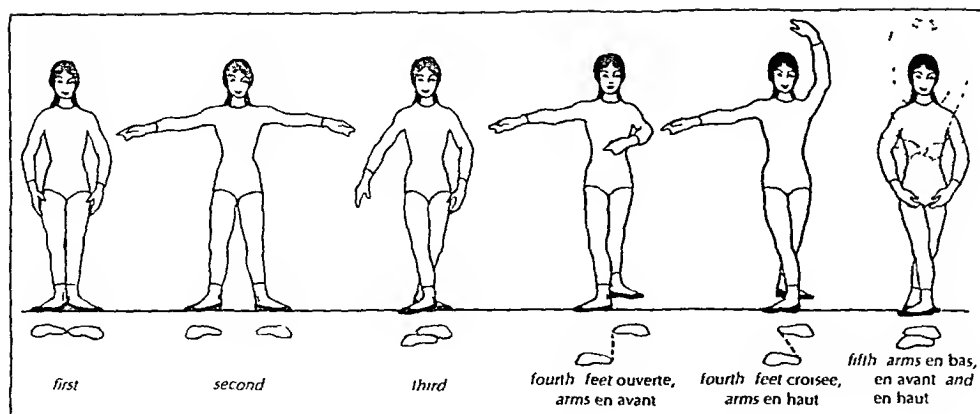
ball-and-socket joint, in engineering, mechanical connection used between parts that must be allowed some relative angular motion in nearly all directions. As the name implies, the joint consists essentially of a spherical knob at the end of a shaft, with the knob fitting securely into a mating socket. Like other mechanical joints, a ball-and-socket joint must have some provision for lubrication and is normally provided with a seal to prevent loss of the lubricant. Joints of this type are commonly used in mounting the front wheels of automobiles, allowing these wheels movement sufficient for steering. In this application they are usually called ball joints.

Ballantyne, James (bäl'antín), 1772–1833, Scottish editor and publisher. Ballantyne and his brother John set up a publishing business in Edinburgh with the aid of Sir Walter Scott. The firm published Scott's works, beginning in 1802 with *Minstrelsy of the Scottish Border*. Although the firm failed in 1826, it still continued to operate under the creditors' trustees, and Ballantyne remained its manager.

Ballarat (bäl'arät'), city (1971 pop. 39,606, urban agglomeration pop. 58,434), Victoria, SE Australia. It is an industrial center, clothing, food products, paper, brick and tile, and other goods are made. The city flourished during the gold rush (1860s), then declined. There are Anglican and Roman Catholic cathedrals in Ballarat.

ball bearing: see BEARING

ballet (bäl'ä, bälä') [Ital. *ballare*=to dance], classic, formalized solo or ensemble dancing of a highly controlled, dramatic nature performed to music. Foreshadowed in earlier mummeries and lavish masquerades, ballet emerged as a distinctive form in Italy before the 16th cent. The first ballet that combined movement, music, decor, and special effects was presented in France at the court of Catherine de' Medici in 1581. Organized by the violinist Balhassar de Beaujoyeux, it was entitled *Le Ballet comique de la Reine*. This production was the first *ballet de cour*, the ancestor of the modern ballet, which influenced the English court masque, a 16th-century entertainment with dance interludes. The first treatise on ballet dancing was the *Orchesographie* of Thoinot Arbeau (1588). The 17th cent. saw the major development of ballet in France. At first a court entertainment, the simple entrées were extended c. 1610 and joined together to form scenes, called divertissements, which culminated in a *grand ballet*. Louis XIV, who performed in ballets himself for nearly 50 years, founded the Royal Ballet Académie (1661), the Royal Music Academy (1669), and the first National Ballet School (1672). All parts were performed by male dancers, boys in wigs and masks took the female roles. The first ballet using trained women was *The Triumph of Love* (1681), with music by Lully. Ballet remained a court spectacle and included opera or drama until about 1708, when the first ballet was commissioned for public performance. Thereafter the form, infused with new ideas, developed as a separate art (although the court ballet continued its historic traditions). Choreographic notation came into being, and for the first time mythological themes were explored. With the increased influence of the Italian school of ballet, movement became elevated and less horizontal, and the five classic positions of the feet, which form the base for the dancer's stance and movement, were established by Pierre Beauchamps. The costumes, which had been cumbersome with decoration, long skirts, and high heels (for both men and women) were newly designed to allow greater freedom of movement. The virtuosa dancer Marie Camargo, who introduced the *entrechat* (elevation) for women, shortened her skirt to the middle of the calf, wore tights and what were to be the first ballet slippers (heelless shoes). Her rival, Marie Salle (who was also the first female choreographer), was the first dancer to wear a filmy, liberating Grecian-style costume, made popular two centuries later by Isadora Duncan. Jean Georges Noverre, a revolutionary *maître de ballet*, established the determining principles of the ballet d'action, which he described in his *Lettres sur la danse et les ballets* (1760). He wanted the ballet to tell a story, aided by the music, decor, and dance; he wanted the performer to interpret his role through the dance and through his own body and facial expression. In stressing naturalism, Noverre simplified the costume and c. 1773 abolished the mask. Other innovations came from the great artists of the period, Gaetano and Auguste Vestris, Salvatore Viganò, and Charles Didelot. Technical innovation in dance movement was increased after further modification of the ballet costume. In Milan in 1820, Carlo Blasis first set down the technique of ballet as we know it today—with its stress on the turned-out leg, which permits great variety of movement. With the production of *La Sylphide* (1832) the romantic period formally began, ushering in a new era of brilliant choreography that emphasized the beauty and virtuosity of the prima ballerina. In this production Maria Taglioni first wore the filmy, calf-length costume that was to become standard for classical ballet. The great ballerinas of the era included Taglioni, Fanny Elssler, Carlotta Grisi, and Fanny Cerrito. In keeping with the literature and art of the romantic movement, the new ballet concerned the conflicts of reality and illusion, flesh and spirit. Love stories and fairy tales replaced mythological subjects. At the same time dancing sur les pointes [on the toes] had come into favor. By the end of the century the blocked toe had appeared, and the tutu, a very short, buoyant skirt that completely freed the legs, had come into use. The male dancer functioned as partner to support the ballerina, the central focus of the dance and drama. Ballet declined progressively after 1850 with the ballet d'action giving way entirely to divertissements, finally the great stars had retired, and the sets, costumes, and choreography had become stereotyped and uninteresting. The naturalistic trend in the theater had all but destroyed the imaginative touch necessary to ballet. The renaissance in romantic ballet began in Russia after 1875. The Russian Imperial



The five classical positions in ballet

SOME IMPORTANT BALLET TERMS

arabesque graceful posture in which one leg is raised and extended behind the body, which is bent forward from the hip, the arms are held in one of five basic positions

attitude posture derived from Giovanni Bologna's *Mercury*, the body is bent slightly forward, one leg raised and bent behind the body with the corresponding arm raised and curved forward, and the opposite arm extended downward and back or to the side

entrechat elevation step in which the position of the feet is changed in midair. Nijinsky could perform the *entrechat dix* (ten changes)

glissade sliding step performed to the side

grand jeté great jump, in elevation, performed as an advancing or turning movement

pas de deux dance performed by two partners, usually a romantic duet between a ballerina and a danseur. Famous *pas de deux* form part of the great classical ballets

plié bending of the knees from any of the five positions of the feet, a movement basic both to ballet performance and exercise

port de bras carriage of the arms, the eight basic graceful changes in arm position performed with rounded elbows. They are generally accompanied by complementary movements of the legs and body

premier danseur the principal male dancer of the ballet company

prima ballerina the principal female dancer of the ballet company, if she is termed *assoluta*, she is considered a great dancer

School of Ballet had been founded in 1738. During the early 19th cent the Imperial Theatre housed more than 40 ballet productions staged by the celebrated Swedish master Charles Dridelot. Marius Petipa, who created a powerful sense of unity by rigorously training his corps de ballet as had not been done before, and Nicholas Legat indicated in their choreography the direction of intensified romantic drama that the newly revived art was to take. Petipa contributed many of the classic ballets still considered to be the greatest expressions of the form, including *Don Quixote*, *La Bayadere*, *The Sleeping Beauty*, *Raymonda*, *Harlequinade*, and restagings of *Giselle*, *Coppelia*, *La Sylphide*, and *Swan Lake*. In 1909 the celebrated impresario Sergei Diaghilev took his Russian company to Paris, and for 20 years it dominated the world of dance, displaying the creative talents of such choreographers and dancers as Michel Fokine, Leonide Massine, Vaslav Nijinsky, Bronislava Nijinska, Anna Pavlova, and George Balanchine. In 1931 the company merged with the Ballet Russe de Monte Carlo of Rene Blum and Col W de Basil, which nurtured the talents of Alexandra Danilova, Andre Eglevsky, and Igor Youskevitch. Russian dancing has been maintained at the highest level of excellence to the present day. The Moscow Bolshoi Ballet, which brought fame to Galina Ulanova and Maya Plisetskaya, and the Leningrad Kirov Ballet, whose dancers have included Rudolf Nureyev, Natalia Makarova, and Mikhail Baryshnikov, are the two foremost Soviet companies and are ranked among the finest in the world. In England in about 1918, Enrico Cecchetti, who had taught many great dancers including Pavlova, Nijinsky, Massine, and Danilova, set down his method of training (which is still in practice) in collaboration with Cyril Beaumont, proprietor of "Under the Sign of the Harlequin," a world-famous bookstore specializing in the dance. The Cecchetti Society was founded in 1922 to preserve and protect that system. In 1930, Marie Rambert founded the Ballet Club, the first permanent ballet school and company in England, and in 1931, Ninette de Valois established Sadler's Wells Ballet (now the Royal Ballet), which has drawn international attention to the work of Alicia Markova, Anton Dolin, Frederick Ashton, Margot Fonteyn, Robert Helpmann, Rudolf Nureyev, Antonette Sibbey, Svetlana Benosova, and Anthony Dowell. Nureyev, both a choreographer and dancer, has been instrumental in changing the traditional supportive role of the male dancer to a far more significant, dynamic, and athletic place in the ballet, many other contemporary choreographers have similarly given their male dancers a more flamboyant showcase. In the United States, Lincoln Kirstein and Edward

Warburg founded the American Ballet company in 1934. Under the direction of George Balanchine, its chief choreographer, the company established the first major school of ballet in the country, developed the talents of many notable American dancers (including Maria Tallchief, Todd Bolender, Suzanne Farrell, Patricia McBride, Jacques d'Amboise, Arthur Mitchell, and Edward Villella), and influenced enormously the evolution of an American ballet style as parent company to the New York City Ballet (founded 1948), one of the world's outstanding companies. Among the celebrated choreographers (other than Balanchine) who designed ballets for the New York City Ballet are Eugene Loring, Merce Cunningham, Jerome Robbins, and Antony Tudor. The other major American company, the American Ballet Theatre (formerly the Ballet Theatre), was founded in 1939 as an offshoot of the smaller Mordkin Ballet. The company's principal dancers have included Lucia Chase, Anton Dolin, Nora Kaye, Alicia Alonso, Michael Kidd, Schott Douglas, Royce Fernandez, and Sallie Wilson, performing in works designed for them by Michel Fokine, Leonide Massine, Antony Tudor, Jerome Robbins, Michael Kidd, Agnes De Mille, Herbert Ross, Eugene Loring, Glen Tetley, and many others. Through numerous tours both companies have earned international reputations of a high order. Other American companies of note include the Robert Joffrey Ballet (founded 1956), the Harkness Ballet (1964), and the Dance Theatre of Harlem. In addition to these, there are many active regional ballet companies throughout the United States. Using the traditional formal training and movement, the American choreographers have designed a new sort of pure, abstract ballet, far less dependent on literary plot, often using modern rock and electronic music, and have developed greatly simplified decor and costuming (e.g., Balanchine's *Agon*, Robert Joffrey's *Astarte*, and Glen Tetley's *Chronochromie*). Many modern choreographers have also designed dances for stage and film musicals (e.g., Jerome Robbins's *West Side Story* and Agnes De Mille's *Oklahoma!*). See articles about individuals, e.g., Dame Margot FONTÉYN, and companies, e.g., BOLSHOI BALLET. See also DANCE, MODERN DANCE. See Serge Lifar, *A History of Russian Ballet* (tr. 1955), Ferdinando Reyna, *A Concise History of Ballet* (tr. 1965), A. L. Haskell, *Ballet Retrospect* (1965), Anatole Chujoy, *The Dance Encyclopedia* (1945, rev. ed. 1967), Walter Terry, *The Ballet Companion* (1968), Lincoln Kirstein, *Movement and Metaphor* (1972), and *The New York City Ballet* (1973), Mary Clarke and Clement Crisp, *Ballet: An Illustrated History* (1973).

Ballia (bū'ya), town (1971 pop. 47,080), Uttar Pradesh state, N central India. Situated on a rich alluvial

plain, Ballia is a district administrative center and an important market for rice, sugarcane, and oilseed. Changes in the course of the Ganges River destroyed the old town in the years from 1873 to 1877, and a new town was created in 1900. The annual Dadrī fair, held on the full moon of Kartik (October–November) attracts about one million people. **Ballinger, Richard Achilles** (bāl'īnjər), 1858–1922, U.S. Secretary of the Interior (1909–11), b. Boonesboro (now in Boone), Iowa. He was mayor of Seattle (1904–6) and commissioner of the General Land Office (1907–9). In 1909, Taft appointed him Secretary of the Interior. While Secretary, he was accused by L. R. Glavis of the Land Office of having halted investigation into the legality of certain private coal-land claims in Alaska. With Taft's approval, Glavis was dismissed from service. Glavis took his case to the public in a series of articles in *Collier's Weekly* that roused the conservationists. Led by Gifford Pinchot, they demanded an investigation. A congressional committee exonerated Ballinger, but the questioning of committee counsel Louis D. Brandeis made the Secretary's anticonservationism clear; he resigned in March, 1911. The incident split the Republican party and helped turn the election of 1912 against Taft. See A. T. Mason, *Bureaucracy Confronts Itself* (1941), J. L. Penick, *The Ballinger-Pinchot Affair* (1968).

Baliol, Scottish family. See BALIOL, EDWARD DE, BALIOL, JOHN DE.

Baliol, Edward de. See BALIOL, EDWARD DE.

Baliol, John de. See BALIOL, JOHN DE.

ballistics (bāl'stīks), science of projectiles. Interior ballistics deals with the propulsion and the motion of a projectile within a gun or firing device. Its problems include the ignition and burning of the propellant powder, the pressure produced by the expanding gases, the movement of the projectile through the bore, and the designing of the barrel to resist resulting stresses and strains. Exterior ballistics is concerned with the motion of a projectile while in flight and includes the study not only of the flight path of bullets but also of bombs, rockets, and missiles. All projectiles traveling through the air are affected by wind, air resistance, and the force of gravity. These forces induce a curved path known as a trajectory. The trajectory varies with the weight and shape of the projectile, with its initial velocity, and with the angle at which it is fired. The general shape of a trajectory is that of a parabola. The total distance traveled by a projectile is known as its range. A ballistic missile in the first stage of its flight is powered and guided by rocket engines. After the engines burn out, the warhead travels in a fixed arc as does an artillery shell. In criminology the term ballistics is applied to the identification of the weapon from which a bullet was fired. Microscopic imperfections in a gun barrel make characteristic scratches and grooves on bullets fired through it. See E. D. Lowry, *Interior Ballistics* (1968).

Ballivián, José (hōsā' bāyēvyān'), 1805–52, president of Bolivia (1841–47). An able military commander who had served in the war against Spain, Ballivián was proclaimed president after the breakup of the Peru-Bolivia confederation under SANTA CRUZ. At In-gavi (1841) he defeated President Gomara of Peru, who had attempted to seize La Paz. Ballivián thus insured Bolivian autonomy. Promulgating (1841) a new constitution, he energetically but arbitrarily instituted public reforms. Intense opposition forced him to resign.

balloon, lighter-than-air craft without a propulsion system, lifted by inflation of one or more containers with a gas lighter than air or with heated air. During flight, altitude is gained by discarding ballast (e.g., bags of sand) and is lost by releasing some of the lifting gas from its container. In some late designs using air heated by a small gas-fired burner, the altitude is controlled by varying the temperature of the heated air. Although interest in such a craft dates from the 13th cent., the balloon was not actually invented until the late 18th cent., when two French brothers, Joseph and Jacques Étienne Montgolfier, experimented with inverted paper and cloth bags filled with heated air and, in 1783, caused a linen bag about 100 ft (30 m) in diameter to rise in the air. In the same year the Frenchman Pilâtre de Rozier made one of the first balloon ascents by man, rising in a hot-air-filled captive balloon (i.e., one made fast by a mooring cable to prevent free flight) to a height of 84 ft (26 m). In 1766 the English scientist Henry Cavendish had shown that hydrogen was seven times lighter than air, and the usefulness of this gas in balloon ascension was demonstrated in Dec., 1783, by J. A. C. Charles of France, who with his associates successfully ascended in a hydrogen-

filled balloon and traveled 27 mi (43 km) from the starting point. The first ascent in England was made by James Tytler, a Scottish writer, in 1784, and in 1793 the French balloonist J. P. Blanchard made an ascent at Philadelphia. Blanchard, with Dr. John Jeffries, an American physician, also made the first sea voyage by balloon, crossing the English Channel in 1784. Among the noted balloon voyages of the 19th cent. was that made by the Swedish engineer S. A. Andree, who, in 1897, attempted unsuccessfully to reach the North Pole by balloon. In the American Civil War and World War I, captive balloons were used to observe troop movements and to direct gunfire. Captive balloons, called barrage balloons, were used as obstacles against low-flying aircraft in World War II. The helplessness of the free balloon in controlling direction led to the development of the dirigible balloon (see AIRSHIP). In 1932 the Belgian physicist Auguste Piccard, one of the major figures in 20th-century ballooning, ascended in a balloon with a sealed spherical gondola to a height of 55,500 ft (16,920 m). His brother, Jean, in 1934 reached an altitude of 58,000 ft (17,680 m). Increasingly high ascents followed, with manned balloons exceeding heights of 100,000 ft (30,480 m) and unmanned balloons exceeding 140,000 ft (42,670 m). Today balloons are used primarily as aids to scientific studies, principally meteorology and the study of cosmic rays. Unmanned meteorological balloons carry aloft radios and other instruments, which at regular intervals during the ascent transmit readings to ground stations. Balloons have also been used by the United States to photograph the atmospheres of other planets in the clear air of the stratosphere. Balloon racing has become a popular sport. The gas bags of modern balloons are generally made of synthetic material, as a lifting gas, hydrogen has lost favor to helium because the latter is nonflammable. See L. T. C. Rolt, *The Aeronauts: A History of Ballooning* (1966); Eric Norgaard, *Book of Balloons* (1972).

ballot, means of voting for candidates for office. The choice may be indicated on or by the ballot forms themselves—e.g., colored balls (hence the term *ballot*, which is derived from the Italian *ballotta*, meaning "little ball"), printed tickets, or mechanical devices—or by the depositories into which the ballots are put. The ballot was used in Athens in the 5th cent. B.C. by the popular courts and, on the question of ostracism, by the people as a whole, in India before 300 B.C., and in Rome by the popular assemblies and occasionally by the senate. Like other institutions of popular government, it was largely abandoned during the Middle Ages, but its use reappeared in the Italian communes and in elections to the papacy during the 13th cent. In the 16th and 17th cent. the ballot appeared in English borough and university elections. The General Court of Massachusetts elected governors by ballot after 1634, corn and beans were occasionally used as ballots, following Indian custom. Early American ballots were known as "papers"; the name ballot does not occur in America before 1676. The British colonies in America were the first to elect representatives by secret ballot, and its use was made obligatory in all but one of the state constitutions adopted in the United States between 1776 and 1780. In the 19th cent. the use of the ballot became widespread in local and national elections in Europe. Groups wishing to exert undue influence, intimidation, or force upon the voter have opposed the ballot. The effort to reform election abuses led to the widespread use of the Australian ballot, which was adopted in Victoria in 1857 and in Great Britain in 1872, and grew increasingly popular in the United States after 1888. In the latter country it gradually replaced earlier methods of voting such as the lengthy "tickets" distributed by political parties. In the Australian system all candidates' names are printed on a single ballot and placed in the polling places at public expense, and the printing, distribution, and marking of the ballot are protected by law, thus assuring a secret vote. The Australian ballot is now used in many European countries and in almost all sections of the United States. Separate ballots are frequently distributed for referendums and constitutional propositions. In the United States the office-group, or Massachusetts ballot, on which the candidates' names are listed under the headings of the offices for which they are running, is less used than the party-column, or Indiana ballot. The VOTING MACHINE is increasingly used to ensure electoral honesty. The institution of official ballots has helped bring political parties under the scope of the law. In Great Britain and Canada, party designations are left

off the ballot, elective offices are few, and local and national elections are separate, hence the ballot is a short one, easy to use intelligently. Some critics denounce the excessive length of the ballot in the United States and the combination of many items on one ballot, claiming that the voter is thus too pressed for time in his decisions. See H. M. Bain and D. S. Hecock, *Ballot Position and Voter's Choice* (1957); L. E. Fredman, *Australian Ballot: The Story of an American Reform* (1968).

Ballou, Adin (bālōō'), 1803–90, American Universalist clergyman, b. Cumberland, R.I. He was prominent in the movement that resulted in the Massachusetts Association of Universal Restorationists (1831–41). In 1841 he organized near Milford, Mass., the Hopedale Community, one of the religious utopian communities of the period. He was its president and edited its periodical, the *Practical Christian*. The Hopedale Community, whose dissolution as a communal enterprise began c. 1857, merged (1868) with the Unitarian Hopedale Parish, of which Ballou was pastor until 1880. His writings include *Practical Christian Socialism* (1854), *Primitive Christianity and Its Corruptions* (1870), and *History of the Hopedale Community* (1897). See his autobiography, edited by his son-in-law, W. S. Heywood (1896).

Ballou, Hosea, 1771–1852, American clergyman, foremost among expositors of Universalism in the United States, b. Cheshire co., N.H. From 1818 until his death he was pastor of the Second Universalist Society in Boston. One of the founders (1819) of the *Universalist Magazine*, he was its editor until 1828, from 1830 he edited the *Universalist Expositor*. His works include *Notes on the Parables* (1804), *A Treatise on the Atonement* (1805), and a number of hymns.

Ballou, Hosea, 2d, 1796–1861, American Universalist clergyman, b. Guilford, Vt., grandnephew of Hosea Ballou (1771–1852). He was one of the founders and the first president (1853–61) of Tufts College. His *Ancient History of Universalism* (1829) is the earliest American monograph dealing with the history of the doctrine.

Balls Bluff, hill on the south bank of the Potomac River, near Leesburg, Va. In the Civil War, Union troops who had crossed the river were severely repulsed there on Oct. 21, 1861. Dissatisfaction with that defeat and with the general inactivity of the Union armies led to the organization of a joint congressional committee on the conduct of the war.

Ball State University, at Muncie, Ind., coeducational, founded 1918 as a state institution. In 1929 it became Ball State Teachers College and in 1965 achieved university status.

Ballwin, city (1970 pop. 10,656), St. Louis co., E. Mo., a suburb of St. Louis, settled 1803 as Ballshow, renamed 1837, inc. 1950. It is mainly residential with some light industry.

Ballymena (bālēmē'nə), municipal borough (1971 pop. 16,487), Co. Antrim, NE Northern Ireland, on the Braid River. Linen, woolen goods, carpets, and tobacco products are produced there. According to tradition, St. Patrick worked as a herdsman at Slemish Mt., 5 mi (8.1 km) from Ballymena.

balm, name for any BALSAM resin and for several plants, e.g., the BEE BALM.

Balmaceda, José (hōsā' balmasā'tha), 1840–91, president of Chile (1886–91). A leader of a liberal, anticlerical group, he was sent as minister (1878) to Argentina, where he successfully prevented Argentina from entering the War of the Pacific. He later served as foreign minister under Domingo Santa María. As president, Balmaceda instituted a wide reform program, but his rule was unparliamentary. A resultant quarrel with congress came to a head in 1890. A disastrous civil war broke out in Jan., 1891, led by Jorge Montt. After vigorous fighting the revolutionists triumphed. Balmaceda took refuge in the Argentine legation. Rather than surrender for a trial, he committed suicide.

Balmerino, Arthur Elphinstone, 6th Baron (ēl'fīnstin, bāl'mēr'īnō), 1688–1746, Scottish nobleman. He resigned a command in the English army to join the Jacobite rising of 1715, escaping after its suppression to France. He returned and took part in the 1745 rising, was captured at the battle of Culloden, and was executed.

Balmer series: see SPECTRUM.

balm of Gilead (gīl'ēād), name for several plants belonging to different taxonomic families. The historic Old World balm of Gilead, or Mecca balsam, is a small evergreen tree (*Commiphora opobalsam*) of the family Burseraceae (INCENSE-TREE family) native

to Africa and Asia and the source of the commercial balm of Gilead, it is referred to in the Bible in Jer. B. 22. The Ishmaelites from Gilead were bearing balm when they bought Joseph from his brothers. Balm of Gilead is still in high repute for healing in some countries. The American balm of Gilead is a species of poplar (*Populus candicans*) of the family Salicaceae (WILLOW family) which has large balsamic and fragrant buds. The tree is seldom seen in the wild but was formerly a favorite dooryard tree of the northern states. The buds were used in domestic medicine. This poplar is closely related to, and sometimes considered a variety of, the balsam poplar (*P. tacamahaca*), which has also been called balm of Gilead and tacamahac. The name balm of Gilead has also been used for the balsam fir and for a herbaceous aromatic, shrubby plant (*Dracocephalum canariense* or *Cedronella canariensis*) of the family Labiatae (MINT family) native to the Canary Islands and cultivated in parts of the United States.

Balmont, Konstantin Dmitriyevich (kən-stāntyēn' damē'trēāvich bal'mōnt), 1867–1943, Russian poet and translator. After first hailing the Bolshevik revolution, he repudiated it and lived chiefly in France, where he died destitute and forgotten. Although his early verse was revolutionary in content, after 1894 it revealed the influence of the SYMBOLISTS. He translated Shelley, Ibsen, Poe, Calderon, and Whitman. His major work began with *Under Northern Skies* (1894). *Let Us Be Like the Sun* (1903) and *Love Alone* (1903) are typical of his melodious and inventive verse. His verse written after 1910 is considered mediocre.

balsa: see BOMBAX.

balsam, fragrant RESIN obtained from various trees. The true balsams contain benzoic or cinnamic acid, these include Peru balsam and tolu balsam (both obtained from varieties of the South American tree *Myroxylon balsamum* of the PULSE family), BENZOIN, and STORAX. Other resins called balsams include Mecca balsam (BALM OF GILEAD), CANADA BALSAM, and COPAIBA. Balsams are often used in medical preparations and perfumes.

balsam, garden, common name for the species *Impatiens balsamina*, a member of the JEWELWEED family.

balsam fir, common name for the evergreen tree *Abies balsamea* of NE North American boreal forests. It has small needles and cones and is used for lumber. It is also called CANADA BALSAM, as is the resin it produces, which is used as an adhesive in optical lenses and glass slides. Balsam fir is classified in the division PINOPHYTA, class Pinopsida, order Coniferales, family Pinaceae.

Balsamo, Giuseppe: see CAGLIOSTRO, ALESSANDRO.

Balsas, Río (rē'ō bal'sās), river, c. 450 mi (720 km) long, rising in the state of Puebla, E. central Mexico. One of Mexico's longest rivers, it flows in a curve from south to northwest through Puebla and Guerrero states, where it waters a fertile valley, to Michoacan state, forming most of the boundary between the last two states. Then it turns southwest, passing through a hot, dry region before emptying into the Pacific Ocean. It is also known as the Río Mescala.

Balta, José (hōsā' bal'ta), 1816–72, president of Peru (1868–72). In 1865 he helped Mariano I. Prado to seize the presidency and served in his government, but in 1867 Balta led in overthrowing the dictatorship. As president, he reestablished constitutional rule and undertook vast schemes for internal improvement. He granted a monopoly of guano export to a French company and obtained large loans in Europe, yet the lavish expenditures of his administration plunged Peru deep in debt. Balta was deposed and shot. He was succeeded by Manuel PARDO.

Balthazar (bālt'hā'zār) see WISE MEN OF THE EAST.

Baltic languages, a subfamily of the Indo-European family of languages. The Indo-European subfamily to which the Baltic languages appear to be closest is the Slavic. Because of this, some linguists regard Baltic and Slavic as branches of a single Balto-Slavic division of the Indo-European family. The Baltic tongues are thus named because they are spoken in an area bordering on the Baltic Sea. The principal ones are Lettish (or Latvian) and Lithuanian (together native to about 5 million people in Eastern Europe) and Old Prussian (which ceased to be a living language during the 17th cent.). The early common ancestor of the various Baltic languages, both living and dead, is traditionally referred to as Proto-Baltic. It is thought that Proto-Baltic broke off from the other Indo-European languages before 1000 B.C. A further division into East Baltic (to

which Lettish and Lithuanian belong) and West Baltic (which claims Old Prussian) is believed to have taken place before 300 B.C. The Baltic languages are said to be the closest of the living Indo-European languages to Proto-Indo-European—the original parent of all the Indo-European tongues—both phonologically and grammatically. They show a high degree of inflection in both the noun and verb systems. The earliest surviving text in a Baltic language may be dated c. 1400, but by the 16th cent. documents had become fairly numerous. See also LETTISH, LITHUANIAN, INDO-EUROPEAN. See T. F. Magner and W. R. Schmalstieg, ed., *Baltic Linguistics* (1970).

Baltic provinces, historic regions of COURLAND, LIVONIA, ESTONIA, and INGERMANLAND bordering on the eastern coast of the Baltic Sea. They were conquered by Russia from Sweden in the 18th cent. and made into provinces. Ingermanland was included into Russia proper, and the three independent republics of ESTONIA, LATVIA, and LITHUANIA were established in 1918. See also BALTIC STATES.

Baltic Sea, arm of the Atlantic Ocean, c. 163,000 sq mi (422,170 sq km), including the Kattegat strait, its northwestern extension. The Øresund, Store Bælt, and Lille Bælt connect the Baltic Sea with the Kattegat and Skagerrak straits, which lead to the North Sea, the Kiel Canal, across the Jutland peninsula, is a more direct connection with the North Sea. The Gulf of Bothnia, the Gulf of Finland, and the Gulf of Riga are the chief arms of the Baltic Sea. Of the many islands in the sea, the principal ones are Sjaelland, Fyn, Lolland, Falster, and Bornholm (Denmark), Öland and Gotland (Sweden), the Åland Islands (Finland), Sarema (USSR), and Rugen (East Germany). Most of the Baltic is shallow, and its tides are less pronounced than those of the North Sea. The salinity of the sea is reduced by the many rivers that enter it (the Oder, Vistula, Dvina, Tornälven, Umeälven, Angermanälven, and Dalälven), and parts of the sea freeze over in winter. The Baltic was frequented from ancient times, especially because of the amber found along the coast. In the late Middle Ages commerce on the Baltic was dominated by the Hanseatic League. Copenhagen, Szczecin, Gdansk, Riga, Leningrad, Helsinki, and Stockholm are the chief ports. The Baltic Sea is connected with the White Sea by the White Sea-Baltic Canal, and with the Volga River by the Volga-Baltic Waterway.

Baltic Shield, the continental core of Europe, composed of Precambrian crystalline rock, the oldest of Europe. The tectonically stable region was not affected by the Caledonian, Hercynian, and Alpine mountain periods of Europe, although mountains did rise along the edges. The exposed portion of the Baltic Shield, Fennoscandia, is found in Finland, Sweden, and Norway. During the Pleistocene epoch, great continental ice sheets scoured and depressed the shield's surface, leaving a thin covering of glacial material and innumerable lakes and streams. The ancient rocks have yielded a rich variety of minerals, especially iron and copper. In W. USSR the Russian Platform is that portion of the Baltic Shield buried beneath a great thickness of sedimentary rock.

Baltic states, the countries of ESTONIA, LATVIA, and LITHUANIA, bordering on the eastern coast of the Baltic Sea. Formed in 1918, they remained independent republics until their incorporation in 1940 into the USSR. Finland is usually classed with the Scandinavian rather than with the Baltic states. See also BALTIC PROVINCES.

Baltimore, Cecilius Calvert, 2d Baron. see CALVERT, CECILIUS.

Baltimore, Charles Calvert, 3d Baron. see CALVERT, CHARLES.

Baltimore, George Calvert, 1st Baron. see CALVERT, GEORGE.

Baltimore (bôl'tīmôr, -môr), city (1970 pop. 905,759), N. Md., surrounded by but politically independent of Baltimore co., on the Patapsco River estuary, an arm of Chesapeake Bay, inc. 1745. The largest city in the state and the seventh largest in the country, it is a port of entry, a commercial and industrial center, an important railroad point, and a great seaport with extensive anchorages and dock and storage facilities. Large amounts of coal and grain, and iron, steel, and copper products are exported. Among Baltimore's leading industries are shipbuilding, sugar and food processing, copper and oil refining, and the manufacture of chemicals, steel, clothing, aerospace equipment, fertilizer, and tin cans. The site was first settled in the early 17th cent., but the city was not founded until 1729, when the provincial assembly authorized the building of a

town. The excellent harbor soon made Baltimore an important center for the shipping of tobacco and grain. Shipbuilding, an early industry, flourished during the Revolution and the War of 1812 with the fitting out of many privateers, and in the early 1800s the famous Baltimore clippers were built. The nation's wars have played a large role in the city's history. When the British occupied (1777) Philadelphia, Baltimore became the meeting place of the Continental Congress. In the War of 1812 the gallant defense of FORT MCHENRY inspired Francis Scott Key to write "The Star-spangled Banner." After the War of 1812, Baltimore experienced a phenomenal growth, largely because of the NATIONAL ROAD. When the Erie Canal (completed in 1825) endangered the city's hold on the trans-Allegheny traffic, Baltimore businessmen chartered (1827) the BALTIMORE & OHIO RAILROAD to meet the competition of New York as a new ocean outlet for the West. During the Civil War, Baltimore was strongly pro-Southern in sentiment, the 6th Massachusetts Regiment, passing through the city in April, 1861, was attacked by a mob. In World Wars I and II, Baltimore was an important shipbuilding and supply-shipping center. A disastrous fire in 1904 destroyed almost the entire downtown section but enabled the emergence of a more beautiful and better-planned city. Today it is famous for its residential streets of red brick row houses with scrubbed white steps. An important cultural and educational center, Baltimore is the seat of The Johns Hopkins Univ., the Univ. of Baltimore, St. Mary's Seminary and Univ., Goucher College, Loyola College, College of Notre Dame of Maryland, Coppin State College, a branch of the Univ. of Maryland and its schools of medicine, dentistry, pharmacy, nursing, law, and social work, and two junior colleges. Also in Baltimore are the Peabody Conservatory of Music, the Maryland College of Art, the Maryland Academy of Sciences, the Walters Art Gallery, and the Baltimore Museum of Art. The Enoch Pratt Free Library and the municipal symphony orchestra are well known. The city's many historical attractions include Flag House, the first Roman Catholic cathedral in the United States (1806-21, designed by B. H. Latrobe), a Unitarian church (1817), the Edgar Allan Poe House (c. 1830), Westminster Churchyard, where Poe is buried, Fort McHenry National Monument and Historic Shrine (see NATIONAL PARKS AND MONUMENTS, table), the Baltimore and Ohio Transportation Museum, and numerous colonial homes. The USS *Constellation*, a national historic shrine, is docked in Baltimore; it was the first U.S. navy ship (1797) and is the oldest navy ship still afloat. Other landmarks are the historic square Mt. Vernon Place, which contains the Washington Monument (1815-42, designed by Robert Mills), Druid Hill Park, with a zoo and a natural history museum, Baltimore's Memorial Stadium, home of the city's professional baseball (Orioles) and football (Colts) teams, and Pimlico Race Course, site of the famous Preakness, held annually since 1873. Baltimore-Washington International Airport is nearby. H. L. Mencken is one of the many famous people born in Baltimore. See A. M. Siousat, *Old Baltimore* (1931), Hamilton Owens, *Baltimore on the Chesapeake* (1941), F. F. Beirne, *The Amiable Baltimoreans* (1951, repr. 1968), and *Baltimore: A Picture History* (rev. ed. 1968), J. F. Waesche, *Baltimore Today* (1969), J. T. Scharf, *History of Baltimore* (1881, repr. in 2 vol., 1971) and *The Chronicles of Baltimore* (1874, repr. 1972).

Baltimore & Ohio Railroad (B&O), first U.S. public railroad, chartered in 1827 by a group of Baltimore businessmen to regain trans-Allegheny traffic lost to the newly opened Erie Canal. Construction began in 1828, and the first division opened in May, 1830, between Baltimore and Ellicott's Mills, Md. Horses were the first source of power, but the successful trial run of Peter Cooper's *Tom Thumb* in Aug., 1830, brought the change to steam locomotives. The B&O expanded steadily and reached St. Louis in 1857. During the Civil War the railroad moved Union troops and supplies. By the end of the 19th cent. the B&O had achieved most of its present 5,800 mi (9,334 km) of track and connected with Chicago, Philadelphia, and New York City. By the mid-1900s it had become mainly a freight carrier. Faced with financial difficulties, the B&O merged with the Chesapeake & Ohio in 1965. The B&O was the first railroad to publish a timetable, to use electric locomotives and specialty cars (e.g., dining and baggage), and to run fully air-conditioned trains.

Baltimore oriole: see ORIOLE.

Baltimore-Washington Parkway: see NATIONAL PARKS AND MONUMENTS (table).

Balts, peoples of the east coast of the Baltic Sea. They include the Latvians, the Lithuanians, and the now extinct Old Prussians. Their original home was farther east, but from the 6th cent. they were pushed westward by the Slavs. In the 13th cent. the TEUTONIC KNIGHTS and the LIVONIAN BROTHERS OF THE SWORD conquered the region later comprising Estonia and Latvia and forced Christianity on the inhabitants. Pressed by the Teutonic Order, the Lithuanians formed (13th cent.) a unified state of LITHUANIA, which successfully resisted annexation and became one of the largest states of medieval Europe. In 1387, under Grand Duke Jagiello (King Ladislaus II of Poland), Lithuania officially adopted Christianity. The Teutonic Order lost (15th cent.) all but East Prussia, but descendants of the German knights and settlers continued to control land and commerce in Latvia and Estonia until the 20th cent. After the union (1569) of Lithuania with Poland, the Lithuanian nobility became thoroughly Polish in language and politics. The Estonians, a Finnic rather than a Baltic people, came under Swedish rule in 1561 and in 1721 passed to Russia, which by 1795 acquired all the Baltic lands. The incorporation of the Baltic nations of Lithuania, LATVIA, and ESTONIA into the Soviet Union since 1940 has been a source of political disputes. For earliest history to the 13th cent. see Marija Gimbutas, *The Balts* (1963).

Baluchi (balōō'chē), language belonging to the Iranian group of the Indo-Iranian subfamily of the Indo-European family of languages. See INDO-IRANIAN languages.

Baluchistan (balōō'chīstān), region and province (1969 est. pop. 1,484,000), c. 134,000 sq mi (347,000 sq km), Pakistan. It is bounded by Iran on the west, by Afghanistan on the north, and by the Makran coast of the Arabian Sea on the south. QUETTA is the capital. Lying outside the monsoon zone and with few rivers usable for irrigation, Baluchistan is largely desert land with inarable hills and mountains. Pastoral nomads, such as the Baluchi and Pathans, who speak languages related to Persian, constitute the bulk of the sparse population. Some cotton is raised and processed, and natural gas is exploited. On the coast there is trade in fish and salt.

baluchitherium (balōōchīthērēəm), extinct primitive rhinoceros, belonging to the genus *Baluchitherium*, of the Oligocene epoch, fossilized bones of which were found in central Asia. It had an estimated shoulder height of nearly 18 ft (5.5 m) and a weight of about 10 tons, and is believed to have been the largest land mammal of all time. The baluchitherium is classified in the phylum CHORDATA, subphylum Vertebrata, class Mammalia, order Perissodactyla, family Rhinocerotidae.

Balue, Jean (zhāN balu'), c. 1421-1491, French statesman, cardinal of the Roman Catholic Church. A trusted adviser of the French king LOUIS XI, he saved Paris for the king during the revolt of the League of the Public Weal (1465). Subsequently he conspired with Charles the Bold of Burgundy against Louis and arranged the meeting of the two rulers at Peronne (1468), where Charles made Louis a prisoner. After his release Louis held Balue prisoner from 1469 to 1480, when the pope intervened. The legend that Balue was kept in an iron cage is unproved. Balue went to Rome, but in 1484 he returned temporarily to France as a papal legate.

Balzac, Honoré de (bāl'zāk, bōl-, Fr. ōnōrā də balzak'), 1799-1850, French novelist, b. Tours. Balzac ranks among the great masters of the novel. Of a bourgeois family, he himself later added the "de" to his name. Neglected in childhood, he was sent to a grammar school at Tours and later to a boarding school at Vendôme, where he was a dull student but a voracious reader. In 1816 he began studying law at the Sorbonne, but after receiving his license in 1819 he decided to abandon law for literature. Half starving in a Paris garret, Balzac began writing sensational novels to order, publishing them under a pseudonym. Throughout his life he worked with feverish activity, sleeping a few hours in the evening and writing from midnight until noon or afternoon of the next day. He was ridden with debts, which were increased rather than relieved by his business ventures. Balzac's first success, *Les Chouans* (1829, first published as *Le Dernier Chouan*), was followed by *La Peau de chagrin* (1831). In the next 20 years he produced the vast collection of novels and short stories called "La Comédie humaine." This, his greatest work, is a reproduction of the French society of his time, picturing in precise detail individuals of every class and every profession. The chief novels in "La Comédie humaine" are *Louis Lambert*

(1832), *Eugénie Grandet* (1833), *La Recherche de l'absolu* (1834), *Le Pere Goriot* (1835), *Les Illusions perdues* (1837), *César Biotteau* (1837), *La Cousine Bette* (1847), and *Le Cousin Pons* (1847). Outweighing Balzac's faults—his lack of literary style, his moralizing, his tendency toward melodrama—are his originality, his great powers of observation, and his vivid imagination. His short stories include some of the best in the language, but his attempts at drama failed. Though an unattractive, awkward man, Balzac formed several famous liaisons. Only a few months before his death he married the Polish Countess Evelina Hanska, with whom he had conducted a romantic correspondence for 18 years. See *The Human Comedy* (with introductions by George Saintsbury, 40 vol., 1895–98), *Balzac's Letters to His Family, 1809–1850* (ed. by W. S. Hastings, 1934), biographies by H. J. Hunt (1957, repr. 1969), A. Maurois (1966), and V. S. Pritchett (1973), studies by E. J. Oliver (1959, repr. 1964), P. Bertault (1963), bibliography and index comp. by W. H. Royce (1929, repr. 1969).

Balzac, Jean Louis Guez de (zhān lwē gā), 1597?–1654, French writer. His *Lettres* (1624, tr. 1634) and other writings were a great influence in reforming French prose. Their style was marked by their orderly, Latinate sentence structure.

Bamah (bā'ma) [Heb., =high place], term elsewhere translated, but in Ezek. 20:29 given in the original. The word is translated earlier in the same verse. There is a pun on the verb "to go" that had in Hebrew a sound much like the word Bamah.

Bamako (bamakó'), city (1970 est. pop. 170,000), capital of Mali and of its Bamako region, SW Mali, on the Niger River. It is the nation's administrative center, as well as a river port, a junction on the Dakar-Niger RR, and a major regional trade center. Manufactures include textiles, processed meat, and metal goods. Bamako ships shea-nut oil, kapok, cotton, and peanuts. There is commercial fishing on the Niger. Bamako was a leading center of Muslim learning under the Mali empire (c.11th–15th cent.) but by the 19th cent. had declined into a small village. In 1883 it was occupied by French troops under Joseph S. GALLIENI. In 1908, Bamako became the capital of the French Sudan (see MALI) and began to develop into a major city. As a result of a conference of Africans from French West and Equatorial Africa, held in Bamako in 1946, the Rassemblement démocratique africain, an important regional political party, was founded. Bamako is a picturesque city, with a botanical and zoological park and many decorative gardens. Residential areas often consist of mud huts arranged in a star or checkerboard pattern and enclosed by a wall. Bamako's educational institutions include schools of administration, medicine, and engineering. The city also has an international airport.

Bamberg (bam'bērk), city (1970 pop. 70,581), Bavaria, S West Germany, a port on the Regnitz River. It is an industrial and commercial center, its manufactures include textiles, clothing, electrical equipment, machinery, and beer. Bamberg was the capital of a powerful ecclesiastical state from 1007 to 1802. In 1803 it passed to Bavaria. Noteworthy buildings in the picturesque city include the cathedral (built mostly in the 13th cent.), which includes the tombs of Emperor Henry II and Pope Clement II, a Gothic church (14th cent.), and two episcopal residences (16th and 18th cent.). It is the seat of a Roman Catholic archbishopric and has a museum of natural history.

Bamberger, Ludwig (lōōt'vīkh bām'bērgər), 1823–99, German economist, politician, and journalist. An ardent liberal, he took part in the Revolution of 1848 and was forced to live in exile until 1866. He worked for the unification of Germany, and as a leader of the National Liberals he supported Otto von Bismarck until he was alienated by the chancellor's turn to protection and state socialism. In 1880, Bamberger led a group out of the party. As a member of the Reichstag (1871–93), he was chiefly responsible for the adoption of the gold standard in Germany and for the founding of the Reichsbank.

Bambocciante: see LAER, PIETER VAN

Bamboccio, Il: see LAER, PIETER VAN

bamboo, plant of the family Gramineae (GRASS family), chiefly of warm or tropical regions, where it is an extremely important component of the vegetation. It is most abundant in the monsoon area of E Asia. Many species are among the largest grasses, sometimes reaching 100 ft (30 m). The stalks are round (rarely square), jointed, and hollow or solid with evergreen or deciduous leaves. Some types die

after flowering and some do not flower until they are about 30 years old. In many places bamboo is used as wood, for construction work, furniture, utensils, fiber, paper, fuel, and innumerable small articles. Bamboo sprouts are eaten as a vegetable, and the grains of some species are also utilized for food. The bamboo has long been used for decorative purposes, both in gardens and in art. In the United States the native bamboo is a CANE. The most common bamboo is *Bambusa arundinacea*. Bamboo is classified in the division MAGNOLIOPHYTA, class Filiales, order Cyperales, family Gramineae. See F. A. McClure, *The Bamboos* (1966).

Bamburgh, village, Northumberland, NE England, on the North Sea. It was the capital of ancient BERNICIA and for a time of NORTHUMBRIA. In the 6th cent. a castle was erected above a tall cliff on the site of a Roman fort. Restored in the 18th cent., it is still used as a residence and contains the 14,000-volume Crewe Library.

Bamford, Samuel, 1788–1872, English weaver, poet, and social reformer. Always sympathetic toward the working class, he was jailed in 1819 for his part in the Peterloo massacre. His dialect verses were popular among the Lancashire workers. Besides his poetry, Bamford is noted for *Passages in the Life of a Radical* (2 vol., 1840–43, repr. 1967).

Bamian (bamyān'), town (1969 est. pop. 48,000), N central Afghanistan, on the Kunduz River. It was long a major caravan center on the route between India and central Asia. By the 7th cent. the town was a prominent center of Buddhism, the Bamian valley is lined with cave dwellings cut out of the cliffs by Buddhist monks. Particularly interesting are two great Buddha figures (probably 6th or 7th cent.) carved from rock and finished in fine plaster. In the same area are grottoes decorated with well-preserved wall paintings in Greco-Buddhist styles. Bamian was invaded by the Saffarids in 871, and many Buddhist idols were carried off to Baghdad. A Muslim fortress town from the 9th to the 12th cent., Bamian was sacked by Jenghiz Khan in 1221 and never regained its former prominence.

Bamian, valley, E Afghanistan, NW of Kabul, site of the ancient commercial and cultural center of Bamian. This major archeological area is noted for its two gigantic statues of Buddhist saints, 174 ft (53 m) and 115 ft (35 m) high, carved in the valley's rock walls. Many of the rock sanctuaries and cells are still in use.

Bamoth (bā'mōth) [Heb., =pl. of BAMAH], unidentified place, E of the Dead Sea. Num. 21:19, 20. It is probably the same as Bamoth-baal (-bā'el), Joshua 13:17. Bamoth-baal is translated in Num. 22:41.

Bampton, John, 1689–1751, English clergyman, founder of an Oxford lectureship on religious subjects. The Bampton Lectures, given annually, have frequently given rise to lively controversy.

Bampton, Rose, 1909–, American operatic soprano, b. Cleveland. Bampton studied at the Curtis Institute of Music, Philadelphia. She made her debut at the Metropolitan Opera in 1932 in the leading contralto role in Ponchielli's *La Gioconda* and sang contralto and mezzo-soprano roles until 1936, when she retrained her voice to soprano range and made her first European tour. She made her soprano debut at the Metropolitan in 1937.

Banaba: see OCEAN ISLAND

Banach, Stefan (stē'fan bā'nakh), 1892–1945, Polish mathematician. He was educated at the Institute of Technology in Lvov, his doctoral thesis laid the foundations of modern functional analysis, which he continued to work at throughout his life. He also made fundamental contributions to general topology, set theory, the theory of measure and integration, and the general theory of linear spaces, or vector spaces, e.g., *Théorie des opérations linéaires* (1932). He introduced and developed the concept of complete normed linear spaces, now called Banach spaces.

banana, name for several species of the genus *Musa* and for the fruits these produce. The banana plant—one of the largest herbaceous plants—is said to be native to tropical Asia, but is now cultivated throughout the tropics. Used to a minor degree for its leaf fiber, the banana is of the same genus as the extremely valuable fiber plant MANILA HEMP, or abaca, and is also related to the BIRD-OF-PARADISE FLOWER. Along with the banana, these are economically the most important plants of the banana family (the Musaceae), a group of large monocotyledonous tropical herbs. The banana is of palmlike aspect and has very large leaves, the overlapping bases of which form the so-called false trunk. As the plant

reaches maturity its true stem rises from the ground and pushes through the center of the false trunk to emerge from the top of the plant, there becoming pendent and bearing the male and female flowers. The female flowers develop into bananas, the clusters of upturned fruits being called "hands" and each banana a "finger." The plants are cut down to harvest the fruit, since they bear only once. Their seeds are sterile, shoots from the rhizomes are used for propagation. The banana fruit (botanically a berry) is a staple food in the tropics and is used in many forms, raw or cooked, and grown in many varieties, e.g., the plantain. Dried bananas are eaten as "banana figs" and inferior fruits serve as a stock feed. Banana oil is a synthetic product, so named because of its odor. Although the banana has long been cultivated in Asia—Alexander the Great encountered it in India—the large international traffic began only in the late 19th cent. with the development of refrigerated transport. The most common banana of North American commerce is *M. sapientum* (or *M. paradisiaca sapientum*). Bananas are classified in the division MAGNOLIOPHYTA, class Liliales, order Zingiberales, family Musaceae.

banana fish: see BONEFISH

Bananal Island, Brazil: see ARAGUAIA, river

Banat (bā'nāt), region extending across W Rumania, NE Yugoslavia, and S Hungary. The term *banat* originally referred to any of several frontier provinces of Hungary and Croatia that were ruled by bans (governors). The Banat region is bordered on the E by Transylvania and Walachia, on the W by the Tisza River, on the N by the Mureșul River, and on the S by the Danube. Except for some eastern mountains, it is primarily an agricultural area of fertile, rolling plains. Inhabited since prehistoric times, the Banat was occupied successively by Romans, Goths, Gepidae, Huns, and Avars. Slavs began to settle there in the 5th cent. and Magyars in the 9th cent. In 1233, King Andrew II of Hungary established the Banat of Severin, a frontier province whose defense was entrusted to the Knights Hospitalers. In the aftermath of the Turkish victory over the Serbs at Kosovo (1389) and the Turkish occupation of Serbia (1459), many Serbs emigrated to the Banat, which itself became a Turkish sanjak (province) around 1552. By the Treaty of Passarowitz (1718), the Banat was made an Austrian military frontier zone known as the Banat of Temesvár. Empress Maria Theresa put the region under civilian government in 1751 and brought in thousands of German colonists. In 1779 the Banat passed to Hungary, to which it belonged until 1918, except for a brief period as an Austrian crownland. Although the Allies in World War I had promised through a secret agreement to give the Banat to Rumania, it was divided by the Treaty of Trianon (1920) between Rumania and newly independent Yugoslavia, with the Szeged district reserved for Hungary.

Banbury, municipal borough (1971 pop. 29,216), Oxfordshire, central England, on the Cherwell River. It is an agricultural market and manufactures aluminum, fabricated steel, farm machinery, electrical apparatus, and furniture. The town still produces the spiced currant cakes for which it has been famous since the 17th cent. The Banbury Cross of the nursery rhyme was destroyed by the Puritans in 1602, a new one was installed in 1859.

Bancroft, Anne, 1931–, American actress, b. New York City as Anne Italiano. Her New York stage debut in *Two for the Seesaw* (1958) was a major triumph. She was acclaimed for her performance in *The Miracle Worker* (1959) and won an Academy Award for the 1962 film version. In the mid-1960s she appeared in *Mother Courage, The Devils, and A Cry of Players*. Bancroft's films include *The Pumpkin Eater* (1964), *The Graduate* (1968), and *Young Winston* (1972).

Bancroft, Edward, 1744–1821, spy in the American Revolution, b. Westfield, Mass. While living in London, he became a friend of Benjamin Franklin and in the Revolution began to operate as an American secret agent. He reported to the American commissioners in France, but, unknown to them, he was a double agent and reported their movements to the British. Bancroft in 1778 gave advance information of the Franco-American alliance to the British. Evidence of his duplicity was revealed by Paul L. Ford in 1891. See Lewis Einstein, *Divided Loyalties* (1933).

Bancroft, George, 1800–1891, American historian and public official, b. Worcester, Mass. He taught briefly at Harvard and then for eight years at the Round Hill School in Northampton, Mass., of which he was a founder and proprietor. He then turned

definitely to writing His article (Jan, 1831) in the *North American Review* attacking the Bank of the United States delighted Jacksonian Democrats, and in 1834 Bancroft became an avowed apostate from New England Federalism, "a traitor to his class" In that year also appeared the first volume of his monumental work, *A History of the United States* (10 vol, 1834-74, revised into 6 vol by the author in 1876 and 1883-85) As a reward for his speeches and writings for the Democratic cause he was appointed (1837) collector of the port of Boston by President Martin Van Buren, and as the dispenser of the patronage of that office Bancroft was the Democratic boss in Massachusetts He was defeated for the governorship in 1844, but President Polk, whom he had helped nominate, made him Secretary of the Navy In that post (March, 1845-Sept, 1846) he established the U.S. Naval Academy at Annapolis and issued the standing orders under which Capt John D Sloat, commanding the Pacific squadron, seized California ports on the outbreak of the Mexican War That conflict formally began in May, 1845, when Bancroft, then serving also as acting Secretary of War, gave the order that sent Gen Zachary Taylor into Mexico While minister to Great Britain (1846-49), he diligently collected materials for his *History* in British and French archives Bancroft, an antislavery Democrat, came to support Abraham Lincoln in the Civil War and on Feb 12, 1866, delivered the official memorial address on Lincoln before the Congress (he had also been the official eulogist of Andrew Jackson in 1845) He is assumed to have written President Andrew Johnson's first message to Congress, and in 1867 Johnson appointed him minister to Prussia He held the post until 1874 Although his famous *History* is little read today, it was an important landmark in American historiography, hitherto burdened with Federalist myths, and it remains valuable for its extensive use of source materials The *History* is violently anti-British and intensely patriotic and leaves no doubt that the author was passionately sincere in his devotion to democracy Acknowledged partisan that he was, Bancroft, the first American trained in the so-called scientific school of German historical scholarship, nevertheless insisted that his was an objective interpretation, the high praise his work won from the great Leopold von Ranke as the best history ever written from the democratic point of view annoyed as well as gratified him His literary style was sonorous and rather ponderous, although some passages still have an emotional appeal See biographies by M A De Wolfe Howe (1908) and R B Nye (1944, repr 1964), study by R H Canary (1974)

Bancroft, Hubert Howe, 1832-1918, American publisher and historian, b Granville, Ohio Bancroft began his career as a bookseller in San Francisco in 1852 Soon he had his own firm, the largest book and stationery business W of Chicago He also developed a passion for collecting materials on the western regions of North and South America, from Alaska to Patagonia After toying with the idea of compiling an encyclopedia, he settled on the publication of a prodigious history (39 vol, 1874-90), reissued (1882-90) as *The Works of Hubert Howe Bancroft* The *Works* cover the history and to some extent the anthropology of Central America, Mexico, and the Far West of the United States The first 5 volumes concern the native races, the next 28 the Pacific states, and the last 6 are essays *Literary Industries*, the 39th volume, contains autobiographical material and an account of Bancroft's historical method About a dozen assistants—out of hundreds Bancroft had tried out in his "history factory"—did the actual writing of the *Works*, Bancroft personally wrote very little Because his assistants were not given credit lines and because of Bancroft's rather unethical business practices, Bancroft and the *Works* were at first severely attacked However, his enormous contribution soon received just recognition When Bancroft presented his library to the Univ of California (1905) it contained about 60,000 items, including rare manuscripts, maps, books, pamphlets, transcripts of archives made by his staff, and personal narratives of early pioneers as recorded by his reporters Known as the Bancroft Library, the collection remains an outstanding repository of the history of the West See biography by J W Caughey (1946, repr 1970)

Bancroft, Marie Effie Wilton, Lady, 1839-1921, English actress and manager She made her debut (1856) at the Lyceum Theatre, London, and in 1865 became joint manager of the Prince of Wales's Theatre, London, with Sir Squire Bancroft, 1841-1926, whose entire name was Squire Bancroft White But-

terfield They were married in 1867 With their production of *Caste* in the same year, the Bancrofts, as co-stars, began an association with its author, Tom Robertson, that was to prove most successful Their presentations of his plays, which were more true to life than the current melodramas, and their utilization of the reforms of Mme VESTRIS introduced realism to the 19th-century English stage They continued their work at the Haymarket theater in London (1880-85) The Bancrofts appeared together until 1886, when Mrs Bancroft retired Squire Bancroft was knighted in 1895 See their joint memoirs, *Mr and Mrs Bancroft, on and off the Stage* (1888) and *Recollections of Sixty Years* (1909), Sir Squire Bancroft, *Empty Chairs* (1925)

Bancroft, village (1971 pop 2,276), SE Ont, Canada, on the York River Uranium mines are in the area

band, in music, a group of musicians playing principally on wind and percussion instruments, usually outdoors Such grouping of loud instruments characterized Saracen military bands participating in the Crusades About 1300 similar groups, often including the SHAWM (a type of oboe), trumpet, and drum, appeared in the courts and towns of Europe Town bands were manned by members of the watch and were integral to both the civic and social life of the community These musicians participated in processions, dances, weddings, and feasts and provided incidental music for dramatic representations During the 16th cent the practice of playing instruments of the same family in consort (as in a shawm band) became popular, and new families of wind instruments added variety As the town band began to decline at the end of the 17th cent, its official duties gradually shifted to the military band, which had assumed classical proportions in the early Renaissance A vestige of the extravagant, almost ritualistic affectations of the instrumentalists has survived in the routines of present-day drum majors and majorettes For several centuries the general composition of the military band remained static, the fife and drum being associated with the infantry and the trumpet and kettledrum with the cavalry France introduced the oboe in the latter half of the 17th cent, and a gradual merger with the full wind contingent of the town band ensued Important developments in instrument-making affected the composition of bands in the 19th cent A Prussian bandmaster, Wilhelm Wierprecht (1802-72), introduced (c 1830) valve trumpets and horns into the military band The saxhorns and saxophones of Adolphe Sax were incorporated into French military bands at midcentury The sarrusophone was added in the 1860s, thus completing the ensemble that in most respects is known today Two outstanding European bands are the British Royal Artillery Band (founded 1762) and the band of the French Garde Republicaine, playing under that name since 1872 The U.S. Marine Band, founded in 1798, was the first important band in the United States and remains outstanding The first U.S. band devoted exclusively to the presentation of public concerts was that of P S Gilmore, founded in 1859 His successor as America's leading bandmaster was John Philip SOUSA (1854-1932) In 1911, Edwin Franko Goldman organized the Goldman Band, which continues to give outdoor concerts in New York City in the summer Modern bands usually include the PICCOLO, FLUTE, CLARINET, OBOE, ENGLISH HORN, BASSOON, SAXOPHONE, CORNET, TRUMPET, FRENCH HORN, TROMBONE, TUBA, flugelhorn, euphonium, and various PERCUSSION INSTRUMENTS Concert bands may add the cello, bass viol, and harp The band repertory has traditionally included flourishes, marches, and music transcribed from other mediums As town bands once provided music for social dancing, so do modern jazz and rock bands of numerous descriptions (see ROCK MUSIC) Prior to the 18th cent, the term *band* was frequently applied in a generic sense to cover the combinations of instruments employed by kings and nobles The term is also used for an ensemble of any one type of instrument, as brass band, wind band, marimba band See R F Goldman, *The Band's Music* (1938) and *The Concert Band* (1946)

Banda, Hastings Kamuzu (kamōō'zōō ban'dā), 1902?- , African political leader, president of Malawi (1966-) Overcoming the disadvantages of his peasant background, he received a medical degree in the United States and established a prosperous practice in London after World War II He returned to Africa (1953) and then to his homeland, Nyasaland (1958), to campaign against the federation of Nyasaland (now Malawi) with Rhodesia In a 1961 general election Banda's Malawi Congress party won a sweeping victory Nyasaland, led by Banda as prime minister,

became an independent member of the British Commonwealth as Malawi in 1964 Banda instituted constitutional changes in 1966, making himself life president and eliminating political opposition In 1971 he became the first black African leader to visit South Africa See biography by Philip Short (1974)

Banda Islands, group of 10 volcanic islands, c 70 sq mi (180 sq km), E Indonesia, in the Banda Sea, in the Moluccas The capital and commercial center is Bandanaira, a seaport on Bandanaira island The largest island in the group is Bandalontar Nutmeg and mace are the chief products The islands were discovered and claimed by the Portuguese in 1512 The Dutch ousted the Portuguese in the early 1600s, and the Dutch East India Company assumed control in 1619 Conflict with the English led to the so-called Ambon massacre Many inhabitants are Christian

Banda Oriental (ban'dā öryäntal') [Span, = eastern shore, i.e., of the Rio de la Plata], region, S Uruguay An alluvial plain, it is Uruguay's principal livestock-raising and wheat-growing region In the Spanish colonial period Banda Oriental was the term applied to Uruguay

Bandar, India see MASULIPATAM

Bandar Abbas (bandar' ab-bas'), town (1971 est pop 38,000), S Iran, on the Strait of Hormoz at the mouth of the Persian Gulf A port of strategic and commercial importance, it is the focal point of the trade routes of S Iran It was long noted for its trade with India The town has food processing and textile industries, cotton, rugs, nuts, and dates are exported Early in the 16th cent the Portuguese established themselves in the region, seizing the islands in the strait and using the town, which they fortified and called Gamru, as a mainland port Shah Abbas I recaptured (c 1615) the town and later the islands The Dutch (without the shah's consent) and the English (with the shah's approval) subsequently set up trading stations there, they called the town Gombroon In 1622, Shah Abbas renamed the town Bandar Abbas (port of Abbas) and developed it into a major port Bandar Abbas began to lose importance in the late 1800s, especially after the opening of the Trans-Iranian RR terminal at the head of the Persian Gulf

Bandaranaike, Sirimavo (sērēmā'vō bandranī'kē), 1916-, prime minister of Sri Lanka (formerly Ceylon) Of an aristocratic family, she was educated at a Roman Catholic convent In 1940 she married S W R D Bandaranaike, also a Christian She was converted to Buddhism, as was her husband, before he became (1956) prime minister After her husband was assassinated (1959) she led the Sri Lanka Freedom party to victory in the 1960 elections and became prime minister She remained in office until 1965, pursuing a nationalist program, was defeated in the 1965 elections, but returned as prime minister in 1970 In 1972 she was the guiding force behind the adoption of a new constitution that proclaimed a republic and officially changed the country's name to Sri Lanka

Bandaranaike, Solomon West Ridgeway Dias, 1899-1959, prime minister (1956-59) of Ceylon (later Sri Lanka), husband of Sirimavo Bandaranaike A lawyer educated in England, he entered politics and rose to hold a cabinet position He resigned, however, in 1951 to form what became the Sri Lanka Freedom party In 1956 he organized a leftist coalition that came to power with the 1956 elections As prime minister, he took a neutralist stance in foreign affairs, domestically, he was faced by economic problems and disputes over languages He was assassinated by a dissident Buddhist monk

Bandar-e Pahlavi (bandar-ā palāvē'), city (1966 pop 41,785), Gilan prov, NW Iran, a port on the Caspian Sea It has fisheries and exports food products, cotton, fish, and caviar The city is also called Pahlevi and was formerly known as Enzeli

Bandar-e Shah (sha), town (1966 pop 13,000), Mazandaran prov, N Iran, on the Caspian Sea The town has fisheries and serves as the northern terminus of the Trans-Iranian Railway, which runs to the Persian Gulf

Bandar-e Shahpur (shapōōr'), town (1966 pop 6,000), Khuzestan prov, SW Iran, a port at the head of the Persian Gulf It is the southern terminus of the Trans-Iranian Railway, which runs to the Caspian Sea

Banda Sea (bān'dā, ban'dā), section of the Pacific Ocean, c 600 mi (970 km) long and c 300 mi (480 km) wide, E Indonesia, outlined by the South Molucca islands The deepest point is c 21,000 ft (6,400 m) Reefs and currents near the sea's islands are a hazard to shipping

Bandeira (bāndē'ē-rā), highest peak of Brazil, 9,462 ft (2,884 m) high, in the Serra do Caparaó, situated on the border between Minas Gerais and Espírito Santo states, SE Brazil

Bandelier, Adolph Francis Alphonse (bāndēl'ēr'), 1840–1914, American archaeologist, b. Bern, Switzerland. His pioneering studies on ancient Mexican civilizations and his important excavations in Peru and Bolivia laid the foundations for later research in American archaeology. He is well known for his popular books *The Delight Makers* (1890, repr. 1954) and *The Gilded Man* (1893).

Bandelier National Monument: see NATIONAL PARKS AND MONUMENTS (table)

Bandello, Matteo (mat-tē'ō bāndēl'ō), 1485–1561, Italian storyteller, a Dominican priest. He is famous for his novellas, short tales in imitation of Boccaccio, that provided themes for several 17th-century plays. Often coarse, they have considerable vitality and occasional tragic force. His version of an earlier *Romeo and Juliet* is probably the source of Shakespeare's play. An edition of his novellas was translated into English by Sir Geoffrey Fenton in 1567 and reprinted in 1924.

bandicoot, small marsupial mammal native to Australia and nearby islands. Bandicoots have long, pointed, shrewlike faces, gray or brown fur, and long, bushy, ratlike tails. They range in size from that of a rat to that of a rabbit. Their feet are equipped with sharp claws, used for digging food; they feed nocturnally on insects, worms, roots, and vegetables dug from the ground. The second and third toes of the hind legs are bound together and the paired claws are used as a comb for grooming the fur. Bandicoots are able to hop about like rabbits on their strong hind legs, but they also commonly creep on all fours. Bandicoots are classified in the phylum CHORDATA, subphylum Vertebrata, order Marsupialia, family Peramelidae.

bandicoot rat, giant rat of southern Asia, unrelated to true bandicoots. It is an agricultural pest in the grain crops and gardens of India and Sri Lanka and is known for the piglike grunts it emits when attacked. Bandicoot rats are classified in the phylum CHORDATA, subphylum Vertebrata, class Mammalia, order Rodentia, family Muridae.

Bandinelli, Bartolomeo (bārtōlōmā'ō bāndēnēl'īē) or **Baccio** (bat'chō), 1493?–1560, Florentine sculptor and painter, son of a goldsmith. He attempted to emulate Michelangelo, and derived from him a strong interest in musculature. Although his drawings are forceful, his sculpture tends toward a somewhat petrified rendering of the human form. Among his works are a statue of St. Peter and an altar screen in the cathedral at Florence. *Hercules and Cacus* and the monument to Giovanni delle Bande Nere are also in Florence. Together with his assistants, he is responsible for the execution of the tombs of popes Leo X and Clement VII in Santa Maria sopra Minerva, Rome.

bandit: see BRIGANDAGE

Bandjarmasin (ban'jərmasin), city (1961 pop. 214,096), capital of South Kalimantan prov., S Borneo (Kalimantan), Indonesia, on a delta island near the junction of the Barito and Martapura rivers. An important deep-water port, it is the trade center of the rich Barito basin, exports include rubber, pepper, timber, oil, coal, gold, and diamonds. There is a large oil refinery, and coal mines and sawmills are in the vicinity. In the 14th cent. Bandjarmasin was part of the Hindu kingdom of Madjapahit, but it passed to Muslim rulers in the late 15th cent. The Dutch opened trade there in 1606. The British controlled the city for several brief periods, and in 1787 it became a Dutch protectorate. There is much flooding, and many of the inhabitants live on raftlike dwellings. A state university is in the town. It is also spelled Banjermasin or Bandjermasin.

Bandjermasin: see BANDJARMASIN, Indonesia

Bandoeng see BANDUNG, Indonesia

Bandung or Bandoeng (both bān'dōōng), city (1971 est. pop. 1,114,000), capital of West Java prov., W Java, Indonesia, near the Guntur volcano. Formerly the administrative and military headquarters of the Netherlands East Indies, it is the third largest city in Indonesia, an industrial hub, a famous educational and cultural center, and a tourist resort known for its cool, healthful climate. Bandung is a textile center and the site of the country's quinine industry, which uses the cinchona grown on nearby plantations. Other manufactures include ceramics, chemicals, rubber products, and machinery. The city is the seat of a textile institute, the Pasteur Institute, a technological institute, a state university, two pri-

vate universities, and a nuclear research center. Nearby is Malabar radio station, one of the most powerful in SE Asia. Founded by the Dutch in 1810, Bandung became important with the arrival of the railroad in the late 19th cent.

Bandung Conference, meeting of representatives of 29 African and Asian nations, held at Bandung, Indonesia, in 1955. The aim—to promote economic and cultural cooperation and to oppose colonialism—was more or less achieved in an atmosphere of cordiality. Communist China played a prominent part and strengthened its friendly relations with other Asian peoples. Not invited to the conference were South Africa, Israel, Nationalist China, the Republic of Korea, and the People's Republic of Korea. In the 1960s and 1970s, conflicts between the African and Asian nations eroded the solidarity expressed at Bandung. See AFRO-ASIAN BLOC. See Carlos P. Romulo, *The Meaning of Bandung* (1956).

baneberry, any plant of the small genus *Actaea*, north temperate perennials of the family Ranunculaceae (BUTTERCUP family) sometimes cultivated for the handsome (though poisonous) berrylike fruits. Native species, formerly used medicinally by both Indian and white man and also called cohosh, are the red baneberry (with a stalk of red berries) and the white baneberry (with a stalk of white berries). The plant is also one of several plants called herb Christopher, particularly the dark-fruited European species. The baneberry is similar to the related bugbane, one species of which is also called cohosh. Baneberry is classified in the division MAGNOLIOPHYTA, class Magnoliopsida, order Ranunculales, family Ranunculaceae.

Banér, Johan (yōō'han bānār'), 1596–1641, Swedish field marshal in the THIRTY YEARS WAR. He served (1626–29) in Poland and Russia and accompanied (1630) Gustavus II of Sweden to Germany. At Gustavus's death (1632) Baner was a leading officer, and after the major Swedish defeat at Nordlingen he became the chief Swedish general in Germany. Baner reestablished Sweden's military prestige at Wittstock (1636), where he defeated the Saxon and imperial forces. After recovering (1638) Pomerania and Mecklenburg and winning (1639) a victory over the Saxons at Chemnitz, he penetrated (1639) into Bohemia but was forced to retreat.

Banerjee, Sir Surendranath (sōōrēn'drənāt ba'nārjē), 1848–1926, Indian nationalist. One of the first Hindus to join the Indian civil service, he was dismissed (1874) for a minor error and was considered by many to be the victim of discrimination. He became a teacher in Calcutta and editor of the nationalist paper *Bengalee*, and in 1876 he founded the nationalist Indian Association, a predecessor of the Indian National Congress. He served twice (1895, 1902) as president of the latter organization but withdrew in 1918 to espouse a more moderate nationalism that called for Hindu-Muslim cooperation and gradual reform. Knighted in 1921, he served (1921–24) as minister for local self-government in Bengal. He was a founder (1882) of Ripon College in Calcutta, which in 1947 was renamed Surendranath College. See his autobiography, *A Nation in Making* (1925). Daniel Argov, *Moderates and Extremists in the Indian Nationalist Movement, 1883–1920* (1967).

Banff (bāmf, bānf), town (1971 est. pop. 3,500), SW Alta., Canada, on the Bow River in the Rocky Mts. A famous tourist center and a winter resort, it is the administrative headquarters of Banff National Park. The Banff School of Fine Arts is a branch of the Univ. of Alberta.

Banff National Park, 2,564 sq mi (6,641 sq km), W Alta., Canada, in the Rocky Mts., est. 1885. Noted for its mountain scenery and hot mineral springs, the park is a year-round resort area. Banff and Lake Louise are the chief resort centers.

Banffshire or Banff, county (1971 pop. 43,501), NE Scotland. Banff is the county town. The terrain slopes from the Cairngorm mts. in the south to a fertile farm belt near the Moray Firth. Oats and barley are the staple crops, and sheep and cattle are raised. The distilling industry is mainly around Dufftown. Glenlivet is also famous for whiskey. Fishing villages dot the coast. Buckie and Banff are important cod and herring ports. There is also a boat-building industry. Fine woollens are manufactured at Keith. The county has granite, limestone, and marble quarries. Banffshire was torn by religious strife after the Reformation, and troubles continued through the period of the ENGLISH CIVIL WAR. After the GLORIOUS REVOLUTION (1688–89), the county was strongly Jacobite. In 1975, Banffshire became part of the new Grampian region.

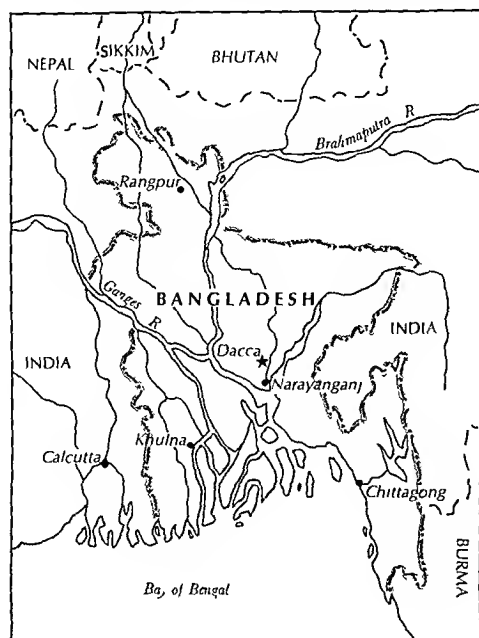
Bangalore (bāng-gālōr'), city (1971 pop. 1,648,232), capital of Karnataka state, S central India, 3,000 ft (914 m) above sea level. A major industrial center and transportation hub of S India, Bangalore has electronics and aircraft industries, textile mills, and varied manufactures. Coffee is traded. A well-planned city with numerous parks and wide streets, it is famous as a place of retirement. It was founded in 1537, taken by Haidar Ali (c. 1760), but was restored to the original rulers of Bangalore after the British defeated Tipoo Sahib, the son of Haidar Ali, at Srirangapatna in 1799. Bangalore became the administrative seat of Mysore in 1831. The remains of the palace of Tipoo Sahib and several institutes of learning, notably the Tata Institute of Science, are the outstanding landmarks of the city.

Bangka or Banka (both bāng'ka, bāng'kə), island (1961 pop. 251,639), c. 4,600 sq mi (11,910 sq km), Indonesia, in the Java Sea, SE of Sumatra, from which it is separated by the narrow Strait of Bangka. Pangkalpinang is the largest town, and Muntok is the principal port. Since c. 1710, when tin was discovered there, Bangka has been one of the world's principal tin-producing centers. Tin production is a government monopoly; there is a smelter at Muntok. Pepper is also produced on the island. The majority of the inhabitants are Chinese; they are mostly employed as mine laborers. Bangka was ceded to Britain by the sultan of Palembang in 1812, but in 1814 it was exchanged with the Dutch for Cochinchina in India.

Bangkok (bāng'kōk'), Thai *Krung Thep*, city (1970 pop. 2,132,000), capital of Thailand and of Phra Nakhon prov., SW Thailand, on the east bank of the Chao Phraya River, near the Gulf of Siam. Thailand's largest city and one of the leading cities of Southeast Asia, Bangkok lies in the heart of the country's major commercial rice-growing region. The metropolitan area includes Bangkok proper, the industrial city of THON BURI on the west bank of the river, and Klongtoei Wharf, c. 5 mi (8 km) downstream, which, along with Bangkok's man-made harbor, handles the bulk of Thailand's foreign trade. The city is the hub of a continental Southeast Asian railroad network and has modern highways. Nearby Don Muang international airport is one of the busiest in Asia. Despite these transportation facilities, Bangkok depends mainly on its numerous canals to carry the commercial produce of the surrounding area. Rice, tin, teak, rubber, gold, silver, hides, and processed fish are the leading exports of the city's port. Industrial plants include rice mills, cement factories, sawmills, oil refineries, and shipyards. Textiles, motor vehicles, electrical goods, and food products are also manufactured. The city is a famous jewelry trading center, dealing in silver and bronze ware and precious stones. Ethnic Chinese dominate both commerce and industry in Bangkok, whose population includes sizable Indian, Pakistani, European, and American communities. The city began as a small trading center and port community serving Ayutthaya, the capital of Siam until its destruction by Burmese invaders in 1767. Thon Buri became the capital in 1769, but in 1782, King Rama I, founder of the present ruling Chakri dynasty, built his royal palace on the east bank of the river and made Bangkok his capital. The vast, walled Grand Palace complex encompasses the Wat Phra Kaew (the royal chapel housing the sacred image of the Emerald Buddha). There are more than 400 other Buddhist temples in Bangkok. During World War II the city was occupied by the Japanese and was a target of Allied bombing raids. Bangkok's educational and cultural facilities include four universities, a fine arts academy, the national theater, and the national museum, which has a large collection of Thai antiquities. Of particular interest is the daily floating market, in which merchandise is sold aboard boats on canals.

Bangladesh (bang-ladēsh', bāng-) [Bengali, = Bengal Nation], republic (1972 est. pop. 75,000,000), 55,126 sq mi (142,776 sq km), S Asia. Dacca is the capital. Bangladesh was formerly East Pakistan, which had been called East Bengal until 1955 and was constituted from the eastern portion of BENGAL and the former Sylhet district of Assam. Bangladesh proclaimed its independence from Pakistan on March 26, 1971, it achieved sovereignty in Dec., 1971, following the war between India and Pakistan. Bangladesh borders on the Bay of Bengal in the south, the Indian states of West Bengal in the west and Assam in the north, and Burma in the southeast. A humid, low-lying, alluvial region, Bangladesh is composed mainly of the great combined delta of the Ganges, Brahmaputra, and Meghna rivers. Except for the

Chittagong Hills along the Burma border, most of the country is no more than 300 ft (90 m) above sea level. Bangladesh is laced with numerous streams,



distributaries, and tidal creeks, forming an intricate network of waterways that constitutes the country's chief transportation system. Along the southeastern coast is the Sundarbans, a heavily forested swamp area with numerous low islands. Bangladesh has a tropical monsoon climate with a short dry season in the winter. It receives an average annual rainfall of 80 in (203 cm), with most falling during the summer monsoon period. The Sylhet district in the northeast is the wettest part of the country, having an annual average rainfall of 140 in (356 cm). The low-lying delta region is subject to severe flooding from monsoon rains, cyclones, and tidal waves and usually suffers major crop damage and high loss of life. The cyclone and tidal wave of Nov., 1970, devastated the southern delta region and caused an estimated 300,000 deaths. Monsoon rains in mid-1974 caused much damage. Bangladesh, one of the world's ten most populated countries, has the highest population density (more than 1,300 people per sq mi/500 people per sq km) of any nation on earth, its yearly growth rate is a very high 3%. The great majority of Bangladesh's population is Bengali, the Biharis, a non-Bengali Muslim group, form a large minority that has not been assimilated into the national social structure. About 80% of the population is Sunni Muslim, there are Hindu, Buddhist, and Christian minorities. Bengali is the nation's official language, but English is in wide use. Bangladesh has a predominantly rural population, with about 80% of the people engaged in agriculture. Dacca and CHITTAGONG are the largest cities. Bangladesh has several universities, including those at Chittagong, Dacca, MYMENSINGH, and RAJSHAHI. Except for natural gas (found along its eastern border) and oil (in the Bay of Bengal), Bangladesh is lacking in minerals. The country's economy is based on agriculture, with about 65% of the territory under cultivation. Jute, rice, sugarcane, tea, tobacco, and wheat are the chief crops. Bangladesh produces more than half of the world's raw jute. Fishing is also an important economic activity. Dacca and Chittagong (the country's chief port) are the principal industrial centers of Bangladesh, jute products, textiles, paper, processed food, and leather goods are manufactured. Raw jute and jute products account for about 90% of the country's exports, which also include tea, leather, and fish. Since the country is unable to feed itself, the most important of Bangladesh's imports is food. Raw cotton, transportation equipment, and consumer goods are other major imports. Bangladesh is governed by the constitution of 1972 (amended in 1975) and has a presidential system of government. The president is the head of state, and the prime minister is the head of government. There is a 315-seat national assembly. The Awami League is the chief political party, and in the country's first general election (March, 1973) it won virtually all the seats in the national assembly.

History Until 1757, when ROBERT CLIVE, the British statesman who laid the basis of the British Empire in India, defeated the Nawab, Suraj-ud-daulah, at Plas-

sey, the area that is now Bangladesh was ruled by Afghan or Mogul dynasties or by independent Muslim kings. Baber, who took Kabul in 1504 and thence advanced through the northwest, established the Mogul empire in India in 1526. Thereafter, with interruptions, the Mogul empire united India until 1857. Like India and Pakistan, the territory that is now Bangladesh was part of imperial British India from 1857 until 1947, when India and Pakistan achieved independence, for nearly 25 years afterward, Bangladesh existed as East Pakistan, the eastern province of Pakistan (for pre-1970 history see PAKISTAN). The two provinces of Pakistan, which differed considerably in natural setting, economy, and historical background, were separated from each other by more than 1,000 mi (1,610 km) of India. The East Pakistanis, who comprised 56% of the total population of Pakistan, were discontented under a government centered in West Pakistan, the disparity in government investments and development funds given to each province also added to the resentment, especially since the eastern province's jute and tea sales supplied two-thirds of the country's foreign earnings. Efforts over the years to secure increased economic benefits and political reforms proved unsuccessful, and serious riots broke out in 1968 and 1969. The movement for greater autonomy gained momentum when, in the Dec., 1970, general elections, the Awami League under the leadership of Sheikh MUJIBUR RAHMAN won practically all of East Pakistan's seats and thus achieved a majority in the Pakistan National Assembly. President Muhammad Agha YAHYA KHAN, hoping to avert a political confrontation between East and West Pakistan that might have led to East Pakistan's regional autonomy and control of its foreign exchange and trade, twice postponed (March, 1971) the opening session of the national assembly. The government's attempts to forestall the autonomy bid led to general strikes and nonpayment of taxes in East Pakistan and finally to civil war on March 25. On the following day the Awami League's leaders proclaimed the independence of Bangladesh. Yahya Khan's government outlawed the Awami League, imprisoned Sheikh Mujibur Rahman on treason charges, and imposed strict press censorship. During the months of conflict an estimated one million Bengalis were killed in East Pakistan and another ten million fled into exile in India. Fighting raged in Dacca, Chittagong, COMILLA, SYLHET, JESSORE, BARISAL, RANGPUR, and KHULNA. Finally India allied itself with Bangladesh, which it had recognized on Dec. 6, and during a two-week war (Dec. 3-16) defeated the Pakistani forces in the east. The Awami League leaders of Bangladesh's provisional government returned from exile in Calcutta, India. Sheikh Mujibur Rahman, who had been chosen president while in prison in West Pakistan, was released and allowed to return to Bangladesh in early Jan., 1972. He set up a government and assumed the premiership. Abu Sayeed Choudhury became president. Rejecting Pakistan's call for a reunited country, the Sheikh embarked upon the tremendous job of rehabilitating an economy devastated by months of warfare. Relations with Pakistan were hostile, Pakistan withheld recognition from Bangladesh, and Bangladesh and India refused to repatriate more than 90,000 Pakistani prisoners of war who had surrendered at the end of the conflict. Armed Bengali "freedom fighters" fought Bihari civilians in Bangladesh, particularly after Indian troops withdrew from Bangladesh in March, 1972. In addition, Bangladesh announced its intention to bring to trial a number of captured civilians and soldiers on war crime charges. Tensions were eased in July, 1972, when President Zulfikar Ali BHUTTO of Pakistan (who assumed power after the fall of the Yahya Khan government) and Prime Minister Indira Gandhi of India agreed during a meeting in Simla, India, to peacefully settle the differences between their countries. In the summer of 1973 the Pakistan national assembly authorized President Bhutto to extend recognition to Bangladesh when he deemed it in the national interest, and he did so in Feb., 1974, prior to the start of a summit conference of Islamic nations in Lahore, Pakistan. Subsequently, India and Pakistan reached consensus on the release of Pakistani prisoners of war and the exchange of hostage populations—between 150,000 and 400,000 Bengalis were permitted to leave Pakistan for Bangladesh, and about 260,000 Biharis were allowed to resettle in Pakistan—but the actual transfer procedures were very slow. Bangladesh was gradually recognized by most of the world's nations. It joined the British Commonwealth in April, 1972, but its first bid for membership in the United Nations was vetoed

(Aug., 1972) by China. Widespread famine has been averted through massive international aid, but a smallpox epidemic claimed about 7,000 lives in early 1972. In March, 1972, the country's major industries, banks, and shipping and insurance firms were nationalized. The high rate of inflation has hampered rehabilitation efforts and has triggered open criticism of the government's economic policies. Bangladesh has signed treaties of friendship and trade agreements with India and the Soviet Union. The constitutional amendment of 1975 made Sheikh Mujib president and greatly increased his powers. For bibliography of preindependent Bangladesh see under PAKISTAN, see Mohamed Ayoob and K. Subrahmanyam, *The Liberation War* (1972), Subrata Roy Chowdhury, *The Genesis of Bangladesh* (1972), A. R. Khan, *The Economy of Bangladesh* (1972), Prabhat Srivastava, *The Discovery of Bangla Desh* (1972), *Bangladesh Documents*, prepared by the Ministry of External Affairs, India (1973), P. S. Payne, *Massacre* (1973).

Bangor (bāng'gôr), municipal borough (1971 pop. 35,178), Co. Down, E. Northern Ireland, on Belfast Lough. It is a seaport, resort, and yachting center (site of an annual regatta), with some light industry. The Elizabethan Bangor Castle is in the borough. There are also remains of an abbey founded c.555 by St. Comgall and destroyed by the Danes in the 9th cent. Rebuilt in 1120, it was taken over by Franciscans in 1469. The missionary abbey was dissolved in 1542.

Bangor (bāng'gôr, bān'-, bāng'gôr), city (1970 pop. 33,168), seat of Penobscot co., S. Maine, at the confluence of the Penobscot and Kenduskeag rivers, inc. as a town 1791, as a city 1834. It is a port of entry, commercial center, and gateway to an extensive resort and lumber region. Major industries include the production of shoes and paper, food and lumber processing, and printing. The city was settled in 1769 and was known as Sunbury. During the War of 1812 it was occupied by the British. In the 19th cent. Bangor was a shipbuilding center that carried on an extensive coastal and overseas trade in lumber, stone, and ice. The city has a theological seminary, a conservatory of music, and a community college. Bangor International Airport, part of which was once Dow Air Force Base, has one of the largest runways in the United States.

Bangor (bāng'gôr), municipal borough (1971 pop. 14,526), Caernarvonshire, NW Wales, at the northern end of Menai Strait. Slate is shipped from adjacent Port Penrhyn. The cathedral, on the site of a 6th-century church, dates from the 11th cent. and has been rebuilt several times. In 1974, it became part of the new nonmetropolitan county of Gwynedd. Bangor is the seat of the University College of North Wales.

Bangorian Controversy (bāng-gôr'ēan), religious dispute in the Church of England during the early part of the reign of George I. Benjamin HOADLY, bishop of Bangor, Wales, delivered a sermon (1717) before the king in which he denied that the church had any doctrinal or disciplinary authority. Advocates of ecclesiastical authority (among them William LAW) attacked Hoadly's position, and a sharp controversy ensued, in which some 50 writers participated and about 200 pamphlets were issued. Attacks on Hoadly in convocation, the church assembly, led the king to suspend that body in 1717; it was not allowed to meet again until 1852.

Bangs, John Kendrick, 1862-1922, American humorist, b. Yonkers, N.Y., grad. Columbia, 1883. He was the editor of *Puck* (1904-5) and other magazines and wrote over 30 books of humorous stories, verse, and plays, including *Three Weeks in Politics* (1894), *The Idiot* (1895), and *A Houseboat on the Styx* (1896).

Bang's disease: see BRUCELLIS

Bangu (bang-gé'), city (1971 est. pop., with suburbs, 187,000), capital of the Central African Republic, a port on the Ubangi River, near the Zaire border. Bangu is an administrative, trade, and communications center. Its manufactures include textiles, food products, beer, shoes, and soap. Bangu's port handles most of the country's international trade, the chief exports are cotton, timber, coffee, and sisal. Bangu is at the hub of the nation's road network, which connects the city with Cameroon, Chad, and Sudan. The city was founded in 1889 by an aide of the French explorer Savorgnan de BRAZZA. Jean-Bedel Bokassa University (1970) is located there.

Bangweulu (bāng'wōō'lōō) or **Bangweolo** (-wōō'lōō), lake and swamps, c. 3,800 sq mi (9,840 sq km), NE Zambia. The lake is c. 50 mi (80 km) long and 25 mi

(40 km) wide. Commercial fishing is pursued in the lagoons of the swamps. The swamps are formed largely by the flooding of the lower Chambezi River, which enters Lake Bangweulu from the east. The lake is drained in the S by the Luapula River, a tributary of the Congo.

Banha (bān'hā) or **Benha** (bēn'-), city (1970 est pop 72,500), capital of Qalyubiyah governorate, N Egypt, in the Nile River delta. A rail junction and trade center, Banha has cotton-ginning, rug-weaving, and food-processing industries.

Bani (bā'nī) 1 One of David's mighty men. 2 Sam 23:36. 2 Musician. 1 Chron 6:46. 3 Levites. Neh 3:17, 9:4, 11:22. 4 Family in the return from exile. Ezra 2:10, 10:29, Neh 10:14. Binnui. Neh 7:15. S The same as BINNUI. 1. 6 Judahite. 1 Chron 9:4. 7 Jew married to a foreign wife. Ezra 10:3B.

Bani Hasan (bā'nē hāsān'), village, E central Egypt, on the Nile near Al Minya. There are 39 tombs, carved out of solid rock in the XII dynasty of ancient Egypt. The name is also spelled Beni Hasan.

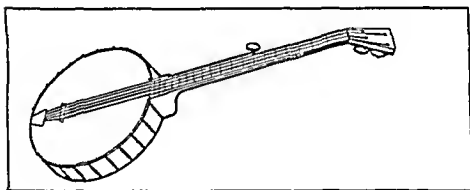
banishment: see EXILE.

Bani Suwayf (bā'nē swāf) or **Beni Suef** (bē'-), city (1970 est pop 99,400), capital of Bani Suwayf governorate, N central Egypt, on the Nile River. Situated in an intensely cultivated farming region, Bani Suwayf has cotton mills and sugar refineries. Alabaster is quarried near the city.

Banja Luka (bān'yā lōō'kā), city (1971 pop 157,515), W Yugoslavia, in Bosnia, on the Vrbas River. It has varied manufactures, including iron goods and electrical equipment. Banja Luka was captured by the Turks in 1528 and was (1583-1638) the seat of the pashas of Bosnia. Later (1878-1918) a part of Austria-Hungary, it passed to Yugoslavia after World War I. The city has Roman ruins and a 16th-century mosque.

Banjarmasin: see BANDJARMASIN, Indonesia.

banjo, stringed musical instrument, with a body resembling a tambourine. The banjo consists of a hoop over which a skin membrane is stretched; it has a long, often fretted neck and four to nine



Banjo

strings, which are plucked with a pick or the fingers (see FRETTED INSTRUMENT). Negro slaves brought it to America (by 1688) from W Africa, to which it may have come from Europe or Asia. It is used frequently in hillbilly and Southern folk music. Because of an incisive, percussive quality, it is often used as a rhythm or a solo instrument in Dixieland bands.

Banjoewangi: see BANJUWANGI, Indonesia.

Banjul (bān'jool), formerly **Bathurst** (bāth'arst), port city (1971 est pop 45,000), capital of The Gambia, W Gambia, situated on St. Mary's Island where the Gambia River enters the Atlantic Ocean. It is the only large urban area in The Gambia and is the country's economic and administrative center. Its port handles oceangoing ships. Banjul's chief export is peanuts, beeswax, palm kernels and oil, and skins and hides are also shipped. Peanut processing is the chief industry. The city was founded by the British on the site of an anchorage in 1816 as a trading post and a base for suppressing the slave trade. A vocational school is in the city.

Banjuwangi (bān'yōōwāng'ē), city (1961 pop 54,408), E Java, Indonesia, opposite Bali on Bali Strait. It is a railroad terminus and the seaport for shipment of passengers and goods to Bali. It is also spelled Banyuwangi or Banjoewangi.

Banka: see BANGKA, Indonesia.

Bank for International Settlements (BIS), financial institution established (1930) in Basel, Switzerland, by bankers and diplomats of Europe and the United States. Chartered under Swiss laws, the BIS was originally designed to conduct a limited banking business and to administer German war reparations payments according to the provisions of the Hague Agreements. Since then it has become one of the world's foremost international banks. As a meeting place for the governors of West European central banks, the BIS serves to promote international financial cooperation. It is the representative of sev-

eral important West European financial enterprises, holding the accounts of the European Coal and Steel Community and serving as agent for the European Monetary Agreement. Its professional staff and its publications, especially the *Annual Report*, are important sources of economic data and analysis. The BIS is run by a board composed of eight West European central bank governors and five other financiers. By the early 1960s American interests in the bank had become minimal, with most of the original U.S. shares having been sold to European groups. BIS has holdings of about 30 billion francs (approximately 6 billion dollars).

Bankhead, John Hollis, 1872-1946, American politician, b. Moscow, Alabama, brother of William Brockman Bankhead. He was elected to the Alabama legislature in 1903 and served in the U.S. Senate from 1931 until his death. Bankhead was a leader of the farm bloc in the Senate and strongly supported the New Deal. He sponsored (with his brother) the Bankhead Cotton Control Act of 1934.

Bankhead, Tallulah Brockman, 1903-68, American actress, b. Huntsville, Ala., daughter of William Brockman Bankhead. After her debut in 1918, Bankhead had great success on the London stage (1923-30). She was acclaimed for her Broadway performance as Regina in *The Little Foxes* (1939). Her best-known film performance was in *Lifeboat* (1944). Bankhead's beauty, wit, and uninhibited behavior made her a legend. See her autobiography (1952), biographies by Brendan Gill (1972), Lee Israel (1972), and Kieran Tunney (1973).

Bankhead, William Brockman, 1874-1940, U.S. Representative from Alabama (1917-40), b. Lamar, Ala. Chairman of the House rules committee (1934-35), Democratic floor leader (1935-36), and speaker of the House (1936-40), he was one of the outstanding New Deal legislative leaders. The Cotton Control Act of 1934 was largely the work of Bankhead and his brother, Senator John H. Bankhead. He was also interested in monetary legislation and was considered one of the ablest parliamentarians in the House.

bank holidays, days when the law requires that banks be closed. In the United States the list varies from state to state but generally includes, besides the major holidays, many days that are observed only by the banks and such government institutions as post offices. In England since 1871 bank holidays have had special significance as secular and perpetual holidays. The days include Christmas, Boxing Day (the first weekday after Christmas), Good Friday, Easter Monday, Whitmonday (the day after Pentecost), and the special banking day on the first Monday in August.

banking, primarily the business of dealing in money and instruments of credit. Banks are usually differentiated from other financial institutions by their principal functions of accepting deposits—subject to withdrawal or transfer by check—and of making loans. A simple form of banking was practiced by the ancient temples of Egypt, Babylonia, and Greece, which loaned at high rates of interest the gold and silver deposited for safekeeping. Private banking existed by 600 B.C. and was considerably developed by the Greeks, Romans, and Byzantines. Medieval banking was dominated by the Jews and Levantines because of the strictures of the Christian Church against interest and because other occupations were largely closed to Jews. The forerunners of modern banks were frequently chartered for a specific purpose, e.g., the Bank of Venice (1171) and the Bank of England (1694), in connection with loans to the government, the Bank of Amsterdam (1609), to receive deposits of gold and silver. Banking developed rapidly throughout the 18th and 19th cent., accompanying the expansion of industry and trade, with each nation evolving the distinctive forms peculiar to its economic and social life. In the United States the first bank was the Bank of North America, established (1781) in Philadelphia. Congress chartered the first BANK OF THE UNITED STATES in 1791 to engage in general commercial banking and to act as fiscal agent of the government, but failed to renew its charter in 1811. A similar fate attended the second Bank of the United States, chartered in 1816 and closed in 1836. Prior to 1838 a bank charter could be obtained only by a specific legislative act, but in that year New York adopted the Free Banking Act, which permitted anyone to engage in banking, upon compliance with certain charter conditions. Free banking spread rapidly to other states, and from 1840 to 1863 all banking business was done by state-chartered institutions. In many Western states it degenerated into "wildcat" banking because of laxity and

abuse of state laws. Bank notes were issued against little or no security, credit was overexpanded, and depressions brought waves of bank failures. In particular, the multiplicity of state bank notes caused great confusion and loss. To correct such conditions, Congress passed (1863) the National Bank Act, which provided for a system of banks to be chartered by the Federal government. In 1865, by granting national banks the authority to issue bank notes and by placing a prohibitive tax on state bank notes, an amendment to the act brought all banks under Federal supervision. Most banks in existence did take out national charters, but some, being banks of deposit, were unaffected by the tax and continued under their state charters, thus giving rise to what is generally known as the "dual banking system." The number of state banks expanded rapidly with the increasing use of bank checks and has exceeded the number of national banks since 1892. Recurrent banking panics caused by overexpansion of credit, inadequate bank reserves, and inelastic currency prompted Congress in 1908 to create the National Monetary Commission to investigate the field of banking and currency and recommend legislation. Its suggestions were embodied in the Federal Reserve Act (1913), which provided for a central banking organization, the FEDERAL RESERVE SYSTEM. Aside from their type of charter, banks may be distinguished according to their primary functions. Commercial banks, which include national and state banks, trust companies, stock savings banks, and industrial banks, render a wide range of services in addition to their primary functions of making loans and investments and handling demand as well as savings and other time deposits. Mutual savings banks, which are exclusively state-chartered institutions, accept only savings and other time deposits, and the types of loans made and services rendered are limited. The fact that commercial banks are able to expand or contract their loans and investments in accordance with changes in reserves and reserve requirements further differentiates them from mutual savings banks, where the volume of loans and investments is governed by changes in customers' deposits (See SAVINGS BANK.) Since the establishment of the Federal Reserve System, Federal banking legislation has been limited largely to detailed amendments of the National Bank and Federal Reserve acts. The Banking Act of 1933 was an extensive reform measure designed to correct the abuses that had led to numerous bank crises in the years following the stock market crash of 1929. It strengthened the powers of supervisory authorities, increased controls over the volume and use of credit, and provided for the insurance of bank deposits under the Federal Deposit Insurance Corporation (FDIC). The Banking Act of 1935 strengthened the powers of the Federal Reserve Board of Governors in the field of credit management, tightened existing restrictions on certain banking operations, and enlarged the supervisory powers of the FDIC. Membership in the FDIC is compulsory for all Federal Reserve member banks but optional for other banks. The Federal Savings and Loan Insurance Corporation insures deposits in all federally chartered—and in many state-chartered—savings and loan associations, or corporations that make real estate loans and accept savings deposits. Types of financial institutions that are not subject to the supervision of state or Federal banking authorities but that perform one or more of the traditional banking functions are building and loan associations, mortgage companies, finance companies, insurance companies, credit agencies owned in whole or in part by the Federal government, credit unions, brokers and dealers in securities, and investment bankers. Such organizations operate under state or Federal laws, and most of them are under the jurisdiction of the Dept. of Agriculture or the Federal Loan Agency. Other credit institutions operating under Federal laws include the Federal Housing Authority and the Veterans Administration. Building and loan associations, which are state institutions, provide home-building loans to members with funds obtained from savings deposits and from the sale of shares to members. Finance companies make small loans with funds obtained from invested capital, surplus, and borrowings. CREDIT UNIONS, which are institutions owned cooperatively by groups of persons having a common business, fraternal, or other interest, make small loans to their members out of funds derived from the sale of shares to members. The primary functions of investment bankers are the purchase of new issues of securities from public bodies or corporations and their sale to institutional and individual

investors and the distribution of blocks of outstanding securities from large holders to the investing public. Investment bankers usually act as intermediaries between the issuers of securities and investors in supplying long-term capital funds, as distinguished from commercial banks, which primarily make short-term loans to finance the production and distribution of goods. After World War II banking institutions were established to advance credit and further investment on an international scale. The International Bank for Reconstruction and Development (World Bank) was organized (1945) to make loans both to governments and to private investors. The discharge of debts between nations has been simplified and facilitated through the International Monetary Fund, which also provides members with technical assistance in international banking. The European Monetary Agreement also makes possible the rapid discharge of debts and balance of payments obligations between nations. See B. H. Beckhart, ed., *Banking Systems* (1954, repr. 1969), R. G. Thomas, *Our Modern Banking and Monetary System* (4th ed. 1964), R. E. Cameron, *Banking in the Early Stages of Industrialization* (1967), Roger Orsingher, *Banks of the World* (tr. 1967), G. C. Fischer, *American Banking Structure* (1968), H. V. Prochnow and H. V. Prochnow, Jr., eds., *The Changing World of Banking* (1974).

Bank of England, central bank and note-issuing institution of Great Britain. Popularly known as the Old Lady of Threadneedle Street, its main office stands on the street of that name in London. The bank has eight branches, all of which are located in the British Isles. Although Bank of England notes are legal tender throughout the United Kingdom, banks in Scotland and Northern Ireland also issue notes that may be either used as currency themselves or exchanged for Bank of England issues. In all matters beside note issue, the Bank of England has sole central banking functions in Great Britain. It was founded (1694) as a commercial bank by William PATERSON with a capital of £1,200,000, which was advanced to the government in return for banking privileges, including the right to issue notes up to the amount of its capital. In 1709 the capital was doubled, the charter was renewed in 1742, 1764, and 1781. The bank's facilities proved a great asset in English commercial, and later industrial, expansion. The bank's functions were both public and private; it safeguarded the English pound and also operated for private profit. Efficient regulation was assured by the Bank Charter Act of 1844, which laid the basis for the bank's modern structure. The issue department, which handles the issuing of bank notes for general circulation, was separated from the banking department, which handles the remaining banking functions, including the management of the public debt, and serves as the depository of government funds and as the staple bank of England. The affairs of the bank are controlled by a governor, a deputy, and 16 directors. It was privately owned until 1946, when an act of Parliament provided for its nationalization. The stockholders were recompensed with government bonds to the value of more than £58 million, and the bank subsequently dropped virtually all its private business. See J. H. Clapham, *The Bank of England. A History* (2 vol., 1944, repr. 1966), John Giuseppe, *The Bank of England* (1966).

Bank of the United States, name for two national banks established by the U.S. Congress to serve as government fiscal agents and as depositories for Federal funds, the first bank was in existence from 1791 to 1811 and the second from 1816 to 1836. The first bank was established under the auspices of the Federalists as part of the system proposed by Alexander HAMILTON to establish the new government on a sound economic basis. Congress approved a charter for the bank despite the argument that the Constitution did not give Congress power to establish a central bank and the charge that the bank was designed to favor mercantile over agrarian interests. The bank had a head office in Philadelphia and branches in eight other cities. The government subscribed one fifth of the capital of \$10 million, but a loan of \$2 million was immediately made to the government. In addition to acting as a fiscal agent for the government, the bank conducted a general commercial business. It was well managed and paid good dividends, but its conservative policies and its restraining influence on state banks, through its refusal to accept state bank notes not redeemable in specie, antagonized more exuberant business elements, especially in the West. These interests combined with agrarian opponents of the bank to defeat its rechartering, despite the support given the bank

by the Madison administration. The bank concluded its affairs and repaid its shareholders. Later, financing the War of 1812 proved difficult because of the lack of a central bank, and by the end of the war the financial system of the country was in chaos. Enough support was secured to charter a new bank for 20 years. The second bank, capitalized at \$35 million, operated much as did the first one, 25 branches being established. After an initial period of difficulty during the presidency (1816-19) of William Jones, the bank was placed on a sound basis by Langdon CHEVES (1819-22). It became especially prosperous under the management of Nicholas BIDDLE, but aroused criticism by state banks and frontiersmen on the grounds that it was too powerful and that it operated in the interests of the commercial classes of the East. The opponents of the bank came into power with the election (1828) of Andrew JACKSON. Although the bank's charter did not expire until 1836, Henry CLAY persuaded Biddle to apply to Congress for a renewal in 1832. President Jackson vetoed the bill for its recharter and the bank became a leading issue in his fight for reelection against Clay. Interpreting his victory at the polls as an expression of popular will on the subject, Jackson did not wait for the expiration of the bank's charter but began in 1833, through his new Secretary of the Treasury Roger B. TANEY, to deposit government moneys in state banks, known to his opponents as "pet banks." Under Martin Van Buren's administration the INDEPENDENT TREASURY SYSTEM was established to handle the government's funds. See R. C. H. Catterall, *The Second Bank of the United States* (1902, repr. 1960), W. B. Smith, *Economic Aspects of the Second Bank of the United States* (1953), J. A. Wilburn, *Biddle's Bank* (1967).

bankruptcy, in law, settlement of the liabilities of a debtor who is wholly or partially unable to meet his obligations. The purposes of bankruptcy laws are to distribute, through a court-appointed receiver, the bankrupt's assets equitably among his creditors and, in most instances, to discharge him from further liability. The U.S. Constitution authorizes Congress to enact uniform bankruptcy legislation for the entire United States. The present Federal law was adopted in 1898 and has been amended several times, especially in 1938 by the Chandler Act. Bankruptcy proceedings may be voluntary (instituted by the debtor) or involuntary (instituted by creditors). Ordinarily the debtor must be insolvent, i.e., unable to pay all his debts even if the full value of his assets were realized. Bankruptcy is also permitted when the discharge of debts would otherwise be unduly delayed, e.g., if the debtor has fraudulently transferred property to put it out of a creditor's reach. When a person has been adjudged bankrupt, preferred creditors (e.g., unpaid employees or the Federal government) are paid in full, and the other creditors, who manage the estate through a committee, share, usually pro rata, in the remaining assets. Unless a debtor was discharged from debt by bankruptcy proceedings within the previous six years or was guilty of fraud in becoming bankrupt, the effect of bankruptcy proceedings is to wipe out his indebtedness. The law also permits courts, instead of ordering the liquidation of all the assets of a business threatened with insolvency, to reorganize it on a sound basis. In the United States the bankrupt receives perhaps more lenient treatment than in any other country; this practice reflects the belief that business initiative should not be unduly stifled by the threat of criminal or civil penalties for unintentional commercial failure.

Banks, Sir Joseph, 1743-1820, British naturalist and patron of the sciences. He accompanied Capt. James Cook on his voyage around the world and made large collections of biological specimens, most of which were previously unclassified. Botany Bay was named on this voyage. In 1772, Banks went on an expedition to Iceland. From c. 1762 until his death he was the chief influence in inaugurating and directing the policies that made Kew Gardens an important botanical center for encouraging exploration and experimentation. In 1766 he was elected to the Royal Society, and he served as its president from 1778 until his death. The plant genus *Banksia* was named for him. See studies by H. C. Cameron (1952, repr. 1966) and A. M. Lysaght (1971).

Banks, Nathaniel Prentiss, 1816-94, American politician and Union general in the Civil War, b. Waltham, Mass. After serving in the Massachusetts legislature (1849-53), Banks entered Congress as a Democrat, was returned in 1855 as a Know-Nothing and became speaker of the House, and was reelected in 1857 as a Republican. He resigned from

Congress in Dec., 1857, and served as Republican governor of Massachusetts (1858-60). In the Civil War he was given command in the Dept. of the Shenandoah, where he was defeated by T. J. (Stonewall) JACKSON at Front Royal and Winchester and then at Cedar Mt. during the second battle of Bull Run. Late in 1862, Banks replaced B. F. Butler at New Orleans and cooperated with Grant in opening up the Mississippi by capturing Port Hudson in July, 1863, and in participating in the Red River expedition of 1864. After the war he again served as Representative from Massachusetts (1865-73, 1875-79, 1889-91). See biography by F. H. Harrington (1948), L. H. Johnson, *Red River Campaign* (1958).

Banks, Thomas, 1735-1805, English neoclassical sculptor, studied at the Royal Academy. A traveling scholarship enabled him to study in Rome from 1772 to 1779. In 1781 he went to Russia, where Catherine II bought his *Cupid Catching a Butterfly* and commissioned his *Armed Neutrality*. On his return to England he executed numerous monuments and portrait busts, many are in English churches. Monuments to Isaac Watts, Sir Eyre Coote, and William Woollett are in Westminster Abbey. See his *Annals* (ed. by C. F. Bell, 1938).

banksia [for Sir Joseph Banks], popularized name of a genus of Australian evergreen trees and shrubs of the same family as the macadamia and sometimes cultivated in America. Banksias are also called honeysuckle trees or Australian honeysuckle. Banksia is classified in the division MAGNOLIOPHYTES, class Magnoliopsida, order Proteales, family Proteaceae.

Banks Island, c. 26,000 sq mi (67,340 sq km), NW Northwest Territories, Canada, in the Arctic Ocean, in the Arctic Archipelago. It is the westernmost of the group and is separated from the mainland by Amundsen Gulf. Banks Island, which has many lakes, is a hilly plateau rising to c. 2,000 ft (610 m) in the south. There is a small Eskimo population. British explorer Sir Robert McClure discovered that it was an island in 1851. Canadian explorer Vilhjalmur Stefansson spent much time (1914-17) there and explored the interior.

Bankstown, city (1971 pop. 162,310), New South Wales, SE Australia. It is a suburb of Sydney.

Bankura (bang'kōōrā), town (1971 pop. 79,243), West Bengal state, NE India, on the Dhalkisor River. It is a district administrative center and a market for rice, oilseed, cotton, and silk. There are cigarette factories.

Bann, longest river of Northern Ireland, rising as the Upper Bann in the Mourne Mts. and flowing 40 mi (64 km) NW through Counties Down and Armagh to the southern end of Lough Neagh. It leaves the lake at its north shore as the Lower Bann and flows 40 mi (64 km) north, forming the border between Counties Antrim and Londonderry, past Coleraine to the Atlantic Ocean. It has important salmon fisheries.

Bannack, ghost town, SW Mont. Founded in 1862 when gold was discovered along Grasshopper Creek, Bannack was the first town in Montana and was the first territorial capital (1864-65). It declined when many miners left the thin deposits for the richer gold of Virginia City. Bannack is now a state park.

Bannatyne, George (bān'atīn), 1545-1608?, collector of Scottish poems. He compiled the Bannatyne MS (1568), the chief collection of Scottish verse of the 15th and 16th cent. The Bannatyne Club was founded in his honor in 1823 for the purpose of publishing old Scottish works.

banner system, Manchu conscription system. Companies of MANCHU warriors were grouped (1601) into brigades, each with a distinctive banner. The banner system integrated former tribal units into a bureaucratic war machine that enabled the Manchus to conquer and rule China as the CH'ING dynasty (1644-1912). Banners (brigades) and their component companies did not live and fight as units but were garrisoned at various places and contributed a certain quota of men to make up a fighting force when needed. Later, banners of Mongol and Chinese adherents were also organized. About 1.5 million bannermen and their families were garrisoned at strategic points and major population centers throughout China. By the 19th cent. corruption and inefficiency pervaded the banner system, forcing the Ch'ing government to rely increasingly on provincial militia.

Banning, resort city (1970 pop. 12,034), Riverside co., S Calif., in a fruit-growing area between Mt. San Jacinto and Mt. San Geronimo, inc. 1913. Electronic equipment, wearing apparel, plastics, and metal

products are manufactured. An annual stagecoach day festival is held, and the city has a stagecoach museum. Nearby are San Bernardino National Forest, a state park, and a Univ. of Southern California art complex.

Bannister, Roger Gilbert, 1929–, British athlete, b. Harrow, England. A physician, on May 6, 1954, at Oxford's Iffley Road track, Bannister became the first man to run the mile in less than 4 min. His time was 3 min 59.4 sec (the old record set by Gunder Haegg of Sweden in 1945 was 4 min 01.4). John Landy of Australia bettered the record, as did New Zealand's Peter Snell. At the British Empire and Commonwealth Games at Vancouver, Canada, on Aug. 7, 1954, Bannister clocked 3:58.8 when defeating Landy in a thrilling race. Bannister retired from active competition in 1954. See his book, *The Four Minute Mile* (1955).

Bannockburn, moor and parish, Stirlingshire, central Scotland, on the Bannock River. Textiles are manufactured in the parish. In 1314 on the moor, a 10,000-man Scots army led by Robert Bruce routed 23,000 Englishmen under Edward II, thus climaxing Robert's struggle for Scottish independence and establishing him as king of the Scots.

Bannock Indians, North American Indians who formerly ranged over wide territory of the N. Great Plains and into the foothills of the Rocky Mts. They were concentrated in 5 Idaho. Their language belonged to the Uto-Aztecan branch of the Aztec-Tanoan linguistic stock (see AMERICAN INDIAN LANGUAGES). Their culture was typical of the Plains Indians. In 1869, Fort Hall Reservation was established for them and for the Northern SHOSHONE INDIANS, with whom the Bannock were closely associated. Loss of hunting lands, disappearance of the buffalo, and lack of assistance from the U.S. government led to a Bannock outbreak in 1878, which was suppressed. The Bannock and the Shoshone at Fort Hall Reservation today number some 3,000. See B. D. Madsen, *The Bannock of Idaho* (1958); R. F. Murphy, *Shoshone-Bannock Subsistence and Society* (1960).

Bannu (ban'noo), town (1961 pop. 31,623), N. Pakistan. It is a district administrative center and an important road junction and market town. The major industries are wool milling and the production of sandals and wooden articles. Bannu, noted for its weekly fair, also has a college affiliated with Peshawar Univ. Founded by Sir Herbert Edwardes in 1848, the town was formerly called Edwardesabad and was a leading British military base, especially against Afghan border tribes. Still an important military station, Bannu is enclosed by a 12 ft (3.7 m) earth wall with 10 iron gates that are closed at sunset.

Banska Bystrica (ban'ska bis'tritsa), city (1970 pop. 46,846), E. central Czechoslovakia, in Slovakia, at the junction of the Bystrica and Hron rivers. It is an industrial center noted for the large plywood, pulp, and veneer factories nearby. An ancient town, Banská Bystrica became well known in the Middle Ages for its surrounding mines. The city was the heart of the Slovak national uprising against German occupation in 1944.

Banstead, urban district (1971 pop. 44,986), Surrey, SE England, on the North Downs. The district is mainly residential and contains some highly regarded landscapes. There is a church from the Norman period and an excavated Roman villa. The area is mentioned in the Domesday Book.

Bantam fowl, see POULTRY.

Banting, Sir Frederick Grant, 1891–1941, Canadian physician, M.D. Univ. of Toronto, 1922. From 1923 he was professor of medical research at Toronto. Working with C. H. Best under the direction of J. J. R. Macleod, he succeeded in isolating (1921) from the pancreas the hormone later called insulin. For this he shared with Macleod the 1923 Nobel Prize in Physiology and Medicine. He was knighted in 1934. Besides his work on insulin, he made valuable studies of the cortex of the adrenal glands, of cancer, and of silicosis and stimulated research in aviation medicine. He was killed in a plane crash while en route to England on a medical war mission. See Seale Harris, *Banting's Miracle* (1946).

Bantry Bay, inlet of the Atlantic Ocean, 21 mi (34 km) long and 4 mi (6.4 km) wide, Co. Cork, SW Republic of Ireland. It is one of Europe's best natural anchorages. At the head of the bay is Bantry, site of a modern facility for unloading oil tankers. Bear and Whiddy islands are in the bay.

Bantu (ban'too) ethnic and linguistic group of Africa, numbering about 70 million. The Bantu inhabit most of the continent S. of the Congo River except the extreme southwest. Physically the Bantu are similar to the Negroes, and there is a wide range of

types, from the near Hamite to the near Negro, the classification is primarily linguistic, and there are almost a hundred Bantu languages, including Luganda, Zulu, and Swahili. Few cultural generalizations concerning the Bantu can be made. Before the European conquest of Africa the Bantu tribes were either pastoral and warlike or agricultural and usually pacific. There were some highly developed Bantu states, including Buganda in present-day Uganda. Possibly under the fear of European encroachment, several additional Bantu confederations developed in the 19th cent., notably the Zulu and the Basuto (in Basutoland). Other well-known Bantu tribes include the Matabele and the Mashona. In South Africa, the term *Bantu* is commonly used to refer to the native African population, which is there subject to the policies of APARTHEID. See W. M. Macmillan, *Bantu, Boer, and Briton* (rev. ed. 1963); M. F. Perham, *Ten Africans* (2d ed. 1964); W. C. Willoughby, *The Soul of the Bantu* (1928, repr. 1970).

Bantu languages, group of African languages forming a subdivision of the Benue-Niger division of the Niger-Congo branch of the Niger-Kordofanian language family (see AFRICAN LANGUAGES). Bantu contains hundreds of tongues that are spoken by 70 million Africans in the Congo Basin, Angola, the Republic of South Africa, Mozambique, Rhodesia, Zambia, Malawi, Tanzania, and Kenya. The total number of Bantu languages, however, is uncertain. In addition to SWAHILI, its most important member, Bantu has among its significant languages Zulu, Xhosa, and Sotho, which are spoken respectively by 4 million, 2 million, and 4 million persons, all living in the Republic of South Africa. Makua and Thonga, the languages respectively of 2 million and 1 million people in Mozambique, Bemba, the tongue of 900,000 in Zambia, Shona, reaching 2 million in Rhodesia and Mozambique, Kikuyu, native to 1 million in Kenya, Ganda, the language of 2 million in Uganda, Ruanda, spoken by 5 million in Rwanda and Zaïre, Rundi, the tongue of 2 million in Zaïre and Burundi, Mbundu, native to 2 million in Angola, Luba, reaching 3 million in Zaïre, Kongo, the language of 1 million in both the Congo and Zaïre, and Lingala, spoken by 700,000 in Zaïre. The word *Bantu* means "the people" and is made up of the stem *-ntu* ("person") and the plural prefix *ba-*. All of the Bantu languages are tonal, except perhaps Swahili. Tones are used to indicate differences in meaning. Grammatically, nouns belong to a number of classes, each of which has its pair of prefixes, one to denote the singular and the other the plural. Linguists have not yet discovered a logical basis for most of the many different noun classes. Although they are not based on sex, these classes have been compared to the genders of Indo-European tongues. The class prefix of a noun is attached to every word that is connected grammatically with this noun, whether adjective, verb, or other part of speech. The following example from Swahili illustrates the nature of such agreement: *m-thu m-zuri*, "handsome man," but *wu-thu wu-zuri*, "handsome men." The Bantu verb consists of a stem to which are added one or more prefixes (with the exception of the imperative) and also one or more suffixes. The verbal suffixes relate to person, number, negation, tense, voice, and mood. Suffixes added to certain stems can form nouns and verbs, especially of a derivational nature. At present Bantu languages are being used to a considerable extent in primary and secondary schools and are developing literatures. See M. A. Bryan, ed., *The Bantu Languages of Africa* (1959); Malcolm Guthrie, *The Classification of the Bantu Languages* (1948, repr. 1967) and *Comparative Bantu* (4 vol., 1967–71).

Banu Musa (ban'oo' moosa'), family of Arab mathematicians and astronomers of the 9th cent. A.D. The name means "sons of Musa" and refers to the three brothers, Muhammad, Ahmad, and al-Hasan. They supervised the translation of Greek scientific works into Arabic and helped to found the Arabic school of mathematics. The most important work ascribed to them is the geometrical treatise *Book on the Measurement of Plane and Spherical Figures*.

Banville, Théodore de (täodör' də bänvél'), 1823–91, French poet. He was one of the group known as the PARNASSIANS. His many volumes of verse, including *Odes funambulesques* (1857) and *Les Exiles* (1866), are characterized by expert technique.

banyan (bän'yan), species of fig (*Ficus bengalensis*) of the family Moraceae (MULBERRY family), native to India, where it is venerated. Its seeds usually germinate in the branches of some tree where they have been dropped by birds. The young plant puts forth aerial rootlets, which, on reaching the ground, take

root to form secondary trunks to support the giant horizontal limbs. Branches from these trunks ultimately send down more such prop roots until the banyan crowds out the host tree and becomes grovelike in appearance, often covering large areas. This undergrowth is sometimes trimmed to form arbors. Alexander the Great is said to have camped under a banyan tree that was big enough to shelter his whole army of 7,000 men. The seeds frequently germinate on walls and buildings, causing considerable damage as does the related strangling fig of tropical America. Banyan is classified in the division MAGNOLIOPHYTES, class Magnoliopsida, order Urticales, family Moraceae.

Banyuwangi: see BANJUWANGI, Indonesia.

baobab (bā'ōbāb', bā'ō-), gigantic tree of India and Africa, exceeded in trunk diameter only by the sequoia. The trunks of living baobabs are hollowed out for dwellings, rope and cloth are made from the bark and condiments and medicines from the leaves, the gourdlike fruit (monkey bread) is eaten. The botanic name is *Adansonia digitata*. An Australian baobab is also called sour gourd. In spite of the enormous girth of the trees, they are not particularly tall, and thus have a bottle-like appearance. Baobab is classified in the division MAGNOLIOPHYTES, class Magnoliopsida, order Malvales, family Bombacaceae.

Bao Dai (bou dī), 1913–, emperor of Annam (1932–45) and chief of state of Vietnam (1949–55). Born Prince Nguyen Vinh Thuy, he was the son of Emperor Khai Din and succeeded to the throne in 1926, but did not occupy it until 1932. Bao Dai cooperated with both the Vichy French and Japanese during World War II but resigned in 1945 when the Viet Minh nationalists under Ho Chi Minh gained widespread acceptance. After extracting concessions from the French, the emperor returned in 1949 as head of state of Vietnam, which included Annam plus Tonkin and Cochinchina. Bao Dai was unable to establish an effective government, however, and following Vietnam's partition (1954) he accepted Ngo Dinh DIEM as prime minister. In 1955 Diem engineered a referendum that abolished the monarchy and assumed control. Bao Dai subsequently lived in exile, primarily in France.

Baphomet (bāf'ōmēt), idol or mystical figure that the KNIGHTS TEMPLARS were accused of worshipping in the 14th cent. Apparently the name was unknown before that time in Western demonology. Its origin is disputed. It may have been a distorted form of Mahomet, it may have been of Greek origin.

baptism [Gr. = dipping], in most Christian churches a SACRAMENT. It is a rite of purification by water, a ceremony invoking the grace of God to regenerate the person, free him or her from sin, and make that person a part of the church. Thus, baptism is usually required for membership in the church. In Roman Catholic and Anglican theology baptism is also held to confer an indelible character on the person, requiring him or her to worship. Formal baptism is performed by immersion (as among the BAPTISTS) or by pouring or sprinkling water on the person to be baptized. This ceremony is accompanied, in churches that accept the dogma of the Trinity, by a formula asking the blessing of Father, Son, and Holy Ghost. In some churches the child is baptized soon after birth and has sponsors (godfather and godmother) who make declarations of faith in his name. The rite is sometimes called christening, and this term is applied especially to the giving of a baptismal name. Other churches withhold baptism until the person is relatively mature. Some Protestant groups, such as the Religious Society of FRIENDS, reject all outward baptismal rites. Similar customs are known in many non-Christian cultures. The baptism of Jesus himself can be considered part of the founding of the Christian Church (Mat. 3, Mark 1:1–11, Luke 3:1–22, John 3:22, 23).

baptistery (bāp'tistērē), part of a church, or a separate building in connection with it, used for administering baptism. In the earliest examples it was merely a basin or pool, set into the floor. Later, the Christian Church set aside a separate structure for the ceremony. The earliest such structure still extant is in the Lateran basilica at Rome, in which, by tradition, Emperor Constantine was baptized (337). Octagonal in plan, it formed a model for many subsequent baptisteries, most of which were octagonal or circular. In the center of the chamber was the sunken pool, often surrounded by columns, with curtains to screen the neophyte during immersion. Early baptisteries are chiefly found in Italy and Asia Minor. In Hagia Sophia there is a 6th-century example still extant. When immersion was no longer practiced, a

separate structure became unnecessary and was supplanted by a place within the church itself, set aside for the purpose. The standing fonts of the Middle Ages and the Renaissance were often objects of superb artistry. In Italy separate baptisteries continued to be built in the 12th to the 15th cent., notably the beautiful Romanesque structures at Florence, Pisa, Siena, and Parma. The baptistery at Florence contains the celebrated bronze doors of Andrea Pisano and of Lorenzo Ghiberti, that at Pisa the pulpit by Nicola Pisano.

Baptists, denomination of Protestant Christians holding a distinctive belief with regard to the ordinance of BAPTISM. There are over 31 million Baptists worldwide. Since 1644 the name has been applied to those who maintain that baptism should be administered to none but believers and that immersion is the only mode of administering baptism indicated in the New Testament. The doctrine and practices of some earlier bodies, such as the Anabaptists and Mennonites, were similar. In Holland a group of English SEPARATISTS, led by John SMYTH, came under Mennonite influence and formed c 1608 in Amsterdam the first English Baptist congregation. Smyth baptized first himself, then the others. In 1611 certain members of this congregation returned to London and established a church there. This was the first of the churches afterward known as General Baptists, since they held the Arminian belief that the atonement of Christ is not limited to the elect only but is general. In 1633 the Particular Baptists were founded. They were a group whose Calvinistic doctrine taught that atonement is particular or individual. Immersion was not yet insisted upon in these churches, but in 1644 seven Particular Baptist churches issued a confession of faith requiring that form of baptism, and Baptist was thenceforth the name given to those who practiced it. In 1891, General and Particular Baptists united into a single body called the Baptist Union of Great Britain and Ireland. In America it was Baptists of the Particular type that first gained influence among the Puritans and Calvinists, when Roger Williams and his companions in Rhode Island rejected infant baptism and established a church in 1639 based on the individual profession of faith. Baptists were later persecuted in New England for opposing infant baptism, and one group emigrated c 1684 from Maine to Charleston, S.C. A group of Separate Congregationalists from New England under Shubael Stearns and Daniel Marshall established (1755) the Separate Baptists in Sandy Creek, N.C. In the Southeast the General Baptist views found acceptance, but the stricter Calvinistic ideas suited the pioneers who settled the Southern mountains after the Revolution. Their opposition to mission work gave them the name Anti-Mission. They were also called Hard Shell or Primitive Baptists. Baptist churches are congregational in matters of government. Such general associations as are formed do not have control over the individual churches. Early missionary activity extended the Baptist movement to the Continent and elsewhere. In the United States the American Baptist Missionary Union (under a longer title) was formed in 1814 to support workers in foreign lands. In 1832 the American Baptist Home Mission Society was organized. When the question of slavery became a dividing wall, the Southern Baptist Convention was established (1845), with its various boards for missions and other activities, it is the largest body, with about 11.6 million members. The American Baptist Convention, organized in 1907, is a delegated body operating through many agencies (until 1950 it was called the Northern Baptist Convention), it has about 1.5 million members. Both support a number of educational institutions and periodicals. The original national organization of black Baptist churches is the National Baptist Convention of the United States of America, it has about 5.5 million members. Separated from that body is the largely black National Baptist Convention of America, this body has about 2.7 million members. Another large body is the National Primitive Baptist Convention, Inc., with about 1.5 million members. The principal conventions agree in doctrine and ecclesiastical order. Some attempts at mergers of these groups (and numerous other, smaller Baptist groups) have been successful. The Baptist World Alliance (formed 1905) holds international congresses regularly. See H. C. Vedder, *Baptist History* (1907), G. F. D. Dobbin, *Baptists* (1958), R. G. Torbet, *A History of the Baptists* (1963), Samuel Hill, *Baptists North and South* (1964), J. E. Tull, *Shapers of Baptist Thought* (1972), Lawrence Davis, *Immigrants, Baptists, and the Protestant Mind in America* (1973).

bar, offshore. see BEACH

Bar, Confederation of, union formed in 1768 at Bar, in Podolia (now in W Ukraine, USSR), by a number of Polish nobles to oppose the interference of Catherine II of Russia in Polish affairs. Headed by the Pulaski family and supported by the Roman Catholic clergy, it sought to defend Polish independence, the Polish constitution, the rights of the landed gentry, and Roman Catholicism. Further, it endeavored to impose Roman Catholicism, as opposed to Orthodox Eastern beliefs, on the serfs of right-bank Ukraine (W of the Dnepr), which was then under Polish rule. Working against the confederation's policies was the Polish king, STANISLAUS II, whose election (1764) had been sponsored by Catherine and who at her request had conceded to non-Catholics the rights of freedom of worship and participation in the Polish government. Incensed by the confederation's hostile intentions toward them, the right-bank Ukrainians rose up (1768) in the rebellion of the Koliyivshchyna (see UKRAINE). Catherine sent Russian forces to suppress the rebellion, however, in the fear that it might spread among serfs under her control. In 1770, the confederation declared King Stanislaus deposed. Supported to a minor degree by France and more effectively by Turkey, which declared war on Catherine, the confederation fought a bitter war against Russia until 1772, when its effective resistance was ended by the First Partition of Poland.

bar, the, originally, the rail that enclosed the judge in a court, hence, a court or a system of courts. The persons qualified and authorized to conduct the trial of cases are also known collectively as "the bar." From late medieval times in England the INNS OF COURT acted as training schools for men who were to plead causes in the courts, and when a student was judged to be trained in competence, he was "called to the bar" of the Inn, automatically he was then judged competent to plead at the bar of the courts. Modern bar associations, through which the legal profession regulates itself, derive from the Inns of Court. ATTORNEYS must be admitted to the bar before they can practice law in the United States. The requirements for admission vary among the states, but generally an applicant must be of good moral character, have completed a stated course of study at a law school, and have passed a bar examination. The last two requirements were once satisfied by clerking and "reading law" with a practicing attorney. A lawyer can be prohibited from practicing law (disbarred) for conduct impeding justice, criminal acts involving moral turpitude, and unethical professional conduct. The first state to allow women admission to the bar was Iowa (1869), and Great Britain admitted women to law practice in 1919. There are about 150 law schools in the United States, the oldest being Harvard Law School, founded in 1817.

Baraba Steppe (barābā'), agricultural district, SW Siberian USSR, between the Ob and the Irtysh rivers. **Barabinsk**, on the Trans-Siberian RR, is the region's chief town. It was founded in the 19th cent.

Barabbas (barāb'ās), bandit held in jail at the time of Jesus' arrest. Pontius Pilate, who annually released a prisoner at Passover, offered to release Jesus, but the people demanded his death and Barabbas' delivery. Mat. 27 15-18, Mark 15 6-15, Luke 23 13-25, John 18 39, 40.

Barabinsk: see BARABA STEPPE

Barachel (bārāk'ēl, bārāk'əl), father of LUHU 2. Job 32 26.

Barachias (bārākī'ās), the same as BERECHIAH

Baracoa (barakō'a), city (1970 pop. 20,926), Oriente prov., SE Cuba, a port near the eastern extremity of the island. Bananas and coffee are exported. Founded c 1512 by the Spanish explorer Diego de Velazquez, Baracoa is the oldest settlement in Cuba.

Barada (bar'ādā), ancient Abana (āb'āna), river, 52 mi (84 km) long, rising in the Anti-Lebanon mts and flowing S to marshy Lake Al Umayyah, SE Syria, forms the Ghutah oasis, site of the city of Damascus. The Barada's waters have been used for irrigation for centuries, fruit orchards, wheat, and vineyards thrive there. Two dams on the Barada generate hydroelectricity and store water for irrigation. See ABANA.

Baradla Caves (bō'rōdlō), three large caves, NE Hungary and SE Czechoslovakia, c 25 mi (40 km) NW of Miskolc, Hungary. Aggtelek and Juvásfo caves are in Hungary, Dobšina is in Czechoslovakia. They are noted for their huge stalactites. Two underground rivers and a lake are found there.

Baraga, Frederic (bār'āga), 1797-1868, Roman Catholic missionary to the Indians of Upper Michi-

gan, b. Slovenia. He received (1821) a law degree from the Univ. of Vienna, and after study at the Larbach seminary he was ordained (1823). As a missionary, he reached (1831) Cincinnati, where he was later (1853) consecrated bishop of Upper Michigan. The seat of that bishopric was Sault Ste. Marie, and in 1865 he was given authority also over the see of Marquette. His authoritative grammar and dictionary of the Ojibwa language are still used by scholars. See biographies by Edward Jacker (1957) and B. J. Lambert (1967).

Baragaon (būr'āgoun), village, Bihar state, E central India. It was the site of Nalanda Univ., which from the 4th to the 12th cent. A.D. was the most famous center of Buddhist learning in India. There are extensive ruins of stupas, monasteries, and temples.

Barahona (baraō'na), city (1970 pop. 37,889), SW Dominican Republic, on Neiba Bay, an arm of the Caribbean Sea. Barahona is a provincial capital. It has a lumber industry and is a commercial and processing center for an agricultural region.

Barak (bār'āk), leader from N Canaan who fought, with DEBORAH, against Jabin and Sisera. Judges 4:1-24. See also BEDAN.

Baranagar (būr'anāgar), city (1971 pop. 131,431), West Bengal state, NE India, on the Hooghly River. It is a suburb of Calcutta.

Baranov, Aleksander Andreyevich (alyiksan'dar āndrā'avyich bārā'nōf), 1747-1819, Russian trader, chief figure in the period of Russian control in Alaska. When his Siberian business faltered, Baranov accepted (1790) an offer to become managing agent of a Russian fur-trading company on Kodiak Island. The organization of the RUSSIAN AMERICAN COMPANY in 1799 made him virtual governor of all Russian activities in North America until 1817, except for a brief challenge by Rezanov. Baranov's dogged determination to keep the settlement going despite Indian attacks and challenges by British and American trading vessels brought steady profits to the company. He was supplanted in 1817 and died en route to Russia. See Hector Chevigny, *Lord of Alaska* (1942), S. R. Tompkins, *Alaska Promyshlennik and Sourdough* (1945), Clarence Hulley, *Alaska Past and Present* (rev. ed. 1953).

Baranovich (barān'ovyechē), Pol. *Baranowicz* (barānōv'chē), city (1970 pop. 107,000), Belorussia, W European USSR. It is a major railway junction and has industries that manufacture machinery, metalware, and textiles. Founded as a railway station in 1870, Baranovich passed from the Soviet Union to Poland in 1920. In 1939, Baranovich again was incorporated into the USSR.

Barante, Amable Guillaume Prosper Brugiere, baron de (ama'blō gēyōm' prōspēr' bruzhyēr' barōn' dā bārānt'), 1782-1866, French statesman and historian. He held numerous administrative and diplomatic posts but retired with the downfall of Louis Philippe (1848). Of his historical works, the best known is a history of the duchy of Burgundy (1824). His *Souvenirs* (8 vol., 1890-1901), published posthumously, have considerable charm and some value as historical source material.

Barany, Robert (rō'bērt bārānē), 1876-1936, Austrian physician. For his work on the physiology and pathology of the vestibular apparatus of the ear he received the 1914 Nobel Prize in Physiology and Medicine. From 1917 until his death he was professor at the Univ. of Uppsala.

Barataria Bay (bārātār'ēa), SE La., separated from the Gulf of Mexico by Grand and Terre Terre islands. It is linked to the Intracoastal Waterway by a navigable channel. The bay is the center of the Louisiana shrimp industry and is trapped for muskrat furs. Oil and natural gas are found in the area, and the bay region is a major source of sulfur. In the early 19th cent. the bay was the headquarters of Jean Lafitte and his pirates.

Barbados (barbā'dōz), island state (1970 pop. 238,141), 166 sq mi (430 sq km), in the West Indies. The capital is BRIDGETOWN. The island, E of St. Vincent, in the Windward Islands, is low and rises gradually toward its highest point at Mt. Hillaby (1,104 ft/336 m). Although there is ample rainfall from June to December, there are no rivers, and water must be pumped from subterranean caverns. The porous soil and moderate warmth are excellent for the cultivation of sugarcane, long the island's major occupation. Other exports include molasses and rum. Commercial fishing is also important. The population of Barbados, about 90% of black African descent, is mostly rural. The healthful and equable climate makes it a very popular tourist resort and tourism is the country's largest source of foreign ex-

change. Although it was probably discovered by the Portuguese and named Los Barbados for the bearded fig trees they found, the first definite settle-



ment was made by English expeditionaries in 1627 (1605, according to local tradition). Barbados remained a British colony until independence was granted in 1966. During the 19th cent. it was the administrative headquarters of the Windward Islands, but in 1885 it became a separate colony. It was a member of the short-lived Federation of the West Indies (1958-62). The island has a parliamentary form of government. It is a member of the Commonwealth of Nations, the Organization of American States, the Caribbean Free Trade Area, and the United Nations. See O. P. Starkey, *The Economic Geography of Barbados* (1939, repr. 1971), R. H. Schomburgk, *The History of Barbados* (1848, repr. 1971).

Barbara, Saint, fl. 3d or 4th cent., virgin martyr, whose life is shrouded in contradictory legends. Her father is said to have shut her up in a tower and then to have killed her for being a Christian. He was struck down by lightning, and by an extended analogy St. Barbara became the patroness of makers and users of firearms and fireworks. She is invoked for a happy death. Feast Dec. 4.

Barbarelli, Giorgio: see GIORGIONE

Barbari, Jacopo de' (yā'kōpō dā bārba'rē), c. 1440-1516, Germano-Dutch painter and engraver, b. Venice. Barbari was a major link between North European and Italian art, his and Dürer's works reveal a mutual influence. After 1500 he was court painter to rulers in principalities in Germany and the Netherlands, painting portraits, genre scenes, and complex allegorical works. He also showed great skill as an engraver, often treating mythological subjects and the nude. Barbari's still life *Dead Bird* (1504) is in Munich. His name is also given as Jacob Walch.

Barbarossa (bar'barō'sā) [Ital., =red-beard], surname of the Turkish corsair Khayr ad-Din (c. 1483-1546). Barbarossa and his brother Aruj, having seized (1518) Algiers from the Spanish, placed Algeria under Turkish suzerainty. He extended his conquests to the rest of the Barbary States. Between 1533 and 1544, as admiral of the Turkish fleet under Sulayman I, he twice defeated Andrea Doria and ravaged the coasts of Greece, Spain, and Italy. His able son Hasan (d. 1572) succeeded him in Algeria. See biography by E. D. S. Bradford (1969).

Barbarossa, Frederick: see FREDERICK I, Holy Roman Emperor

Barbary ape: see MACAQUE

Barbary Coast, waterfront area of San Francisco, Calif., in the years after the 1849 gold rush. Gamblers, gangsters, prostitutes and confidence men flourished, and the brothels, saloons, and disreputable boardinghouses made the Barbary Coast—named after the pirate coast of North Africa—notorious throughout the world.

Barbary States, term used for the North African states of TRIPOLITANIA, TUNISIA, ALGERIA, and MOROCCO. From the 16th cent. Tripolitania, Tunisia, and Algeria were autonomous provinces of the Turkish Empire. Morocco pursued its own independent development. The corsair BARBAROSSA and his brothers led the Turkish conquest to prevent the region from falling to Spain. A last attempt by Holy Roman Emperor Charles V to drive out the Turks failed in 1541. The piracy carried on thereafter by the Muslims of North Africa began as part of the war against Spain. In the 17th and 18th cent., when the Turkish hold on the area grew weaker, the raids

became less military and more commercial in character. The booty, ransom, and slaves that resulted from attacks on Mediterranean towns and shipping and from occasional forays into the Atlantic became the main source of revenue for local Muslim rulers. All the major European naval powers made attempts to destroy the corsairs, and British and French fleets repeatedly bombarded the pirate strongholds. Yet, on the whole, countries trading in the Mediterranean found it more convenient to pay tribute than to undertake the expensive task of eliminating piracy. Toward the end of the 18th cent. the power of the piratical states diminished. The United States and the European powers took advantage of this decline to launch more attacks. American opposition resulted in the TRIPOLITAN WAR. After the Napoleonic wars, European opinion clearly favored destroying the pirates. In 1816 Lord EXMOUTH with an Anglo-Dutch flotilla all but ended the naval power of the dey of Algiers. An ultimatum from the European Congress of Aix-la-Chapelle (1819) compelled the bey of Tunis to give up piracy. The Tunisian fleet was subsequently sent to help the Ottomans in Greece and was destroyed (1827) at the battle of Navarino. In 1830, France, after a three-year blockade of Algiers, began the conquest of Algeria. The Ottoman Turks were able to reassert (1835) direct control over Tripolitania and end piracy there. About the same time the sultans of Morocco who had occasionally encouraged piracy were forced by France, Great Britain, and Austria to give up plans to rebuild the Moroccan fleet, and North African piracy was at an end. See BLAKE, ROBERT, and DUQUESNE ABRAHAM.

Barbault, Anna Letitia (Atkin) (bar'böld), 1743-1825, English poet and editor. In 1774 she married Rochemont Barbault and with him opened a boarding school. Her *Hymns in Prose* for children, widely read and translated into several languages, was followed by *Early Lessons* (both 1781). She edited works of Collins, Akenside, and Richardson and the 50-volume edition of *British Novelists* with short biographies and critical notes.

Barbazan, Arnaud Guillaume, seigneur de (arnō' gēyōm' sānyōr' dā bārbazān'), c. 1360-1431, French general in the Hundred Years War. He was called *le chevalier sans reproche* [the knight without blame]. A leader of the Armagnacs (see ARMAGNACS AND BURGUNDIANS) and a staunch supporter of the dauphin, the future King Charles VII, Barbazan defended (1420) Melun against the English and was held prisoner by them from 1420 to 1430. After his release he fought successfully against the English and Burgundians and was made governor of Champagne and Brice. He died fighting in Lorraine.

barbecue [West Indian or South American], in the United States, traditionally an open-air gathering, political or social, where an ox or a hog is roasted whole over a pit of glowing embers and food and drink are liberally enjoyed. The term *barbecue* also refers to the meat being roasted. In the modern barbecue smaller cuts of meat dipped in or basted with a highly seasoned sauce may be used. As an American institution it seems to be of Southern origin, the word having been used in Virginia prior to 1700.

barbed wire, wire composed of two zinc-coated steel strands twisted together and having barbs spaced regularly along them. The need for barbed wire arose in the 19th cent. as the American frontier moved westward into the Great Plains and traditional fence materials—wooden rails and stone—became scarce and expensive. Of the many early types of barbed wire, that invented in Illinois in 1873 by Joseph F. Glidden proved most popular. The advent of barbed-wire fences on the plains transformed the cattle industry, ending the open range to a large extent and making possible the introduction of blooded cattle. The transformation was not without protests, which often led to bloodshed. In the 20th cent. barbed wire gained importance as an instrument of defense through its use in wartime for entanglements and obstacles. Barbed-wire fences have been replaced in some applications by other types, e.g., woven-wire fences.

barbel: see CARP

Barb  -Marbois, Fran  ois, marq  is de (fr  nswa' m  rk  ' d   b  rb  ' m  rbw  '), 1745-1837, French statesman. He held diplomatic posts in Europe and, during the American Revolution, in the United States. After holding a governmental post in Saint-Domingue (Santo Domingo), he returned to France and was active in the French Revolution. Suspected of royalist sympathies, he was deported (1797) to French Guiana. He was released by Napoleon I, who

made him director and then minister of the treasury. Barb  -Marbois negotiated the treaty by which Louisiana was ceded to the United States. Under the Bourbon restoration he was briefly (1815-16) minister of justice and keeper of the seals. See E. W. Lyon, *The Man Who Sold Louisiana* (1942).

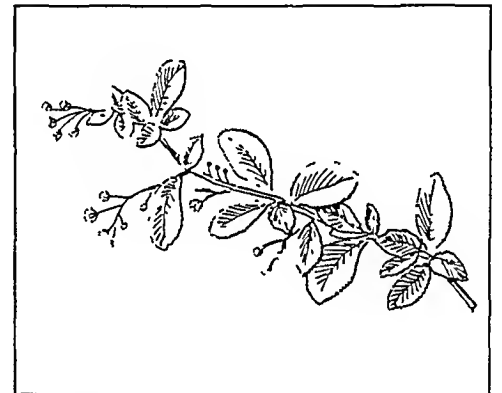
Barber, John Warner, 1798-1885, American engraver, b. East Windsor, Conn. He opened (1823) a business in New Haven, where he produced religious and historical books, illustrated with his own wood and steel engravings. He is best known for books on state, national, and local history, in which his vivid engravings caught the flavor and appearance of city, town, and countryside in his day.

Barber, Samuel, 1910-, American composer, b. West Chester, Pa. Barber studied at the Curtis Institute of Music, Philadelphia. His music is lyrical and generally tonal, his later works are more chromatic and polytonal with striking contrapuntal elements. Among his outstanding works are a setting of Matthew Arnold's "Dover Beach" for voice and string quartet (1931), an overture to *The School for Scandal* (1931), *Adagio for Strings* (1936), two symphonies (1936, 1944), *Capricorn Concerto* for flute, oboe, and trumpet (1944) and a piano concerto (1963, Pulitzer Prize), a ballet, *Medea* (1946), *Knoxville Summer of 1915*, for soprano and orchestra (1947), derived from a segment of James Agee's novel *A Death in the Family*, a modern oratorio, *Prayers of Kierkegaard* (1954), and two operas, *Vanessa* (1956, Pulitzer Prize) and *Antony and Cleopatra* (1966), commissioned to open the new Metropolitan Opera House. See biography by Nathan Broder (1954).

Barberini, Francesco (fr  nch  s'k   b  rb  r  n  ), 1597-1679, Italian prelate and Orientalist, a cardinal of the Roman Catholic Church. He was a founder of the library at Rome noted for rare manuscripts, many of these are now in the library of the Vatican.

Barberini vase: see PORTLAND VASE

barberry, common name for the family Berberidae, and specifically for the spiny barberries (*Berberis* species). The family includes perennial herbs and



Barberry, Berberis vulgaris

shrubs found in the Northern Hemisphere. The fruit is often a colorful, winter-persistent berry. The spiny barberries are primarily Asian in origin. *B. vulgaris*, the common barberry, is naturalized in the United States and is often cultivated for hedges, but it is a host for one stage of wheat rust, a pathogen that destroys the plant. The Japanese barberry (*B. thunbergii*) is resistant. Other members of the family are the blue cohosh or papoose-root (*Caulophyllum thalictroides*), the May apple (genus *Podophyllum*, the common American wild flower is *P. peltatum*), and the Oregon grape (*Mahonia aquifolium*), an evergreen shrub that is the floral emblem of Oregon. The edible berries of these three are sometimes used for condiments and jellies. The barberry family is classified in the division MAGNOLIOPHYTES, class Magnoliopsida, order Ranunculales.

Barberton, city (1970 pop. 33,052), Summit co., NE Ohio, an industrial suburb of Akron, on the Tuscarawas River, inc. 1892. Automobile tires and other rubber products are among its manufactures. Lake Anna is in the city.

Barbey d'Aureville, Jules Am  d  e (zh  l   mad  ' b  rb  ' d  rv  y  '), 1809?-1889, French writer and critic. An aristocrat and monarchist, he supported himself by journalism, his output of critical and polemical articles was enormous. He favored Balzac, early admired Baudelaire, and harshly criticized naturalism. His novels and stories, set in his native Cotentin, are notable portrayals of provincial life.

and tragic struggle. Perhaps best remembered is *Les Diaboliques* (1874, tr 1925), hallucinatory tales with a Satanic motif.

Barbier, Antoine Alexandre (aŋtwaŋ' alɛksaŋ'drɑ barbyɑ'), 1765-1825, French bibliographer and government librarian. Barbier was one of a committee appointed to collect works suppressed by the Revolution. He later became librarian to Napoleon I. His outstanding work was a great bibliography of anonymous and pseudonymous works in French and Latin (1806-8, 3d ed 1872-79).

Barbieri, Giovanni Francesco: see GUERCINO

Barbirolli, Sir John (bɑr' bɑrɔ'lɪ), 1899-1970, English conductor and cellist, b London. After being cellist (1920-24) in the International String Quartet, he organized the Barbirolli String Orchestra. Barbirolli held positions as conductor of the British National Opera Company (1926), the Covent Garden Opera Company (1930-33), the Scottish Orchestra, and the Leeds Symphony (1933-36). In 1937 he succeeded Toscanini as conductor of the New York Philharmonic-Symphony Orchestra (1937-42). After 1943, Barbirolli conducted the Halle Orchestra, Manchester, and was knighted in 1949. He became conductor of the Houston Symphony Orchestra in 1961. Barbirolli was noted for sensitive musical interpretation and for his transcriptions of early music for the modern orchestra. See biographies by Charles Reid and Michael Kennedy (both 1971).

barbiturate (bɑrbɪtʃ'əraɪt'), any one of a group of drugs that act as DEPRESSANTS on the central NERVOUS SYSTEM. High doses depress both nerve and muscle activity and inhibit oxygen consumption in the tissues. In low doses barbiturates act as SEDATIVES, i.e., they have a tranquilizing effect, increased doses have a hypnotic or sleep-inducing effect, and still larger doses have anticonvulsant and anesthetic activity. The mechanism of action on the central nervous system is not known. The barbiturates are all derivatives of barbituric acid, which was first prepared in 1864 by the German organic chemist Adolf von Baeyer. The drugs differ widely in the duration of their action, which depends on the rapidity with which they are distributed in body tissues, degraded, and excreted. Ultrashort-acting barbiturates such as Pentothal are often used as general anesthetics. Seconal and Nembutal are short-acting barbiturates, Amytal is intermediate in duration of action, and Luminal, or phenobarbital, is a long-acting derivative. Barbiturates are commonly used as sleeping pills. Certain personality types may develop a psychological dependency on them that can lead to physiological tolerance and addiction and even death by overdose (see DRUG ADDICTION AND DRUG ABUSE). Barbiturate addicts must be withdrawn from the drug gradually to avoid severe withdrawal symptoms such as convulsions. Although barbiturates have a sedative or tranquilizing action, they are not analgesic, i.e., they do not relieve pain.

Barbizon school, an informal school of French landscape painting that flourished c 1830-1870. Its name derives from the village of Barbizon, a favorite residence of the painters associated with the school. Theodore Rousseau was the principal figure of the group, which included the artists Jules Dupre, Diaz de la Peña, Constant Troyon, and Charles Daubigny. These men reacted against the conventions of classical landscape and advocated a direct study of nature. Their work was strongly influenced by 17th-century Dutch landscape masters including Ruysdael, Cuyp, and Hobbema. Corot and Millet are often associated with the Barbizon group, but in fact Corot's poetic approach and Millet's humanitarian outlook place them outside the development of the school. The Barbizon painters, with their insistence on a relatively straightforward rendering of landscape, helped prepare for the subsequent development of the impressionist schools. Paintings of the Barbizon school were very popular with American collectors of the late 19th and early 20th cent and influenced American painters of this period. The school is well represented in American collections, notably the Corcoran Gallery, the Isaac Delgado Museum of Art, New Orleans, the Metropolitan Museum, and the Museum of Fine Arts, Boston. See American Art Assn, *Master Prints of the Barbizon School* (1970), study by Jean Bouret (tr 1973).

Barbon, Praise-God see BAREBONE, PRAISE-GOD

Barbosa, Ruy (rɔɔ'ɛ barbɔ'sɑ), 1849-1923, Brazilian jurist, writer, and statesman. He was largely responsible for the republican constitution of Brazil and was the champion of law and liberty under recurrent dictatorships. A noted internationalist, he distinguished himself as head of the Brazilian delegation to the 1907 peace conference at The Hague and

was elected (1908) to the World Court. As a writer, Barbosa has been regarded as the greatest stylist in the Portuguese language. See C. W. Turner, *Ruy Barbosa* (1945).

Barbour, John (bɑr'bɔr), c 1316?-1395, Scottish poet. He was archdeacon of Aberdeen from 1355 until his death. His romance, *The Bruce* (1375), celebrating Scotland's emancipation from England, recounts the heroic deeds of Robert I and Sir James Douglas. The poem was meant to be read as history and shows remarkable accuracy. Barbour's authorship of a fragmentary *Troy-Book* and the *Bulk of Alexander* is disputed.

Barbuda, British West Indies. see ANTIGUA

Barca, surname, probably meaning lightning, given members of a powerful Carthaginian family. see HAMILCAR BARCA, HANNIBAL, HASDRUBAL

Barcelona (barsə'lɔ'nə, Span. barthə'lɔ'nə), city (1970 pop 1,745,142), capital of Barcelona prov and chief city of Catalonia, NE Spain, on the Mediterranean Sea. Situated on a plain between the Llobregat and Besos rivers and lying between mountains and the sea, Barcelona is the second largest city of Spain, its largest port, and its chief commercial and industrial center. It is also the seat of a university (founded 1430) and many other educational institutions. Textiles, machinery, automobiles, locomotives, airplanes, and electrical equipment are the chief manufactures. It was founded by the Carthaginians, and, according to tradition, it supposedly derives its name from the great BARCA family of Carthage. The city flourished under the Romans and Visigoths, fell to the Moors (8th cent), and was taken (801) by Charlemagne, who included it in the Spanish March. In the 9th to 10th cent the march became independent under the leadership of the powerful counts of Barcelona, who wrested lands to the south from the Moors, thus acquiring all Catalonia. The counts also won suzerainty over several fiefs in S France. The marriage of Count Raymond Berengar IV to the heiress of Aragon united (1137) the two lands under one dynasty, the title count of Barcelona was subsequently borne by the kings of Aragon, who made the city their capital, and later the kings of Spain. Under its strong municipal government Barcelona vastly expanded both its Mediterranean trade, becoming a rival of Genoa and Venice, and its cloth industry and flourished as a banking center. Reaching its peak around 1400, the city later shared in the general decline of Catalonia, but enjoyed a period of prosperity as the embarkation point of the armies of Emperor Charles V. It was repeatedly (1640-52, 1715, 1808-14) occupied by the French. Barcelona was always the stronghold of Catalan separatism and was the scene of many insurrections. It was the center of the Catalan revolt (1640-52) against Philip IV of Spain. Later it also became the Spanish center of socialism, anarchism, syndicalism, and other radical political beliefs. It was the capital of the Catalan autonomous government (1932-39) and the seat of the Spanish Loyalist government from Oct., 1938, until its fall to Franco on Jan. 26, 1939. Barcelona remains a center of separatism and political liberalism, in the 1950s, it was the scene of sporadic demonstrations against the Franco regime. Present-day Barcelona is the cultural center of Spain. A handsome modern city, it has broad avenues, bustling traffic, and striking new buildings. Its old city, with winding, narrow streets (Roman walls are still visible), has many historic structures, including the imposing Cathedral of Santa Eulalia (14th-15th cent) with its fine cloisters, the Church of Santa Maria del Mar, the city hall, and the *Lonja* or exchange. Also notable is the Church of the Sagrada Família (begun 1882), designed by Antonio Gaudí.

Barclay, Alexander (bɑr'klɑ), 1475?-1552, Scottish clergyman and poet. Although the first to write pastoral eclogues in English, he is best known for *The Ship of Fools* (1509), a translation and elongation of Sebastian Brant's widely popular poem *Das Narrenschiff*.

Barclay, John, 1734-98, minister of the Church of Scotland and founder of the BEREANS or Barclayites. His *Without Faith, without God* (1769) and other works were not acceptable to his presbytery, and he was prohibited from preaching. His adherents then united in independent congregations, and Barclay became minister of the one at Edinburgh. Later he organized a Berean congregation in London.

Barclay, Robert, 1648-90, Scottish apologist for the Society of Friends (Quakers). He wrote many controversial works but is best known for his great treatise *An Apology for the True Christian Divinity*, which appeared in Latin in 1676 and in English two

years later. The duke of York (later James II) granted a patent of the province of East Jersey to 12 members of the Society of Friends, Barclay was nominal governor (1682-88), but he never went to America. His collected works were published in 1692 as *Truth Triumphant*. See biographies by M. C. Cadbury (1912) and D. E. Trueblood (1967).

Barclay de Tolly, Mikhail, Prince (mɛkhəyɛl', bɑr'klɪ' dɑ tɔ'lɪɛ), 1761-1818, Russian field marshal, of Scottish descent. He gained prominence in the Napoleonic Wars, became minister of war in 1810, and commanded the Russian forces against Napoleon in 1812. His policy of continuous retreat into the heart of Russia and his defeat at Smolensk (Aug. 17-18) resulted in his being replaced by Kutuzov, but his successor, recognizing the soundness of the strategy, followed the same policy. After Kutuzov's death (1813) he again commanded the Russian forces and distinguished himself at Leipzig and in the capture of Paris.

Bar Cochba, Simon: see BAR KOKBA, SIMON

bard, in Wales, term originally used to refer to the order of minstrel-poets who composed and recited the poems that celebrated the feats of Celtic chieftains and warriors. The term *bard* in present-day usage has become synonymous with poet, particularly a revered poet.

Bard College, at Annandale-on-Hudson, N.Y., founded 1860 as St. Stephen's College for men, rechartered 1935 as Bard College, became coeducational in 1944, affiliated with Columbia Univ. 1928-44. A small, progressive college, Bard stresses independent study.

Bardeen, John, 1908-, American physicist, b Madison, Wis., grad Univ of Wisconsin (B.S., 1928, M.S., 1929), Ph.D. Princeton, 1936. He was a research physicist at the Bell Telephone Laboratories from 1945 to 1951. In 1951 he became professor of electrical engineering and physics at the Univ of Illinois. He is known for his studies of semiconductivity and other aspects of solid state physics. He shared with Walter H. Brattain and William Shockley the 1956 Nobel Prize in Physics for their work in developing the transistor. He also shared the 1972 Nobel Prize in physics with Leon Cooper and John Schrieffer for development of a theory of SUPERCONDUCTIVITY, becoming the first person to win a Nobel Prize twice in the same field.

Bardesan (bɑrdəsə'nɛz), 154?-222?, Christian philosopher and poet of Syria, missionary among the Armenians. Conflicting traditions report him both as defender of the faith against various Gnostic sects and as a heretic and founder of BARDESANISM.

Bardia see BARDIYAH, Libya

Bardiya or **Bardia** (both bɑrdɪə'a, bɑrdɪə), town, NE Libya, a port on the Mediterranean Sea, near the Egyptian border. During World War II it was the most strongly defended Italian position in the British campaign (Dec., 1940-Feb., 1941) in Libya. The town changed hands several times before being captured permanently by the British in Nov., 1942.

Bardstown, city (1970 pop 5,816), seat of Nelson co., central Ky., SE of Louisville, in a rich farm area, settled 1775, inc. 1788. The city has distilleries, flour and lumber mills, and clothing factories. It was a center for early missionary work in the Mississippi valley and the seat of religious institutions founded by Bishop J. B. M. David, a French missionary. The monument to the American inventor John Fitch, whose grave is there, was erected by the U.S. Congress. Nearby is "Federal Hill" (built 1795-1818), the manor house of John Rowan, it is said that his cousin, Stephen Foster, wrote *My Old Kentucky Home* there. Other places of interest in the area include the Cathedral of St. Joseph (1816-19), which has paintings said to have been given by Louis Philippe of France, and the Abbey of Our Lady of Gethsemane, a Trappist monastery founded in 1848. In the Civil War the city was occupied (Sept., 1862) by Gen. Braxton Bragg's invading Confederate army. The city has wide, tree-lined streets and many early-19th-century houses.

Barebone or Barbon, Praise-God (both bɑr'bɔn), 1596?-1679, English lay preacher and leather merchant. Soon after 1630 he became leader of half of a Baptist congregation that had split over the issue of infant baptism. Barebone favored this practice and wrote a treatise arguing its legitimate scriptural basis. An effective preacher, he attracted large congregations to his house in Fleet Street and acquired a reputation for rabble rousing. He was referred to by his many detractors variously as a Brownist, Anabaptist, and Fifth Monarchy man, but his actual religious beliefs are unclear. In April, 1653, the army dissolved the Rump Parliament, and in July Oliver

Cromwell and his provisional council assembled 140 "godly men" from amongst the nominees of the independent congregations. Barebone was London member in this Nominated Parliament, which was called in derision Barebone's Parliament. Actually his part in the proceedings was insignificant. The body was composed largely of religious reformers who initiated a series of measures regarded as radical by most of their compatriots. The Parliament met from July until December, when the moderate members willingly and the radical members under compulsion resigned their powers into Cromwell's hands. They had accomplished little. Barebone actively opposed the Restoration in 1660 and remained a staunch republican.

Bareilly (bārā'īlē), city (1971 pop. 299,629), Uttar Pradesh state, N central India, on the Ramganga River. It is a district administrative headquarters and a sugar-refining and cotton-trading center. Founded in 1657, Bareilly was the capital (1707-20) of the Hindu Rohilla kingdom. It was ceded to Great Britain in 1801.

Barentsburg (bā'rəntsboörg), town, Spitsbergen island, Svalbard. A coal-mining settlement, it was established (1912) by a Norwegian company. Its mines have been worked by the Dutch (1921-26) and since 1932 by the USSR. It was totally destroyed (Sept., 1943) by German battleships but quickly rebuilt.

Barentsøya (bā'rənts-o'ya) or **Barents Island**, island of Svalbard, 513 sq mi (1,329 sq km), in Barents Sea between Spitsbergen and Edgeøya. The island rises to 1,302 ft (397 m).

Barents Sea, arm of the Arctic Ocean, N of Norway and E USSR, partially enclosed by Franz Josef Land on the north, Novaya Zemlya on the east, and Svalbard on the west. Its waters are warmed by the remnants of the North Atlantic Drift, so that its ports, including Murmansk and Vardö, are ice-free all year. The sea was named for Willem Barentz, the Dutch navigator.

Barentz or Barents, Willem (both vī'ləm bā'rənts), d. 1597, Dutch navigator. He made three voyages (1594, 1595, 1596-97) in search of the Northeast Passage to Asia. He reached Novaya Zemlya on the first two expeditions. On the third he accidentally discovered Spitsbergen, rounded the north point of Novaya Zemlya, and was caught in the ice. After the arctic winter the crew started for the mainland in two small boats. Barentz died on the way. The extent of his explorations and the accuracy of his charts made him one of the most important of all arctic explorers. The meteorological data that Barentz collected is still consulted today.

Barere de Vieuxaz, Bertrand (bèrrān' bārē' də vyozak'), 1755-1841, French revolutionary. A member of the Revolutionary National Assembly and of the Convention, he moved from a moderate to a radical stand, voting for the execution of King Louis XVI. He was a member of the Committee of Public Safety, the dictatorial body that ruled France for a time during the Revolutionary Wars. When the moderates in the Convention turned against Maximilien ROBESPIERRE, one of the leaders of the committee and perpetrator of the REIGN OF TERROR (June, 1794), Barere deserted his colleague. Nevertheless, Barere was imprisoned for his role in the Terror. Escaping from prison, he remained in hiding for several years but reappeared as a secret agent of Emperor Napoleon I. Banished (1815) after the Bourbon restoration, he returned in the reign of Louis Philippe. He left memoirs. See biography by Leo Gershow (1962).

Baretti, Giuseppe Marc'Antonio (jōzēp'pā markāntō'nyō bārēt'tē), 1719-89, Italian writer and lexicographer. Baretti held various official positions in several Italian cities while making regular contributions to periodicals. In 1751 he went to London, where he was active in literary and cultural circles and where he wrote an Italian grammar and a biographical dictionary of Italian authors. His *Dictionary of the English and Italian Languages* (1760) remained the best of its kind until the 20th cent. Returning to Italy in 1760, Baretti published a bi-monthly iconoclastic review of books, *La Frusta letteraria* [the literary scourge]. The Venetian government eventually suppressed the journal, and Baretti returned to London, where he published amusing and perceptive descriptions of his travels. He is considered largely responsible for the popularity of Italian literature in England in the 18th cent.

Barfrush, see BABOL, city, Iran.

barge, large boat, generally flat-bottomed, used for transporting goods. Most barges on inland waterways are towed, but some river barges are self-propelled. There are also sailing barges. On the Great

Lakes and in the American coastal trade, huge steel barges are used for transporting bulk cargoes such as coal. Large flat-bottomed barges called *lighters* are used for transporting cargo to or from a vessel that cannot be berthed at a pier or dock, LASH (for lighter-aboard ship) vessels are equipped to receive and unload lighters on board and thus reduce the time spent in port. Barge towing, done in the past by men or by horses or mules, is now accomplished mostly by steam or motor tugboat or by other, self-propelled barges. In use since the dawn of history, barges were common on the Nile in ancient Egypt. Some were highly decorated and used for carrying royalty, use of such state barges persisted in Europe until modern times.

Bargello (barjē'lō), 13th-century palace in Florence, Italy, which houses the national museum. Once the residence of the highest city official but later used as a prison and as the office of the chief of police (*bar-gello*), it was restored in 1859 to receive the art treasures of the city. The Bargello is famous for its courtyard and its Renaissance sculptures, including works by Michelangelo, Verrocchio, Donatello, the Della Robbias, Cellini, and others.

Barham, Richard Harris (bār'əm), pseud. **Thomas Ingoldsby** (īng'gəlbzē), 1788-1845, English humorist, grad Oxford. Ordained a minister in 1813, he became a minor canon of the Chapel Royal in 1824. In 1837 he began in *Bentley's Miscellany*, under his pseudonym, a series of parodies of country superstitions, medieval legends, and contemporary foibles. Barham had a lively invention, a gift of creating suspense, and an unusually discerning sense of the ludicrous. *The Ingoldsby Legends* were first published in book form in 1840.

Bar Harbor, town (1970 pop. 3,716), SE Maine, on MOUNT DESERT ISLAND and on Frenchman Bay, settled 1763, inc. 1796. It was one of the most famous resorts in New England during the 19th cent. Bar Harbor is a port of entry, with ferry connections to Yarmouth, N.S., during the summer. In Oct., 1947, a large part of the town was destroyed by a forest fire. Acadia National Park, which covers most of Mount Desert Island, is nearby.

Bar-Hebraeus, Gregorius (bār-hēbrē'ās), 1226-86, Syrian scholar, bishop of the JACOBITE CHURCH. Partly Jewish in ancestry, his original name was Abu-l-Faraj. His most celebrated work is a chronicle in Syriac of the world from Adam down. His commentaries (in Arabic and Syriac) on Aristotle were widely known among Arabic-speaking scholars.

Barhumite (barhyō'mīt, bār'hyō-) see BAHURIM.

Barì (bā'rē), city (1971 pop. 356,733), capital of Bari prov. and of Apulia, S Italy, on the Adriatic Sea. It is a major seaport and an industrial and commercial center. Manufactures include chemicals, textiles, printed materials, and petroleum. Probably of Illyrian origin, Bari became a Greek and then a Roman colony. It later was controlled by the Goths, the Lombards, and the Byzantines. The Normans conquered Bari in 1071. The city became the chief city of Apulia, and many Crusaders sailed from there. Enfeoffed to the kingdom of Naples, Bari, during the Middle Ages, was a duchy ruled by powerful lords, including the Hohenstaufens and the Sforzas of Milan. It was badly damaged in World War II. Noteworthy buildings include the Romanesque basilica (1087-1197), a major place of pilgrimage, with relics of St. Nicholas of Bari (see NICHOLAS, SAINT), the Romanesque cathedral (12th cent.), and the Hohenstaufen castle (1233). The city has a university founded in 1924.

Bariah (bār'ā), one of the house of David. 1 Chron. 3:22.

Barim, island, Arabia. see PERIM.

Baring, British family of bankers. Sir Francis Baring (1740-1810) founded (1763) the John and Francis Baring Company, which he renamed Baring Brothers and Company in 1806. At first the firm acted as import and export agents for others, but it soon became an independent merchant bank. Sir Francis, a close associate of William Pitt the Younger, helped finance the Napoleonic Wars and underwrote marine insurance. He was succeeded by his son Alexander Baring (later 1st Baron Ashburton, 1774-1848), who was a pioneer in the financing of United States trade. He was (1834) president of the Board of Trade in the first administration of Sir Robert Peel and was raised to the peerage in 1835. He was the British commissioner sent to the United States in 1842 to negotiate the WEBSTER-ASHBURTON TREATY. The family continued to manage the firm and by 1890 its importance to the British government was such that the Bank of England guaranteed their debts to save

them from bankruptcy when Argentina defaulted (1890) on bond payments. Members of the Baring family were also notable public servants. The more important members of the family include Thomas George Baring, 1st earl of Northbrook (1826-1904), a Liberal statesman who served as a successful viceroy of India (1872-76), Evelyn Baring, 1st earl of CROMER, Maurice BARING (1874-1945), author, and George Rowland Stanley Baring, 3d earl of Cromer, (1918-), governor of the Bank of England (1961-66) and ambassador to the United States (1971-74). The family still controls Baring Brothers and Company. See R. W. Hidy, *The House of Baring in American Trade and Finance, 1763-1861* (1949).

Baring, Maurice (bār'ing), 1874-1945, English author. After a career in the diplomatic service, he turned to journalism in 1904. A war correspondent during the Russo-Japanese War, he wrote several books on Russia, including *A Year in Russia* (1905-6) and *The Russian People* (1911). In 1919, following service as staff officer in World War I, he began writing novels. His chief books include *C* (1924), *Daphne Adeane* (1926), and *Tinker's Leave* (1927). He also wrote poetry and plays.

Barisal (barī'sāl'), city (1969 est. pop. 79,300), S Bangladesh, on the Ganges River delta. It is an important river port, a transshipment point for jute and rice, and a market for betel nuts and fish. There are also flour, rice, oilseed, and jute mills. Barisal has three colleges affiliated with the Univ. of Dacca. The "Barsal guns," unexplained sounds resembling distant thunder or cannon, are a curious local phenomenon, they may have a seismic origin.

Barisan (barē'san'), volcanic mountain range, c. 1,000 mi (1,600 km) long, paralleling the western coast of Sumatra island, Indonesia. It rises to Mt. Kerintji (12,467 ft/3,800 m high). Numerous lakes are found in the mountains, including Toba, the largest in Indonesia.

barite (bār'it), **barytes** (bār'ītēz) [New Lat., from barium], or **heavy spar**, a white, yellow, blue, red, or colorless mineral. It is a sulfate of barium, BaSO₄, found in nature in tabular crystals or in granular or massive form. The mineral is abundant and is found widely distributed throughout the world. It occurs often mixed with other minerals in veins. It is insoluble in water, and this property is made use of in testing for the SULFATE radical. It is practically insoluble under ordinary conditions in all the usual chemical reagents. Barite is used as a commercial source of barium and many of its compounds. Ground barite is used as a filler in the manufacture of linoleum, oilcloth, rubber, and plastics. Finely ground barite is used to make a thixotropic mud for sealing oil wells during drilling. Prime white, a bleached barite, is used as a pigment in white paint but is not as satisfactory as blanc fixe, a chemically precipitated barium sulfate, or LITHOPONE, a mixture of barium sulfate, zinc sulfide, and zinc oxide.

Barito (barē'tō), river, c. 550 mi (890 km) long, rising in the mountains of central Borneo, Indonesia, and flowing generally S to the Java Sea. Banjarmasin is the head of ocean-going navigation. The wide floodplain of the lower Barito is intensely cultivated and contains one of Indonesia's largest rubber plantations.

baritone or **barytone** (both bār'itōn), male VOICE, in a lighter and higher range than a bass but lower than a tenor. The term is also an alternate name for the viola da gamba.

barium (bār'ēəm) [Gr., =heavy], metallic chemical element, symbol Ba, at no 56, at wt 137.34, m.p. probably about 850°C, b.p. probably about 1140°C, sp. gr. 3.5 at 20°C, valence +2. Barium is a soft, silver-white, chemically active, poisonous metal with a face-centered cubic crystalline structure. It is an ALKALINE-EARTH METAL in group IIa of the PERIODIC TABLE. Its principal ore is BARITE (barium sulfate), it also occurs in the mineral witherite (barium carbonate). The pure metal is obtained by the electrolysis of fused barium salts or, industrially, by the reduction of barium oxide with aluminum. Barium is often used in barium-nickel alloys for spark-plug electrodes and in vacuum tubes as a drying and oxygen-removing agent. Barium oxidizes in air, and it reacts vigorously with water to form the hydroxide, liberating hydrogen. In moist air it may spontaneously ignite. It burns in air to form the peroxide, which produces hydrogen peroxide when treated with water. Barium reacts with almost all of the nonmetals, all of its water-soluble and acid-soluble compounds are poisonous. Barium carbonate is used in glass, as a pottery glaze, and as a rat poison. Chrome yellow (barium chromate) is used as a paint pigment and in safety matches. The chlorate and nitrate are used in

pyrotechnics to provide a green color. Barium oxide strongly absorbs carbon dioxide and water; it is used as a drying agent. Barium chloride is used in medicinal preparations and as a water softener. Barium sulfide phosphoresces after exposure to light; it is sometimes used as a paint pigment. Barite, the sulfate ore, has many industrial uses. Because barium sulfate is virtually insoluble in water and acids, it can be used to coat the alimentary tract to increase the contrast for X-ray photography without being absorbed by the body and poisoning the subject. Barium salts give a characteristic green color in the FLAME TEST. Barium metal was first isolated in 1808 by Sir Humphry Davy by electrolysis.

barium sulfate: see **BARITE**

Bar-jesus, called **Elymas** (ēl'īmās), Jewish sorcerer at Paphos who tried to divert a prospective Christian convert and was cursed with blindness. Acts 13 6-12.

Bar-jona (bar-jō'nə), patronymic of St. Peter. Mat 16:17. Peter's father is called Jonas (KJV) and John (RSV). John 21:15,16,17. He is called Jona (KJV) in John 1:42.

bark, outer covering of the stem of woody plants, composed of waterproof cork cells protecting a layer of food-conducting tissue—the phloem or inner bark (also called bast). As the woody stem increases in size (see **CAMBIUM**), the outer bark of inelastic dead cork cells gives way in patterns characteristic of the species. It may split to form grooves, shred, as in the cedar, or peel off, as in the sycamore or the shagbark hickory. A layer of reproductive cells called the cork cambium produces new cork cells to replace or reinforce the old. The phloem (see **STEM**) conducts sap downward from the leaves to be used for storage and to nourish other plant parts. "Girdling" a tree, i.e., cutting through the phloem tubes, results in starvation of the roots and, ultimately, death of the tree; trees are sometimes girdled by animals that eat bark. The fiber cells that strengthen and protect the phloem ducts are a source of such textile fibers as hemp, flax, and jute; various barks supply tannin, cork (see **CORK OAK**), dyes, flavorings (e.g., cinnamon), and drugs (e.g., cocaine and quinine). The outer bark of the paper birch was used by the American Indians to make baskets and canoes.

bark or barque (both *bark*), sailing vessel with three masts, of which the mainmast and the foremast are square-rigged while the mizzenmast is fore-and-aft-rigged. Although the word was once used to mean any small boat, later barks were sometimes quite large (up to 6,000 tons). In addition to the standard three-masted bark there are also four-masted barks (fore-and-aft-rigged on the aftermast) and barkentines, or three-masted vessels with the foremast square-rigged and the other masts fore-and-aft-rigged. Large numbers of barks were employed in carrying wheat from Australia to England before World War I, and in 1926 the bark *Beatrice* sailed from Fremantle, Western Australia, to London in 86 days.

bark cloth, primitive fabric made in tropical and subtropical countries from the soft inner bark of certain trees. It has been made and used in parts of Africa and India, the Malay Peninsula, Samoa, the Hawaiian Islands, and the Fiji Islands and perhaps reached its highest perfection in Polynesia and parts of Central America. Lengths of branches or of young stems are cut from trees, such as the fig, the breadfruit, or the paper mulberry. The outer bark is removed, the inner bark is cut in narrow strips and then alternately soaked and beaten with a grooved or carved wooden mallet, or beetle, until the fibers are well matted and become thin and flexible. Gum is sometimes added, and pieces may be joined and beaten together to form large sheets. The peeling and beetling are usually done by the men, the decorating, by the women. Patterns, often elaborate, may be sketched or may be applied by block printing or by leaves dipped in dye and pressed on the cloth. The cloth may be gummed or oiled to make it waterproof. Tapa cloth is a fine variety made in the Pacific islands. Bark cloth is used for loincloths, skirts, draperies, and wall hangings; in thick layers it makes an excellent bed. So ancient is the art of making the cloth that it is deeply involved in religious and ceremonial life. In Borneo a strip of the cloth signifies mourning. In Malawi it has traditionally formed the initiation dress of girls. In India some sects prescribe bark cloth as the dress of a religious recluse.

Barker, Eugene Campbell, 1874-1956, American historian, b. Walker Co., Texas. His distinguished teaching career, begun in 1899, was almost entirely at the Univ. of Texas. An outstanding social historian, Barker wrote about the period of American set-

tlement in Texas and about the Texas Revolution. Notable among his works are a biography of Stephen F. Austin (1925, repr. 1968), *Mexico and Texas 1821-1835* (1928, repr. 1965), and an edition (with Amelia W. Williams) of the writings of Sam Houston (8 vol., 1938-43, repr. 1969). See biography by W. C. Pool (1971).

Barker, George (George Granville Barker), 1913-, English poet, b. Essex, England. He has taught in Japan and the United States as well as in England. His highly dramatic poems are often concerned with themes of remorse and pain. Barker's published works include *30 Preliminary Poems* (1933), *Eros in Dogma* (1944), *News of the World* (1950), *The True Confession of George Barker* (1950), *Collected Poems* (1957), *The View From a Blind I* (1962), *Thurgarton Church* (1969), and *The Alphabetical Zoo* (1972).

Barker, Harley Granville: see **GRANVILLE-BARKER**

Barker, James Nelson, 1784-1858, American playwright, b. Philadelphia. In 1838, Van Buren appointed him comptroller of the Treasury, and with slight interruptions he worked in the Treasury Dept. until his death. He wrote 10 plays, five of which have survived in print. The best were *The Indian Princess* (1808), *The Court of Love* (1836, pub. in 1817 as *How to Try a Lover*), and *Superstition* (1824), a tragedy set in colonial New England. His dramatization (1812) of Scott's *Marmion* had extraordinary success on the stage for 30 years. Aside from his merits as a dramatist, Barker is important for his use of American material and themes, unusual in his period. See biography by P. H. Musser (1929, repr. 1970).

Barking, borough (1971 pop. 160,499), Greater London, SE England. Barking was created in 1965 by the merger of portions of the municipal boroughs of Barking and Dagenham. The borough has a power plant and a Ford Motor Company plant as well as engineering, chemical, paint, wood, and other industries. The remains of a Benedictine abbey (c. 670) are there.

Barkla, Charles Glover (glū'vər bā'klə), 1877-1944, English physicist. He was professor of natural philosophy at Edinburgh from 1913. For his discovery of the characteristic X rays of elements he received the 1917 Nobel Prize in Physics. He evolved the laws of X-ray scattering and the laws governing the transmission of X rays through matter and excitation of secondary rays.

Barkley, Alben William, 1877-1956, Vice President of the United States (1949-53), b. Graves Co., Ky. After being admitted (1901) to the bar, he served as prosecuting attorney (1905-9) and judge (1909-13) for McCracken Co., Ky., and was U.S. Representative (1913-27) and U.S. Senator (1927-49) from Kentucky. A loyal Democrat, he was majority leader in the Senate from 1937 to 1946. He became Vice President under Truman in 1948. In 1954, Kentucky returned him to the Senate. See his autobiography, *That Reminds Me* (1954).

Bar Kokba, Simon, or Simon Bar Cochba (kōk'ba) [Heb. =son of the star], d. A.D. 135, Hebrew hero and leader of a major revolt against Rome under Hadrian (132-135). He may have claimed to be a Messiah, the Talmud relates that Akiba ben Joseph credited him with this title. His personality and the facts of his life are surrounded by legend. He is sometimes called Simon the Prince of Israel. At first he successfully defeated the Roman armies, but the tide turned against him with the victories of the Roman general Julius Severus, and he was killed at Bethar. Israeli archaeologists have found a number of letters in his handwriting.

Barkos (bā'kōs), ancestor of a family of Nethinim. Ezra 2:53, Neh. 7:55.

Barlaam and Josaphat (bā'laəm, jō'səfāt), legend popular in medieval times. It corresponds in part to the legend of Buddha. Versions of the story have been found in nearly every language. At the birth of Josaphat (or Josaph), the son of the Indian king Abenner, it was prophesied that the young prince was destined for greatness not as a royal leader but as a holy man. The king did all that was possible to stop the prophecy from coming true, but the prince, through the teachings of the monk Barlaam, was converted to religion (according to Western legend, Christianity). After the death of Abenner, Josaphat abdicated the throne and lived out the remainder of his days with Barlaam, as a religious recluse. See the standardized Greek text with translation by G. R. Woodward and Harold Mattingly (1914).

Barlach, Ernst (ēmst bār'lakh), 1870-1938, German expressionist sculptor, graphic artist, and writer. After studying at the Dresden Art Academy he lived in

Paris (1895-96) and in Berlin, Hamburg, and other German cities. A trip to Russia in 1906 gave him impetus to his art. Barlach pioneered in the introduction of expressionism into Germany. Though the power of his simple, angular, and compact forms, he communicated intense emotion and compassion. From clay modeling he turned to working in carving and woodcutting. Many of his works were destroyed by the Nazis, however, some remain. In Lüneburg and the Busch-Reisinger Museum, Cambridge, Mass., Barlach illustrated some of his plays and plays. See his *Three Plays* (tr. 1964), study by Carl D. Carls (1969).

Bar-le-Duc (bar-la-duk'), town (1968 pop. 20,384), capital of Meuse dept., NE France, in Lorraine. It has textile mills, iron foundries, printing plants, and metallurgical and food-processing industries. Situated in the picturesque Ornain valley, Bar-le-Duc has preserved many old houses (16th, 17th, and 18th cent.). It has a 15th-century church and one from the 13th and 14th cent. It was the capital of the county (later duchy) of Bar, an irregularly shaped area stretching from the Marne to the Luxembourg frontier. The duchy passed (15th cent.) to René of Anjou, later also duke of Lorraine. Bar thereafter shared the history of Lorraine, with which it passed to France in 1766.

Barletta (barlēt'a), city (1971 pop. 75,329), Apulia, S. Italy, on the Adriatic Sea. It is a seaport and a commercial and industrial center. Salt is mined nearby, and wine is produced. Barletta passed to the Goths after the fall of the Roman Empire. Later controlled by the Byzantines and the Lombards, it became a Norman city in the later 12th cent. and prospered (14th-15th cent.) with its large merchant fleet. Noteworthy buildings include the Romanesque-Gothic cathedral (12th-14th cent.), the Church of Santo Sepolcro (13th cent.), and a castle (mainly 13th cent.).

barley, annual cereal plant (*Hordeum vulgare* and sometimes other species) of the family Gramineae (GRASS family), cultivated by man probably as early as any cereal. It was known to the ancient Greeks, Romans, Chinese, and Egyptians and was the chief bread material in Europe as late as the 16th cent. It has a wide range of cultivation and matures even at high altitudes, since its growing period is short, however, it cannot withstand hot and humid climates. Today barley is typically a special-purpose grain with many varieties rather than a general market crop. It is a valuable stock feed (often as a corn substitute) and is used for malting when the grain is of high quality. It is a minor source of flour and breakfast foods. Pearl barley is often used in soups. In the Middle East a limited amount of barley is eaten like rice. In the United States most spring barley comes from the western states and most winter barley is grown in the southeastern states for autumn and spring pasture and as a cover crop. Barley is subject to several diseases including smut and rust. Barley is classified in the division MAGNOLIOPHYTES, class Liliatae, order Cyperales, family Gramineae.

Barlow, Joel, 1754-1812, American writer and diplomat, b. Redding, Conn., grad. Yale, 1778. He was one of the CONNECTICUT WITS and a major contributor to their satirical poem *The Anarchiad* (1786-87). His own epic, *The Vision of Columbus* (1787), brought him fame in America and Europe and was revised later as *The Columbiad* (1807). Inspired by his friend Thomas Paine, he wrote *Advice to the Privileged Orders* (1792), urging that the state must represent not a class but the people and must be responsible for the welfare of the individual. His *Letter to the National Convention of France on the Defects in the Constitution of 1791* won him French citizenship. His best-known lighter work is a mock eulogy, *The Hasty-Pudding* (1793). Appointed U.S. consul to Algiers in 1795, Barlow succeeded in releasing many American prisoners and in negotiating treaties with Algiers, Tunis, and Tripoli. Sent to Europe in 1811 to negotiate a commercial treaty with Napoleon I, he was caught in the disastrous retreat of the armies from Moscow and died from exposure. See biography by J. L. Woodress (1958, repr. 1969).

Barmecides: see **HARUN AR-RASHID**

Bar Mitzvah (bar mīts'və) [Aramaic, =son of the Commandment], Jewish ceremony in which the young male is initiated into the religious community and performs his first act as an adult, the reading in the synagogue of a part of the weekly portion of the Torah. According to a tradition dating to the Talmudic period, this is to be done at the age of 13 years and a day. Today the ceremony consists of two parts, the religious rite that surrounds the reading and the social celebration that follows it, which is

considered a Seudat Mitzvah, a feast in celebration of the fulfillment of a commandment. The 20th cent has seen the introduction of the Bas, or Bat, Mitzvah, a comparable ceremony for the young female, by the Reform and Conservative groups and to a much lesser extent by the Orthodox. The exact nature of both the Bar and Bas Mitzvah ceremonies varies from community to community according to local traditions (e.g., Ashkenazic, Sephardic, Oriental).

barn, abbr b, in physics, unit of nuclear cross section, i.e., the effective target presented by a NUCLEUS for collisions leading to nuclear reactions, it is equal to 10^{-24} square centimeters. The barn is approximately the size of the geometric cross section of an atomic nucleus, the term was coined because an effective cross section that large would present a target "as big as a barn," i.e., an easy target for nuclear bombardment. In practice, effective cross sections of nuclei for many reactions are measured in millibarns (10^{-3} barn) because, for most interactions, only a small fraction of collisions cause reactions.

Barnabas, Saint (bār'nābas), Christian apostle. He was a Cypriot and a relative of St. Mark, his forename was Joseph (or Joseph). Barnabas was a founder of the church at Antioch and was the companion of St. Paul on his first missionary journey. Acts 4:36, 37, 9:27, 11:22-30, 12:25, 13-15, 1 Cor 9:6, Gal 2:19, 13, Col 4:10. He is said to have been martyred in Cyprus. One of the oldest Christian PSEUDEPIGRAPHS is an epistle attributed to Barnabas. Feast June 11.

barnacle, common name of the sedentary crustacean animals constituting the subclass Cirripedia. Barnacles are exclusively marine and are quite unlike any other crustacean because of the permanently attached, or sessile, mode of existence for which they are highly modified. Typical barnacles attach to the substrate by means of an exceedingly adhesive cement, produced by a cement gland, and secrete a shell, or carapace, of calcareous (limestone) plates, around themselves. Colonies of such barnacles form conspicuous encrustations on wharves, boats, pilings, and rocky shores. They range in length from under 1 in. (2.5 cm) to 30 in. (75 cm). Their shells are commonly yellow, orange, red, pink, or purple, sometimes with striped patterns. Because of their sedentary life and enclosing shells, barnacles were thought to be mollusks until 1830, when their larval stages were discovered. Much of what is known about barnacles is the result of research by Charles Darwin, who published a monumental work on the subject in the 1840s. Barnacles with a calcareous shell (order Thoracica) include the gooseneck barnacles, which are attached to the substrate by means of a stalk, or peduncle, and the acorn, or rock, barnacles, which are attached directly to the substrate. The stalk of gooseneck barnacles is simply an elongation of the attached end of the animal's body. In some gooseneck barnacles the stalk as well as the body is covered by calcareous plates, in others it is a naked leathery or horny structure. A gooseneck barnacle found in large numbers on ships and pilings is *Lepas*, which has a leathery stalk and flattened shell and looks rather like a small clam attached by its siphon. *Balanus* is an acorn barnacle commonly found on rocks; it has a thick conical shell attached at its wide base, with an opening at the top. As in many of the acorn barnacles, the plates of the surrounding carapace form an impenetrable wall, and the opening is equipped with two movable plates that can be pulled down to close off the body completely. In both gooseneck and acorn barnacles the feathery legs of the animal may sometimes be seen protruding through the carapace opening. When the animal feeds, these jointed legs, called cirri, sweep organic particles and minute planktonic organisms toward the mouth, which is located deeper inside the shell. The attached end of the animal is its anterior, or head region. The barnacle has been described as a shrimplike animal standing on its head in a limestone house and kicking food into its mouth with its feet. Barnacles lack gills, gas exchange occurs through the cirri and the body wall. Some shelled barnacles are commensal, attaching themselves to living animals, such as whales, porpoises, turtles, crustaceans, and echinoderms. The gooseneck barnacle *Conchoderma* may be found growing on the acorn barnacle *Coronula*, which grows on the skin of whales. Besides the shelled barnacles there are naked barnacles (orders Acrothoracica and Rhizocephala), which live on, and in some cases parasitize, other invertebrate animals. There are also shell-less boring barnacles (order

Acrothoracica), which live inside holes that they drill in shells and corals. Although nearly all other crustaceans have separate sexes, most barnacles are HERMAPHRODITES, with cross-fertilization between adjacent individuals being the rule. Some species, however, have dwarf males, which are parasitic on female or hermaphroditic individuals. The fertilized egg develops into a free-swimming larva, called a nauplius larva, of the basic crustacean type, with paired antennae. This form then molts to become a cypris, or bivalve, larva, which eventually attaches itself to a suitable substrate by its first pair of antennae and undergoes METAMORPHOSIS into an adult. Barnacles are economically significant because they settle on ship hulls and harbor installations, the resulting encrustation of the ships greatly increases friction, diminishing speed and increasing fuel consumption. Ships are treated with plastic coating or with antifouling paints containing copper or mercury to prevent or diminish encrustation. Barnacles are classified in the phylum ARTHROPODA, class Crustacea, subclass Cirripedia.

Barnard, Christian Neething, 1923-, South African surgeon. The son of a Dutch Reformed minister, Barnard studied medicine at the Univ. of Cape Town (M.B. 1946, M.D. 1953), then came to the United States in 1955 to improve his surgical technique under Owen H. Wangenstein at the Univ. of Minnesota. While in Minneapolis he performed his first heart operation. Returning to Cape Town, he was appointed director of surgical research at the Groote Schuur Hospital, where he made medical history on Dec. 3, 1967, when he completed the first human heart transplant. Barnard designed artificial heart valves, wrote extensively on the subject of congenital intestinal atresia, and developed surgical procedures relating to organ transplants. See Peter Hawthorne, *The Transplanted Heart* (1968) and L. E. Leopold, *Dr. Christian N. Barnard, The Man With the Golden Hands* (1971).

Barnard, Edward Emerson, 1857-1923, American astronomer, b. Nashville, Tenn., grad. Vanderbilt Univ., 1887. From 1887 to 1895 he was astronomer at Lick Observatory in California, and from 1895 he was professor of practical astronomy at the Univ. of Chicago and astronomer at Yerkes Observatory. The discoverer of 16 comets, Jupiter's fifth satellite (1892), and BARNARD'S STAR (1916), he was given distinguished recognition by the Academy of Sciences of France and the Royal Astronomical Society of Great Britain. His photographs of comets, planets, nebulae, and the Milky Way are notable contributions to astronomy.

Barnard, Frederick Augustus Porter, 1809-89, American educator and mathematician, b. Sheffield, Mass., grad. Yale, 1828. After tutoring at Yale and teaching in institutions for the deaf and mute, he joined the faculty of the Univ. of Alabama, serving as professor of mathematics and natural philosophy (1837-48) and as professor of chemistry and natural philosophy (1848-54). From 1854 to 1856 he was professor of mathematics and natural philosophy at the Univ. of Mississippi. He served there as president (1856-58) and chancellor (1858-61), but resigned at the outbreak of the Civil War to return to the North. After a period of research in astronomy and after work as head of the map and chart department of the U.S. Coast Survey, he was selected to succeed Charles King as president of Columbia College (now Columbia Univ.) During his long administration (1864-89), Columbia grew from a small undergraduate college of 150 students into one of the nation's great universities, with an enrollment of 1,500. He was instrumental in expanding the curriculum, adding departments and fostering the development of the School of Mines (founded 1864, now included in the School of Engineering). He extended the elective system and advocated equal educational privileges for men and women. Barnard College, the woman's undergraduate unit of Columbia, was named for him and opened shortly after his death. Barnard was active in founding the American Association for the Advancement of Science and the National Academy of Sciences. He edited *Johnson's New Universal Cyclopaedia* (1876-78) and wrote many addresses, articles, books, and pamphlets in the fields of mathematics, physics, economics, and education. His annual reports on Columbia, outstanding discussions of the significance of current educational progress, were edited by W. F. Russell in *The Rise of a University*, Vol. I (1937). See memoirs by John Fulton (1896).

Barnard, George Grey, 1863-1938, American sculptor, b. Bellefonte, Pa. He studied engraving then sculpture, first at the Art Institute of Chicago, then

in the École des Beaux-Arts, Paris. A strong Rodin influence is evident in his early work, such as *Two Natures* (Metropolitan Mus.). In 1912 he completed several figures for the new state capitol at Harrisburg, Pa. A colossal statue of Lincoln in 1917 was the subject of heated controversy because of its rough-hewn features and slouching stance. It is now in Manchester, England, and a replica is in Cincinnati. Interested in medieval art, Barnard gathered discarded fragments of Gothic works from French villages. He established this collection near his home in Washington Heights, New York City, in a building that he called the CLOISTERS. Others of Barnard's sculptures are *The God Pan* (Columbia Univ.), *The Hower* (Cairo, Ill.), and *Rising Woman and Adam and Eve* (both Rockefeller estate, at Pocantico Hills, N.Y.). At the time of his death he was at work on the 100-ft (30-km) *Rainbow Arch*, a memorial to peace.

Barnard, Henry, 1811-1900, American educator, b. Hartford, Conn., grad. Yale, 1830. He studied law and was admitted to the bar in 1835. As a member (1837-39) of the Connecticut legislature, he originated and secured the passage in 1838 of an act to provide for the better supervision of the common schools. Horace Mann had carried through a similar reform in Massachusetts in 1837, and the two men became leaders in the movement to reform the common schools of the country. Barnard was secretary of the Connecticut board of commissioners of common schools from 1838 to 1842. He performed pioneer work in school inspection, recommendation of textbooks, organization of teachers' institutes and associations of parents and teachers, and the framing of additional legislative measures on education. He also edited the *Connecticut Common School Journal* and made valuable reports, including a survey of the existing school system. A political reversal in Connecticut in 1842 abolished his office and entire program. In 1843, Barnard was selected to survey the common school system of Rhode Island and instituted similar reforms there, as well as starting school libraries and revising examination methods. In 1849 he returned to Connecticut, where his program had been reestablished, to serve as superintendent of schools and principal of the new state normal school at New Britain. Ill. health compelled his resignation in 1855. In 1858 he accepted the chancellorship of the Univ. of Wisconsin, and in two years there he did much for the state's common school system. He became president of St. John's College, Annapolis, in 1866, but resigned in 1867 to become the first U.S. commissioner of education. Barnard had long urged the establishment of a Federal agency to gather and disseminate educational information and statistics, which had been collected for the first time in the census of 1840. As commissioner he planned and organized the work of this agency and prepared extensive reports on education in this country and abroad and on school legislation. Barnard resigned in 1870. He continued the publication of the *American Journal of Education* (31 vol., 1855-81, reissued in 1902 with an additional volume dated 1882). This journal, subsidized by Barnard, included translations of many previously unavailable European educational classics. Approximately 50 of these treatises were reprinted as Barnard's "Library of Education." See his *Memoirs on Teachers and Educators* (1861, repr. 1969), R. C. Jenkins and G. C. Warner, *Henry Barnard: An Introduction* (1937), and J. S. Brubacher, ed., *Henry Barnard on Education* (1931, repr. 1965).

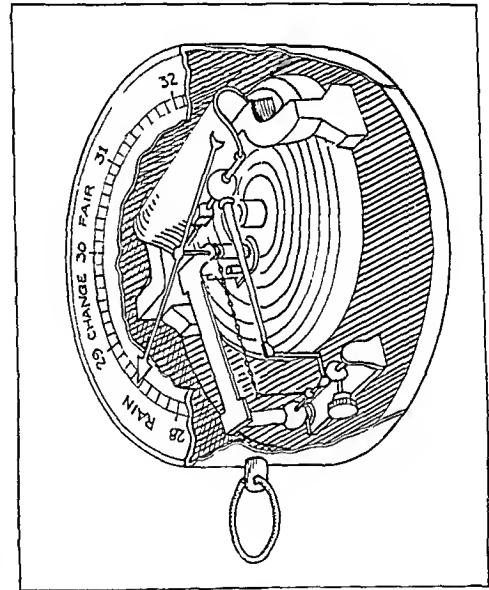
Barnard College: see COLUMBIA UNIV.

Barnardo, Thomas John, 1845-1905, British social reformer. Pioneering in the care of destitute children, he founded (1867) in London the East End Juvenile Mission. In 1870, with the aid of the 7th earl of Shaftesbury, he opened a boys' home, the first of his famous Dr. Barnardo Homes. These soon spread throughout Great Britain and the British possessions. There are presently over 100 homes in Britain and others in Australia and Canada. Barnardo was instrumental in securing the passage (1891) of parliamentary legislation for child welfare. See biographies by Arthur Williams (3d ed. 1966) and Gladys Williams (1966).

Barnard's star, star with the largest observed PROPER MOTION (annual angular shift in position), located in the constellation Ophiuchus, 1970 position R.A. 17^h56^m, Dec. +4°36'. The star's large proper motion, 10.28", is due in part to the fact that it is the second-nearest star, being at a distance of 5.98 light-years. Barnard's star, discovered in 1916 by E. E. Barnard, is a faint red dwarf star of SPECTRAL CLASS M5, lying near the bottom of the main sequence in the HERTZSPRUNG-RUSSELL DIAGRAM. Its apparent MAGNITUDE is

The key to pronunciation appears on page xi

barom or baron, Michael (mishel) baron' or baronid(N'), 1965-1-279, one of the first great French actors & protege of Moliere, he acted at the Hotel de Bourgoines and at the Comedie Francaise. He brought a naturalness to the bombastic acting style established by Moliere. In 1691 he retired at the age of 60.



which is mounted on a drum rotated by a clock-work. Each barotmeter usually provides one week's record. See BAROMETER.

Baroja y Nessi, Pio (pi'õ bar'õhã è nã'sã), 1879-1956, Spanish novelist from the Basque Province, member of the group of writers known as the GENERATION OF '98. He left medicine to devote himself to literature and came to be the most popular Spanish novelist of the 20th cent. Of his several trilogies, the most widely read abroad concerns the underworld of Madrid—*La lucha por la vida* [the struggle for existence] (1904), comprising *La busca* (tr. *The Quest*, 1922), *Malta hierba* (tr. *Weeds*, 1923), and *Aurora roja* (tr. *Red Dawn*, 1924). The longest cycle (22 vol.) has a historical background and is known as *Memorias de un hombre de acción* [memories of a man of action]. Baroja's novels are forceful though loosely constructed, characterized by a spare yet lyrical style and an undercurrent of social discontent.

Barometer (bar'õm'etãr), instrument for measuring atmospheric pressure. It was invented in 1643 by the Italian scientist Evangelista Torricelli, who used a column of water in a tube 34 ft (10.4 m) long. This inconvenient water column was soon replaced by

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Barnburners, radical element of the Democratic

party in New York state from 1842 to 1848, opposed to the conservative Hunkers. The name derives from the fabled Dutchman who burned his barn to rid it of rats; by implication, the Barnburners would destroy corporations and public works to do away with the abuses they foster. Among their leaders were C. C. Campbell, Elias Wright, Azariah C. Flagg, and Samuel J. Tilden. Opposed to the extension of slavery, the Barnburners seceded from the Democratic state organization when the Hunkers captured the state convention at Syracuse in 1847. Refused recognition at the Democratic national convention of 1848, they nominated Martin Van Buren for President and endorsed the Free-Soil Party candidate, Charles Francis Adams (1807–86), for Vice President. Largely because of this Democratic split, the Whig candidate, Zachary Taylor, defeated the regular Democratic Lewis Cass. After 1848 some Barnburners joined the Free-Soilers, who merged with the new Republican party; others returned to the Democratic party. See H. D. A. Donovan, *The Barnburners* (1925).

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Barneveldt, Johan van Olden: see *OLDBARNNE*.

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Barnum, Phineas Taylor, 1810–91, American showman, b Bethel, Conn. As a youth Barnum worked at diverse sales jobs and managed a boarding house. He made his first sensation in 1835 when he bought and exhibited Joice Heth, a slave who claimed she was 161 years old (she was about 80) and had been the nurse of George Washington. In 1842 he opened the American Museum in New York City and immediately became famous for his extravagant advertisements. Among his exhibits of freaks. Among his great attractions were the Fiji Mermaid (formed by joining the upper half of a monkey to the stuffed lower half of a fish), "General Tom Thumb," who was viewed by over 20 million people, and the original siamese twins, Chang and Eng. In 1850, Barnum managed the American tour of the Swedish singer Jenny Lind and, with his talent for publicity, made it a huge financial success for her and for himself. In 1855 he retired from show business, he served as mayor of Bridgeport, Conn., and in the Connecticut legislature. Driven into bankruptcy by unwise business ventures, he reopened the American Museum and then organized his famous circus, "The Greatest Show on Earth," which opened in Brooklyn, N Y, in 1871. In 1881 he merged with his most successful competitor, James A. Bailey, and under the name Barnum and Bailey the circus continued for a generation after Barnum's death. The stellar attraction of the circus was Jumbo, the 6½-ton African elephant that Barnum purchased from the London Zoo despite the furious protests of English elephant fanciers, including Queen Victoria. The elephant was stuffed and is on exhibit at the Barnum Museum of Natural History (est 1883 at Tufts Univ in honor of Barnum, who was one of its trustees). His autobiography was published in 1855 and went through many editions. He also wrote *Humbugs of the World* (1865), *Struggles and Triumphs* (1869), and *Money Getting* (1888). See his autobiography, ed by W. R. Browne (1927), repr 1961), biographies by Raymond Fitzsimons (1970) and Neil Harris (1972).

Barocchio, Giacomo. See *VIGNOLA*, GIACOMO DA.

Barocci or Baroccio, Federico (fēdēricō' bārōtchē-cho), c 1530–1612, Italian painter, b Urbino, where he was continually employed throughout his life. In the 1550s he traveled to Rome and was influenced by the art of Raphael, Michelangelo, and Taddeo Zuccaro. His mature works reflect Baroque tendencies. Noted for his skill as a portraitist, he also executed a small number of important engravings. Among his more notable achievements are Saint Sebastian (c 1557, cathedral, Urbino), frescoes (1561–63) in the Vatican, and *The Last Supper* (1592–99, Santa Maria sopra Minerva, Rome). A large collection of his drawings is in the Uffizi. See monograph by Harald Olsen (repr, 1962).

Baroda (bārō'dā), former native state, now incorporated in Gujarat state, W central India. It is a prosperous area on a fertile alluvial plain. Its chief city, Baroda (1971 pop 467,422), a district administrative center on the Vishwamini River, has cotton-textile, chemical, and metal industries, an oil refinery, and a fertilizer plant. There are several colleges.

Barograph, instrument used to make a continuous recording of atmospheric pressure. The pressure-sensitive element, a partially evacuated metal cylinder, is linked to a pen arm in such a way that the vertical displacement of the pen is proportional to the changes in the atmospheric pressure. The pen traces a record of pressure versus time on a chart.

9.5 Slight oscillations in its motion indicate that it has one or possibly two unseen companions, which would have to be planets rather than dim stars because the mass of each is small—at most equal to that of Jupiter

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Barnes, former municipal borough, SE England. See RICHMOND UPON THAMES.

Barnet, borough (1971 pop 303,578) of Greater London, SE England. The borough was created in 1965 by the merger of the urban districts of Barnet, East Barnet, and Friern Barnet, and the municipal boroughs of Finchley and Hendon. Although mainly residential, the borough manufactures automobile and aircraft parts, electrical components, and beverages. At the battle of Barnet (1471) during the Wars of the Roses, Edward IV of the House of York defeated the Lancastrian Richard Neville, earl of Warwick. Warwick died in the fighting.

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Barneveldt, Johan van Olden. see OLDENBARNEVELDT, JOHAN VAN

Barney, Joshua, 1759-1818, American naval officer and privateer, b Baltimore. He entered the navy early in the American Revolution, engaged in many feats of daring, and was captured by the British three times, his most famous exploit was the capture (1782) of the *General Monk* in Delaware Bay. From 1796 to 1802 he served with distinction in the French navy. In the War of 1812 he engaged in large-scale privateering. In July, 1814, he was given the task of checking the British advance up Chesapeake Bay. For several weeks he slowed the drive on Washington, and when the British did disembark, he rushed with some 400 sailors to Bladensburg, where Gen William Winder was in command. In the battle on Aug. 24, the American lines quickly broke, Barney and his men stayed behind to cover the retreat. Their gallant defense was soon broken, and Barney was wounded and captured. See biographies by W F Adams (1912), R D Paine (1924), and Hulbert Footner (1940).

Barnfield, Richard, 1574-1627, English poet. His entire output consists of three small books of poetry written before he was 25. *The Affectionate Shepherd* (1594), *Cynthia* (1595), and *The Encomion of Lady Pecunia* (1598). The lyric "As I fell upon a day" is perhaps his most notable work.

Barnsley, county borough (1971 pop 75,330), West Riding of Yorkshire, N England. It is the railroad center of a coal region and has ironworks, linen

mills, and other industries. In 1974, Barnsley became part of the new metropolitan county of South Yorkshire.

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Barnum, Phineas Taylor, 1810-91, American showman, b Bethel, Conn. As a youth Barnum worked at diverse sales jobs and managed a boarding house. He made his first sensation in 1835 when he bought and exhibited Joice Heth, a slave who claimed she was 161 years old (she was about 80) and had been the nurse of George Washington. In 1842 he opened the American Museum in New York City and immediately became famous for his extravagant advertising and his exhibits of freaks. Among his great attractions were the Fiji Mermaid (formed by joining the upper half of a monkey to the stuffed lower half of a fish), "General TOM THUMB," who was viewed by over 20 million people, and the original Siamese Twins, Chang and Eng. In 1850, Barnum managed the American tour of the Swedish singer Jenny LIND and, with his talent for publicity, made it a huge financial success for her and for himself. In 1855 he retired from show business, he served as mayor of Bridgeport, Conn., and in the Connecticut legislature. Driven into bankruptcy by unwise business ventures, he reopened the American Museum and then organized his famous circus, "The Greatest Show on Earth," which opened in Brooklyn, N.Y., in 1871. In 1881 he merged with his most successful competitor, James A. Bailey, and under the name Barnum and Bailey the circus continued for a generation after Barnum's death. The stellar attraction of the circus was Jumbo, the 6½-ton African elephant that Barnum purchased from the London Zoo despite the furious protests of English elephant fanciers, including Queen Victoria. The elephant was stuffed and is on exhibit at the Barnum Museum of Natural History (est 1883 at Tufts Univ in honor of Barnum, who was one of its trustees). His autobiography was published in 1855 and went through many editions. He also wrote *Humbugs of the World* (1865), *Struggles and Triumphs* (1869), and *Money Getting* (1883). See his autobiography, ed by W R Browne (1927, repr 1961), biographies by Raymond Fitzsimons (1970) and Neil Harris (1973).

Barocchio, Giacomo. see VIGNOLA, GIACOMO DA

Barocci or Baroccio, Federico (fādārē'gō barōt'-chē, -chō), c 1530-1612, Italian painter, b Urbino, where he was continually employed throughout his life. In the 1550s he traveled to Rome and was influenced by the art of Raphael, Michelangelo, and Taddeo Zuccaro. His mature works reflect baroque tendencies. Noted for his skill as a portraitist, he also executed a small number of important engravings. Among his more notable achievements are *Saint Sebastian* (c 1557, cathedral, Urbino), frescoes (1561-63) in the Vatican, and *The Last Supper* (1592-99, Santa Maria sopra Minerva, Rome). A large collection of his drawings is in the Uffizi. See monograph by Harald Olsen (repr, 1962).

Baroda (barō'dā), former native state, now incorporated in Gujarat state, W central India. It is a prosperous area on a fertile alluvial plain. Its chief city, *Baroda* (1971 pop 467,422), a district administrative center on the Vishvamitri River, has cotton-textile, chemical, and metal industries, an oil refinery, and a fertilizer plant. There are several colleges.

barograph, instrument used to make a continuous recording of atmospheric pressure. The pressure-sensitive element, a partially evacuated metal cylinder, is linked to a pen arm in such a way that the vertical displacement of the pen is proportional to the changes in the atmospheric pressure. The pen traces a record of pressure versus time on a chart,

which is mounted on a drum rotated by a clockwork. Each chart usually provides one week's record. See **BAROMETER**.

Baroja y Nessi, Pio (pě'ō bārō'hā ē nās'sē), 1879–1956, Spanish novelist from the Basque Provinces, member of the group of writers known as the **GENERATION OF '98**. He left medicine to devote himself to literature and came to be the most popular Spanish novelist of the 20th cent. Of his several trilogies, the most widely read abroad concerns the underworld of Madrid—*La lucha por la vida* [the struggle for existence] (1904), comprising *La busca* (tr. *The Quest*, 1922), *Mala hierba* (tr. *Weeds*, 1923), and *Aurora roja* (tr. *Red Dawn*, 1924). The longest cycle (22 vol.) has a historical background and is known as *Memorias de un hombre de accion* [memoirs of a man of action]. Baroja's novels are forceful though loosely constructed, characterized by a spare yet lyrical style and an undercurrent of social discontent.

barometer (bārōm'ētar), instrument for measuring atmospheric pressure. It was invented in 1643 by the Italian scientist Evangelista Torricelli, who used a column of water in a tube 34 ft (10.4 m) long. This inconvenient water column was soon replaced by

height of his power only to return (1720) in perfect form to act with Adrienne **LECOUVREUR**. He wrote several plays, of which *L'Homme a bonnes fortunes* (1686) was the most popular.

Baron, Salo Wittmayer (sa'lō vīt'miār barōn'), 1895–, Jewish historian and educator, b. Galicia. He was taken as a child to Vienna, where he later studied at the university, earning doctorates in philosophy (1917), political science (1922), and law (1923), and where he was ordained at the Jewish Theological Seminary (1920). He taught history at the Jewish Teachers College in Vienna (1919–26) before going to the United States to teach at the Jewish Institute of Religion (1927–30). From 1930 to 1963 he taught at Columbia, holding the first professorship of Jewish history in an American university. Among his works are *The Jewish Community* (3 vol., 1942), *Modern Nationalism and Religion* (1947), and *Jews of the United States, 1790–1840: A Documentary History* (ed. with J. L. Blau, 3 vol., 1963). In his monumental and as yet uncompleted *A Social and Religious History of the Jews* (Vol. 1–XV, 2d ed., 1952–73), Baron stresses the social history of the Jewish people in the wider context of world history rather than their history as seen through the lives of its most prominent figures.

Baronius, Caesar (bārō'nēas), 1538–1607, Italian ecclesiastical historian, cardinal of the Roman Catholic Church. He went to Rome c. 1557 and soon came under the tutelage of St. Philip Neri. His chief work is *Annales ecclesiastici a Christi nato ad annum 1198* [ecclesiastical annals from the Nativity to 1198]. It is erudite and complete, revealing the author as a remarkably honest scholar, although it was directed against the Protestant arguments, Protestants as well as Catholics concede that Baronius never suppressed a fact. He was a strong defender of the Holy See. He was largely responsible for the Roman martyrology. Baronius became superior of the Oratory (1593) on St. Philip Neri's death, cardinal (1596), and librarian of the Vatican, he was confessor to Pope Clement VIII. It is said that only the hostility of the Spanish, aroused when Baronius questioned the authenticity of their claims to Sicily, prevented Baronius from becoming pope.

Barons' War, in English history, war of 1263–67 between King HENRY III and his barons. In 1261, Henry III renounced the PROVISIONS OF OXFORD (1258) and the Provisions of Westminster (1259), which had vested considerable power in a council of barons, and reasserted his right to appoint counselors. The barons led by Simon de MONTFORT, earl of Leicester, finally resorted to arms in 1263 and forced the king to reaffirm his adherence to the Provisions. In 1264 a decision in favor of the crown by Louis IX of France as arbitrator led to a renewal of war, but Montfort defeated Henry's forces in the battle of Lewes, and the king once again submitted to government by council. Early in 1265, Montfort summoned his famous representative PARLIAMENT to strengthen his position, which was threatened by the possibility of an invasion by Henry's adherents abroad. The invasion did not take place, but an uprising against Montfort of the Welsh "Marchers" (Englishmen along the Welsh border) led to his defeat by the king's son (later EDWARD I) at Evesham. Montfort was killed in the battle, but some baronial resistance continued until 1267. The barons had failed to establish their own control over the crown, but they had helped prepare the way for the constitutional developments of the reign of Edward I. See R. F. Treharne, *The Baronial Plan of Reform* (1932, repr. 1972), F. M. Powicke, *King Henry III and the Lord Edward* (1947).

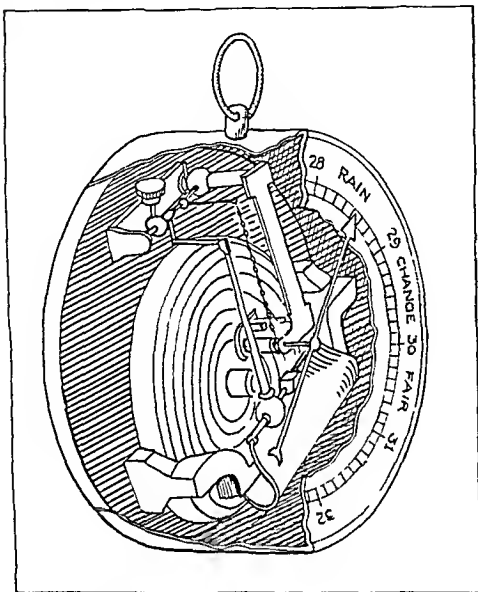
baroque (bārōk'), in art and architecture, style developed in Europe, England, and Latin America during the 17th and early 18th cent. Although the restrained and classical works created by most French and English artists look very different from the exuberant style favored elsewhere, both trends share to varying degrees certain characteristics. Essential among these is an emphasis on unity, a balance achieved among diverse parts. Through the technical brilliance of its artists, the baroque revealed a remarkable harmony of media wherein architecture took on the fluid, plastic aspects of sculpture and both buildings and sculpture employed the CHIAROSCURO effects of painting. During the baroque there was also in art an extraordinary emphasis on grand scale or the superhuman quality of massive figures. Works of the baroque age engage the beholder in physical and emotional participation. In painting and sculpture this was achieved by means of highly developed ILLUSIONISM. This device served to enhance an unequalled sense of drama, energy, and movement of forms. These characteristics are

clearly embodied in the works of three of the giants of the baroque, Pietro da Cortona, Bernini, and Rubens. In architecture the interest in size, impressiveness, and the overwhelming ordering of a dignified environment is most clearly seen at Versailles or in Bernini's elliptical piazza in front of St. Peter's in Rome. Sweeping and multiple rhythms abound in the art of Italy, Germany, Austria, Spain, and Latin America. Buildings of the period are composed of great curving forms with undulating facades or ground plans of unprecedented complexity, as in the churches of Borromini and Wren. Some are created with intricate views through layers of architecture and alternations of light and shade, as in the buildings of Guarini and Hardouin-Mansart. The movement of water was exploited, and fountains, hitherto thin streams, became exciting forms, issuing forth joyous geysers and cascades. The effects of deep space interested many artists including Ruisdael, Guercino, Bacciocci, Pozzo, and Claude Lorrain. In their paintings space is deepened in interior scenes by representing long files of rooms, with extended views outside through open doors or windows, as in the works of Velázquez and de Hooch. Dramatic effects are achieved both with highly contrasting areas of light and shadow in the works of Caravaggio, Zurbaran, Georges de la Tour, and Rembrandt and with masses defined by color in either the clear calm tones of Vermeer and Philippe de Champaigne or the warm and shimmering colors of Rubens, Claude Lorrain, and Pietro da Cortona. In no other period is light so important for suggesting supernatural illusions in painting and sculpture. Light effects are exploited in architecture to heighten sculptural qualities, most conspicuously in Venetian churches and in buildings in Spain and Portugal and their colonies. Baroque sculptors felt free to combine different materials within a single work and often used one material to simulate another. Bernini's St. Theresa succumbs on a dull-finished marble cloud in an alabaster and marble niche in which bronze rays descend from a hidden source of light. Many figures of the mourning Virgin in Spain and Latin America cry glass tears. A fascination with emotional states permeates baroque art. The Carracci, Poussin, and Georges de la Tour portrayed restrained feeling, in accordance with the academic principles of dignity and decorum, after 1625, others, including Bernini, Puget, Rembrandt, Montañes, and Cano, depicted religious ecstasy, anguish, or individual psychology. Although history painting, allegories, and portraits were still considered the most noble subjects, landscape painting was practiced by Annibale Carracci, Ruisdael, Hobbema, Rembrandt, Claude Lorrain, and Rosa. Genre scenes and still life became the major preoccupation of van Laer, Steen, de Hooch, Terborch, Vermeer, and the Le Nain family. Caravaggio and his early followers are especially significant for their naturalistic treatment of unidealized, ordinary people. For convenience the baroque period is divided into three parts.

Early Baroque, c. 1590–c. 1625 The early style was preeminent in Rome where the Carracci and Caravaggio diverged decisively from the preceding late-mannerist artificialities. The Carracci painted heroic figures, modeled from nature and classical antiquity. Caravaggio's dramatic narratives were implemented by a forceful, economic style, remarkable for the use of chiaroscuro. The Carracci school anticipated the opulent excitement of works by Lanfranco and Guercino as well as the markedly classical works of Domenichino and Reni. Caravaggio's followers, including Ribera, Terbrugghen, and Vouet, spread interest in realism and dramatic light throughout Europe. Rubens's early work reveals profound Italian influence. Bernini's early mannerism opened out to express a new vigor, freeing him to render with stunning precision realistic details and textures.

High Baroque, c. 1625–c. 1660 Italian art was dominated by Bernini, Borromini, and Pietro da Cortona, exemplifying the exuberant trends, while Poussin, Claude Lorrain, Sacchi, and Duquesnoy represented the classicist trends. This period produced an astonishing number and variety of artists of the first rank, including Rembrandt, Rubens, Velázquez, Vermeer, Hals, Van Dyck, Ruisdael, and Zurbaran.

Late Baroque, c. 1660–c. 1725 In Italy and Spain after c. 1660, sculptors and painters, e.g., Murillo and Preti, used lighter, softer colors and replaced the clearly organized forms and volumes of the high baroque with flickering patterns and figures. Italy lost its position of artistic dominance to France, and gradually the massive forms of the baroque yielded to the lighter, more graceful outlines of the ROCCO. See articles about individual artists, e.g., **BERNINI**. See Ru-



Aneroid barometer

mercury, which is denser than water and requires a tube about 3 ft (0.9 m) long. The mercurial barometer consists of a glass tube, sealed at one end and filled with pure mercury. After being heated to expel the air, it is inverted in a small cup of mercury called the cistern. The mercury in the tube sinks slightly, creating above it a vacuum (the Torricellian vacuum). Atmospheric pressure on the surface of the mercury in the cistern supports the column in the tube, which varies in height with variations in atmospheric pressure and hence with changes in elevation, generally decreasing with increases in height above sea level. Standard sea-level pressure is 14.7 lb per sq in. (1,030 grams per sq cm), which is equivalent to a column of mercury 29.92 in. (760 mm) in height; the decrease with elevation is approximately 1 in. (2.5 cm) for every 900 ft (270 m) of ascent. In weather forecasting, barometric readings are plotted on base maps so that analyses of weather-producing pressure systems can be made. At a given location a storm is generally anticipated when the barometer is falling rapidly; when the barometer is rising, fair weather may usually be expected. The aneroid barometer is a metallic box so made that when the air has been partially removed from the box the surface depresses or expands with variation of air pressure on it; this motion is transmitted by a train of levers to a pointer which shows the pressure on a graduated scale. A **BAROGRAPH** is a self-recording aneroid barometer in which a pen traces a continuous pressure record on a cylindrical chart which revolves by clockwork. An **ALTIMETER**, an instrument for measuring altitude, is often an aneroid barometer calibrated to indicate altitude.

Baron or Boyron, Michel (mēshēl' bārōn' or bwārōn'), 1653–1729, one of the first great French actors. A protégé of Molière, he acted at the Hôtel de Bourgogne and at the Comédie Française. He brought a naturalness to the bombastic acting style established by Montfleury. In 1691 he retired at the

great comedienues of her day, she appeared under the management of the Frohmans and acted with Lawrence Barrett and Edwin Booth. The Barrymores' older son, **Lionel Barrymore**, 1878-1954, b. Philadelphia, first appeared in minor roles in the company of Louisa Lane Drew, his grandmother, and John Drew, his uncle. A much admired character actor, he is best remembered for his work in films, e.g., *Dinner at Eight* (1933), *You Can't Take It with You* (1938), and in 15 Dr. Kildare films. He received an Academy Award in 1931 for his performance in *A Free Soul*. His portrayal of Scrooge in Dickens's *Christmas Carol* won him a wide radio audience from 1936. In later life, crippled and confined to a wheelchair, he became known for his portrayals on radio. A man who loved art and music more than the theater, he composed over 100 unpublished musical pieces and was a member of the American Society of Etchers. He also wrote a novel, *Mr. Cantonwine: a Moral Tale* (1953). See his autobiography, *We Barrymores* (1951). His sister, **Ethel Barrymore**, 1879-1959, b. Philadelphia, also began her career under the auspices of her relatives. After an engagement with Henry Irving in London she returned to New York City, where, under the Frohman banner, she appeared in Clyde Fitch's *Captain Jinks of the Horse Marines* (1901) and achieved instant success. Although her original desire was to become a concert pianist, she made the theater her home and gained a reputation as an actress of dignity and warmth. Her most endearing portrayal was in *The Corn Is Green* (1940-42). Her work in films was limited, although in 1944 she won an Academy Award for best supporting actress in *None But the Lonely Heart*. A theater bearing her name was opened in 1928 in New York City. See her autobiography, *Memories* (1955). Their younger brother, **John Barrymore**, 1882-1942, b. Philadelphia, tried his hand at painting and cartooning before turning to the stage. After his debut in 1903, he became a matinee idol to millions of playgoers and movie fans because of his dashing nature and good looks. His portrayal of Hamlet in 1922 electrified the public. After 1912 most of his work was confined to films and radio, his last appearance, in 1939, was on the stage in *My Dear Children*, a pathetic burlesque of his baroque private life. He was four times married, his tempestuous personality passed on to two of his four children, Diana and John, Jr. (John Drew Barrymore), who also became actors. Diana died at the age of 38, shortly after the publication of her autobiographical *Too Much Too Soon* (1958). See John Barrymore's autobiography, *Confessions of an Actor* (1926), biography by Alma Powers-Waters (1941), Gene Fowler, *Good Night, Sweet Prince* (1943). Lionel, Ethel, and John Barrymore appeared together only once, in the movie *Rasputin and the Empress* (1932). *The Royal Family* (1934), a play by Edna Ferber and George S. Kaufman, is based, to some extent, on the Barrymore family. See Hollis Alpert, *The Barrymores* (1964).

Barsabas (bar'sabās), surname of JOSEPH BARSABAS and JUDAS BARSABAS.

Barstow, city (1970 pop. 17,442), San Bernardino co., SE Calif., on the dry Mojave River, founded in the 1880s as a silver-mining town, inc. 1947. Railroad shops, the Goldstone interplanetary tracking station, and nearby U.S. marine corps supply centers are major employers. Barstow is an outfitting point for expeditions into Death Valley. A junior college is there.

Bart, Jean (zhaN bar), 1650-1702, French naval hero, b. Dunkirk. Of a seafaring family, he enlisted in the Dutch navy but entered French service as a privateer at the outbreak of the Dutch War (1672). In 1686 he was commissioned a navy captain. As a reward for his spectacular exploits, particularly in the War of the Grand Alliance, he was ennobled (1694) and made a rear admiral (1696) by King Louis XIV.

Bartas, Guillaume de Salluste Du. see DU BARTAS.

Barth, Heinrich (hīn'rikh bart), 1821-65, German explorer in British service. After traveling (1845-47) through the Levant and N Africa, he entered the service of the British government. He joined (1849) an expedition to the W. Sudan. He visited the Fulani and the Hausa and discovered the upper Benue River. After exploring the Chad region he turned westward and made his way through Kano and Sokoto to Gwandu, in N. Nigeria. Barth's interest in the Islamic culture of W. Africa led him on to Timbuktu where he stayed eight months before returning (1855) to England. His *Travels and Discoveries in North and Central Africa* (5 vol., 1857-58, in English and German) is a masterpiece of narrative and geographic research.

Barth, John, 1930-, American novelist, b. Cambridge, Md., grad. Johns Hopkins (B.A. 1951, M.A. 1952). He has been professor of English at the State University of New York at Buffalo since 1965. Barth's novels, experimental and often comic, reflect his anger and despair with the ludicrous, meaningless world of the 20th cent. He has a particular genius for parody. *The Sot-Weed Factor* (1962) is a deft parody of historical novels. *Giles Goat-Boy* (1966) is a massive satirical allegory in which the world is a large university. Barth's other works include the novels *The Floating Opera* (1956) and *The End of the Road* (1958), and *Chimera* (1972), three novellas.

Barth, Karl, 1886-1968, Swiss Protestant theologian, one of the leading thinkers of 20th-century Protestantism. He taught in Germany, where he early opposed the Nazi regime. In 1935 when he refused to take the oath of allegiance to Adolf Hitler, he was retired from his position at the Univ. of Bonn and deported to Switzerland. There he continued to expound his views, known as dialectical theology or theology of the word. Barth's primary object was to lead theology back to the principles of the Reformation. For Barth, modern theology with its assent to science, immanent philosophy, and general culture and with its stress on feeling, was marked by indifference to the word of God and to the revelation of God in Jesus Christ, which he thought should be the central concern of theology. In the confrontation between man and God, which was Barth's fundamental concern, the word of God and His revelation in Christ is His only means of revealing Himself to humans, he argued that people must listen in an attitude of awe, trust, and obedience. This theological position is also related to those of Emil Brunner, Friedrich Gogarten, and Rudolf Bultmann, although Barth's position is the more orthodox. Barth's writings include *Der Römerbrief* (1918, tr. *The Epistle to the Romans*, 1933), *Das Wort Gottes und die Theologie* (1924, tr. *The Word of God and the Word of Man*, 1928), *Credo* (1935, tr. 1936), and *Die Kirchliche Dogmatik* (Vol. I-IV, 1932-1962, tr. *Church Dogmatics*, Vol. I-IV, 1936-62). See Wilhelm Pauck, *Karl Barth, Prophet of a New Christianity?* (1931), Herbert Hartwell, *The Theology of Karl Barth: An Introduction* (1965), J. F. Andrews, comp., *Karl Barth* (1969), J. S. Bowden, *Karl Barth* (1971), R. E. Willis, *The Ethics of Karl Barth* (1971).

Barthélemy, Auguste Marseille (ögust' marsä'ya bartäl'mē'), 1796-1867, French poet. With his friend Joseph Mery he wrote several brilliant and popular political satires, including *La Villefiade* (1827), *Napoleon en Égypte* (1828), and *Le Fils de l'homme* (1829), a poem on Napoleon II, for which Barthélemy was briefly imprisoned. A political chameleon, he celebrated the Revolution of 1830 in *L'insurrection*, only to attack the July Monarchy in his short-lived (1831-32) journal *Némésis*.

Barthélemy, François, marquis de, 1747?-1830, French statesman. While minister to Switzerland, he negotiated the Treaties of Basel (1795), which took Prussia and Spain out of the French Revolutionary Wars. Elected to the Directory (1797), he was arrested in the coup d'état of 18 Fructidor (Sept. 4, 1797) and was deported to French Guiana. He soon escaped, returned to France, and supported Napoleon. In 1814 he went over to the Bourbons, who raised him to the peerage.

Barthelme, Donald (bar'thēlm), 1931-, American writer, b. Philadelphia. He has been ranked by critics with those modern writers who, like Kafka, have found the actual world so unreal that traditional modes of fiction can no longer reflect or describe it. Hence Barthelme uses language and symbol to fit his own private vision of an absurd reality. His stories are replete with parodies of advertising jargon and hip talk, counterfeit footnotes, typographical extravagances, telegraphic sketches, and interviews. Barthelme's works include the novel *Snow White* (1967), the short-story collections, *Unspeakeable Practices*, *Unnatural Acts* (1968), *City Life* (1970), *Sadness* (1972), and a collection of non-fiction pieces, *Guilty Pleasures* (1974).

Bartholdi, Frédéric Auguste (frädär'ek' ögust' bartöldē'), 1834-1904, French sculptor, b. Colmar, Alsace. He studied painting under Ary Scheffer but turned to sculpture. Among his many works is a colossal group, *Switzerland Succoring Strasbourg*, presented by France to Switzerland and now at Basel. His monuments and statues include those of Martin Schongauer at Colmar, Vergeretorix at Clermont-Ferrand, and Lafayette and Washington at Paris Union Square, New York City, has his sculpture of Lafayette. Bartholdi's colossal *Lion of Belfort* commemorates the heroic defense of Belfort in 1870-71

and is carved from the rock flanking the citadel. His best-known work is *Liberty Enlightening the World* (see LIBERTY, STATUE OF), erected on Bedloe's Island, New York Bay, and dedicated in 1886.

Bartholin (bart'ölēn), renowned Scandinavian family. **Kaspar Bartholin**, 1585-1629, b. Sweden, was a Danish physician. He was professor of medicine and later of theology at the Univ. of Copenhagen and author of a textbook of anatomy, *Institutiones anatomicae* (1611). His son, **Thomas Bartholin**, 1616-80, physician, naturalist, and philologist, was professor of mathematics and of anatomy at the Univ. of Copenhagen. He was the first to describe the entire lymphatic system. **Kaspar Bartholin**, 1655-1738, a son of Thomas Bartholin, also a professor at the Univ. of Copenhagen, is credited with discovering the glands of Bartholin (a pair of glands of the vagina) and an accessory duct of the sublingual salivary gland.

Bartholomaeus Anglicus: see BARTHOLOMEW DE GLANVILLE.

Bartholomew, Saint (bart'höl'ämēōō), one of the Twelve Disciples, usually identified with NATHANAE. Nathanael is a given name, Bartholomew an Aramaic patronymic meaning "son of Talmai." Mat. 10:3, Mark 3:18, Luke 6:14, Acts 1:13. Tradition makes N. India his missionary field and Armenia the place of his martyrdom, either by faying, beheading, or crucifixion. Feast Aug. 24.

Bartholomew de Glanville or Bartholomaeus Anglicus (bart'höl'ämē'ās āng'glīkōs), fl. c. 1250, English Friar Minor. He taught theology at Paris, and he was the author of *De proprietatibus rerum* (first pub. c. 1470), a famous medieval encyclopedia of natural history.

Barthou, Louis (lwē bartōō'), 1862-1934, French cabinet minister and man of letters. He held portfolios in numerous cabinets after 1894 and was briefly premier in July-August, 1913. His government was responsible for the law that increased military service from two to three years. In 1934 he became foreign minister in the cabinet of Gaston Doumergue. Barthou sought to strengthen the French position in Eastern Europe. He was welcoming King Alexander of Yugoslavia at Marseilles when a Croatian nationalist assassinated (Oct., 1934) both the king and Barthou. A man of culture and learning, Barthou was the author of several biographies, notably one of Victor Hugo (tr. 1919). See Allen Roberts, *The Turning Point* (1970).

Bartimaeus (bartimē'ās), blind man to whom Jesus restored sight. Mat. 20:29-34, Mark 10:46-52, Luke 18:35-43.

Bartlesville, city (1970 pop. 29,683), seat of Washington co., NE Okla., on the Caney River, inc. 1897. It is a distribution center for a ranching and rich oil-producing area. Petroleum production, marketing, and research have been major enterprises since the first well was tapped in 1897. Of interest are the Price Tower, a concrete and glass building with cantilevered floors, designed by Frank Lloyd Wright, and the Nellie Johnstone oil well, a replica of the first commercial oil well in the state. A U.S. Bureau of Mines energy research center is in the city.

Bartlett, John, 1820-1905, American compiler and publisher, b. Plymouth, Mass. While he worked in his university book store in Cambridge, he compiled the invaluable *Familiar Quotations* (1855), which ran through nine editions in his lifetime and has been revised and enlarged several times since. Bartlett joined the publishing firm of Little, Brown & Company in 1863 and in 1878 became senior partner. His Shakespeare concordance (1894) is still a standard work.

Bartlett, Josiah, 1729-95, political leader in the American Revolution, signer of the Declaration of Independence, b. Amesbury, Mass. He practiced medicine in Kingston, N.H., and was a delegate to the provincial assembly (1765-75) and the provincial congress (1775) before serving in the Continental Congress (1775-76, 1778). He returned to New Hampshire, held judicial posts, advocated (1788) the adoption of the Federal Constitution, and was chief executive of the state (1790-94). Bartlett, N.H., is named for him.

Bartlett, Robert Abram, 1875-1946, American arctic explorer, b. Briggs, near St. John's, N.F., Canada. He accompanied Robert E. Peary on the expeditions of 1897-98 and 1905-6, and in 1908-9 he accompanied Peary to lat. 87° 47' N and was the last white man from whom Peary parted to make his dash for the North Pole. Bartlett commanded the *Karluk* on the expedition headed by Vilhjalmur Stefansson in 1913-14. The vessel was frozen in ice near Point Barrow and drifted until it was crushed by ice near Wrangel Island. Bartlett crossed to Siberia for help.

and returned to rescue 13 members of the party. Later he commanded on many arctic voyages of his own, making an annual cruise from 1925 to 1941. His exploring and scientific work in Greenland was especially notable, and he was widely known and admired. See his *Log of Bob Bartlett* (1928), biography by Paul Sarnoff (1966).

Bartlett, Samuel Colcord, 1817-98, American Congregational clergyman and educator, b. Salisbury, N.H., grad. Dartmouth College, 1836. He studied at Andover Theological Seminary and was ordained in 1843. He was professor (1858-77) of biblical literature and sacred theology at the Chicago Theological Seminary and from 1877 to 1892 was president of Dartmouth.

Bartlett, William Henry, 1800-1854, English painter and illustrator. After four visits to the United States, Bartlett illustrated a book, *American Scenery* (1840), with panoramic vistas of the American landscape. During his travels, he also executed drawings of Jerusalem for a book about the Holy Land. See study by A. M. Ross (1973).

Bartók, Béla (bā'la bār'tök, Hung. bā'lo bōr'tök), 1881-1945, Hungarian composer and collector of folk music. He studied (1899-1903) and later taught piano at the Royal Academy, Budapest. In 1905 he and Zoltán Kodály began to collect folk music of Eastern Europe, and throughout his life Bartók devoted much attention to folk music of varied origin. As a composer he gained his first success with his mime play *The Wooden Prince* (1914-16). An opera, *Duke Bluebeard's Castle* (1911), and a ballet, *The Miraculous Mandarin* (1919), also gained notice. He became better known, however, for his compositions for piano, for violin, and for orchestra. Among his piano works are a set of progressive studies called *Mikrokosmos* (1926-27) and a concerto for two pianos and orchestra (1938), which he performed with his second wife, Ditta, in New York in 1943. Bartók's important orchestral works include *Music for Strings, Percussion and Celesta* (1936) and *Concerto for Orchestra* (1943). Utilizing in varying degrees folk elements, atonality, and traditional techniques, Bartók achieved an original modern style, which has had a great influence on 20th-century music. In 1940 he emigrated to the United States and was commissioned by Columbia Univ. to transcribe a large collection of Yugoslav folk melodies. He spent his last years in poverty and neglect, but after his death his fame grew steadily. Among his studies of folk music that have been published in English are *The Hungarian Folk Song* (tr. 1931) and *Serbo-Croatian Folk Songs* (with A. B. Lord, 1951). See his letters, ed. by Janos Demeny (1971), biographies by Halsey Stevens (rev. ed. 1964), Agatha Fassett (1958, repr. 1971), and Josef Ujfalussy (tr. 1972), studies by Emil Haraszti (1938) and Serge Moureaux (tr. 1953).

Bartolini, Lorenzo (lōrēn'tsō bār'tōlē'nē), 1777-1850, Italian neoclassical sculptor, studied in Florence and Paris. His most imposing creation is the Niccolò Demidoff monument in Florence. Napoleon commissioned many works from him. Among these was a colossal portrait bust of the emperor (Bastia), which is typical of Bartolini's prodigious output in this field.

Bartolommeo di Pagholo del Fattorino, Fra (fra bār'tōlōmē'ō dē pa'gōlō dēl fat'tōrē'nō), 1475-1517, Italian painter, also called Baccio della Porta. Under the influence of Savonarola, he joined (1500) the Dominican order. He abandoned art for a while, but resumed practice in 1504, becoming the leading Florentine master for a number of years. He visited Venice (1508) and Rome (1514). Influenced by the art of Raphael, he adapted the classic equilibrium of composition and harmony of color typical of the High Renaissance. He executed a number of paintings together with Albertinelli. Among his works are *Annunciation* (cathedral, Volterra), *Vision of St. Bernard* (Florence Acad.), *God the Father Adored by Mary Magdalen and St. Catherine* (Lucca), two panels of the *Marriage of St. Catherine* (Louvre and Pitti Palace, Florence).

Bartolozzi, Francesco (frānchēs'kō bār'tōlōzē'sē), 1727-1815, Italian engraver. In Florence he studied drawing and painting and formed a lifelong friendship with Cipriani, most of whose plates he later engraved. In 1764 he went to London, where he became one of the original members of the Royal Academy. He was responsible for the vogue in England of the stipple technique of engraving, which greatly improved methods of reproduction.

Barton, Benjamin Smith, 1766-1815, American physician and botanist, b. Lancaster, Pa., studied at the College of Philadelphia, at Edinburgh, and at

Gottingen (M.D., 1789). He taught at the College of Philadelphia and, after it merged with the Univ. of Pennsylvania, succeeded Benjamin Rush. Barton's chief works were *Elements of Botany* (1803), the first botanical textbook published in the United States, and *Collections for an Essay toward a Materia Medica of the United States* (1798-1804).

Barton, Clara, 1821-1912, American humanitarian, organizer of the American Red Cross, b. North Oxford (now Oxford), Mass. She taught school (1839-54) and clerked in the U.S. Patent Office before the outbreak of the Civil War. She then established a service of supplies for soldiers and nursed in army camps and on the battlefields. She was called the Angel of the Battlefield. In 1865 President Lincoln appointed her to search for missing prisoners; the records she compiled also served to identify thousands of the dead at Andersonville Prison. In Europe for a conference at the outbreak of the Franco-Prussian War (1870), she went to work behind the German lines for the International Red Cross. She returned to the United States in 1873 and in 1881 organized the American National Red Cross, which she headed until 1904. She worked for the President's signature to the Geneva treaty for the care of war wounded (1882) and emphasized Red Cross work in catastrophes other than war. Among her writings are several books on the Red Cross. See biographies by Ishbel Ross (1956) and W. E. Barton (1969).

Barton, Sir Edmund, 1849-1920, Australian jurist and statesman. He held high political offices in New South Wales, was a leader in the movement for Australian federation, and became the first prime minister of the Commonwealth of Australia in 1901. He was knighted in 1902 and the next year was appointed justice of the High Court.

Barton, Elizabeth, 1506?-1534, English prophet, called the Maid of Kent or the Nun of Kent. She was a domestic servant. After a period of illness, she began (c.1525) to go into trances and to utter prophecies, which were claimed to be of divine origin. She entered a convent in Canterbury, and, under the influence of Edward Bocking, her prophecies became increasingly dangerous politically. In particular she foretold dire consequences to King Henry VIII should he divorce Katharine of Aragon and marry Anne Boleyn. Bocking probably hoped to stir an uprising against the king, but his protégée was arrested (1533) and brought to confess herself an impostor. She and her accomplices were put to death. See biography by Alan Neame (1971), study by E. J. Devereux (1966).

Bartow, city (1970 pop. 12,891), seat of Polk co., central Fla., inc. 1882. The economy is based on the production of phosphate and the raising of citrus fruit and cattle. Bartow was established in 1853 on the site of a fort built in the Seminole War (see SEMINOLE INDIANS).

Bartram, John, 1699-1777, pioneer American botanist, b. near Darby, Pa. He had no formal schooling but possessed a keen mind and a great interest in plants. In 1728 he purchased land along the banks of the Schuylkill River near Philadelphia and planted there the first botanical garden in the United States; it still exists as a part of the Philadelphia park system. He made journeys in the Alleghenies and the Catskills and in the Carolinas and Florida in search of new plants. Among his correspondents were nearly all the great European botanists of the day. By exchanging specimens with them, Bartram introduced many American plants into Europe and established some European species in the New World. To his home and gardens came the famous Americans of his day and many distinguished European travelers. His *Observations* (1751) records a trip to Lake Ontario, and the journal of his Florida trip (1765-66) was published in William Stork's *Description of East Florida* (3d ed. 1769). His name is commemorated in a genus of mosses, *Bartramia*. See Ernest Earnest, *John and William Bartram* (1940) and Ann Sutton, *Exploring with the Bartrams* (1963).

Bartram, William, 1739-1823, American naturalist, b. Philadelphia, son of John Bartram. He is known chiefly for his *Travels* (1791), in which he describes his journey (1773-77) through the Carolinas, Georgia, and Florida and the Indian country to the west. His book vividly portrays the plants and wildlife of the country and lists 215 native birds, the most complete list of that time. Bartram's influence is seen in the works of Wordsworth, Coleridge, Chateaubriand, and other writers who found his book an unexcelled source of descriptions of the American wilderness and its inhabitants.

Bartsch, Adam von (Johann Adam Bernhard von Bartsch) (a'dam fən barch), 1757-1821, Austrian engraver, etcher, and writer. His critical catalogue, *Le Peintre Graveur* (21 vol., 1803-21), is still authoritative. Bartsch executed over 500 plates from his own designs and from those of others.

Baruch (bā'rāk) 1. Jeremiah's scribe, for whom the book of BARUCH is named. 2. Judahite Neh. 11:5. 3. Builder of the wall Neh. 3:20. 4. Signer of the Covenant Neh. 11:5.

Baruch, Bernard Mannes (bār'ōk'), 1870-1965, U.S. financier and government adviser, b. Camden, S.C. He grew rich through stock-market speculation before he was 30. In World War I he advised on national defense and was (1918-19) chairman of the War Industries Board. In World War II he became (1942) special adviser to James F. Byrnes and wrote the report (1943) on post-war conversion. As U.S. Representative to the U.N. Atomic Energy Commission (1946) he formulated plans for international control of atomic energy. See his autobiography *Baruch* (2 vol., 1957-60), biography by W. L. White (1950, repr. 1970).

Baruch, biblical book included in the Old Testament of the Western canon and Septuagint, but not included in the Hebrew Bible and placed in the Apocrypha in the Authorized Version. It is named for a Jewish prince Baruch (fl. 600 B.C.), faithful friend of JEREMIAH the prophet and editor of his book Jer. 32:12-16, 36, 43:3, 45. Baruch contains the following parts: a message from the exiled Jews to the Jews still at home (1-3:8), including a prayer for Palestinian Jews to use, confessing sin and asking divine mercy, an exhortation to wisdom (3:9-4:4), including a famous messianic allusion (3:37), a consolation of Jerusalem (4:5-5:9) containing a lament, finally chapter 6, which is a letter of Jeremiah (sometimes called the Epistle of Jeremy) warning the exiles against idolatry. The extant ancient versions of Baruch are in Greek, but Hebrew was probably the original language. Critics disagree greatly over the dates of Baruch, some see it as a collection of works by several authors. For the Apocalypse of Baruch, see PSEUDEPIGRAPHIA. For bibliography, see APOCRYPHA.

Baruch College, division of the City University of New York, coeducational, founded 1919 as the school of business administration of City College. Its name was changed to the Bernard M. Baruch School of Business and Public Administration in 1953. In 1968 it became a separate liberal arts college within the City University of New York (see NEW YORK, CITY UNIVERSITY OF).

Bary, Heinrich Anton de: see DE BARY.

Barye, Antoine Louis (āntwān' luvē bārē'), 1796-1875, French animal sculptor. Son of a Parisian goldsmith, he followed his father's trade as a youth. In 1832 he exhibited at the Salon his *Lion and Serpent* (Tuileries), which won him recognition, but only late in life did he achieve fame and free himself from debt. His simple, romantic, and forceful studies of animals or groups of animals were often small and designed for commercial reproduction in bronze. They enjoyed an international popularity and are still highly prized. Well-known examples of his work are *Tiger and Gavia*, *Jaguar and Hare*, *The-seus and the Minotaur* (all Louvre), and *Centaur and Lapith* (Tuileries). He is also represented in the Metropolitan Museum and in the Brooklyn Museum. See Charles S. Smith, *Barbizon Days* (1902, repr. 1969).

baryon (bār'ēōn") [Gr. = heavy], class of ELEMENTARY PARTICLES that includes the PROTON, the NEUTRON, and a large number of unstable, heavier particles, known as hyperons. From a technical point of view, baryons are strongly interacting fermions, i.e., they experience the strong nuclear FORCE and are described by the Fermi-Dirac statistics, which apply to all particles obeying the Pauli EXCLUSION PRINCIPLE. All members of the baryon family of particles adhere to the law of conservation of baryon family number (see CONSERVATION LAWS, in physics), the baryon family number is +1 for ordinary baryons and -1 for antibaryons (see ANTIPARTICLE). In any particle interaction, the sum of the baryon family numbers of the interacting particles must equal the sum for the resulting particles. In reactions involving only nucleons, this law requires that the total number of nucleons be the same before and after the reaction. In addition to the nucleons (protons and neutrons), other members of the baryon family include the lambda (Λ), sigma (Σ), delta (Δ), xi (Ξ), and N particles, as well as a series of higher-mass recurrences of each of these particles. These recurrences may be considered excited states of the lowest-mass member of the series.

barytes* see BARITE

barytone* see BARITONE

Barzillai (barzil'āi) 1 Chief in Gilead who was friendly to David 2 Sam 17:27-29, 19:31-39, 1 Kings 2:7, Ezra 2:61, Neh 7:63 2 The father-in-law of Saul's daughter MERAB

Barzun, Jacques (zhak bar'zan), 1907-, American writer and educator, b. France, grad. Columbia (B.A., 1927, Ph.D., 1932). Barzun moved to the United States in 1919. A student of law and history, he began teaching history at Columbia in 1928. He was appointed professor in 1945 and dean of the graduate faculties in 1955. In 1958 Barzun was made dean of faculties and provost. He has written and edited critical and historical studies on a wide variety of subjects; they include *Race* (a *Study in Modern Superstition* (1937)), *Darwin, Marx, Wagner* (1941), *Romanticism and the Modern Ego* (1945), *The Teacher in America* (1945), *The House of Intellect* (1959), *Classic, Romantic, and Modern* (1961), *Science: The Glorious Entertainment* (1964), *The American University* (1968), *Berlioz and the Romantic Century* (3d ed. 1969), and *The Use and Abuse of Art* (1974).

basal metabolism* see METABOLISM

basalt (basōlt', bās'ōlt'), fine-grained ROCK of volcanic origin, dark gray, dark green, brown, or black in color. Basalt is an igneous rock, i.e., one that has congealed from a molten state. It is the most abundant rock in volcanic LAVA. Most of the world's great lava flows, e.g., the Deccan trap in India, the Iceland flows, and the Columbia River plateau of the NW United States, are basaltic rock. Basalt contains a high percentage of iron and magnesium. Some basalts are porphyritic, i.e., they contain large crystalline structures called phenocrysts embedded in a matrix called a groundmass (see PORPHYRY). Phenocrysts are usually formed in the molten lava before eruption and are often composed of the minerals olivine and PYROXENE. Where molten basalt cools rapidly, as at the earth's surface, fine-grained rocks are formed, if chilling and solidification are very rapid, the groundmass may even be glassy. Basalt may be compact or vesicular, i.e., porous because of gas bubbles contained in the lava while it is solidifying. If the vesicles become filled subsequently with secondary minerals, e.g., quartz or calcite, the rock is called amygdaloidal basalt. Igneous rocks of basaltic composition called gabbros are coarse-grained rocks formed by slow cooling in large underground masses. They are common in the Adirondack Mts. of New York State. Diabase, sometimes called dolerite, is a dark-colored igneous rock intermediate in texture between gabbros and basalt. It is common in formations such as SILLS, which are bodies of igneous rock that when molten ascended into a vertical fissure, and DIKES, which are bodies of igneous rock that when molten filled a bedding plane, or horizontal fissure. Diabase sills make up such Triassic period formations as the Palisades of the Hudson River and similar bodies of the Connecticut River valley (see TRIASSIC PERIOD). When subjected to metamorphism, i.e., very high temperatures and very great pressures, basalt is transformed into various kinds of SCHISTS including hornblende schist. Basalt universally underlies the sediment cover in the world's oceans as evidenced by the basaltic makeup of such midocean islands as the Hawaiian Islands and Iceland, and by samples of lava flows found in drill cores recovered by vessels of the DEEP SEA DRILLING PROJECT and the now defunct Project Mohole. Seismic studies indicate that an irregular layer of basaltic rock underlies the granite-like rocks of the earth's continents. Crystalline rocks returned from the moon by Apollo astronauts were similar in many respects to terrestrial basalts. Fine-grained basaltic lunar rocks were vesicular, with glass-lined pits on exposed surfaces that have been interpreted as micrometeorite impact scars. Coarse-grained basaltic rocks were also found. Lunar rocks differed from terrestrial basalts in lacking water and ferric iron, and were significantly higher in titanium and iron content.

Bascama (bās'kāmā), unidentified town, E of the River Jordan, where Jonathan the Maccabee was killed 1 Mac 13:23-26

Bascom, Henry Bidleman, 1796-1850, American Methodist minister and college president, b. Hancock, N.Y. At the age of 17 he became a preacher in the Ohio Methodist Conference and was a frontier circuit rider. Bascom was chaplain (1824-26) in the U.S. Congress, president (1827-29) of Madison College, Uniontown, Pa., professor (1832-42) of moral science at Augusta College, Augusta, Ky., and president (1842-49) of Transylvania Univ., Lexington, Ky. He played an important role at the convention of

1844, which split the Methodist Church over the question of slavery and resulted in the organization of the Methodist Episcopal Church, South. In 1850 he was elected a bishop of that church. He is the author of *Methodism and Slavery* (1847).

base: see ACIDS AND BASES

baseball, the "national game" of the United States. It derives its name from the four bases on the wide, flat (except for a slight rise at the pitcher's mound) playing field (the diamond). Horsehide-covered hard balls, wooden bats, and padded gloves (the catcher and chief umpire wear additional protective material) constitute the basic equipment. A game is played by two opposing teams of nine players each—a pitcher, a catcher, four infielders, and three outfielders. Once replaced in a particular game, a player may not again take part in that contest. The umpires rule on the plays of the game. To win, a team must score more runs in nine innings than its opponent, a run being made when a player completes a circuit of the bases. If the score is tied at the end of nine innings, play continues until one team has scored more runs than the other in an equal number of innings. Although earlier rules existed, the American and National leagues adopted joint playing rules in 1904, amendments having been introduced since then. A form of baseball, doubtless derived from the English games of cricket and rounders, was played in the early 19th cent., and the children's game "one old cat" existed before that time. Baseball was played largely in the northeastern states before the Civil War, and Alexander Cartwright, who set (c. 1845) bases at 90 ft (27.43 m) apart, and Henry Chadwick, who wrote (1858) the first rule book, were important in the development of the game. The report (1907-8) of a commission headed by A. G. Mills declaring that Abner Doubleday created the modern game in 1839 at Cooperstown, N.Y., has been refuted by some authorities. Baseball made great headway in New York City and the neighboring regions, and in 1845 the Knickerbocker Baseball Club, the first organized team, was formed in New York. The National Association of Baseball Players, the first governing body of the sport, was formed in 1858. The sport was popular with Union soldiers during the Civil War, and after the war professional teams banded together in associations. Today there are two main professional baseball associations that together form the major leagues, along with approximately 20 associations of lesser teams that make up the minor leagues. The older of the two major leagues, the National League (organized 1876), is at present made up of the Atlanta Braves, Chicago Cubs, Cincinnati Reds, Houston Astros, Los Angeles Dodgers, Montreal Expos (the first major league team outside the United States), New York Mets, Philadelphia Phillies, Pittsburgh Pirates, St. Louis Cardinals, San Diego Padres, and San Francisco Giants. In 1900 the Western League regrouped as the American League and three years later gained recognition as the second major league. The American League is composed of the Baltimore Orioles, Boston Red Sox, California Angels, Chicago White Sox, Cleveland Indians, Detroit Tigers, Kansas City Royals, Milwaukee Brewers, Minnesota Twins, New York Yankees, Oakland Athletics, and Texas Rangers. The locations of major league franchises were stable for 50 years until 1953, when the Boston Braves moved to Milwaukee and became the first major league team W of Chicago and St. Louis. During the rest of the 1950s a number of other teams continued the westward migration, largely made possible by the expansion of intercity air travel. The 1960s were another period of change. At the beginning of that decade there were eight teams in each of the major leagues, by 1969 each league had grown to include two divisions of six teams each, for a total of 24 teams. Since 1903 the National and American league champion teams have met in an annual series of games, known as the world series, to decide the world's championship. The winners of the world series were 1903, Boston Red Sox, 1904, no series because the New York Giants of the National League refused to play the Boston Red Sox of the American League, 1905, New York Giants, 1906, Chicago White Sox, 1907-8, Chicago Cubs, 1909, Pittsburgh Pirates, 1910-11, Philadelphia Athletics, 1912, Boston Red Sox, 1913, Philadelphia Athletics, 1914, Boston Braves, 1915-16, Boston Red Sox, 1917, Chicago White Sox, 1918, Boston Red Sox, 1919, Cincinnati Reds, 1920, Cleveland Indians, 1921-22, New York Giants, 1923, New York Yankees, 1924, Washington Senators, 1925, Pittsburgh Pirates, 1926, St. Louis Cardinals, 1927-28, New York Yankees, 1929-30, Philadelphia Athletics, 1931, St. Louis

Cardinals, 1932, New York Yankees, 1933, New York Giants, 1934, St. Louis Cardinals, 1935, Detroit Tigers, 1936-39, New York Yankees, 1940, Cincinnati Reds, 1941, New York Yankees, 1942, St. Louis Cardinals, 1943, New York Yankees, 1944, St. Louis Cardinals, 1945, Detroit Tigers, 1946, St. Louis Cardinals, 1947, New York Yankees, 1948, Cleveland Indians, 1949-53, New York Yankees, 1954, New York Giants, 1955, Brooklyn Dodgers, 1956, New York Yankees, 1957, Milwaukee Braves, 1958, New York Yankees, 1959, Los Angeles Dodgers, 1960, Pittsburgh Pirates, 1961-62, New York Yankees, 1963, Los Angeles Dodgers, 1964, St. Louis Cardinals, 1965, Los Angeles Dodgers, 1966, Baltimore Orioles, 1967, St. Louis Cardinals, 1968, Detroit Tigers, 1969, New York Mets, 1970, Baltimore Orioles, 1971, Pittsburgh Pirates, and 1972-74, Oakland Athletics. Some of the minor leagues—notably the International League, the Pacific Coast League, and the Texas League—also hold postseason play-offs. The "Black Sox" scandal, involving eight Chicago White Sox players charged with bribery in the 1919 world series, led the committee of baseball executives to appoint (1921) Judge Kenesaw M. Landis to the new post of baseball commissioner. Landis replaced the three-man National Commission, which had ruled professional organized baseball since 1903. Albert B. (Happy) Chandler was elected (1945) to succeed Landis, who had died in office. Other commissioners were Ford C. Frick (1951-65) and William D. Eckert (1965-69). In 1969, Bowie Kuhn was elected to a seven-year term. Night baseball games, introduced in the major leagues in 1935, are now scheduled more frequently than day games. The all-time major league single-game attendance record of 84,587 was set by the Cleveland Indians in 1954. Since the 1960s baseball's position as the national game has eroded. Many minor league teams have disbanded, average attendance at major league games has declined, and the sport has suffered from the criticism that it is too slow, especially in comparison to football, basketball, and ice hockey, the other major professional sports in the United States. In response, baseball executives have promulgated certain reforms in an effort to revitalize interest in the game. Most notable among these has been the tenth player, or designated hitter, experiment introduced into the American League during the 1973 season. Changing social conditions have also forced major league baseball to make changes. In 1947, Jackie Robinson of the Brooklyn Dodgers became the first Negro to play in the major leagues. Prior to that time, Negro ballplayers had been restricted to playing in the segregated Negro Leagues. Baseball's reserve clause, the contractual stipulation that binds a player to his club for as long as the latter desires, has been the subject of three Supreme Court cases (1922, 1953, 1972). In all three cases the Court refused to overturn the reserve clause, ruling that baseball is a sport and not a business, and as such is not subject to Federal antitrust laws. In 1973 major league baseball experienced the first strike in its history. Stemming from a dispute over the size of the players' pension fund, the strike delayed the season's start by 13 days and forced the cancellation of 86 games. Baseball is also played by semiprofessional, amateur, club, college, and school teams. It has achieved considerable popularity in Japan as well as Cuba, Puerto Rico, Mexico, and other Latin American countries. Softball, a form of baseball in which a larger ball and a smaller infield are required, is also popular among amateurs. A number of professional baseball's greatest figures have been elected to the National Baseball Hall of Fame, built (1939) at Cooperstown, N.Y. Among the more famous names in the history of professional baseball are Henry L. Aaron, Grover C. Alexander, Adrian C. (Cap) Anson, John F. (Home Run) Baker, Lawrence P. (Yogi) Berra, Frank L. Chance, Tyrus R. (Ty) Cobb, Gordon S. (Mickey) Cochrane, Edward T. Collins, Joseph E. Cronin, Jerome H. (Dizzy) Dean, William M. (Bill) Dickey, Joseph P. (Joe) DiMaggio, Robert W. A. (Bob) Feller, James E. (Jimmy) Foxx, Frank R. Frisch, Henry L. (Lou) Gehrig, Joshua Gibson, Henry B. (Hank) Greenberg, Robert M. (Lefty) Grove, Rogers Hornsby, Carl O. Hubbell, Miller J. Huggins, Walter P. Johnson, Willie Keeler, William F. Klem, Sanford (Sandy) Koufax, Napoleon (Larry) Lajoie, Walter J. V. (Rabbit) Maranville, Joseph V. McCarthy, Cornelius McGillicuddy (Connie Mack), John J. McGraw, Mickey Mantle, Roger Maris, Christopher (Christy) Mathewson, Willie Mays, Stanley F. (Stan) Musial, Melvin T. (Mel) Ott, Satchel Paige, Jackie Robinson, George H. (Babe) Ruth, George H. Sisler, Warren E. Spahn, Tristram E. (Tris) Speaker, Charles D. (Casey) Stengel, William H. (Bill) Terry, John S. Vander Meer, John P. (Honus) Wagner, Paul G. (Big Poison) Wan-

er, Theodore S (Ted) Williams, and Denton T (Cy) Young See Douglass Wallop, *Baseball* (1969), Roger Angell, *The Summer Game* (1972), Leonard Koppett, *All About Baseball* (rev ed 1974), *Baseball Encyclopedia* (rev ed 1974)

Basedow, Johann Bernhard (yōhān' bērn'hārt bā'-zādō), 1723-90, German educator, b Hamburg, educated in Hamburg and at the Univ of Leipzig. Later he taught in Denmark (1753) and Germany (1761) but became involved in controversies aroused by his unorthodox religious writings. In 1774 his *Elementarwerk* was published with funds raised by popular subscription, and Basedow opened at Dessau a school called the Philanthropinum, where the methods of elementary education outlined in this text were employed. Drawing upon the writings of Comenius, Locke, and Rousseau, Basedow emphasized realistic teaching and introduced nature study, physical education, and manual training. He resigned in 1778 because of disagreements with his staff, and the school closed in 1793. His reforms were widely influential, however, and similar institutions were established throughout Germany and Switzerland.

Basel (bā'zāl) or **Basle** (bāl), Fr *Bâle*, canton, N Switzerland, bordering on France and West Germany. It is bounded in the N by the Rhine River (which becomes navigable in the canton) and in the S by the Jura mts. Although it has industries, Basel is mainly a region of fertile fields, meadows, orchards, and forests. Its inhabitants are German-speaking and Protestant. The canton has been divided since 1833 into two independent half cantons—**Basel-Land** (1970 pop 240,889), 165 sq mi (427 sq km), generally comprising the rural districts, with its capital at Liestal, and **Basel-Stadt** (1970 pop 234,945), 14 sq mi (36 sq km), virtually coextensive with the city of Basel (1970 pop 212,857) and its suburbs. Divided by the Rhine, the city consists of Greater Basel (left bank), which is the commercial and intellectual center, and Lesser Basel, where industry is concentrated. Basel is a major economic center and the chief rail junction and river port of Switzerland. It is also a financial center. The city is the seat of the Swiss chemical and pharmaceutical industry and of the Swiss Industries Fair, it also has an important publishing industry. Other products are metal goods, foodstuffs, and silk textiles. Founded by the Romans (and named *Basilia*), it became an episcopal see in the 7th cent. It passed successively to the Alemanni, the Franks, and to Transjurane Burgundy. In the 11th cent. it became a free imperial city and the residence of prince-bishops. The celebrated Council of Basel (see separate article) met there in the mid-15th cent. Basel joined the Swiss Confederation in 1501 and accepted the Reformation in 1523. Although expelled from the city, the bishops continued to rule the bishopric of Basel (including *PORRENTURY* and *DELÉMONT*, which in 1815 became part of Bern canton). The oppressive rule of the city's patriciate over the rest of the canton led to revolts (1831-33) and the eventual split into two cantons. One of the oldest intellectual centers of Europe, Basel has through its university (founded 1460 by Pius II) attracted leading artists, scholars, and teachers. It was the residence of Froben, Erasmus, Holbein the Younger, Calvin, Nietzsche, and the Bernoulli family. Jakob Burckhardt and Leonhard Euler were born there. Among the city's noted structures are the cathedral (consecrated 1019), in which Erasmus is buried, the medieval gates, several guild houses, the 16th-century town hall, and an art gallery with a valuable collection of Holbein's works.

Basel, Council of, 1431-49, first part of the 17th ecumenical council in the Roman Catholic Church. It is generally considered to have been ecumenical until it fell into heresy in 1437, after that it is regarded as an anticonciliar. Its chief importance lies in the contest between council and pope for supremacy. The Council of Constance had seen the rise of the conciliar theory, the doctrine that the ultimate authority in the church rests upon the general council, to which the pope must be subject. It had been the plan to have frequent councils, but that of Basel was the first of importance to follow Constance, that of Pavia-Siena (1423-24) having accomplished little. Pope Martin V convoked the council but died soon afterward, and it was his successor, *EUGENE IV*, who confirmed the convocation. Various problems were brought before the council: the settlement of the difficulties with the *HUSSITES*, reform in the church, particularly financial reform, and the matter of negotiations for the union of the Eastern church and the Western church. Even though he had convened it, Eugene was suspicious of the council, fearing that

in the question of the *Hussites* it might reawaken doctrinal questions already regarded as settled. Therefore, he ordered the council dissolved almost immediately. This marked the outbreak of trouble between the council and the pope that was not to end until the council did. Holy Roman Emperor *SIGISMUND*, who desired the settlement of *Hussite* disputes from the council and desired coronation at the hands of the pope, acted as mediator. The council pronounced its supremacy over the pope and in 1433 reached the zenith of its power. Fearing schism, Eugene was driven to granting more and more concessions, but any compromise reached was temporary. The continual assertion of the conciliar supremacy led to the institution of a process against the pope for disobedience and ultimately to the papal denunciation of the council in the bull *Doctores gentium* (1437). The council, which thus became heretical, had accomplished a good deal. The *Compactata* had marked a compromise with the *Hussites*, the annates and various papal taxes had been declared illegal, church organization and finance had been reformed. In order to meet with delegates from the East on the question of reunion, Eugene summoned the council to Ferrara (see *FERRARA-FLORENCE, COUNCIL OF*). The council at Basel continued to function as an anticonciliar. Finally the process against Eugene was carried through, and the council elected *AMADEUS VIII* of Savoy pope (called Antipope Felix V). The allegiance of most temporal rulers was still given to Eugene, although the reforms of Basel were adopted by the French at Bourges and incorporated into the Pragmatic Sanction of Bourges; the council was not itself approved. The German king Frederick III (who was later crowned Holy Roman emperor) remained neutral, but in 1448 his pressure upon the city forced the delegates to retire to Lausanne. Felix, with only scattered support, abdicated in 1449, submitting to Eugene's successor, Nicholas V. The council recognized the legitimate pope and dissolved itself, thus ending the threat of antipapal conciliarism.

base line: see *GEODESY*

Basel-Land and Basel-Stadt: see *BASEL, Switzerland*

basenji (basēnjē), breed of medium-sized *HOUND* whose origins can be traced back several thousand years to Africa and the courts of the Egyptian pharaohs. It stands about 17 in (43.2 cm) high at the shoulders and weighs about 23 lb (10.4 kg). Its short, silky coat may be colored chestnut red, black, or black and tan, with white chest, feet, and tip of tail. The basenji has two unique characteristics: it does not bark but utters a sound that has been described as a chortle or whine, and, in the manner of a cat, it cleans its own body. Possessing a keen sense of smell, the basenji was used in its native Africa as a hunter but is now commonly kept as a house pet. See *DOG*.

Bashan (bā'shān), fertile region E of the Jordan from the latitude of Haifa northward to that of Tyre. It was conquered by the Israelites and given to the half tribe of Manasseh. Scholars believe the Bashan culture, essentially Amorite, shows traces of Indo-Iranian and Hittite influence. Now occupied by the Druses, it forms a part of Syria. Deut 3:11, Num 21:33, 2 Kings 10:33, Ps 22:12, 68:15, Amos 4:1.

Bashan-havoth-jair: see *HAVOTH-JAIR*

Bashemath (bā'sh'amāth), wife of Esau. Gen 26:34, 36:23.

Bashkir Autonomous Soviet Socialist Republic (bāshkēr') or **Bashkiria** (bāshkēr'ēa), autonomous region (1970 pop 3,819,000), 55,444 sq mi (143,600 sq km), E European USSR, in the S Urals, occupying the Belaya River basin. Ufa is the capital, other important cities are *STERLITAMAK*, *BELORETSK*, and *ISHIMBAY*. The Trans-Siberian and South Siberian railroads cross the republic. Bashkiria forms the eastern part of the Volga-Ural petroleum region and also has natural gas, coal, salt, iron, gold, copper, zinc, bauxite, and manganese deposits. The drilling, refining, and processing of oil is the predominant economic activity. About 40% of the land is forested, and sawmilling and the production of plywood and paper are important. Grains (especially wheat, rye, and oats) are the chief agricultural products. The republic's population is made up mainly of Bashkirs (about 25%), Russians (constituting a majority), and Tatars. The Bashkirs, a mixture of Finno-Ugric, Turkic, and Mongolian tribes, are a Muslim people who speak a Turkic language very close to Tatar. Historically, the Bashkirs were controlled by the Volga Bulgars and the Golden Horde, and later by the khans of Kazan, Nogai, and Siberia. In 1557, during the reign of Ivan IV, they came under Muscovite rule. The Russians founded Ufa in 1574 and began

colonization, dispossessing the Bashkirs, who revolted numerous times during the next two centuries (notably under Pugachev in 1773-75). In 1917 a Bashkir national government was formed, but the region experienced heavy fighting between the Red and White armies in the aftermath of the Russian Revolution. In 1919, Bashkiria was made the first autonomous Soviet republic.

basic oxygen process, method of producing *STEEL* from a charge consisting mostly of pig iron. The charge is placed in a furnace similar to the one used in the *BESSEMER PROCESS* of steelmaking except that pure oxygen instead of air is blown into the charge to oxidize the impurities present. One desirable feature of this process is that it takes less than an hour, and is thus much faster than the open-hearth process, another important method of steelmaking. A second advantage is that a major by-product is carbon monoxide, which can be used as a fuel or in producing various chemicals, such as acetic acid. The basic oxygen process also produces less air pollution than methods using air.

Basidiomycete: see *FUNGI*

Basie, Count (William Basie), 1904-, American jazz pianist, band-leader, and composer, b Red Bank, N.J. After working in dance halls and vaudeville in New York City, Basie moved to Kansas City, a major jazz center. There he joined Walter Page's Blue Devils in 1927, moving to Bennie Morton's band in 1929. He formed his own band in 1935, and for 40 years it has produced a distinctive sound marked by a powerful yet relaxed attack. Basie's provocative piano style is characterized by a predominant right hand. Among the many pieces he has composed for his band is "One O'Clock Jump."

Basil, Saint: see *BASIL THE GREAT, SAINT*

Basil I (Basil the Macedonian), c 813-886, Byzantine emperor (867-86). His ancestors probably were Armenians or Slavs who settled in Macedonia. He became (c 856) the favorite of Emperor *MICHAEL III*. In 866, Basil, with the aid of Michael, assassinated Michael's uncle and chief minister, Bardas, and was made coemperor. Michael's feeling toward Basil began to change and in 867 Basil had him murdered and had himself proclaimed emperor. Thus the Macedonian dynasty of the East, which lasted until 1056, was founded. A capable ruler, Basil reformed the finances, modernized the law of Justinian I by introducing a new code, the *Basilica*, protected the poorer classes, and restored the military prestige of the empire. Byzantine art and architecture entered their second golden age during his rule. A major event of his reign was the dissension between the Roman and the Eastern churches. In order to prevent an open break, Basil restored (867) to the patriarchate *IGNATIUS OF CONSTANTINOPLE*, who had been deposed in favor of *PHOTIUS*. On Ignatius' death, Basil reinstated (877) Photius, causing strained relations but not a full break with Rome. Basil in 865 had divorced his wife and married the mistress of Michael III. He was succeeded by his son Leo VI.

Basil II, c 958-1025, Byzantine emperor (976-1025), surnamed *Bulgaroktonos* [Bulgar slayer]. With his brother, Constantine VIII, he nominally succeeded his father, Romanus II, in 963, but had no share in the government during the rule of the usurping generals *NICEPHORUS II* (963-69) and *JOHN I* (969-76). Primarily a soldier, Basil exercised virtually sole rule from 976, while his debauched brother was emperor only in name. Basil suppressed (976-89) a series of revolts of the great landowners led by Bardas Sclerus and revived and strengthened the laws directed against them by *ROMANUS I*. He annexed (1018) Bulgaria, although leaving it some measure of autonomy, and later extended the eastern frontier of his empire to the Caucasus. During his reign the schism between the Roman and the Eastern churches widened. Basil was succeeded by Constantine VIII (reigned 1025-28) and by Constantine's daughter Zoë.

Basil III, Russian ruler: see *VASILY III*

basil (bā'zəl), any plant of the genus *Ocimum*, tender herbs or small shrubs of the family *Labiatae* (*MINT* family), mostly of Old World warm regions and cultivated for the aromatic leaves. The basil of Keats's "Isabella" (and of Boccaccio's story) is the common or sweet basil (*O. basilicum*), once considered medicinal. This is the species usually used for seasoning; it is grown commercially chiefly in the Mediterranean area. There are also the holy basil, venerated in India, the bush basil, and related plants sometimes called basil. Basil is classified in the division *MAGNOLIOPHYTES*, class *Magnoliopsida*, order *Lamiales*, family *Labiatae*.

Basilan (basē'lan), island, 494 sq mi (1,279 sq km), northernmost and largest of the Sulu Archipelago, the Philippines. It is closely associated with the city of Zamboango on Mindanao island, just across the 10-mi (16-km) wide Basilan Strait. Major sources of income are sea products, coconut, timber, and rubber. The Univ. of the Philippines maintains a vast rubber plantation there. With neighboring islets, Basilan forms the Basilan island group. The inhabitants are chiefly Muslim.

Basildon, urban district (1971 pop. 129,073), Essex, E. England. The southern portion is Basildon New Town, a planned community with many factories. There are light engineering, chemical, and joinery works, milk-bottling and printing plants, and clothing and carbon-black factories.

Basile, Giovanni Battista (jōvan'ne bat-tēs'ta basē'lā), 1575-1632, Italian writer. Basile held several important official positions, devoting his spare time to the study of folklore. He is known for his *Lu Cunta de li cuntr* [the tale of tales] (1634-36), a collection of folk and fairy tales written in the Neapolitan dialect in a vigorous, exuberant style. The collection, usually referred to as *Il Pentamerone* because its framework is similar to Boccaccio's *Decameron*, recounts 50 tales told to a prince and his bride by ten women during a five-day period. Cinderella, Rapunzel, Snow White, and many other fairy-tale characters make their first appearance in its pages.

Basilian monks (basē'lē'ān), monks of the Eastern Church. They follow the Rule of St. Basil the Great, which has been universal among them since the 7th cent. They have no centralized government; the rule treats proper monastic living, not organization. Their monasteries are collections of small cells, the whole group being called a *laura*. The chief monastery is the Great Laura of Mt. Athos, another famous Orthodox monastery is St. Catherine on Mt. Sinai. There are Basilians in communion with the pope. The chief figure of Basilian history is the reformer St. Theodore of Studium. See also **MONASTICISM**.

basilica (basē'lī'kə), large building erected by the Romans for transacting business and disposing of legal matters. Often rectangular in form with a roofed hall, the building usually contained an interior colonnade, with an apse at one end or at each end. The central aisle tended to be wide and was higher than the flanking aisles, so that light could penetrate through the clerestory windows. The oldest known basilica was built in Rome in 184 B.C. by the elder Cato. Other early examples are the Basilica Porcia in Rome and one at Pompeii (late 2d cent. B.C.). Probably the most splendid Roman basilica is the one constructed during the reign of Maxentius and finished by Constantine after 313. In the 4th cent. Christians began to build edifices for worship that were related to the form of the basilicas. These had a center nave with one aisle at each side and an apse at one end; on this platform sat the bishop and priests. Basilicas of this type were built not only in

Western Europe but in Greece, Syria, Egypt, and Palestine. A good example of the Oriental basilica is the Church of the Nativity at Bethlehem (6th cent.). The finest basilicas in Rome were St. John Lateran and St. Paul's-outside-the-Walls (4th cent.), and San Clemente (6th cent.). Gradually there emerged the massive Romanesque churches, which still retained the fundamental plan of the basilica.

Basilicata (bazē'lē'kə'tā), region (1971 pop. 602,389), 3,856 sq mi (9,987 sq km), S Italy, bordering on the Tyrrhenian Sea in the southwest and on the Gulf of Taranto in the southeast. It forms the instep of the Italian "boot." POTENZA is the capital of Basilicata, which is divided into Potenza and Matera provs (named for their capitals). The region is crossed by the Lucanian Apennines; its main river is the Bradano. Because of a dry climate and a scarcity of ground water, farming is difficult, although it is the occupation of most inhabitants of the generally poor region. Olives, plums, and cereals are grown, and sheep and goats are raised. There is also some fishing. The transportation network is very limited, and commerce and industry are minimal. Basilicata corresponds to most of ancient LUCANIA and to part of ancient SAMNIUM. Rome took the region in 272 B.C.; it later passed in turn to the Lombards, to the Byzantines, and (11th cent.) to the Norman duchy of Apulia, of which MELFI (now in Basilicata) was the capital. Although later a part of the kingdom of Naples, Basilicata was controlled by virtually independent feudal lords. Malaria, still a scourge on the coasts, caused the flourishing coastal towns to be abandoned in the early Middle Ages. In the 20th cent. there have been reclamation works and social and land reforms in Basilicata, but many of the inhabitants have emigrated to foreign countries (especially the United States) or have taken jobs in the industrial cities of N Italy. The region has suffered numerous earthquakes.

Basilides (basē'lī'dēz), fl. 120-145, Gnostic teacher of Alexandria. He wrote *Exegitica* (his personal gospel with 24 books of commentary) and poems. He claimed to possess a secret tradition handed down from St. Peter and St. Matthias. The Basilidean sect of Gnosticism attracted many followers.

Basilikon Doron (basē'lī'kon dō'rən) [Gr., = royal gift], book written by James VI of Scotland (subsequently James I of England) as a guide for the conduct of his son Henry when he became king. The work was completed in manuscript in 1598 and published the following year. James warned Henry of meddling ministers and expounded the doctrine of the divine right of kings. Henry died in 1612 and did not ascend the throne. See edition by James Craigie (1944-50).

Basileus (bā'sīlēs'kəs), d. c. 477, usurper at Constantinople (475-76). He was responsible for the failure of the expedition sent (468) against the Vandals by his brother-in-law Leo I. He usurped the throne during the reign of Zeno, but his extortions and Monophysite tendencies led to his overthrow and execution when Zeno recovered his throne.

basilisk see **IGUANA**

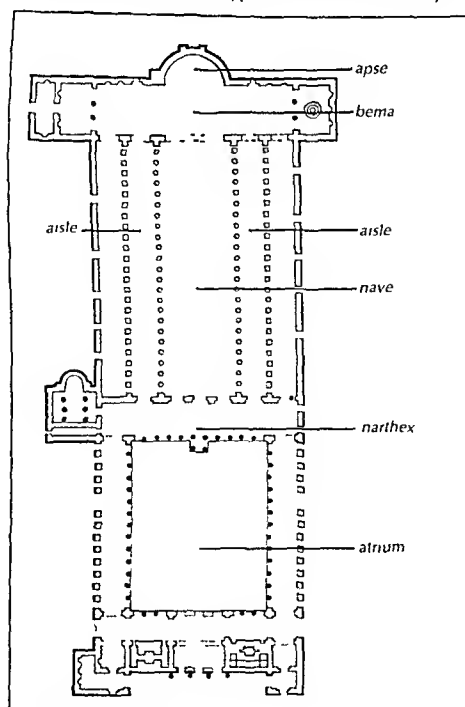
Basil the Great, Saint (bā'zīl, bā'-), c. 330-379, Greek prelate, bishop of Caesarea in Cappadocia, Doctor of the Church and one of the Four Fathers of the Greek Church. He was a brother of St. Gregory of Nyssa. In his student days at Athens he knew Julian, later Roman emperor, and began his lifelong friendship with St. Gregory Nazianzen. Converted to the religious life by his sister, St. Macrina, he withdrew (c. 357) to a retreat in Pontus. There he wrote much of the *Longer Rule* and of the *Shorter Rule*, on these the life of the **BASILIAN MONKS** is based. Through his rules Basil was a spiritual ancestor of St. Benedict. As counselor (365) and successor (370) of Eusebius, bishop of Caesarea and head of most of the church in Asia Minor, Basil established Nicene orthodoxy over Arianism in the Byzantine East. His revision of the liturgy is occasionally used in the Byzantine rite. His works *On the Holy Ghost* and *Against Eunomius* are elegant, acute defenses of the Catholic system. In the West his feast is June 14. See his letters tr. by R. J. Deferrari (4 vol., 1926-34), studies by G. L. Prestige (1956), E. Amand de Mendieta (1965), and M. G. Murphy (1971).

Basingstoke (bā'zīngstōk), municipal borough (1971 pop. 52,502), Hampshire, S. central England, on the North Downs. Formerly a market town trading in silk and woollens, it now has several industries, including the manufacture of agricultural machinery, precision tools and instruments, leather, clothing, and drugs. The borough is growing rapidly, largely because of a spillover from London's population. In

871, Alfred defeated the Danes at nearby Basing. Basingstoke is mentioned as a royal manor in the Domesday Book. Oliver Cromwell won a victory at Basing in 1645.

Baskerville, John, 1706-75, English designer of type and printer. He and CASLON were the two great type designers of the 18th cent. in England. He began his work as printer and publisher in 1757 and in 1758 became printer to Cambridge Univ. Baskerville's first volume was a quarto edition of Vergil. His type faces introduced the modern, pseudoclassical style, with level serifs and with emphasis on the contrast of light and heavy lines. This style influenced that of the DIDOT family in France and that of BODONI in Italy. Books printed by Baskerville are typically large, with wide margins, made with excellent paper and ink. His masterpiece was a folio Bible, published in 1763. The first wove paper used for printing books was made to his order. After his death his wife operated the press until 1777. Then most of his types were purchased by Beaumarchais and were used in his 70-volume edition of Voltaire. The matrices, long lost, were rediscovered and in 1953 were presented to the Cambridge Univ. Press. Among Baskerville's publications in the British Museum are Aesop's *Fables* (1761), the Bible (1763), and the works of Horace (1770). See biographies by William Bennett (1939) and Henry Evans (1953), bibliography by Philip Gaskell (1959).

basketball, game played generally indoors by two opposing teams of five players each. At each end of the court—usually about 92 ft (28 m) long and 50 ft (15 m) wide—is a bottomless basket made of white cord net and suspended from a metal ring, 18 in. (46 cm) in diameter, which is attached 10 ft (3.05 m) above the floor (usually hardwood) to a backboard. Players may pass, throw, bat, roll, or dribble (bounce) the ball but may not run with it. Players of one team seek to advance the ball into position for shooting it through one basket (the ball must enter from above) and to keep the opposition from scoring through the other basket. Each field goal, or basket, scores two points. Illegal body contact is penalized by awarding free throws—counting one point for each made—to players fouled. There is a limit—five in amateur, six in professional play—to the number of fouls a player may commit before he is disqualified from a game. International and collegiate basketball games are played in two 20-min halves. Basketball was originated in the United States, in 1891, by Dr. James NAISMITH, then a physical education instructor at the YMCA college in Springfield, Mass. Today it is one of the leading American sports, attracting well over 30 million spectators a year, and has been enthusiastically adopted throughout the world. In 1937 one of the most important and far-reaching rule changes was made, when the center jump after each score was eliminated. This greatly speeded up the game, increased scoring, and reduced some of the advantage enjoyed by taller players. Another measure designed to reduce the importance of height is the rule (adopted 1968) against "dunking," or ramming the ball directly into the basket from above, in intercollegiate play. Height, however, continues to be an important asset in basketball. The game is a major sport in American colleges, and such postseason collegiate tournaments as the National Invitation Tournament (begun 1938) and the National Collegiate Athletic Association championships (begun 1939) attract wide attention. The latter tournament, held to determine the nation's best collegiate basketball team, was dominated by the University of California at Los Angeles during the late 1960s and early 1970s. Between 1967 and 1973, UCLA won a record-setting seven straight national championships, and had over 60 consecutive victories in regular competition. Another important factor in the popularizing of basketball was the presentation of college games in large public arenas, begun (1934) with double-headers in Madison Square Garden, New York City. The popularity of college basketball continued to grow until serious scandals hit the sport in 1951. Investigations disclosed that in games in Madison Square Garden and elsewhere college players had been bribed by gamblers to "fix" games (i.e., arrange the final scores to a gambler's advantage). Within the next ten years further investigations resulted in the conviction of more than 100 athletes from colleges throughout the country. Since the scandals college basketball has been able to cultivate a more positive image and has grown in popularity. Although an exhibition basketball game was played at the 1904 Olympics, it was not until 1936 that the sport became a regular part of the



Floor plan of a basilica

games International competition differs from American collegiate and professional basketball in that the area directly in front of the basket, known as the free throw lane or the three-second area, is cone-shaped rather than rectangular. International basketball is also considered rougher and involves more physical contact than the American game. The United States dominated almost every major international basketball competition until 1972, when the Soviet Union defeated the U.S. team for the Olympic gold medal, in spite of official American protests that the Soviet team was illegally allowed to score a basket after the game had ended. Professional basketball was begun (1896) in New York City and has since grown very popular. The merger (1949) of the National Basketball League and its rival the Basketball Association of America into the National Basketball Association (NBA) led to great development of the game. The NBA consists of 18 teams in four divisions. The teams are Atlanta Hawks, Boston Celtics, Buffalo Braves, Chicago Bulls, Cleveland Cavaliers, Detroit Pistons, Golden State Warriors, Houston Rockets, Kansas City-Omaha Kings, Los Angeles Lakers, Milwaukee Bucks, New York Knicks, New Orleans Jazz, Philadelphia 76ers, Phoenix Suns, Portland Trail Blazers, Seattle SuperSonics, Washington Bullets. Professional basketball's popularity led to the establishment (1967) of the American Basketball Association (ABA), a rival league to the NBA. The ABA is composed of ten teams in two divisions. The ABA teams are Carolina Cougars, Denver Rockets, Indiana Pacers, Kentucky Colonels, Memphis Tams, New York Nets, San Antonio Spurs, San Diego Conquistadors, Utah Stars, and Virginia Squires. Economic competition between the two leagues resulted in lucrative first-year contracts for many college stars, some of whom were signed for as much as one million dollars. The expense of this bidding war led NBA and ABA owners to seek congressional approval for a merger, although such a plan is opposed by the players, who expect to gain much from interleague competition. The professional game, with 12-min quarters, has adapted its rules, adding a 24-sec time limit for the offensive team to make a shot. A time limit has long been a feature of international competition. The most famous of all the professional teams were the Original Celtics of New York City, the Boston Celtics between 1957 and 1965, and the Harlem Globetrotters, an independent touring team. There are modifications in basketball rules for high school and women's play. See W. R. Alheim, *Beginning Basketball for Men* (1968), Leonard Koppett, *24 Seconds to Shoot* (1968), Bob Cousy, *Basketball* (1970), Pete Axthelm, *The City Game* (1971), Dale Hanson, *Basketball* (1972), B. L. Webb, *The Basketball Man*, James Naismith (1973), Zander Hollander, ed. *The Modern Encyclopedia of Basketball* (rev. ed. 1973).

basket makers, name given to the members of an early North American Indian culture in the Southwest, predecessors of the PUEBLO INDIANS. Because of the cultural continuity from the basket makers to the Pueblos, they are jointly referred to by archaeologists as the Anasazi culture. They are so called because of their extensive practice of basketmaking, by covering the baskets with clay and baking them hard they created fireproof containers. One system of dating places their arrival in the area as early as 1500 B.C. They seem to have been at first nomadic hunters, using wooden clubs, hunting sticks, and the ATLATL. They lived chiefly in houses with adobe floors and learned to grow corn and squash, probably from southern neighbors in Mexico. As they developed a more extensive agriculture, they dug pits and lined them with stone for grain storage and later built substantial dwellings lined with slabs of stone. At some time, perhaps c. 500 B.C., they were succeeded in the area by the ancestors of the Pueblo Indians, who probably absorbed many of them. Some basket makers may have moved and may have been the ancestors of other Indian tribes. Archaeologists divide the time of their culture into the Basket Maker and Modified Basket Maker periods, in the latter period they turned increasingly to agriculture. See INDIANS, NORTH AMERICAN.

basketry, art of weaving or coiling and sewing flexible materials to form vessels or other commodities. The materials used include twigs, roots, strips of hide, splints, osier willows, bamboo splits, cane or rattan, raffia, grasses, straw, and crepe paper. Discoveries in the U.S. indicate that the use of clay-covered baskets for cooking probably led to making pottery, while in the Andaman Islands pottery was evidently made first. In Egypt baskets used

for storing grain in 4000 or 5000 B.C. have been excavated. The tombs of Etruria have yielded ancient specimens, and these, as well as much later Roman baskets, display weaving strokes still in use. Basketry has been employed by primitive peoples for rude huts, which they daubed with clay, and for articles of dress and adornment, granaries, traps, boats, cooking utensils, water vessels, and other utilities. There are two types of baskets—woven and coiled or sewn—but variety is afforded by the many different strokes, forms, and methods of decoration. There are many large commercial basket-weaving establishments, but basketry is still a popular home industry and is taught in schools and as occupational therapy in hospitals.

Baskin, Leonard, 1922–, American sculptor, graphic artist, and teacher, b. New Brunswick, N.J. In sculptural and graphic works that are figurative in style, Baskin's images of a corrupt, bloated mankind retain an element of sardonic humor. His woodcuts are celebrated for their power and expressiveness. Among his notable prints are *Mid-Century Monster* and *The Poet Laureate*, his sculpture *Man with a Dead Bird* is in the Museum of Modern Art, New York City. Since 1953 Baskin has taught at Smith College. His works, often reproduced, are represented in many of the world's major museums. Baskin founded the Gehenna Press, noted for fine typography, in Northampton, Mass. See his *Sculpture, Drawings and Prints* (1970).

basking shark, large, plankton-feeding shark, *Cetorhinus maximus*, inhabiting many oceans of the world, especially in temperate regions. Found singly or in schools of up to 100, it spends much of its time on or just below the surface, cruising slowly with its dorsal fin breaking water. It reaches a length of 40 ft (12 m) and weighs up to 8,500 lb (3,900 kg)—among fishes it is second in size only to the whale shark. It feeds by filtering out plankton as water passes into its mouth and out of the gills. Its gill openings are greatly enlarged to accommodate a large volume of water, and its throat is lined with numerous slender structures called gill rakers. These rakers, which are attached to the inside of the gill arches, form a fine mesh that serves as a strainer. The basking shark has a torpedo-shaped body, a nearly symmetrical tail fin, and long, conspicuous gill slits. Its color ranges from gray to black or brown. It is fished commercially, mostly by harpooning; its flesh is used for fish meal and its liver oil for certain tanning processes. It is classified in the phylum CHORDATA, subphylum Vertebrata, class Chondrichthyes, order Selachii, family Ceterorhinidae.

Basle, Switzerland. See BASEL.

Basmath (bās'māth), daughter of Solomon. 1 Kings 4:15.

Basque language (bāsk), tongue of uncertain relationship spoken by about 800,000 people, most of whom live in NE Spain and some of whom reside in SW France. The language has eight dialects. Speakers of Basque are, for the most part, bilingual, and the chances for the survival of the language are not good. Basque is definitely not an Indo-European tongue. Some scholars believe it is descended from Aquitanian, which was spoken on the Iberian peninsula and in S Gaul in ancient times. Other linguists think Basque is akin to the CAUCASIAN LANGUAGES and suggest that its speakers came from Asia Minor to Spain and Gaul c. 2000 B.C. However, no relationship between Basque and any other language has been established with certainty. The alphabet used for Basque employs Roman letters. The first printed book in Basque appeared in the 16th cent. Basque is both agglutinative and polysynthetic. In an agglutinative language, different linguistic elements, each of which exists separately and has a fixed meaning, are often joined to form one word. In a polysynthetic language, a number of word elements are joined together to form a composite word that functions like a sentence or phrase in Indo-European languages, but each element has meaning usually only as part of the sentence or phrase and not as a separate item. See William J. Entwistle, *The Spanish Language, Together with Portuguese, Catalan, and Basque* (2d ed. 1962).

Basque Provinces, Basque *Euzkadi*, Spain. Vascongadas, comprising the provinces of Álava, Guipúzcoa, and Vizcaya (1970 pop. 1,876,787), N Spain, S of the Bay of Biscay and bordering on France in the northeast. The region includes the W Pyrenees and is bounded in the southwest by the Ebro River. It is crossed by the Cantabrian Mts. (In a wider sense the name also applies to other territories largely inhabited by Basques: Spanish Navarre and Basses-Pyrénées dept. in France.) Bilbao, capital of Vizcaya

prov., is the largest Basque city and one of the chief industrial centers of Spain. Other cities include San Sebastián, capital of Guipúzcoa prov., Vitoria, capital of Álava prov., and historic Guernica. In the densely populated coastal provinces of Vizcaya and Guipúzcoa the chief occupations are the mining of iron, lead, copper, and zinc, and metalworking, shipbuilding, and fishing. The minerals are exported mainly to England. Álava is primarily agricultural; corn and sugar beets are grown, and wine and apple cider are made. For the history of the three provinces up to 1936, see BASQUES. Shortly after the outbreak of the Spanish civil war in 1936 the central government granted the three provinces autonomy. The Basque nationalist leader, Jose Antonio de Aguirre, was elected president of the autonomous government. The Basques defended their newly won status with their customary heroism and fervor, but a large part of their territory was soon in insurgent hands. The fighting was over by Sept. 1937. The new Franco regime abolished Basque autonomy, but to this day Basque nationalism remains strong. Protests and strikes are common, and terrorists, operating from headquarters in other European countries, stage frequent attacks.

Basques (bāsk), people of N Spain and SW France. There are about 1,774,000 Basques in the three Basque provs and Navarre, Spain, over 100,000 in Labourd, Soule, and Lower Navarre, France, and communities of various sizes in Central and South America and other parts of the world. Many preserve their ancient language, which is unrelated to any other tongue. They have guarded their ancient customs and traditions, although they have played a prominent role in the history of Spain and France. The origin of the Basques, almost certainly the oldest surviving ethnic group in Europe, has not yet been determined, but they antedate the ancient Iberian tribes of Spain, with which they have been erroneously identified. Genetically and culturally, the Basque population has been relatively isolated and distinct, perhaps since Paleolithic times. Primarily free peasants, shepherds, fishermen, navigators, miners, and metalworkers, the Basques have also produced such figures as St. Ignatius of Loyola, St. Francis Xavier, and Francisco de Vitoria. Before Roman times, the Basque tribes, little organized politically, extended further to the north and south than at present. But the core of the Basque country resisted Romanization and was only nominally subject to Roman rule. Christianity was slow in penetrating (3d–5th cent.). Once converted, the Basques remained fervent Roman Catholics, but they have retained a certain tradition of independence from the hierarchies of Spain and France. The Basques withstood domination by the Visigoths and Franks. Late in the 6th cent. they took advantage of the anarchy prevailing in the Frankish kingdom and expanded northward, occupying present-day Gascony (Lat. *Vasconia*), to which they gave their name. The duchy of Vasconia, formed in 601 and chronically at war with the Franks, Visigoths, and Moors, was closely associated with, and at times dominated by, Aquitaine. In 778 the Basques, who had just been reduced to nominal vassalage by Charlemagne, destroyed the Frankish rearguard at Roncevaux, but they subsequently recognized Louis the Pious, king of Aquitaine, as their suzerain. The duchy of Gascony continued, but the Basques early in the 9th cent. concentrated in their present habitat and in 824 founded, at Pamplona, the kingdom of Navarre, which under Sancho III (1000–1035) united almost all the Basques. Although Castile acquired Guipúzcoa (1200), Álava (1332), and Vizcaya (1370), the Castilian kings recognized the wide democratic rights enjoyed by the Basques. GUERNICA was the traditional location of Basque assemblies. With the conquest (1512) of Navarre by Ferdinand the Catholic, the Basques lost their last independent stronghold. After the 16th cent., Basque prosperity declined and emigration became common, especially in the 19th cent. Basque privileges remained in force under the Spanish monarchy, but in 1873 they were abolished because of the Basques' pro-Carlist stand in the Carlist Wars. To regain autonomy, the Basques supported nearly every political movement directed against the central authority. In the civil war of 1936–39, the Basque Provinces, not including Navarre, defended the republican government, under which they had autonomous status. The Basques of Navarre supported the Franco forces. The Franco government, once in power, for the most part discouraged Basque political and cultural autonomy, although Basque nationalism has retained its appeal to the Basques. The trial of Basque nationalists in

1970 caused serious political conflicts in Spain, and the years following have been increasingly marked by unrest and violence by and against the Basque separatist organization. See Rodney Gallop, *A Book of the Basques* (1930, repr 1970).

Basra (būs'ra), Arabic *al Basrah*, city (1965 pop 313,327), SE Iraq, on the Shatt al Arab. Basra is the only port in Iraq. Its commercially advantageous location, near oil fields and 75 mi (121 km) from the Persian Gulf, has made it prosperous. Since 1948 many oil refineries have been built in the city. Petroleum products, grains, wool, and dates are exported. Basra was founded (A.D. 636) by the caliph Umar I. It was a cultural center under Harun ar-Rashid and declined with the decay of the Abbasid caliphate. Its possession was long contested by the Persians and the Turks. After World War I the construction of a rail line to Baghdad and the building of a modern harbor restored the city's importance. It is the seat of a branch of the Univ. of Baghdad. The name also appears as Bassora, Bussora, and Busra.

Bas-Rhin (ba-rān'), department (1968 pop 827,367), E France, in N Alsace. STRASBOURG is the capital and the commercial and industrial center.

Bass, Sam, 1851-78, American desperado, b. near Mitchell, Ind. He went (c 1870) to Denton, Texas, where he worked at various jobs before he became an outlaw. He was a road agent and train robber around Deadwood, S. Dak., for a time, then returned to Texas, where he gained notoriety as a train robber. One of his gang informed on him, and when Bass arrived to rob the bank at Round Rock he was mortally wounded by the Texas Rangers. His career and especially his death provided material for frontier ballads. See biographies by Wayne Gard (1936, repr 1969) and C. L. Martin (1880, repr 1956, 1968).

bass, common name applied to various fishes of the families Serranidae (sea basses) and Centrarchidae (black basses and sunfishes). The sea basses are a large, diverse, and important family of perchlike fishes with oblong, rather compressed bodies. All basses are carnivorous and most are marine, although several species are found in fresh water (see SUNFISH). Sea basses inhabit warm and temperate seas throughout the world and are highly valued as game and food fishes. Along the Atlantic coast as far north as Cape Cod is found the common, or black, sea bass, a sluggish bottom fish averaging 6 lb (2.7 kg) in weight and 18 in (45 cm) in length. Offshoots of the sea basses and classified with them are the white basses, including the striped bass (or rockfish) and the white perch, both found in fresh and brackish waters from Florida to Canada, the white bass of the Mississippi valley and the Great Lakes, and the similar but smaller yellow bass, found in the same range. The Pacific sea basses include the giant sea bass, or Pacific jewfish, a bulky bottom fish that reaches a weight of 600 lb (270 kg) and a length of 7 ft (2.1 m), as well as the 2-ft (60-cm) kelp and sand basses. The GROUPERS are an important genus of large tropical sea basses. Very closely allied to the sea basses are the tripletails, with prominent anal and dorsal fins, and the robalo, or snook, widely distributed in tropical American salt waters. Basses are classified in the phylum CHORDATA, subphylum Vertebrata, class Osteichthyes, order Perciformes, families Serranidae and Centrarchidae.

bass (bās), in musical harmony, the part of lowest pitch. The term is used for the lowest-pitched male VOICE and for instruments of low pitch, such as bass clarinet, bass drum, French horn, bassoon (bass oboe), and bass trombone.

Bassano, Jacopo (ya'kōpō bas-sa'nō), c 1515-1592, Venetian painter, whose original name was Jacopo, or Giacomo, da Ponte, b. Bassano, Italy. Bassano first studied with his father, Francesco da Ponte, and then went to Venice. There he was influenced by Titian and Lorenzo Lotto, but he soon evolved a more turbulent mannerist style. Returning to Bassano c 1540, he established a thriving workshop producing works primarily on biblical themes. Into his paintings, which were characterized by a dramatic intensity, he introduced vignettes of country life. He was among the first Italian painters to depict animals, farmhouses, and landscapes. Jacopo's works include *Jacob's Return to Canaan* (Ducal Palace, Venice), *Dives and Lazarus* (Cleveland Mus.), *Acteon and the Nymphs* (Art Inst., Chicago), *Annunciation to the Shepherds* (National Gall. of Art, Washington, D.C.). See study by Pietro Zampetti (tr 1958). Of Jacopo's four sons, his most worthy followers were Francesco Bassano, 1549-92, whose biblical and pastoral scenes were similar in style to his father's, and Leandro Bassano, 1558-1623, who

Painted altarpieces and portraits as well as pastoral GENRE. The Cleveland Museum of Art has his *Pieta*. **Bassano del Grappa** (bas-sa'nō dēl grap'pa), city (1971 pop 35,187), Venetia, NE Italy, on the Brenta River. It is an agricultural, commercial, and industrial center. First mentioned c 998, the city came under several lords before passing to Venice in 1404. In Sept., 1796, Napoleon I defeated the Austrians there. The Da Ponte family of painters, called the Bassano family after the city, had a flourishing school there in the 16th cent., and many of their works remain in the city. In the 17th and 18th cent. the Remondini printing plant was famous throughout Europe. Of note are a 13th-century castle, a wooden covered bridge (13th cent., rebuilt numerous times including 1945), and a number of fine old churches and villas.

Bassein (bāsēn', -sān'), town (1969 est. pop 175,000), S Burma, on the Bassein River. Lying at the western edge of the Irrawaddy delta, Bassein is accessible to large vessels; it is also the terminus of a branch of the main railroad line. The town is a rice-milling and export center; teak and bamboo are also handled. The British established a fort at Bassein in 1852. It was occupied by the Japanese during World War II.

Basses-Alpes: see ALPES-DE-HAUTES-PROVENCE.

Basses-Pyrénées: see PYRÉNÉES-ATLANTIQUE.

Basse-Terre (bastēr'), town (1969 est. pop 16,000), capital of GUADELOUPE dept., French West Indies. It is a port that ships the products of the surrounding agricultural area. Founded by the French in 1643, it retains its French colonial atmosphere, but its commercial prosperity passed to Pointe-à-Pitre in the late 18th cent.

Basseterre, town (1970 est. pop 14,000), capital of SAINT KITTS-NEVIS, on St. Kitts island, British West Indies. It is one of the chief commercial depots of the Leeward Islands. Sugar refining is the leading industry. Basseterre was founded by the French in 1627.

basset hound, breed of short-legged, long-bodied HOUND developed centuries ago in France. It stands from 12 to 15 in (30.1-38.1 cm) high at the shoulder and weighs from 25 to 50 lb (11.3-22.7 kg). The short, dense coat is usually black, tan, or white or any combination of these colors. The basset was perfected to hunt such game as rabbits, fox, squirrels, and pheasant in very heavy ground cover, the shortness of its legs allows it to keep its head to the scent with a minimum of difficulty. It has also been trained to hunt raccoons and opossum and to retrieve. Renowned for its scenting ability, which is second only to that of its close relative the bloodhound, the basset is still popular as a slow but efficient hunter. It is also raised as a pet. See DOG.

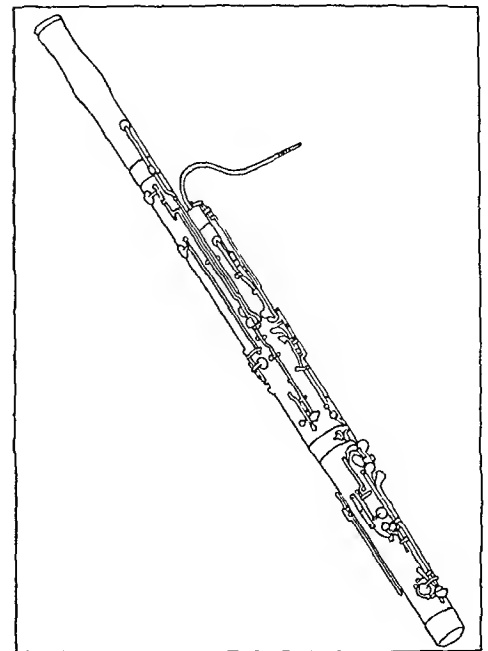
Bassett, James, 1834-1906, American Presbyterian missionary, b. Canada. In 1872, under the auspices of the American Board, he founded the first American mission at Teheran, Persia. Under his supervision other mission stations were founded, and in 1882 he became senior missionary and head of the Eastern Mission of Persia. He wrote *Persia, the Land of the Imams* (1886) and *Persia, Eastern Mission* (1890).

Bassett, John Spencer, 1867-1928, American historian, b. Tarboro, N.C. He was professor of history at Trinity College (now Duke Univ.) from 1893 to 1906 and then at Smith from 1906 to 1928. His first writings were mostly monographs on North Carolina history. Bassett founded (1902) the *South Atlantic Quarterly*. Chief among his writings are *The Federalist System, 1789-1801* (1906, repr 1968, Vol. II in the "American Nation" series), *The Life of Andrew Jackson* (1911, repr 1967), and *The Middle Group of American Historians* (1917). He also edited much original material, including *The Writings of "Colonel" William Byrd* (1901), *Selections from the Federalist* (1921), *The Southern Plantation Overseer as Revealed in His Letters* (1925, repr 1968), and *The Correspondence of Andrew Jackson* (7 vol., 1926-35).

Bassompierre, François, baron de (fraNswa' barōN' dā basōNpyēr'), 1579-1646, marshal of France. Under King Henry IV he distinguished himself in the army and as a courtier, and after Henry's death he remained loyal to the queen, Marie de' Medici, during her regency. Subsequently he was ambassador to Spain, to England, and to Switzerland, and he fought against the HUGUENOTS in 1621-22 and 1627-28. Because of his opposition to Cardinal Richelieu and his alleged part in an intrigue he was imprisoned (1631) in the Bastille until after the cardinal's death (1643). During his captivity he wrote valuable memoirs.

bassoon (bāsōōn'), double-reed woodwind instrument that plays in the bass and tenor registers. Its B-

ft (2.4-m) conical tube is bent double, the instrument thus being about 4 ft (1.2 m) high. It evolved from earlier double-reed instruments in the 16th



Bassoon

cent. and by 1600 was common throughout Europe. When the orchestra developed in the 17th cent., the bassoon was one of the original woodwinds included and has been indispensable ever since. It was much improved in the 19th cent. in both France and Germany, the French and German bassoons have since differed from each other appreciably in tonal quality and construction. Although used in chamber music, the bassoon has only a small literature as a solo instrument. When played staccato it can have a humorous effect that has been frequently exploited by composers. The contrabassoon, also called double bassoon, is pitched an octave below the bassoon. Fingering is the same for both. The contrabassoon's tube, more than 16 ft (4.9 m) long, is doubled back upon itself four times. First made by Hans Schreiber of Berlin in 1620, it was used by Handel, Haydn, and Beethoven. Technical imperfections hindered any extensive use until a German, Wilhelm Heckel, in the late 19th cent. improved its construction and intonation, producing the model in general use today.

Bassora: see BASRA, Iraq.

Bass Strait (bās), channel, 80 to 150 mi (129-241 km) wide, between Tasmania and Victoria, SE Australia, connecting the Indian Ocean and Tasman Sea. Port Phillip Bay and Melbourne are on the northwest coast. Bass Strait is an important fishing area. The discovery of the strait by English explorer George Bass in 1798 proved that Tasmania was not a part of the Australian continent.

bass viol (bās vi'ol), properly, the largest instrument of the VIOL family. The term now refers most often to the DOUBLE BASS.

basswood: see LINDEN.

Bast (bāst), ancient Egyptian cat goddess. At first a goddess of the home, she later became known as a goddess of war. The center of her cult was at Bubastis. Her name also appears as Ubast.

bast: see BARK.

bastard, person born out of wedlock whose legal status is illegitimacy. In CIVIL LAW countries and in about half the states of the United States, the union of the parents in marriage after birth makes the child legitimate. Unlike civil law, which granted bastards certain rights, English COMMON LAW treated them almost as persons outside the law and left their care to poorhouses. At common law a bastard has no right to inherit property from his mother or father except by specific designation (e.g., in a will). Recently their condition has been much improved by statute. It is presumed that any child born to a married woman, or within competent time after termination of the marriage, is the child of her husband. If, however, it can be proved that it was physically impossible for the husband to have been the

father (e.g., because of nonaccess to the wife), he may bring action to establish the illegitimacy of the child. For the status of children born to annulled marriages, see NULLITY OF MARRIAGE, HUSBAND AND WIFE. See also LEGITIMATION.

Bastenaken: see BASTOGNE, Belgium

Bastia (băstă'ă), city (1968 pop. 50,100), NE Corsica, France, on the Tyrrhenian Sea. It is the island's largest city and chief commercial center. It has a thriving export industry, sawmills, and cigarette and food-processing plants. Founded (14th cent.) as a fort by the Genoese, it was the capital of Corsica until 1791. Its citadel (16th–17th cent.) and its many 18th-century buildings are tourist attractions.

Bastian, Adolf (ă'dôlf băst'yăn'), 1826–1905, German anthropologist. Often called the father of ethnography, he recorded his observations of peoples and cultures in *Der Mensch in der Geschichte* [man in history] (1860). His concept of "elemental ideas" as common to mankind but varying in form according to "folk ideas" of a given area foreshadows the culture-area theory of modern anthropology. His influence was transmitted through the works of Franz BOAS and others. Bastian's important studies appeared in the *Zeitschrift für Ethnologie*, which he helped to found and edit, and in *Ethnologische Forschungen* (1871–73).

Bastiat, Frédéric (irădă'rek' băstyă'), 1801–50, French economist. In his *Harmonies of Political Economy* (1850, tr. 1860) he developed the classical theories of economic individualism and laissez-faire. A popular and controversial writer, he vigorously supported free trade. There are several translations of his essays called *Sophismes économiques* (1847–48). See studies by Dean Russell (1959 and 1965) and G. C. Roche, 3d (1971).

Bastidas, Rodrigo de (rôthre'gô dă băstê'thăs'), c.1460–1526, Spanish conquistador in Colombia. In 1501, accompanied by BALBOA and Juan de la COSA, he discovered the mouths of the Magdalena River. Because of difficulties with the Spanish crown, it was 1525 before he returned to found SANTA MARTA. He prohibited exploitation of the Indians and so dissatisfied his followers that they tried to murder him. Wounded, he fled to Santo Domingo, but bad weather forced him to land in Cuba, where he died.

Bastille (băstêl') [O Fr. = fortress], fortress and state prison in Paris, located, until its demolition (started in 1789), near the site of the present Place de la Bastille. It was begun c.1369 by Hugh Aubriot, provost of the merchants [mayor] of Paris under King Charles V. Arbitrary and secret imprisonment by LETTRE DE CACHET gave rise to stories of horror, but actually the Bastille was generally used for persons of influence, and its regime for most political prisoners was mild. As a symbol of absolutism the Bastille was hated. It had strategic importance, for its guns commanded one of the gates of Paris. On July 14, 1789, a Parisian mob stormed the Bastille in the hope of capturing ammunition. The governor, the marquis de Launey, was killed, the seven inmates, none of them political prisoners, were freed. This first spontaneous act of the people of Paris opened the way for the lower classes in the French Revolution. The event acquired symbolic significance, and July 14—Bastille Day—became the national holiday of republican France.

Bastogne (băstô'nyă), Flemish Bastenaken, town (1970 pop. 6,816), Luxembourg prov., SE Belgium, in the Ardennes and near the border of the duchy of Luxembourg. It is a market town noted for its hams and is a rail junction. In World War II during the Battle of the Bulge (Dec., 1944–Jan., 1945) it was held mainly by a U.S. division, against intensive bombardment by the Germans and generally overwhelming odds, until relieved by the U.S. 3rd Army. Nearby are military cemeteries and the Mardesson monument to the U.S. soldiers who died in battle.

Bastrop (băst'rôp'), city (1970 pop. 14,713), seat of Morehouse parish, NE La., founded c.1845. An industrial city in a cattle, farm, and timber area, Bastrop is the center of the huge Monroe natural gas field (discovered 1916). Its principal manufactures are paper, wood pulp, wood products, and chemicals.

Basutoland: see LESOTHO

bat, winged mammal of the order Chiroptera, which includes between 1,000 and 2,000 species classified in about 200 genera and 17 families. Bats range in size from a wingspread of over 5 ft (150 cm) to a wingspread of less than 2 in. (5 cm). They are found in nearly all parts of the world but are most numerous in the tropics; there are about 30 species in the United States. Bats are the only mammals capable of

true flight, that is, flight powered by muscular movement as distinct from gliding. The wing is a double membrane of skin stretched between the enormously elongated bones of four fingers and extending along the body from the forelimbs to the hind limbs and from there to the tail. The thumb is small, clawed, and free from the membrane. The hind limbs are small and may be rotated in such a way that the knees bend backward rather than forward, as in other mammals, this is presumably an adaptation for take off and flight. The body of the bat is mouselike and usually covered with fine fur. The face varies greatly from one species to another, many species have complex appendages on the snout and projections, or false ears, in front of the true ears, the ears themselves are often very large and elaborately convoluted. These facial structures are part of the sensory apparatus that receives sound vibrations. Nearly all bats are nocturnal and many live in caves, although they see well, they rely primarily on their highly developed hearing, using echolocation (sonar) to avoid collisions and to capture insects in flight. The bat emits high-pitched sounds (up to 50,000 hertz) that echo from any object it encounters; the echo provides the bat with information about the size, shape, and distance of the object. The rate at which bats emit these squeaks is sometimes as high as 200 per sec. Blinded bats easily find their way through complex obstacle courses, but deafness leaves them helpless. Bats at rest hang head down, grasping a twig or crevice with their clawed feet, they take off into flight from this position. Some bats are solitary, living in caves, crevices, hollow trees, or attics, other species are communal, with thousands or even millions of bats roosting together in a cave or on branches in a section of forest. In some species of communal bats, the entire colony leaves the roost together in the evening and returns together in the morning, in others, individuals come and go at different times. Bats of northern regions migrate, hibernate, or both in winter. In most species, males and females do not associate except during the mating season. Females of most species bear a single young in the summer of each year. The young are then carried by the mothers for a few days, after which they are left in the roost when not nursing, they begin to fly in a few weeks. The life span of some bats is 20 years in captivity. The bat order is divided on anatomical grounds into two major divisions, or suborders, the Megachiroptera, or FRUIT BATS, found only in the Old World tropics, and the Microchiroptera, or insect-eating bats, with a worldwide distribution. The fruit bats include the largest species of bat, the flying foxes, which may weigh 2 or 3 lbs (9 to 14 kg). Their diet is confined almost entirely to fruit, nectar, and pollen. The insect-eating bats include the smallest bat species. Despite the name, some of these bats live wholly or largely on fruit, a large number eat insects and, in some cases, larger animals. Members of several species catch fish as they skim over water, and the South American VAMPIRE BATS feed exclusively on blood. The most common bats of the temperate Northern Hemisphere are the Old World horseshoe bats (*Rhinolophus*), characterized by one or two horseshoe-shaped facial appendages, the cosmopolitan little brown bats (*Myotis*), big brown bats, or serotines (*Eptesicus*), and pipistrelles (*Pipistrellus*). The last three, all represented by species in North America, belong to the plain-nosed bat family (Vespertilionidae), characterized by a lack of appendages on the snout. There are over a dozen species of *Myotis* in North America, the common little brown bat, *M. lucifugus*, is distributed over the entire continent from Alaska and Labrador to the S. United States. A colonial bat, it is found in many habitats, including houses. It is about 2½ in. (6.3 cm) long without the tail and weighs about ¼ oz (7 grams). The North American big brown bat, *Eptesicus fuscus*, of similar distribution, is about three times as heavy, with a wingspread of 12 in. (30 cm). Large, solitary North American bats of wide distribution are the hoary bat, *Lasiurus cinereus*, yellow-brown with silver frosting, and the red bat, *L. borealis*, which is a striking brick-red color. Both have soft, thick fur and roost in trees. The freetail bats (family Molossidae) are a cosmopolitan group of communal bats characterized by a long tail extending well beyond the end of the wing membrane. Among them are the guano bats (*Tadarida*), which live in enormous colonies. Their excrement, called GUANO, accumulates in great quantities in their roosting places and is commercially valuable as fertilizer. Most New World freetail bats are tropical, but several are found in the S. United States. One of

these, the Mexican freetail bat (*Tadarida brasiliensis*), is noted for its colonies in the Carlsbad Caverns of New Mexico, numbering an estimated 9 million individuals. When these bats leave the caves together it takes about 20 min for the entire column to make its exit. This family also includes the mastiff bats (*Eumops*), largest of the North American bats, with a wingspread of 18 in. (46 cm). Most bats are economically valuable because of the large number of insects they consume. Bats are classified in the phylum CHORDATA, subphylum Vertebrata, class Mammalia, order Chiroptera. See R. W. Barbour and W. H. Davis, *Bats of America* (1969), W. A. Wimsatt, ed., *Biology of Bats* (2 vol., 1970).

Bataan (bătăn', -lăn', bătă-ăn'), peninsula and province (1970 pop. 214,131), W. Luzon, the Philippines, between Manila Bay and the South China Sea. Balanga is the provincial capital. A mountainous, thickly jungled region, it has some of the best bamboo forests in the Philippines. There is a pulp and paper mill, a large fertilizer plant, and an oil refinery (established there in 1961). Subsistence farming is carried on. Early in World War II (Dec., 1941–Jan., 1942), the U.S.-Filipino army withdrew to Bataan, where it entrenched and, despite the lack of naval and air support, fought a gallant holding action that upset the Japanese timetable for conquest. The army was crippled by starvation and disease when it was finally overwhelmed on April 9, 1942. The U.S. and Filipino troops captured there were subjected to the long, infamous "Death March" to the prison camp near Cabanatuan, thousands perished. Homage is annually paid these victims on Bataan Day, a national holiday, when large groups of Filipinos solemnly rewalk parts of the death route. The battleground of Bataan is now a national shrine. See also CORREGIDOR. See S. L. Falk, *Bataan: The March of Death* (1962), Robert Conroy, *The Battle of Bataan: America's Greatest Defeat* (1969).

Batalha (bătă'lyă) [Port. = battle], town (1970 municipal pop. 6,673), W. central Portugal, just S of Leiria, in Estremadura. It has a magnificent Dominican monastery and church (Santa Maria da Vitoria), built by John I of Portugal to commemorate his victory (1385) over John I of Castile at nearby Aljubarrota. The monastery is now a national museum.

Batalpashinsk: see CHERKESK, USSR.

Batanes, the Philippines. See BATAN ISLANDS.

Batangas (bătăn'găs), city (1970 pop. 927,290), capital of Batangas prov., SW Luzon, the Philippines. An important port on the Calumpian River near its mouth on Batangas Bay, it has a large oil refinery and serves a fertile farm area noted for its fruits, cacao, and coffee. Tourist attractions in Batangas province include Lake Taal, with its active volcano (which erupted in 1965, causing extensive damage and many deaths), and the popular summer resort city of Tagaytay.

Batan Islands (bătăn'), island group (1970 pop. 11,425), 76 sq mi (197 sq km), northernmost of the Philippine islands. They include the islands of Itbayat, Batan, Sabtang, and a number of islets, and comprise the province of Batanes. Basco is the provincial capital. The Batan Islands are separated from Taiwan by the Bashi Channel (50 mi/80 km wide). Coal is mined, and fishing is an important industry. In World War II, Batan Island was the site of the first Japanese landing in the Philippines (Dec. 8, 1941).

Batavi (bătă'vî), ancient Germanic tribe that settled (1st cent. B.C.) in the Rhine delta. Batavian regiments served under Rome, although this relationship was interrupted in A.D. 70 by the anti-Roman conspiracy of CIVILIS, one of their leaders. The tribal name was revived in 1795 to designate Holland, particularly the BATAVIAN REPUBLIC.

Batavia: see DJAKARTA, Indonesia.

Batavia, city (1970 pop. 17,338), seat of Genesee co., N.Y., inc. 1915. It was laid out in 1801 by Joseph Ellicott, agent for the Holland Land Company. Situated in a farm area, Batavia has industries producing television sets, die castings, shoes, road equipment, paper boxes, and heating equipment. The city was a center of the Anti-Masonic movement in the 19th cent.

Batavian Republic, name for the Netherlands in the years (1795–1806) following conquest by the French during the FRENCH REVOLUTIONARY WARS. The United Provinces of the Netherlands were reconstituted as the Batavian Republic in 1795 and remained under French occupation and tutelage. In 1801, Napoleon imposed a new constitution on the republic, which was financially drained by French requisitions, and in 1806 he transformed Batavia into the kingdom of Holland under the domain of his brother Louis BO-

NAPARTE *Batavia*, which derives from the *BATAVI*, an ancient Germanic tribe, is still used occasionally as a name for Holland

Bate, William Brimage, 1826–1905, U.S. politician and Confederate general, b. Castalian Springs, Tenn. He served in the Mexican War and was involved in Tennessee politics before entering the Confederate army in 1861. In a spectacular career Bate rose from private to major general and served with distinction in six major campaigns. He was elected governor of Tennessee in 1882 and reelected in 1884. He served in the U.S. Senate from 1887 to 1905. See biography by Park Marshall (1908)

Bates, H. E. (Herbert Ernest Bates), 1905–74, English author, b. Rushden, Northamptonshire. During World War II he served with the Royal Air Force. A good storyteller, Bates had the ability to render the sense of a particular place and time and was noted for his descriptions of the English countryside. Among his many novels are *Fair Stood the Wind for France* (1944), *The Jacaranda Tree* (1949), and *The Triple Echo* (1970). See his autobiography (3 vol., 1969, 1971, 1971)

Bates, Henry Walter, 1825–92, English naturalist and explorer. In 1848 he went with A. R. Wallace to Brazil, where he explored the upper Amazon, returning in 1859 with some 8,000 new zoological species. He was the first to state a plausible theory of MIMICRY. His great work was *The Naturalist on the River Amazon* (1863). From 1864, Bates was assistant secretary of the Royal Geographical Society.

Bates, Katharine Lee, 1859–1929, American author, b. Falmouth, Mass., grad. Wellesley, 1880. She was professor of English literature at Wellesley (1891–1925). Her hymn, "America the Beautiful," first appeared in the *Congregationalist* magazine on July 4, 1895. Besides several books of poems, she wrote scholarly works and books for children. See biography by D. W. B. Burgess (1952).

Bates College, at Lewiston, Maine, coeducational, founded 1855 as Maine State Seminary, chartered as a college 1864. It was the first Eastern college to admit women students.

batfish: see ANGLER

Bath, city (1971 pop. 84,545), Somerset, SW England, in the Avon River valley. Since 1974, it has been part of the new nonmetropolitan county of Avon. Britain's leading winter resort, Bath has the only natural hot springs in the country. There are also engineering, printing, bookbinding, wool-weaving, and clothing industries. In the 1st cent. A.D., the Romans discovered the natural springs and named the site *Aquae Solis* ("waters of the sun"), and built elaborate lead-lined baths with heating and cooling systems (first excavated in 1755). In Saxon times the city was destroyed and the baths buried. From the time of Chaucer until the Tudor era, Bath had a flourishing wool and cloth industry. In the 18th cent. Richard (Beau) Nash, establishing social standards equal to those of London society, and the architect John Wood and his son transformed Bath into England's most fashionable spa. The Woods, using Bath stone from nearby quarries, built Queen Square, the Circus, and the Royal Crescent, all excellent examples of Georgian architecture. The Assembly Rooms, of the same period, were destroyed by air raids in World War II but later restored. Near Bath is a museum of American arts and crafts.

Bath, city (1970 pop. 9,679), seat of Sagadahoc co., SW Maine, on the west bank of the Kennebec River near its mouth on the Atlantic, settled c. 1670, inc. as a city 1847. It is a port of entry, with a fine harbor. Once a great shipbuilding center, it still has active shipyards and marine manufactures, but summer tourism is becoming increasingly important. Champlain and others visited or passed near this site when exploring the Kennebec River, and at nearby Popham Beach a short-lived colony was established (1607) by George Popham. Shipbuilding began early, many clipper ships were constructed in the 19th cent., and the Bath Iron Works began producing steel warships and commercial vessels in the 1880s. The city flourished, particularly during World Wars I and II, when a large number of destroyers were built. There is a marine museum, and many fine old mansions remain.

batolith, enormous mass of intrusive igneous rock, that is, rock made of once-molten material that has solidified below the earth's surface. Batholiths usually are granitic in composition, have steeply inclined walls, and are without any visible floors, they commonly extend over areas of thousands of square miles. One of the larger single batholiths in North America is the Coast Range

batolith of W. Canada and Alaska, encompassing an area of about 73,000 sq mi (182,500 sq km). Important batholiths in the United States include the Idaho batholith, 18,000 sq mi (45,000 sq km), and the Sierra Nevada batholith, 16,000 sq mi (40,000 sq km). In New England, the White Mountain and Sterling batholiths encompass a total of 1,200 sq mi (3,000 sq km). Batholiths are formed in mountain regions at great depth in the earth's crust and thus are exposed at the surface only after considerable erosion of the overlying mountain mass. The formation and emplacement of batholiths is one of the most perplexing and controversial subjects in geology. Some batholiths appear to have been emplaced by a process called magmatic stoping, in which liquid magma works its way upward in the crust by shattering and breaking large blocks of the roof of the magma chamber by means of thermal or mechanical wedging. These blocks of country rock may sink and ultimately be melted into the hot magma, or they may survive and be incorporated into the batholith as xenoliths. Other batholiths appear to have formed by the alteration of earlier-formed sedimentary or metamorphic rocks into granite without melting. This theoretical process, called granitization, has many supporters, since field studies sometimes show a close relationship between structures found in the granite and the surrounding country rock in many batholiths.

Báthory (ba'tòrë), Pol. *Batory*, Hungarian noble family. Stephen Báthory, 1477–1534, a loyal adherent of JOHN I of Hungary (John Zápolya), was made (1529) voivode [governor] of TRANSYLVANIA. His youngest son became (1575) king of Poland (see STEPHEN BATHORY, king of Poland) and was succeeded as prince of Transylvania by his brother, Christopher Bathory, 1530–81. Christopher married Elizabeth, sister of Stephen BOCSKAY. His son and successor, Sigismund Bathory, 1572–1613, was mentally unbalanced. At first a loyal vassal of the Hapsburg king of Hungary (Holy Roman Emperor Rudolf II), he crushed (1594) the pro-Turkish faction of nobles and was recognized by Rudolf as hereditary prince. In 1597, he abdicated in favor of Rudolf but returned to assume power in Aug., 1598. The following March he abdicated in favor of his cousin, Andrew Cardinal Bathory (d. 1599), but again reversed his decision and, with the help of Stephen Bocskay, returned to power as a vassal of Sultan Muhammad III. He abdicated definitively in 1602 (in favor of Rudolf) and retired to Silesia. Elizabeth Bathory, d. 1614, a niece of Stephen Bathory, is celebrated in legend and history as a female werewolf. She is said to have slaughtered more than 600 virgins in order to renew her youth by bathing in their blood. She was incarcerated in 1610 and died in prison. See biography by Valentine Penrose (tr. 1970), Baring Gould, *Book of Werewolves* (1865). Gabriel Báthory, 1589–1613, a nephew of Andrew Cardinal Bathory, became prince of Transylvania in 1608. His harsh regime provoked a rebellion by the nobles, and he was murdered. By the marriage of his niece Sophia (d. 1680) to George II Rákoczy, the two families were united.

Bath-rabbim (bāth-rāb'īm), gate in Heshbon. Song 7:4

baths, in architecture. Ritual bathing is traceable to ancient Egypt, to prehistoric cities of the Indus River valley, and to the early Aegean civilizations. Remains of bathing apartments dating from the Minoan period exist in the palaces at Knossos and Tiryns. The ancient Greeks devised luxurious bathing provisions, with heated water, plunges, and showers. Bathing in public facilities, or *thermae*, was developed by the Romans to a unique degree. *Thermae*, probably copied after the Greek *gymnasia*, had impressive interiors, with rich mosaics, rare marbles, and gilded metals. Water, brought by aqueducts, was stored in reservoirs, heated to various temperatures, and distributed by piping to the bath apartments. Certain rooms were kept heated by means of furnaces which sent hot air into lines of flues beneath floors and in the walls. There are ruins of public baths in Pompeii, and in Rome there exist extensive remains of the *thermae* of Titus (A.D. 80), of Caracalla (A.D. 212–35), and of Diocletian (A.D. 302).

Bath-sheba (bāth'-shēbā, -shē'bā), wife of Uriah the Hittite. David seduced her, effected the death of her husband, and then married her. Her second son by David was Solomon. 2 Sam. 11, 12, 1 Kings 1, 2, Mat. 16. Bath-shua 1 Chron. 3:5

Bath-shua (bāth-shō'ā), same as BATH SHEBA

Bathurst, city (1971 pop. 17,169), New South Wales, SE Australia, on the Macquarie River. It is an agricultural market with food processing and other light

industries and railroad workshops. Founded in 1815 and named for the earl of Bathurst, then British colonial secretary, it was the first settlement on the western side of the Blue mts. Bathurst is the seat of Roman Catholic and Anglican bishoprics.

Bathurst, city (1971 pop. 16,674), N. N. B., Canada, on Chaleur Bay at the mouth of the Nepisiguit River. A popular beach resort, it is also the center of an area of lead, zinc, and copper mines and has large pulp, paper, and lumber mills.

Bathurst: see BANJUL, Gambia

Bathurst Island, c. 1,000 sq mi (2,590 sq km), Northern Territory, N. Australia, near Melville Island, between the Timor and Arafura seas. There is an aboriginal reservation on the island.

Bathurst Island, 7,609 sq mi (19,707 sq km), in the Arctic Archipelago, Franklin dist., Northwest Territories, N. Canada. It is the present site of the North Magnetic Pole.

batik (bat'ek'), method of decorating fabrics practiced for centuries by the natives of Indonesia. It consists of applying a design to the surface of the cloth by using melted wax. The material is then dipped in cool vegetable dye, the portions protected by the wax do not receive the dye, and when the wax is removed in hot water the previously covered areas display a light pattern on the colored ground. Remains of clothing found in Java indicate that the same or similar patterns have been in use for about 1,000 years and are handed down in families. Certain designs were traditionally reserved for royalty and high officials. Motifs are geometric or are based on conventionalized natural objects. Cotton cloth is generally used, and some silk. Batik was first brought into Europe by Dutch traders. In the 19th cent., Western craftsmen adopted the art.

Batista y Zaldivar, Fulgencio (fóolhēn'sēō bat'ē'stā ē saldē'var), 1901–73, president of Cuba (1940–44, 1954–58). An army sergeant, Batista took part in the overthrow of Gerardo MACHADO in 1933 and subsequently headed the military and student junta that ousted Carlos Manuel de CESPEDES and installed Ramon GRAU SAN MARTIN. Made chief of staff of the army, he increased its size and power and soon became de facto ruler, launching a three-year plan of economic and social rehabilitation. In 1940, with support from the extreme left, he was elected president and subsequently ruled with a considerable degree of democratic equity. He accepted the defeat of his candidate when Grau won in the election of 1944. However, in 1952, when Batista was a presidential candidate, he seized power through a coup just prior to the election. An election was held in 1954 and Batista, unopposed and employing dubious methods, won easily. Discontent with his regime led to several uprisings, notably that of Fidel CASTRO. Pressed by the rebels and after a mock election (1958) had failed to calm the populace, Batista fled Cuba (Jan., 1959) for the Dominican Republic and thence to Portugal and Madeira. He died in Spain.

Batley, municipal borough (1971 pop. 42,004), West Riding of Yorkshire, N. central England. In 1974, it became part of the new metropolitan county of West Yorkshire. Heavy woollens, shoddy, and other textiles are the chief manufactures, tiles, carpets, mattresses, felt, biscuits, and machinery are also produced. The Bagshaw Museum in Batley illustrates the history of clothmaking. Joseph Priestley, the radical minister and scientist, attended Batley Grammar School.

Batlle y Ordóñez, José (hōsā' bat'yā' ē órdō'nyās), 1856–1929, president of Uruguay (1903–7, 1911–15). A journalist and the head of the Colorado party, Batlle was a campaigner for political reform. In his second term he initiated radical legislation to increase public welfare and substitute government for the anarchism that had plagued Uruguay since the winning of independence. Among his most significant proposals were universal adult suffrage, labor reforms, and the decentralization of the executive into a junta modeled after the Swiss federal council. The constitution of 1917, framed under his influence, curbed the power of the executive and provided for socialist government, a trend not interrupted until TERRA became president in 1931. See study by M. I. Vanger (1963).

Batoche (bātōsh'), historic site, central Sask., Canada, on the South Saskatchewan River. During Riel's Rebellion, Louis Riel made his headquarters there, and the rebels were routed on May 12, 1885.

Batoni, Pompeo Girolamo (pōmpē'ō jērō'lamō batō'nē), 1708–87, Italian painter. Batoni studied and worked in Rome. His paintings tend toward the

neoclassical, a style foreshadowing that of Mengs. Among his notable works are *The Education of Achilles* (Uffizi), *Aeneas and His Family Fleeing Troy* (Turin), and *Mary Magdalen* (Louvre). Batoni is noted also for his portraits, including many of the reigning popes of his day.

Baton Rouge (băt'ən rōzh) [Fr. = red stick], city (1970 pop 165,963), state capital and seat of East Baton Rouge parish, SE La., on a bluff along the eastern bank of the Mississippi River, inc. 1817. It is a busy deepwater port of entry, an important transportation, distributing, and commercial center for a large oil, natural gas, and farm area, and a major oil-refining hub. There are large petrochemical industries, food-processing plants, machine shops, foundries, and ironworks. Baton Rouge was founded in 1719 when the French built a fort on that strategic spot along the river. The settlement was ceded to Great Britain in 1762, captured by the Spanish in 1779, and acquired by the United States in 1815 (following a brief period when it was a part of Spanish Florida). It became state capital in 1849. In the Civil War it was captured by Farragut after the fall of New Orleans (May, 1862), a Confederate attempt to recover it failed (Aug., 1862). It has notable antebellum houses. The old capitol (1882), built in the Gothic style of the original that was burned in the Civil War, still stands; a new 34-story capitol was occupied in 1932. Also of interest are the governor's mansion, the old arsenal museum, and the Huey Long grave and memorial. The city has an arts and science center with a planetarium, several museums, a zoo, and a symphony orchestra. It is the seat of Louisiana State Univ. and Agricultural and Mechanical College and of Southern Univ. and Agricultural and Mechanical College.

Batory: see STEPHEN BATHORY and BATHORY, family

Battambang (băt'əmbāng), city (1967 est. pop. 43,000), capital of Battambang prov., W Cambodia, in a great rice-growing area. The second largest city in Cambodia, it is a market center with numerous rice mills. Textiles are also made. The city is on both the highway and railroad linking Phnom Penh with Thailand, after the outbreak (1970) of civil war in Cambodia, the Battambang-Phnom Penh road was a prime target of the Khmer Rouge insurgents, who, by capturing it, severed Phnom Penh from its major source of rice. Battambang was acquired by Thailand in 1809 and returned to Cambodia in 1907. A technical university is located in the city.

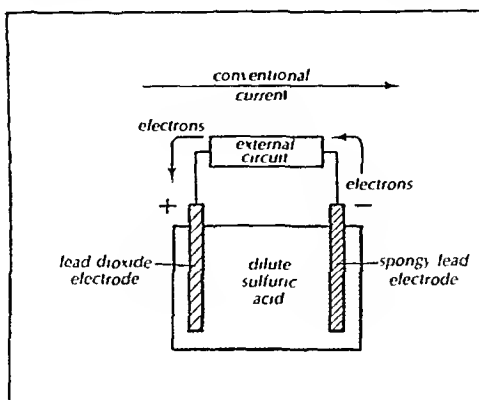
Battenberg (băt'ənbörg), German princely family, issued from the morganatic union of Alexander, a younger son of Louis II, grand duke of Hesse-Darmstadt, and Countess Julia von Hauke, who was created (1858) princess of Battenberg. Their oldest son, Louis (1854-1921), an admiral in the British navy, was created marquess of Milford Haven and married a granddaughter of Queen Victoria. During World War I he renounced (1917) his German title and anglicized his name as Mountbatten. His daughter Louise married Gustavus VI, king of Sweden. Another daughter, Alice, married Prince Andrew of Greece, third son of King George I of Greece; their son Philip was created duke of Edinburgh and married (1947) Princess Elizabeth of England (later Queen Elizabeth II). Louis MOUNTBATTEN is the son of the 1st marquess of Milford Haven. The second son of Prince Alexander of Hesse-Darmstadt was (1879-86) prince of Bulgaria (see ALEXANDER). A third son, Henry, married Beatrice, daughter of Queen Victoria of England; their daughter, Victoria, married Alfonso XIII of Spain. See ALDEN HATCH, *The Mountbattens* (1965) and EDWARD SPIRO, *From Battenberg to Mountbatten* (1966).

Battery, the park, 21 acres (8.5 hectares), southern tip of MANHATTAN island, New York City, site of Dutch and English fortifications. Castle Clinton, a fort built in 1808 for the defense of New York harbor, was ceded to the city in 1823 and renamed Castle Garden. It was remodeled and served as a noted amusement hall and opera house. Swedish soprano Jenny Lind made her U.S. debut on its stage in 1850. From 1855 to 1892 it served as an immigration station, and from 1896 to 1914 it housed an aquarium. After World War II the park was remodeled, and Castle Clinton became a national monument (see NATIONAL PARKS AND MONUMENTS, table). The park also contains a war memorial and a statue of Giovanni da Verrazano, who discovered New York harbor. Boats to Liberty Island leave from the park.

battery, in law, the unpermitted touching by an aggressor, or by some force put in motion by an aggressor, of any part of the person of another or of anything worn or carried by another. Every consummated ASSAULT is a battery. To be the basis for a suit,

contact must be intended by the aggressor, it must be such that a reasonable man would consider it offensive, and there must be no consent on the part of the one affected. Consent is assumed for the ordinary and customary contacts that are necessary in everyday life. Gross negligence may be considered by the court as providing the intention necessary to constitute a battery. Actual physical injuries need not be sustained in order to support an action (e.g., a doctor who performs an operation without consent can be sued for battery, even though the patient is benefited by the operation). The term "assault and battery" refers to a criminal offense, the unlawful touching of another with the intention of committing an injury.

battery, electric, term commonly used for an electric cell such as the dry-cell flashlight battery but more correctly for a group of cells connected to act as a source of direct electric current at a given voltage. A cell consists of two ELECTRODES immersed in



Lead storage cell. At the lead-dioxide electrode, electrons from the circuit combine with lead dioxide and sulfuric acid to form lead sulfate and water. At the spongy-lead electrode, lead reacts with sulfate ions to form lead sulfate and release electrons.

an ELECTROLYTE, which acts chemically upon the electrodes to produce current. Batteries consisting of carbon-zinc dry cells connected in various ways (as well as batteries consisting of other types of dry cells) are used to power such devices as lanterns, transistor radios, and portable public-address systems. A battery called the storage battery is generally of the wet-cell type, i.e., it uses a liquid electrolyte and can be recharged many times, unlike the ordinary dry-cell battery, which uses a paste electrolyte and can be recharged few times, if at all. The storage battery consists of several cells connected in series. Each cell contains a number of alternately positive and negative plates separated by the liquid electrolyte. The positive plates of the cell are connected to form the positive electrode; similarly, the negative plates form the negative electrode. In the process of charging, the cell is made to operate in reverse of its discharging operation, i.e., current is forced through the cell in the opposite direction, causing the reverse of the chemical reaction that ordinarily takes place during discharge, so that electrical energy is converted into stored chemical energy. The storage battery's greatest use is in the automobile. In the United States the lead storage battery is commonly used; the nickel-cadmium battery, although far more costly, is also in wide use. The cell of the lead storage battery consists of alternate plates of lead (negative electrode) and lead coated with lead dioxide (positive electrode) immersed in an electrolyte of sulfuric acid solution, when fully charged, it produces a voltage of between 2.0 and 2.5 volts. In the discharging process lead sulfate is deposited on both the negative and the positive electrodes, while the sulfuric acid electrolyte becomes weaker. Another type of storage cell, called the Edison cell, has a nickel oxide positive plate and an iron negative plate suspended in a solution of potassium and lithium hydroxides. Because of its capacity to withstand abuse and its longer effective life, the Edison cell is preferred to the lead cell for railroad signal and lighting service. See FUEL CELL, SOLAR CELL.

Battle, rural district (1971 pop. 33,563), East Sussex, SE England. The town grew up on the site (then a moorland) of the battle of HASTINGS (1066). The victorious William the Conqueror built Battle Abbey to commemorate the event. The abbey is now a girls' school, but ruins can be seen.

battle, wager of: see ORDEAL.

Battle above the Clouds see CHATTANOOGA CAMPAIGN.

Battle Creek, city (1970 pop. 38,931), Calhoun co., S Mich., at the confluence of the Kalamazoo and Battle Creek rivers, settled 1831, inc. as a city 1859. It is an agricultural trade center and is known for its cereals, pet foods, and biscuits. Other manufactures include valves, pumps, farm equipment, trucks, registers, paper products, and brass and wire goods. Battle Creek Sanitarium (founded by Dr. J. H. Kellogg in 1886 as the Health Reform Institute), a natural history museum, a bird sanctuary, a state park, and Kellogg Community College are in or near the city. There is also a civil defense staff college, the training center for U.S. civil defense directors.

Battleford, town (1971 pop. 1,803), N central Sask., Canada, at the confluence of the Battle and North Saskatchewan rivers. Battleford is one of the oldest towns in the central part of the province. It served as the capital (1876-83) of the Northwest Territories and figured prominently in Riel's Rebellion of 1885.

Battle of Britain, in World War II, series of air battles between Great Britain and Germany, fought over Britain from Aug. to Oct., 1940. As a prelude to a planned invasion of England, Germany attacked British coastal defenses, radar stations, and shipping. On Aug. 24 the attack was shifted inland to Royal Air Force installations and aircraft factories in an effort to gain control of the air over S. England. Failing to destroy the RAF, the Germans began (Sept. 7) the night bombing, or blitz, of London. Heavy night bombings of English cities continued into October, when the attack was shifted back to coastal installations. The Germans gradually gave up hope of invading England, and the battle tapered off by the end of October. Though heavily outnumbered, the RAF put up a gallant defense, radar, used for the first time in battle, played an important role. The Germans lost some 2,300 aircraft, the RAF lost some 900. The Battle of Britain was the first major failure of the Germans in World War II. See DEREK WOOD and DEREK DEMPSTER, *The Narrow Margin* (1961, repr. 1967), ALEXANDER MCKEE, *Strike from the Sky* (1960, repr. 1971), RICHARD COLLIER, *Eagle Day* (1966), TELFORD TAYLOR, *The Breaking Wave* (1967), PETER TOWNSEND, *Duel of Eagles* (1970).

Battle of the Bulge, popular name in World War II for the German counterattack in the Ardennes, Dec., 1944-Jan., 1945. It is also known as the Battle of the Ardennes. On Dec. 16, 1944, a strong German force, commanded by Marshal von Rundstedt, broke the thinly held American front in the Belgian Ardennes sector. Taking advantage of the foggy weather and of the total surprise of the Allies, the Germans penetrated deep into Belgium, creating a dent, or "bulge," in the Allied lines and threatening to break through to the N. Belgian plain. Simultaneously, the main Allied supply port of Antwerp was subjected to intensive bombardment by V-2 rockets. An American force held out at Bastogne, even though surrounded and outnumbered. The U.S. 1st and 9th armies, temporarily under Field Marshal Montgomery, attacked the German salient from the north, while the U.S. 3d Army attacked it from the south. Improved flying weather (after Dec. 24) facilitated Allied counterattacks. By Jan. 16, 1945, the German forces were destroyed or routed, but not without some 77,000 Allied casualties. See J. S. D. EISENHOWER, *The Bitter Woods* (1969), P. ELSTOB, *Hitler's Last Offensive* (1971).

Battle of the Spurs 1 Fought in 1302 near Courtrai, Belgium, between the rebellious Flemish towns, led by Bruges, and an army sent by Philip IV of France, who had annexed Flanders in 1301. The French were totally defeated. The spurs taken from the fallen French knights formed so huge a trophy that they gave the battle its name. 2 Won in 1513 by the English under Henry VIII over the French, at Guinegate, N. France. This second battle received its name possibly because of the speedy flight of the French cavalry.

battleship, large, armored warship equipped with the heaviest naval guns. The battleship evolved from the ironclad warship of the mid-19th cent. By 1872 the French were building iron and steel warships, and in 1876 the British started construction of two all-steel war vessels. Development continued in range, size, and accuracy of armament. The H.M.S. *Dreadnought*, which was completed in 1906, was the first modern battleship and introduced the "all-big-gun" class of warship. She was armed with ten 12-in. (30.5-cm) guns and was powered by steam turbines, which developed a speed of 21 knots. The battleship became the major capital unit in modern navies and in World War I and at the beginning of World War II was extensively employed in naval en-

gagements. However, with the development of new aerial tactics, such as dive bombing, and the introduction (1941) of aircraft carriers as the major unit of a naval attack force, battleships became nearly obsolete. The fate of the battleship as a major weapon in modern warfare was sealed on Dec 7, 1941, when Japanese carrier-borne aircraft attacked and sank the greater part of the U.S. navy's battleships at Pearl Harbor. Shortly after the Korean War the last battleships of the British and American navies were decommissioned. The U.S. navy, during part of the Vietnam War, used one battleship, the *New Jersey*, for shore bombardment and antiaircraft defense. See Siegfried Breyer, *Battleships and Battle Cruisers, 1905-1970* (tr. 1973).

Batu Khan (ba'tōō kan), d. 1255, Mongol leader, a grandson of Jenghiz Khan. In 1235, Batu became commander of the Mongol army assigned to the conquest of Europe; his chief general was Subutai. Batu crossed the Volga, sending part of his force to Bulgaria but most of it to Russia. By 1240 he had Moscow and Kiev in his grasp, and in the following two years he conquered Hungary and Poland and invaded Germany. His recall to Karakorum in 1242 to participate in the election of a grand khan is sometimes said to have saved Europe from subjection to the Mongols. Batu died while preparing additional campaigns. The domain he established is known as the Kipchak khanate. In Russia it came to be known as the GOLDEN HORDE, because of the gorgeous tents in which the army camped.

Batumi (batōō'mī) or **Batum** (batōōm'), city (1970 pop. 101,000), capital of Adjara Autonomous Republic, SE European USSR, in Georgia, on the Black Sea near the Turkish border. A major port and trade center, it is also the terminus of the Trans-Caucasian RR, the Crimean-Caucasian steamship line, and an oil pipeline. Batumi is an important petroleum-shipping port and has oil refineries, shipyards, and food-processing plants. Site of the ancient Greek colony of Batis, the city belonged to Georgia in the Middle Ages, fell to the Turks in the late 16th cent., and passed to Russia in 1878.

Batwa: see PYGMY

Bat Yam (bat yam), city (1972 pop. 99,800), W central Israel, on the Mediterranean Sea, near Tel Aviv-Jaffa. It is a seaside resort and an industrial center. The city was founded in 1926 and originally called Bayit VeGan [Heb., =home and garden].

Baucis: see PHILEMON AND BAUCIS

Baudelaire, Charles (sharl bōdlār'), 1821-67, French poet and critic. His poetry, classical in form, introduced symbolism (see SYMBOLISTS) by establishing symbolic correspondences among sensory images (e.g., colors, sounds, scents). The only volume of his poems published in his lifetime, *Les Fleurs du mal* (1857, enlarged 1861, 1868, several Eng. tr., *The Flowers of Evil*), was publicly condemned as obscene, and six of the poems were suppressed. Later recognized as a masterpiece, the volume is especially remarkable for the brilliant phrasing, rhythm, and expressiveness of its lyrics. Baudelaire's erratic personality was marked by moodiness, rebelliousness, and an intense religious mysticism. His life was burdened with debts, misunderstanding, illness, and excesses, and his work unremittingly reflects inner despair. The main theme is the inseparable nature of beauty and corruption. A collection of poetic prose pieces was published posthumously as *Petits Poèmes en prose* (1869). As poet and critic Baudelaire earned distinction in literary circles. Believing criticism to be a function of the poet, he wrote perceptive appraisals of his contemporaries. His criticism was collected posthumously in *Curiosités esthétiques* (1868) and *L'Art romantique* (1869). He felt a great affinity to Poe, whose works he translated and brought to the attention of the French public. One of the great figures of French literature, Baudelaire has also been a major influence in other Western poetry. See his letters (tr. by S. Morini and F. Tuten, 1970), his intimate journal (tr. by Christopher Isherwood, 1947), and selected letters (tr. and ed. by L. B. and F. E. Hyslop, 1957), biography by Enid Starkie (rev. ed. 1958), studies by Jean-Paul Sartre (1950, repr. 1972) and M. A. Ruff (1965).

Baudouin (bōdōōān'), 1930-, king of the Belgians (1951-), son of LEOPOLD III. He joined his father in exile (1945-50) in Switzerland. After their return to Belgium his father's unpopularity led to Baudouin's appointment (1950) as regent, and on Leopold's abdication (1951) Baudouin ascended the throne. In 1960 he married Fabiola de Mora y Aragon, a Spanish noblewoman.

Bauer, Georg: see AGRICOLA, GEORGIUS

Bauer, Harold, 1873-1951, Anglo-American pianist. He was first a successful violinist, but in 1892 he

studied the piano with Paderewski and then earned international recognition as a pianist. He also promoted chamber music and exercised a strong influence on American musical life. See his memoirs (1948).

Baugh, Samuel Adrian (Sammy Baugh) (bō), 1914-, American football player, b. Temple, Texas. An All-American backfield star at Texas Christian Univ., he turned professional (1937) to play with the Washington Redskins. Baugh's precision passing gained for him the nickname of "Slinging Sammy." He established many professional passing and punting records before retiring in 1952. Baugh coached the New York Titans of the American Football League in 1960 and 1961, and in 1964 the Houston Oilers of the same league.

Bauhaus (bou'hous), school of art and architecture in Germany. The Bauhaus revolutionized art training by combining the teaching of the pure arts with the study of crafts. It was founded at Weimar in 1919 and headed by Walter GROPIUS, with a faculty including Paul Klee, Lyonel Feininger, Wassily Kandinsky, László Moholy-Nagy, and Marcel Breuer. The teaching plan insisted on functional craftsmanship in every field with a concentration on the industrial problems of mechanical mass production. Bauhaus style was characterized by economy of method, by a severe geometry of form, and by design that took into account the nature of the materials employed. The school's concepts aroused vigorous opposition from leading politicians and academicians. In 1925 the Bauhaus moved to the more friendly city of Dessau, where Gropius designed special buildings to house the various departments. Gropius resigned in 1928 to return to private architectural practice, and the leadership was continued by the architect Johannes Meyer, who in turn was replaced in 1930 by Mies van der Rohe. In the summer of 1932 the opposition to the school had increased to such an extent that the city of Dessau withdrew its support. The school was then moved to Berlin, where the faculty endeavored to carry on their ideas, but in 1933 the Nazi government closed the school entirely. The Bauhaus ideas, enveloping design in architecture, furniture, weaving, and typography, among others, had by this time found wide acclaim in many parts of the world and especially in the United States, where many of the instructors went to encourage and practice further work with the same ideals. The Chicago Institute of Design, founded by MOHOLY-NAGY, most completely carried on the teaching plan of the Bauhaus. See Walter Gropius, *The New Architecture and the Bauhaus* (rev. ed. 1955), H. M. Wingler, *The Bauhaus*, ed. by Joseph Stein (1969), Marcel Franciscano, *Walter Gropius and the Creation of the Bauhaus* (1971).

Bauhin, Gaspard (gaspar' bōān'), 1560-1624, Swiss botanist and doctor of medicine, of French descent. His early classification of plants by genus and species in his chief work, the *Pinax theatri botanici* (1623), anticipated the binomial arrangement of Linnaeus. Bauhin reformed anatomical nomenclature, especially that of muscles. His elder brother, Jean Bauhin, 1541-1613, was also a botanist and doctor of medicine. A genus of plants, *Bauhinia*, was named for the brothers.

Bauld, Cape: see GREAT NORTHERN PENINSULA, Canada

Baum, Lyman Frank (bōm), 1856-1919, American journalist, playwright, and author of juvenile stories, b. Chittenango, N.Y. While working as a newspaperman in South Dakota he wrote his first book, *Father Goose* (1899), which became an immediate best-seller. In 1900 he published his most famous work, *The Wonderful Wizard of Oz*, a story about a little girl carried by a cyclone to the magical land of Oz. His dramatization of the book was produced in 1902, the story was also made into an extraordinarily popular motion picture in 1938. Baum published 13 other stories of Oz, including *Ozma of Oz* (1907) and *The Scarecrow of Oz* (1915). See *The Annotated Wizard of Oz*, ed. by M. P. Hearn (1973).

Baumann, Oskar (ōs'kar bou'man), 1864-99, Austrian explorer in Africa. He traveled up the Congo River to Stanley Falls (1885) and the following year explored Fernando Po, in the Gulf of Guinea. After accompanying a party to Mt. Kilimanjaro in 1888, he explored (1890) East Africa for the German East Africa Society. He took a party (1892-93) to Lake Victoria where he found the Kagera River to be the chief tributary of the lake and the ultimate source of the Nile.

Baumeister, Willi (vil'ē bou'mishtər), 1889-1955, German artist. Influenced by primitive art and Miró's SURREALISM, Baumeister created abstractions that contain mechanical and organic forms. In later

works (e.g., *Reddish Relief with Sand*, 1950, Baumeister Coll., Stuttgart) he included ideographic signs in his compositions.

Baumeler, Joseph Michael. see BIMELE, JOSEPH MICHAEL

Baungsgård, Hilmer (hīl'mər bouns'gōr), 1920-, Danish politician. A businessman, he was president of the youth organization of the Social-Liberal party (1948-50) and a member of the executive of the Social-Liberal party (1948-57), serving (1954-57) as its vice-president. He was elected to parliament in 1957. From 1961 to 1964, Baungsgård headed the ministry of commerce. He became prime minister in 1968, he resigned in 1971 when his center-right coalition lost its parliamentary majority over economic issues, especially inflation, taxation, and balance of payment deficits.

Baur, Ferdinand Christian (fēr'dīnant krīs'tēan bour), 1792-1860, German Protestant theologian. He was from 1826 on the theological faculty of Tübingen. He became convinced of Hegel's philosophy of history and studied Christian history and doctrines and the Bible from that point of view. In New Testament criticism he rejected the authenticity of most of the books, using philosophical and literary criteria. His methods and disciples were referred to as the Tübingen School. See study by P. C. Hodgson (1966).

Bautzen (bou'tsən), city (1970 pop. 43,670), Dresden district, SE East Germany, on the Spree River. It is an industrial city, a rail junction, and the center of a kaolin-quarrying region. Manufactures include machinery, textiles, chemicals, leather and paper goods, and railroad cars. Bautzen was founded in the 10th cent. and was contested in the 11th and 12th cent. by Poland, Meissen, Brandenburg, and Bohemia. It eventually passed to Bohemia, was burned (1634) in the Thirty Years War, and passed (1635) with LUSATIA to Saxony. Noteworthy landmarks include a 13th-century church and numerous 18th-century buildings. In 1813, Napoleon I defeated a Russo-Prussian army nearby.

Baux, Les (lā bō), village (1968 pop. 91), Bouches-du-Rhône dept., SE France, in Provence. Nearby are the ruins of a medieval town. The once flourishing town, carved out of dazzling white limestone, was the seat of a powerful feudal family. Destroyed by gunfire in 1632 as a stronghold of enemies of the crown, its ruins are a great tourist attraction. Bauxite, first discovered (1821) there and named accordingly, is mined in the vicinity.

bauxite, mixture of hydrated aluminum oxides usually containing oxides of iron and silicon in varying quantities. A noncrystalline substance formerly thought to be a mineral, bauxite is claylike and earthy and ranges in color from white to deep brown or red according to the nature and quantity of its components. Bauxite occurs characteristically in pisolitic form, i.e., composed of small, round concretions. Its composition varies, alumina constituting from about 50% to about 70%. Bauxite is widely distributed, important deposits occurring in Africa, South America, the USSR, the West Indies, France (notably at Baux, where it was first discovered and from which it received its name), and the United States (Alabama, Arkansas, and Georgia). It is the chief source of aluminum and of its compounds, including alumina, alums, and alundum. It is used in the preparation of abrasives and as a refractory for spark plugs and furnace linings.

Bavai (bāv'āi, bāv'ā'i), the same as BINNUI 1.

Bavaria, Ger. *Bayern*, state (1970 pop. 10,479,000), 27,239 sq mi (70,549 sq km), 5 West Germany. MUNICH is the largest state of West Germany. Bavaria is bordered by Czechoslovakia on the east, by Austria on the southeast and south, by Baden-Württemberg on the west, by Hesse on the northwest, and by East Germany on the north. A region of rich, softly rolling hills, it is drained by several rivers (notably the Main, Danube, Isar, and Inn) and is bounded by mountain ranges (especially the Bavarian Alps and the Bohemian Forest). Bavaria is divided into seven administrative districts: Upper and Lower Bavaria, Upper, Middle, and Lower FRANCONIA, SWABIA, and the Upper PALATINATE. Until the early 19th cent. Bavaria did not include Swabia and Franconia, which have separate histories. Upper Bavaria, with Munich as its capital, rises to the Bavarian Alps, along the Austrian border, and culminates in the ZUGSPITZE, West Germany's highest peak. Between the Alps and the BOHEMIAN FOREST, which forms the border with Czechoslovakia, lies the Franconian Jura plateau, traversed by the Danube. Lower Bavaria comprises part of this plateau and part of the Bohemian Forest. Franconia, in N Bavaria, includes the Frankenwald, the FICHELGEIRGE, and the

Main valley Swabia, in SW Bavaria, is part of the Danubian plateau. The Upper Palatinate, in NE Bavaria, is separated from Czechoslovakia by the Bohemian Forest. The population of Bavaria is about 70% Catholic. Forestry and agriculture are important occupations, wheat, barley, sugar beets, and dairy goods are the leading products. Industry is centered in Munich, Nuremberg, Augsburg, Hof, Ingolstadt, Erlangen, and Schweinfurt. Major industrial products include glass and ceramics, iron and steel, paper, chemicals, machinery, textiles, clothing, optical instruments, petroleum, and motor vehicles. Bavarian beer is world famous. Toys and musical instruments are made by craftsmen. Salt, graphite, iron ore, and lignite are the chief mineral resources. The scenic beauties and the picturesque local customs and costumes of the Bavarian Alps attract many tourists. Among the resorts are Garmisch-Partenkirchen, Berchtesgaden, and the spas Bad Kissingen and Bad Reichenhall. Bayreuth is a cultural center, and Augsburg, Nuremberg, Bamberg, and Würzburg are historic and artistic centers. There are universities at Munich, Regensburg, Würzburg, and Erlangen-Nuremberg.

From the Romans to the Wittelsbachs The borders of Bavaria have varied considerably in its history. The region was inhabited by Celts when Drusus conquered it (15 B.C.) for Rome. The Bajuarii (see GERMAN) invaded it (6th cent. A.D.) and set up the duchy to which they gave their name. It was one of the five basic or stem duchies of medieval Germany. Irish and Scottish monks began the Christianization of the area, and it was completed (8th cent.) by St. Boniface. In 788, Charlemagne defeated Duke Tassilo III and added Bavaria to his empire. From 817 to 911, Bavaria was ruled by the Carolingians LOUIS THE GERMAN, CARLOMAN (d. 880), ARNULF, and LOUIS THE CHILD. In 911 the duchy (then comprising, roughly, Bavaria proper, present-day Austria, and part of the Upper Palatinate) came under indigenous rulers. Frequent Magyar inroads were stopped (955) by Emperor OTTO I, who in 947 had given Bavaria to his brother Henry. Henry's grandson was duke of Bavaria when he was elected (1002) German king as Henry II. After his accession Bavaria was ruled by various houses, but in 1070 Emperor Henry IV gave the fief to Welf, or Guelph, d'Este IV (see ESTE), who began the dynasty of the GUELPHS. From the 9th to the 12th cent. the Bavarian dukes, of whatever house, were at the center of the rebellions of the great German princes against the imperial authority. To reduce their power Emperor OTTO II in 976 stripped the duchy of all but present-day Upper and Lower Bavaria and the Tyrol. When in 1137 the Guelph HENRY THE PROUD acquired Saxony in addition to Bavaria, CONRAD III deposed him and gave Bavaria to the BABENBERG rulers of Austria. Frederick II restored (1156) Bavaria to HENRY THE LION but in 1180 deposed the rebellious Guelph and bestowed the duchy (from which he detached considerable territory in what is now Austria) on Otto of Wittelsbach. The political history of Bavaria, much reduced in importance, became that of the WITTELSBACH family, which ruled until 1918.

Bavaria under the Wittelsbachs The Wittelsbach fiefs, including the Rhenish Palatinate (acquired in 1214), were almost always divided among the numerous branches of the dynasty. Under the Wittelsbach emperor LOUIS IV (reigned 1328-47), Bavaria was briefly reunited. Duke Albert IV (1467-1508), who again united Bavaria (except the Rhenish Palatinate), introduced the law of primogeniture, thus Bavaria entered the Reformation period much strengthened. The triumph of Catholicism in Bavaria proper was crucial for its later history. Duke Maximilian I (1597-1651) headed the Catholic League in the Thirty Years War and was rewarded with the Upper Palatinate and the rank of elector. The agricultural wealth and the strategic position of Bavaria made it a coveted prize and a frequent battleground then and later. Bavaria was overrun by foreign armies, notably in the War of the SPANISH SUCCESSION, the War of the AUSTRIAN SUCCESSION, the War of the Bavarian Succession (1778, by which Bavaria lost the Inn Quarter to Austria), and the French Revolutionary Wars. Elector Maximilian IV Joseph, who in 1799 united all Wittelsbach lands, allied himself with Napoleon I, joined the CONFEDERATION OF THE RHINE, and in 1806 was proclaimed king of Bavaria as MAXIMILIAN I. In 1813, Maximilian abandoned Napoleon and joined the allies, who at the Congress of Vienna (1814-15) left him in possession of virtually all of present-day Bavaria, including the Rhenish Palatinate. During the period of reaction that followed in Europe, Bavaria stood out for its relatively liberal government. The liberal constitution of 1818 lasted exactly a century. King Louis I (1825-48), dethroned

by the mild revolution of 1848, was succeeded by the able MAXIMILIAN II (1848-64) and the brilliant but insane LOUIS II (1864-86). All three rulers had a passion for the arts, science, and architecture. The reputation of Bavaria, particularly Munich, as a cultural center dates from their reigns. The abolition in 1848 of guild restrictions opened the way for industrialization. At the same time, the rural prosperity of Bavaria and the strong influence of the Catholic Church (which predominates except in the Upper Palatinate and in Middle Franconia) accentuated the hostility of Bavaria toward the rising power of Prussia. Bavaria sided with Austria in the Austro-Prussian War (1866). Defeated in that war, it acknowledged Prussian leadership, sided with Prussia against France in 1870-71, and joined (1871) the German Empire. As the chief German state after Prussia, Bavaria retained separatist tendencies.

Bavaria since World War I King LOUIS III, successor to the mad OTTO I, was dethroned in Nov., 1918, by Kurt EISNER, who established a socialist republic. The assassination (Feb., 1919) of Eisner led to a Communist revolution (April, 1919), which was bloodily suppressed by the German army. Bavaria then joined the Weimar Republic. In the early 1920s, Munich became the center of the National Socialist (Nazi) movement, in 1923 the National Socialists made an abortive attempt (Beer Hall Putsch) in that city to seize power. Catholic Bavaria as a whole gave little support to the movement until Adolf Hitler came to national power in 1933. Under the National Socialist regime Bavaria lost its autonomy. After World War II the Rhenish Palatinate was separated from Bavaria and was later made part of the state of Rhineland-Palatinate. A new constitution for Bavaria was drawn up in 1946. Since the founding of the Federal Republic of Germany in 1949, the conservative Christian Social Union, allied nationally with the Christian Democratic Union, has been the strongest Bavarian political party.

Bavarian Succession, War of the, between Austria and Prussia, 1778-79. With the extinction of the Bavarian line of the house of WITTELSBACH on the death of Elector Maximilian Joseph in 1777, the duchy of Bavaria passed to the elector palatine, Charles Theodore, of the Sulzbach line. However, by a secret treaty with Holy Roman Emperor Joseph II, who wished to strengthen imperial and Austrian influence in Germany, Charles Theodore ceded Lower Bavaria to Austria and Austrian troops occupied the area. Charles Theodore had no legitimate issue, but his heir presumptive, Duke Charles of Zweibrücken, on the advice of Frederick II of Prussia, protested the transfer of this portion of his inheritance. Prussia, allied with Saxony, declared war on Austria and invaded Bohemia. No serious engagement took place, and the war ended with the Congress of Teschen (1779). Austria renounced its claims but retained the Inn quarter, a small but fertile and densely populated triangle of land along the border between Bavaria and Austria. Prussia's claims to Ansbach and Bayreuth were recognized, and Saxony received monetary compensation. The conflict has been called the Potato War because Prussian troops spent time picking potatoes in the fields.

Bax, Sir Arnold, 1883-1953, English composer, studied at the Royal Academy of Music, London. His early works, in an elaborately chromatic style, did not find great favor with the public, but works in a simpler style, composed after 1910, brought him recognition as an outstanding composer. French impressionism, Celtic folklore, and the work of Richard Wagner all influenced his compositions, which include seven symphonies, many tone poems, chamber music, concertos, ballets, songs, and choral works. He was knighted in 1937 and became Master of the King's Music in 1941. See his autobiography, *Farewell My Youth* (1943).

Bax, Ernest Belfort, 1854-1926, English socialist philosopher. He studied music and philosophy in Germany. In England, influenced by Marxist and other radical thought, he became active in socialist groups, especially the Social Democratic Federation. He left this to help found (1885), with William Morris, the Socialist League, but returned when the League veered toward anarchism. With Morris he wrote *Socialism: Its Growth and Outcome* (1893). His other writings include *The Problem of Reality* (1893, rev. ed. 1914), *The Fraud of Feminism* (1913), and *The Real, the Rational, and the Alogical* (1920). See his autobiography (1918).

Baxter, Richard, 1615-91, English nonconformist clergyman. Ordained in 1638, he began his ministry at Kidderminster in 1641. He sided with Parliament when the civil war broke out and served (1645-47) as a chaplain in Cromwell's army, where he urged

moderation in both religious and political opinions. At the Restoration, Baxter was chosen by Charles II as one of the royal chaplains. He took a leading part at the Savoy Conference (1661), where he tried to provide means that would permit moderate dissenters to stay in the Church of England. He declined an offer of the bishopric of Hereford, and with the passage of the Act of Uniformity (1662) he left the Church of England. Despite the persecution of nonconformist ministers, Baxter continued to preach, his followers were known as Baxterians. After a trial conducted with great brutality by Judge Jeffreys, he was imprisoned for 18 months on the charge of having libeled the Church of England in his *Paraphrase of the New Testament* (1685). Among Baxter's voluminous works are *The Saints' Everlasting Rest* (1650), *Gildas Salvianus, the Reformed Pastor* (1656), and *A Call to the Unconverted* (1657). His autobiographical *Reliquae Baxterianae* (1696) was edited (1925) by J. M. L. Thomas. See biography by F. J. Powicke (2 vol., 1924-27), study by Hugh Martin (1954).

bay: see LAUREL, MAGNOLIA

Bayamo (bayā'mō), city (1970 pop. 71,660), Oriente prov., SE Cuba. Its economy is based on sugarcane and cattle. Founded in 1513, Bayamo was an inland port until the 19th cent. A former center of revolutionary movements, it gave its name to the Cuban national anthem, *el Himno Bayamés*. Both the Ten Years War (1868-78) and the successful revolt of 1895 began in Bayamo. Carlos Manuel de Cespedes and Tomas Estrada Palma were born in the city.

Bayamón (bayāmōn'), town (1970 pop. 147,552), NE Puerto Rico, a residential and industrial suburb of San Juan. Founded in 1772, it is one of the oldest settlements on the island.

Bayar, Celâl (jäläl' ba'yār), 1884-, Turkish statesman. The son of a religious leader and teacher, Bayar joined the nationalist movement after the Young Turk revolution. Kemal Atatürk's colleague after World War I, he held several ministerial positions (1921-37), he supervised the Greek-Turkish exchange of population (1923). In 1937 he became premier, but he resigned the post after Atatürk's death (1938). In 1946 he founded with Adnan Menderes and others the Democratic party, which came to power in 1950. He then became president of the republic and was reelected in 1954 and 1957. Ousted in 1960 by Cemal Gürsel, he was tried for violating the constitution and sentenced to death. The sentence was commuted to life imprisonment in 1961. Bayar was released because of ill health in 1964 and pardoned in 1966.

Bayard, James Asheton (bī'ard), 1767-1815, U.S. Representative (1797-1803) and Senator (1805-13) from Delaware, b. Philadelphia. Admitted to the bar in 1787, he began practice at Wilmington, Del. Bayard, a prominent Federalist, played a leading part in securing Thomas Jefferson's election as President over Aaron Burr in 1801. Of an independent mind, he, unlike other Federalists, supported the Nonimportation Act of 1806 and the War of 1812, although he had used all his influence to prevent hostilities. In 1814 he served on the commission that negotiated the Treaty of Ghent (see GHENT, TREATY OF) ending the War of 1812. His papers were edited (1915, repr. 1970) by Elizabeth Donnan. See Morton Borden, *The Federalism of James A. Bayard* (1954).

Bayard, James Asheton, 1799-1880, U.S. Senator from Delaware (1851-64, 1867-69), b. Wilmington, Del., son of James Asheton Bayard (1767-1815). His Unionist sentiments led him into the new Republican party, but he bitterly opposed the dominant radical Republicans and in 1864 he resigned. He was elected again, however, and served (1867-69) as a Democrat and supporter of President Andrew Johnson's Reconstruction policy. His son, Thomas Francis Bayard, was elected to succeed him in the U.S. Senate.

Bayard, Pierre du Terrail, seigneur de (bā'ard, pyēr du tēr'ya sānyor' də bāyar'), c. 1474-1524, French military hero, called *le chevalier sans peur et sans reproche* [the knight without fear or blame]. He exhibited bravery and genius as a commander in all the important battles of the ITALIAN WARS, from Fornovo (1495) to the Sesia, in which he was killed. His defense of Mezières (1521) saved central France from an imperial invasion. See biography by Samuel Shellabarger (1928, repr. 1971).

Bayard, Thomas Francis, 1828-98, U.S. statesman, b. Wilmington, Del., son of James Asheton Bayard (1799-1880). He began his law practice at Wilmington (1851). An active Democrat, Bayard was elected U.S. Senator (1869) to succeed his father and was reelected in 1875 and 1881. He became Secretary of

State during Cleveland's first administration Bayard was much concerned with Anglo-American relations He became ambassador to Great Britain during Cleveland's second term See study by C C Tansill (1940, repr 1969)

Bayard (bā'ərd), Ital *Barardo* (bayar'dō), in chivalric romance, a bay horse, remarkable for his spirit and for his unique ability to fit his size to his rider He appears in the 12th-century French epic *Renaud de Montauban* and in later tales of *ROLAND* by Boiardo, Ariosto, and Tasso

bayberry, common name for the Myricaceae, a family of trees and shrubs with aromatic foliage, found chiefly in temperate and subtropical regions The waxy gray berries of the North American wild or cultivated bayberry shrubs (chiefly *Myrica cerifera*) are used to make fragrant bayberry candles, scented soap, and sealing wax, bayberry is also called candleberry and wax myrtle Sweet gale (*M. gale*), a bog plant, yields tannic acid Sweet fern (*Comptonia peregrina*) is a North American shrub found chiefly in the E United States and cultivated elsewhere in dry, sandy areas Its foliage is used for medicines and tea Bayberry is classified in the division MAGNOLIOPHYTA, class Magnoliopsida, order Myricales

Bay City. 1 City (1970 pop 49,449), seat of Bay co, S Mich, a port of entry on the Saginaw River at its mouth on Saginaw Bay (an inlet of Lake Huron), inc 1859 with the consolidation of several settlements along the river Its harbor handles considerable Great Lakes and ocean shipping Bay City is the industrial, marketing, and shipping center of a rich farm area that yields sugar beets, potatoes, and dairy products It grew as a great lumbering center, and when the forests were depleted (after 1890) it turned to diversified manufacturing Delta College is in nearby University Center The vicinity is rich in Indian relics A state park and two state forests are in the area 2 City (1970 pop 11,733), seat of Matagorda co, S Texas, near the Colorado River and the Gulf of Mexico, inc 1894 It is a shipping and industrial center for a region that produces oil, gas, sulfur, beef cattle, rice, cotton, soybeans, and grain sorghums There are petrochemical plants and grass and turf farms in the city The county museum is there, and Matagorda Bay and several Gulf beaches are nearby

Bayer process, procedure for obtaining alumina from the aluminum ore bauxite The alumina can then be used for various industrial purposes or smelted to provide aluminum The first step in the process is the mixing of ground bauxite into a solution of sodium hydroxide By applying steam and pressure in tanks containing the mixture, the bauxite slowly dissolves The alumina released reacts with the sodium hydroxide to form sodium aluminate After the contents of the tank have passed through other vessels where the pressure and temperature are reduced and impurities are removed, the solution of sodium aluminate is placed in a special tank where the alumina is precipitated out The precipitate is removed from the tank, washed, and heated in a kiln to drive off any water present The residue is a commercially pure alumina

Bayes, Thomas, 1702-61, English clergyman and mathematician The son of a Nonconformist minister, he was privately educated and earned his livelihood as a minister to the Nonconformist community at Tunbridge Wells Although he wrote on theology, e.g., *Divine Benevolence* (1731), Bayes is best known for his two mathematical works, *Introduction to the Doctrine of Fluxions* (1736), a defense of the logical foundations of Newton's calculus against the attack of Bishop Berkeley, and "Essay Towards Solving a Problem in the Doctrine of Chances" (1763) The latter, a pioneering work, attempts to establish that the rule for determining the probability of an event is the same whether or not anything is known antecedently to any trials or observations concerning the event

Bayeux (bāyō', Fr bayo'), town (1968 pop 12,871), Calvados dept, N France, in Normandy, near the English Channel It is a farm and communications center, noted for its lace industry A Roman town and episcopal see from the 4th cent, it was burned (1105) by Henry I of England Sections of its Romanesque church withstood the fire and form a part of the remarkable Gothic cathedral built for the most part in the 13th cent The town is particularly famous for its museum containing the Bayeux tapestry In World War II, Bayeux was the first French city liberated by the Allies (June 6, 1944)

Bayeux tapestry. This so-called tapestry is in fact an embroidery that chronicles the Norman conquest of England by William the Conqueror in 1066 It is a

long, narrow strip of coarse linen, 230 ft by 20 in (70 m by 51 cm), embroidered in worsteds of eight colors in couching and stem stitch The embroidery is a valuable document on the history and the costumes of the time Its prominence and date have long been disputed Tradition attributes it to Queen Matilda, wife of William the Conqueror, and her handmaidens, but it is now thought to be of somewhat later origin and possibly the work of English embroiderers The embroidery is preserved in the Bayeux Museum See Sir Eric Maclagan, *The Bayeux Tapestry* (1945), Frank Stenton and others, *The Bayeux Tapestry* (1957, repr 1965)

Bayh, Birch Evans (bī), 1928-, U S Senator (1963-), b Terre Haute, Ind A Democratic member of the Indiana state assembly (1955-62), he served as minority leader (1957-58, 1961-62) and as speaker (1959-60) Elected (1962) to the U S Senate, Bayh became (1963) chairman of the subcommittee on constitutional amendments of the Judiciary Committee He was credited with formulating the 25th Amendment to the Constitution on presidential succession, which was ratified in 1967 In 1969 and 1970, Bayh led the successful fight against confirmation of the nominations of Clement F Haynsworth and G Harrold Carswell to the Supreme Court He is the author of *One Heartbeat Away* (1968)

Bay Islands, Span *Islas de la Bahía*, archipelago, 144 sq mi (373 sq km), off the north coast of Honduras, in the Caribbean Sea The archipelago makes up a department of Honduras Of the three principal islands (Roatan, Guanaja, and Utila), Roatan is the largest and the port of entry Guanaja was visited by Columbus in 1502 The climate is sultry The chief products are fruits and logwood, which English logcutters exploited as early as the 17th cent British garrisoning of the islands in 1848 led to unrest, which was partially settled by the CLAYTON-BULWER TREATY (1850) and relinquishment of British rights (1859) to Honduras Dissatisfied, the English islanders sided with the American filibuster William Walker The population today retains many English characteristics

Baykal or Baikal (both bī'kal'), lake, 12,160 sq mi (31,494 sq km), SE Siberian USSR It is the largest freshwater lake of Eurasia, with a width up to 50 mi (80 km) and a length of c 395 mi (640 km) Its maximum depth is 5,714 ft (1,742 m), making Baykal the world's deepest lake There are numerous feeder streams (notably the Selenga), but the only outlet is the Angara River, whose great volume is harnessed by a hydroelectric station at nearby Irkutsk Lake Baykal is navigable and is used to float timber Surrounded by beautiful mountain scenery, it is rich in fish, including many unusual species Although it is known for its crystal-clear waters, the lake is now in danger of pollution because of recent industrial development in Siberia The Trans-Siberian RR skirts the lake's southern shores Between Lake Baykal and the upper Amur River lies the region known as Transbaykalia

Bayle, Pierre (pyër bāl), 1647-1706, French rationalistic philosopher Born a Huguenot, he converted to Roman Catholicism and then returned to Protestantism To avoid French intolerance of Protestants, he moved in 1681 to Rotterdam, where he lived for most of the rest of his life Trained as a philosopher and with a strong background in theology, Bayle supported Calvinism but was also an advocate of religious toleration, contending that morality was independent of religion His chief work was *Dictionnaire historique et critique* (1697), a compendium of biographies with comprehensive and detailed criticisms by Bayle His views had a profound influence on the French and German ENLIGHTENMENT, especially on the authors of the *Encyclopédie* and on the English deists See K C Sandberg, *At the Crossroads of Faith and Reason* (1966), H E Smith, *The Literary Criticism of Pierre Bayle* (1971)

bayleaf: see LAUREL

Baylis, Lilian see OLO VIC

Bayliss, Sir William Maddock (bā'lis), 1860-1924, English physiologist At University College, London, he investigated the mechanism of heart action, circulation, and digestion With E H Starling he discovered, in 1902, secretin, a hormone produced in the small intestine, and developed a theory of hormone action He wrote *Principles of General Physiology* (1914) and *The Vaso-Motor System* (1923)

Baylor, Robert Emmett Bledsoe, 1793?-1873, American jurist, founder of Baylor Univ, b Kentucky He served in the War of 1812, studied law, and served in the Kentucky legislature Moving (1820) to Alabama, he served in the Alabama legisla-

ture and was (1829-31) a U S Representative from Alabama before moving again (1839), this time to Texas He was a district and supreme court judge in the Republic of Texas and was prominent in drafting the state constitution, which became operative upon the annexation of Texas He became a state judge under the new constitution Baylor was also a Baptist preacher and is chiefly remembered because he drew up and secured passage of a charter for a college that became Baylor Univ

Baylor University, mainly at Waco, Texas, coeducational, chartered and opened 1845 by Baptists (see BAYLOR, ROBERT E B) at Independence, moved 1886 and absorbed Waco Univ (chartered 1861) The library has a noted Robert Browning collection Frank Lloyd Wright designed a theater center at Dallas for the graduate school The university's medical school was founded (1900) as part of the Univ of Dallas, and it became affiliated with Baylor in 1903 In 1943 it moved to Houston, and in 1969 it became a separate corporation under the title of Baylor College of Medicine It was in connection with the Baylor Univ medical school that Michael De Bakey did his pioneer work in artificial heart implantation and heart transplantation Baylor Univ maintains a medical center at Dallas, but there is no medical school

Bayne, Stephen Fielding, Jr. see LAMBETH CONFERENCE

Bay of Pigs Invasion, 1961, an unsuccessful invasion of Cuba by Cuban exiles, supported by the U S government On April 17, 1961, an armed force of about 1,500 Cuban exiles landed in the Bahía de Cochinos (Bay of Pigs) on the south coast of Cuba Trained since May, 1960, in Guatemala by members of the Central Intelligence Agency (CIA) with the approval of the Eisenhower administration, and supplied with arms by the U S government, the rebels intended to foment an insurrection in Cuba and overthrow the Communist regime of Fidel Castro The Cuban army easily defeated the rebels and by April 20, most were either killed or captured The invasion provoked anti-U S demonstrations in Latin America and Europe and further embittered U S-Cuban relations Poorly planned and executed, the invasion subjected President Kennedy to severe criticism at home Cuban exile leader Jose Miro Cardona, president of the U S-based National Revolutionary Council, blamed the failure on the CIA and the refusal of Kennedy to authorize air support for the invasion In Dec, 1962, Castro released 1,113 captured rebels in exchange for \$53 million in food and medicine raised by private donations in the United States See K E Meyer and Tad Szulc, *The Cuban Invasion* (1962), H B Johnson, *The Bay of Pigs* (1964)

Bay of Whales see ROSS SEA, ANTARCTICA

Bayonne (bayōn'), town (1968 pop 45,175), Pyrénées-Atlantiques dept, SW France, in Gascony, on the Adour River near its entrance into the Bay of Biscay Despite a shifting sandbar at the mouth of the Adour, it is a seaport, exporting sulfur The town also has metallurgical, chemical, aeronautical, leather, and wood industries French and Spanish, as well as Basque, are spoken there At Bayonne, Napoleon I forced Charles IV and Ferdinand VII of Spain to abdicate (1808) At the end of the Peninsular War, Bayonne successfully resisted a British siege Bayonne gives its name to the bayonet, invented there in the 17th cent The Cathedral of Bayonne (13th cent) is copied from those of Soissons and Rheims There is a Basque museum and a fine arts museum, left to the city by the painter Bonnat, who was born there Parts of the town's Roman and medieval walls are preserved, as are Vauban's fortifications (17th cent)

Bayonne (bāyōn'), city (1970 pop 72,743), Hudson co, NE N J, on a 3-mi (4.8-km) peninsula, inc 1869 It has oil and chemical industries Its huge oil refineries (operating since 1875) are supplied by a branch of the oil pipeline from the Southwest On Bayonne's 9-mi (14.5-km) waterfront is a large U S naval dry dock and supply depot Dutch traders came to this site c 1650, the British gained possession in 1664 The city is connected to Staten Island by Bayonne Bridge (1,675 ft/511 m long, opened 1931)

bayou (bī'ō, bī'ōō) [Louisiana Fr, from Choctaw *bayuk*=small stream], term used mainly in U S Gulf states, especially Louisiana and Mississippi, to describe a stationary or sluggishly moving body of water that was once part of a lake, river, or gulf and is swampy or marshy in nature Bayou is sometimes used as a synonym for oxbow lake

Bay Psalm Book, common hymnal of the Massachusetts Bay colony Written by Richard Mather,

John Eliot, and Thomas Weld, it was published in 1640 at Cambridge as *The Whole Book of Psalms Faithfully Translated into English Metre*. The announced effort of the authors to make a literal rendering at the expense of elegance is successful if the crudity of the verse be a criterion. This was the first book published in the Thirteen Colonies. See Zoltan Haraszti, *The Enigma of the Bay Psalm Book* (1956).

Bayreuth (bīrōit'), city (1970 pop. 64,536), capital of Upper Franconia, Bavaria, S West Germany, on the Red Main River. It is an industrial center, its manufactures include textiles, metals, and machinery. Founded in the mid-12th cent., Bayreuth belonged to a branch of the Hohenzollern family from 1248 to 1791, when it was annexed by Prussia. It was taken by France in 1807 and passed to Bavaria in 1810. Richard Wagner lived in Bayreuth from 1872 to 1883, and annual music festivals of international importance are held in the Festspielhaus, an opera house designed by Wagner and built in 1872-76. Wagner and Franz Liszt are buried in Bayreuth.

Bayreuth Festival, also called the Richard Wagner Festival, annual season of performances of Wagner's works, held in the Bavarian town of Bayreuth. In about 1851, Wagner began to visualize a festival theater that would be devoted to the performance of great German works for the theater. In 1876 the Wagner Festival Theatre (the Festspielhaus) was completed at Bayreuth, and the first festival took place. Planned by Wagner himself, the Festspielhaus is an amphitheater with many notable features, including a sunken, covered orchestra pit and unusually fine acoustics. Despite the composer's original intention, the Bayreuth Festival presents performances only of Wagner's works, usually *Parsifal*, the "Ring" cycle, and one other work. The festivals were interrupted for seven years after World War II but resumed in 1951.

bay rum, aromatic liquid used chiefly as a cosmetic and a perfume. It originated in the West Indies, where it was prepared by distillation from rum and bay leaves. It is now commonly a mixture of oil of bay (from a bayberry), alcohol, water, oil of pimento, and oil of orange peel.

Bayrut: see BEIRUT, Lebanon.

Bay Shore, uninc. city (1970 pop. 11,119), Islip township, Suffolk co., SE N.Y., on the south shore of Long Island, at the widest point of Great South Bay, founded 1708. It is noted as a fishing and duck-hunting center and has some light industry. A ferry runs from there to Fire Island.

Baytown, city (1970 pop. 43,980), Harris co., S Texas, at the head of Galveston Bay, on the Houston ship channel, inc. 1948 after the consolidation of Goose Creek, Pelly, and Baytown. Large volumes of oil are produced in the area, refined in Baytown, and shipped throughout the world. The city also has chemical, synthetic-rubber, and steel industries. A junior college is there.

Bay Village, city (1970 pop. 18,163), Cuyahoga co., NE Ohio, a suburb of Cleveland, inc. 1903. It is a residential community with some light industry.

Baza (ba'tha), town (1970 pop. 19,990), Granada prov., S Spain, in Andalusia. It is a food-processing center for a fertile farm area noted especially for its cattle. Baza has flour mills, tanneries, and textile industries. An important city of the Moorish kingdom of Granada, it fell to the Spaniards in 1489 after a year-long siege.

Bazaine, Achille François (ashēl' fraNswa' bazān'), 1811-88, French army officer. He served in Algeria, Crimea, Lombardy, and Mexico, and in the FRANCO-PRUSSIAN WAR he was given (Aug., 1870) the supreme command by Emperor Napoleon III. Unequal to the task, Bazaine allowed his army, which was entrenched at Metz, to be surrounded by the Prussians. The attempt of Marshal MACMAHON to rescue him led to the disaster of Sedan. Bazaine then entered questionable diplomatic intrigues with the Germans, which led to his capitulation at Metz (Oct. 27). Convicted of treason in 1873, he was sentenced to 20 years of seclusion but escaped. He spent the rest of his life in Italy and Spain. See Philip Guedalla, *The Two Marshals: Bazaine, Petain* (1943).

Bazan, Álvaro de see SANTA CRUZ, ÁLVARO DE BAZAN, MARQUÉS DE.

Bazan, Emilia Pardo see PARDO BAZÁN.

Bazard, Saint-Amand (sāNtāmaN' bazār'), 1791-1832, French socialist. He founded (1818) a republican society, *Les Amis de la vérité* [Friends of Truth], and was a member of the CARBONARI. Bazard plotted (1821-22) for the overthrow of the monarchy but was unsuccessful. He adopted the socialistic doctrines of Claude Henri de SAINT-SIMON and, with EN-

FANTIN, headed the Saint-Simonian movement until 1831.

Bazargic: see TOLBUKHIN, Bulgaria.

Baziotes, William (bāzēō'tēz), 1912-64, American painter, b. Pittsburgh. Baziotes's works of the 1940s and 50s are largely abstract images, usually with brooding, primitive qualities encompassed in rich and muted colors. He taught in New York City at several schools including the Brooklyn Museum Art School and New York Univ. Representative works are *Dragon* (Metropolitan Mus.) and *The Dwarf and Pompeii* (both Mus. of Modern Art, New York City).

Bazlith (bāz'lith), family in the return from exile Neh. 7:54. This is the Bazluth of Ezra 2:52.

bazooka, in warfare, portable, lightweight metal tube from which rockets are launched, usually operated by two men. It is used by infantry as an anti-tank weapon and also for attacking pillboxes and bunkers. In general, the bazooka is a short-range weapon with low accuracy, however, it gives the individual soldier the means of destroying heavily armored vehicles and fortified positions. An American invention, it was widely used in World War II—first by the Allies and later by the Germans—and in the Korean War by the UN forces. Since then, bazookas have largely been replaced by recoilless weapons and antitank missiles. In modern warfare, the first major use of the rocket as a weapon was in the bazooka. See ROCKET.

Bazzi, Giovanni Antonio: see SODOMA, IL.

BCS theory: see SUPERCONDUCTIVITY.

bdellium (dēl'ēam), aromatic gum RESIN obtained from trees of the genus *Commiphora* (or *Balsamodendron*). It is similar to myrrh. Bdellium is used in medicines and perfumes.

Be, chemical symbol of the element BERYLLIUM.

Beach, Mrs. H. H. A., 1867-1944, American composer and pianist, b. Henniker, N.H. Her maiden name was Amy Marcy Cheney. She received her piano training in the United States, and she toured both there and in Europe. In composition she was largely self-taught. Her *Gaelic Symphony* (1896) was the first symphony by an American woman. She composed more than 150 works, including a piano concerto, chamber music, choral pieces, and well-known songs such as "Ah, Love but a Day" and "The Year's at the Spring." Her music is in the traditional romantic style of the 19th cent.

Beach, Moses Yale, 1800-1868, American journalist, b. Wallingford, Conn. As a young man he invented a rag-cutting machine and a gunpowder engine. In 1838 he bought the New York *Sun* from his brother-in-law, Benjamin Day, for whom he had been working as production manager. The *Sun's* chief competitor in the penny-paper field was the New York *Herald*, edited by James Gordon BENNETT. The two rival papers used ingenious means to get news fast—the *Sun* even kept carrier pigeons in a special house atop its building. Costs, especially during the Mexican War, mounted so much that at a conference in Beach's office the editors of a number of New York newspapers established the New York Associated Press to cooperate in securing the news. Beach is credited with the first European edition of an American paper, the weekly *American Sun* (1848), and with starting the newspaper syndicated article. In 1848 he turned the New York *Sun* over to his sons, Moses Sperry Beach and Alfred E. Beach. See F. M. O'Brien, *The Story of the Sun* (1928, repr. 1968).

beach, mobile deposit of sediment subject to wave action at the shore of an ocean or lake. Most beaches are composed of SAND or GRAVEL and extend from the level of the surf at lowest tide landward to the effective limit of wave action that marks the edge of the COAST. Essentially rivers of sediment moved by waves and currents, beaches display many common features. Seaward of the surf is the offshore zone, which commonly contains a trough and an offshore bar. The foreshore is a seaward-sloping surface extending from the low tide limit of the beach to the crest of a ridge, called the berm, that is formed by storm waves. The foreshore is the active portion of the beach affected by breaking waves that send water running up and down it, called swash and backwash, respectively. The slope angle of the foreshore is related to the size of the beach material and the vigor of the waves. The backshore extends landward from the berm as a broad terrace or gently landward-sloping surface, perhaps broken by one or more beach ridges. The presence of a cliff or dune complex landward of the backshore permits a clear demarcation of the edge

of the coast. Most of the sediment making up a beach is supplied by rivers or by the erosion of cliffs along the coast. Beaches undergo a cyclical migration of sand between the beach and the offshore zone caused by the changing character and the direction of approach of the waves. During the summer, waves cause the beach to extend seaward, while in the winter they cut it back, creating a winter berm high on the beach. In addition, the action of tides causes shorter cycles of cut and fill. Along low sandy coasts, such as the Eastern and Gulf coasts of the United States, a long, narrow beach is commonly separated from the coast by a narrow lagoon. This configuration is called a barrier beach. Where the beach extends from land and terminates in open water it is called a spit or a hook. Waves approaching the shore obliquely move the sediment along the beach in a zigzag pattern called longshore transport. It is estimated that an average of 200,000 to 800,000 cubic yards (150,000 to 600,000 cubic meters) of sand are moved per year along beaches in this fashion. Since beaches are mobile deposits, they owe their existence to a constant replenishment of sand. In many coastal areas of the United States a deficiency in the supply of sand is resulting in serious erosion problems. Artificial replenishment by pumping sand onto the beach from offshore is one solution to erosion problems.

beach grass or marram grass, any species of the genus *Ammophila*, perennial grasses used to control the shifting of sand dunes, thereby protecting sandy coastal areas. The European beach grass (*A. arenaria*) has been used to hold dunes in Europe and was early planted at Cape Cod to bind the sands; later it was used at Golden Gate Park and elsewhere in the United States. The American beach grass (*A. breviligulata*) is native to dunes of the Great Lakes and much of the eastern seacoast. Beach grasses have creeping rootstocks which rapidly form an extensive root system. Beach grasses are classified in the division MAGNOLIOPHYTES, class Liliatae, order Cyperales, family Gramineae.

Beachy Head, high chalk cliffs (575 ft/175 m), on the south coast of East Sussex, S England. The battle of Beachy Head, in the War of the Grand Alliance, was fought (1690) between an Anglo-Dutch fleet under the earl of Torrington and the French fleet under the comte de Tourville. Although the French won, they failed to exploit their victory over the damaged opponent to deal a decisive blow to Anglo-Dutch seapower. Torrington, meanwhile, was court-martialed for retreating but, arguing that his action prevented an invasion, was acquitted.

Beacon, city (1970 pop. 13,255), Dutchess co., SE N.Y., on the east bank of the Hudson River opposite Newburgh, settled 1663, inc. as a city in 1913 when Fishkill Landing and Matteawan villages were united. Beacon has textile and related industries, other varied manufactures, and a large industrial research firm. An incline railway ascends Mt. Beacon, site of a towering monument to the Revolutionary soldiers who built signal fires there to warn of the coming of the British. A state hospital for the criminally insane is in the city. Beacon's historic buildings include the Madam Brett homestead (1709).

Beaconsfield, Benjamin Disraeli, 1st earl of: see DISRAELI, BENJAMIN.

beaded lizard: see GILA MONSTER.

Beadle, George Wells, 1903-, American geneticist, b. Wahoo, Nebr., grad. Univ. of Nebraska (B.S., 1926, M.S., 1927), Ph.D. Cornell, 1931. Beadle taught (1931-36) biology at the California Institute of Technology, where he also began genetic research on the fruit fly, *Drosophila*, in T. H. Morgan's laboratory. He was later chairman (1946-61) of the biology department there, and in 1961 he became chancellor of the Univ. of Chicago. Beadle shared with Joshua Lederberg and E. L. Tatum the 1958 Nobel Prize in Physiology for work with Tatum on the bread mold *Neurospora crassa*, which showed that genes control the cell's production of enzymes and thus the basic chemistry of the cell. See George Beadle and Muriel Beadle, *The Language of Life* (1966).

bead test, test used in the identification of certain metals. Some metallic ions that cannot be identified by a FLAME TEST are identified by a bead test. The test can also be used to confirm the results of a flame test. The borax bead test is the most common. A small loop is formed at the end of a platinum wire. The loop is cleaned with concentrated hydrochloric acid and dipped in powdered borax, then heated in the flame of a Bunsen burner until the borax melts, forming a bead. The bead is dipped into a tiny amount of the compound to be tested and is reheat-

ed in the flame. The metal borate that is formed colors the bead. Some metals and the colors they produce in an oxidizing flame are chromium, green, cobalt, blue, copper, blue-green, iron, yellow to brown, manganese, violet, nickel, reddish-brown. If too much of the unknown compound is used, the bead may be opaque and the color difficult to determine. A different color is often obtained in a reducing flame. Several metals may give the same color. Some metals give only colorless or gray beads. A test similar to the borax bead test is often made using microcosmic salt. Results of the bead test may be confirmed by other methods of CHEMICAL ANALYSIS.

beagle, breed of small, compact HOUND developed over centuries in England and introduced into the United States in the 1870s. It stands between 10 and 15 in (25.4–38.1 cm) high at the shoulder and weighs between 20 and 40 lb (9.1–18.1 kg). The breed is divided into two varieties on the basis of size: those under 13 in (33 cm) in height and those between 13 and 15 in (33–38.1 cm). The beagle's short, close-lying, harsh coat is usually colored black, tan, and white. Once widely used, either singly or in packs, to hunt hares, today it is more popular as a field-trial competitor and pet. See DOG.

Beagle, naval vessel. See DARWIN, CHARLES ROBERT.

Beale, Edward Fitzgerald, 1822–93, American frontiersman, b. District of Columbia. During the Mexican War, Beale was in California, where he aided Stephen W. Kearny in the battle of San Pasqual by crawling through the lines with Kit Carson to get help. Later, during one of several trips across the continent, Beale was the first to bring east the news of the California gold strike. Appointed (1852) superintendent of Indian affairs in California and Nevada, he served well. In the Southwest, he is best remembered for a curious experiment in 1857 with camel transportation while doing one of many surveys. Beale was briefly (1876–77) also minister to Austria-Hungary. See biography by Stephen Bonsal (1912), L. B. Lesley, ed., *Uncle Sam's Camels* (1920).

Bealiah (bēālīʾa), warrior who joined David at Ziklag. 1 Chron 12:5.

Bealoth (bēʾālōth) [Heb., =fem. pl. of BAAL], town, S Judah. Joshua 15:24. At 1 Kings 4:16 RSV has Bealoth, but KJV translates "in Aloth."

Bean, Roy, c. 1825–1903, legendary American frontier judge, b. Mason co., Ky. He left Kentucky in 1847 to seek his fortune in California. Soon, however, he was managing a trading post in Chihuahua, Mexico. In 1849 he was chased back into U.S. territory for cattle rustling. During the Civil War, Roy Bean aided the Confederate cause by joining a band of lawless irregulars. After the war he followed the construction camps of the Southern Pacific RR as a saloonkeeper and gambler. In 1882, Bean settled at the Texas camp of Vinegaroon, had it renamed Langtry (for the English actress Lily Langtry), named himself justice of the peace (to which he added the title "the law west of the Pecos"), and set up court in his saloon, the Jersey Lily. He there began to dispense justice with the aid of one law book and a six-shooter. As a judge, Bean rendered arbitrary and unorthodox decisions, usually tempered with wit and common sense. See biographies by C. L. Sonnichsen (1943, repr. 1953) and E. Lloyd (rev. ed. 1967).

bean, name applied to the seeds of leguminous trees and shrubs and to various leguminous plants of the family Leguminosae (PUSE family) with edible seeds or seed pods (legumes). The genera and species encompassed by the term *bean* are many and variable. The broad beans (*Vicia faba*, of the vetch genus), the SOYBEAN types (*Glycine max*), and a few lesser species were the only beans known to the Old World before the discovery of America, by which time the Indians had already developed most of the bean types still used today, e.g., the lima beans, kidney beans, string beans, shell beans, and pea beans. All these are species and varieties of *Phaseolus*, the "true" bean genus, the hereditary history of most is unknown, and hence the taxonomic distinctions are often still uncertain. In general, beans are warm-season annuals (although the roots of tropical species tend to be perennial) that grow erect (bush types) or as vines (pole or running types). The plants are easily cultivated but susceptible to several diseases, e.g., rusts, blights, wilts, and bean anthracnose (a fungus). Field beans are mostly the bush type and are used as stock feed. This has also become the principal use of the ancient large-seeded broad bean (called also the horse or Windsor bean), still widely grown in Europe but seldom as food for man. The common garden beans comprise several bush types and most of the pole types, the most often cultivated and most varied species, *P. vulgaris*,

is familiar as both types. *P. vulgaris* is the French haricot and the Spanish FRIJOLE. String beans, snap beans, green and yellow wax beans, and some kidney beans are eaten as whole pods, several kidney beans, pinto beans, pea beans, and many other types are sold as mature dry seeds. The lima or butter beans (*P. lunatus*, including the former *P. limensis*), usually pole but sometimes bush types, have a long history; they have been found in prehistoric Peruvian graves. The sieva is a type of lima. The scarlet runner (*P. multiflorus*), grown in Europe for food, is mainly an ornamental vine in North America. The tepary (*P. acutifolius latifolius*), a small variety long grown by Indians in the SW United States, has been found better suited to hot, arid climates and more prolific than the frijole. Other beans are the hyacinth bean or lablab (*Dolichos lablab*), grown in the Orient and the tropics for forage and food and cultivated in North America as an ornamental vine, the asparagus bean or yard-long bean (*Vigna sesquipedalis*), grown as a curiosity, and the velvet bean (*Stizolobium*), cultivated in the S United States as a forage and cover crop. The CAROB, the COWPEA or black-eye bean, and the CHICK-PEA or garbanzo are among the many other legumes sometimes considered beans. The sacred bean of India is the seed of the Indian lotus (of the WATER LILY family). Because seeds contain much protein, beans are useful as a meat substitute, and in different parts of the world are a characteristic item—often a staple—of the national fare. Baked beans, cooked for hours with pork or molasses or both, are a traditional New England dish. The Greeks and Romans used the broad bean for balloting—black seeds to signify opposition and white seeds agreement. This custom lingered in England in the election of the king and queen for Twelfth Night and other celebrations and was taken to the New World colony at Massachusetts Bay, where Indian beans were used. Beans are classified in the division MAGNOLIOPHYTES, class Magnoliopsida, order Rosales, family Leguminosae.

bean beetle, common name for a destructive beetle, *Epilachna varivestris*, of the LADYBIRD BEETLE family. Although nearly all other members of this family are beneficial carnivores, the bean beetle attacks leguminous plants, especially beans. Both larva and adult feed on the undersides of leaves and sometimes on the pods. The adult is yellow, with black spots, the yellow, oval-bodied larva has forked spines. Bean beetles overwinter as adults and in early spring lay masses of 10 to 50 eggs on the undersides of leaves. One to four generations occur annually, each requiring about a month to mature. Since most damage occurs during July and August, early-maturing beans suffer the least damage. Removing old bean plants helps to destroy overwintering beetles, although many escape to nearby sheltered areas. Chemical insecticides are used for control. Before 1920 the bean beetle, also called Mexican bean beetle, was found only in the SW United States, but it now occurs throughout most of the United States, except on the Pacific coast. It is classified in the phylum ARTHROPODA, class Insecta, order Coleoptera, family Coccinellidae.

bean weevil, common name for a well-known cosmopolitan species of beetle (*Acanthoscelides obtectus*) that attacks beans and is thought to be native to the United States. It belongs to the family Bruchidae, the seed beetles. The bean weevil is small, about 1/4 in (0.4 cm) long, and stout-bodied, with a short broad snout and shortened wing covers (elytra). The adults attack legumes either in storage or in the field and may even completely destroy them. The grubs, or larvae, hatch from eggs laid in holes that have been chewed by the female into stored beans or into pods in the field. In heavy infestations there may be two dozen or more newly hatched larvae in one bean. When full-grown, the larvae form pupae in the eaten-out cavity. As many as six generations are produced in a single season, and in storage breeding continues as long as there is available food left in the beans and a warm temperature. The larvae can be killed by fumigation or by heating the seeds to 145°F (63°C) for two hours. Bean weevils are classified in the phylum ARTHROPODA, class Insecta, order Coleoptera, family Bruchidae.

Bear river, 350 mi (563 km) long, rising in the Uinta Mts., NE Utah, and flowing in a U-shaped course NW through Wyoming and Idaho, then S into Utah to enter Great Salt Lake. A perennial stream, the Bear played an important role in the development of the region by the Mormons in the mid-1800s. The Bear irrigates c. 50,000 acres (20,230 hectares). At the river's mouth is Bear River National Wildlife Reserve.

bear, large mammal of the family Ursidae in the order Carnivora, found almost exclusively in the Northern Hemisphere. Bears have large heads, bulky bodies, massive hindquarters, short, powerful limbs, very short tails, and coarse, thick fur. They walk on the entire sole of the foot and normally move with a slow, ambling gait. However, they are capable of moving with great speed when necessary and some achieve bursts of 35 mi (56 km) per hr. Most bears can climb trees and swim well. They stand on the hind feet to reach objects with their paws. They have large, strong, non-retractile claws, used for catching prey and for digging. Their teeth are adapted to grinding as well as tearing. Nearly all species are omnivorous, feeding on fruits, roots and other plant matter, honey, carrion, insects, fish, and small mammals. Adult bears are solitary except during the mating season. Groups may feed together where quantities of food are available, but there is little social contact. In cold climates bears sleep through most of the winter in individual dens made in caves or holes in the ground. This sleep is not a true hibernation, as the bear's metabolism remains in a normal state and it may wake and emerge during warm spells. The young, usually twins, are born during winter in a very immature state. Cubs stay with their mothers for about a year, and females usually mate only every other year. Bears are not generally subject to predation, unless they are in a weakened condition. A bear is a formidable adversary and may attack a human if it is injured or startled. The brown bear of Eurasia, *Ursus arctos*, is extinct in much of Western Europe, but small numbers survive in some wooded sections of that region and larger numbers in Russia and N Asia. The Russian variety was the bear most often trained to dance and box by traveling showmen in the past. The North American brown bears, including the Kodiak bear and GRIZZLY BEAR, are regarded by many authorities as varieties of *U. arctos*. Brown bears are dish-faced, i.e., their muzzles curve upward in profile. Their shoulders are humped. They range in color from yellow-brown to nearly black, with much color variation among different varieties, local populations, and individuals. Most varieties do not climb well. The Kodiak bear, or big brown bear, is the largest living member of the Carnivora, sometimes reaching a length of 9 ft (2.7 m), a shoulder height of 4 1/2 ft (1.40 cm), and a weight of over 1,600 lb (730 kg). It is found along the south coast of Alaska and, like the Siberian brown bear, eats large numbers of salmon during salmon runs. The most widespread and numerous North American bear is the so-called black bear, *U. americanus*, found in Alaska, Canada, the Great Lakes region, mountainous areas of the United States, and on the Gulf Coast. American black bears range in color from light brown to black; in northern regions there are gray and nearly white forms. Their muzzles are always cinnamon brown and are straight in profile. They are further distinguished from brown bears by their smaller size and by their hindquarters, which are higher than their shoulders. Males are usually about 6 ft (1.90 cm) long and weigh about 500 lb (230 kg). The Asian black bear, or moon bear, *Selenarctos thibetanus*, is found in forests from central Asia and the Himalayas to Japan. The sun bear, *Helarctos malayanus*, is found in tropical forests of SE Asia. Smallest of the bears, it is about 4 ft (1.20 cm) long and weighs about 100 lb (45 kg). It spends much time in trees and is fond of honey; it is sometimes called honey bear (a name also applied to the KINKAJOU). The sloth bear, *Melursus ursinus*, is a medium-sized bear of the forests of S India and Sri Lanka. The POLAR BEAR, *Thalarctos maritimus*, is an almost exclusively carnivorous species of the arctic regions. The only bear of the Southern Hemisphere is the spectacled bear, *Tremarctos ornatus*, of the Andes mts.; it is so called from the light-colored circles around its eyes. Bears are classified in the phylum CHORDATA, subphylum Vertebrata, class Mammalia, order Carnivora, family Ursidae. See Richard Perry, *Bears* (1970).

bearberry, any plant of the northern and alpine genus *Arctostaphylos* of the family Ericaceae (HEATH family), especially *A. uva-ursi*, a trailing evergreen sometimes cultivated as a ground cover. The small, leathery leaves yield a medicinal astringent and a dye. They were used for tobacco by the Indians, who also utilized the mealy red berries for food and beverages. This Northern Hemisphere genus is most abundant in arid areas, where many of the shrubby species (called manzanita in the West) are common chaparral plants. Other plants are also sometimes called bearberry. Bearberry is classified in the divi-

sion MAGNOLIOPHYTA, class Magnoliopsida, order Ericales, family Ericaceae

Beard, Charles Austin, 1874–1948, American historian, b near Knightstown, Ind. A year at Oxford as a graduate student gave him an interest in English local government, and after further study at Cornell and Columbia universities he wrote, for his doctoral dissertation at Columbia, *The Office of Justice of the Peace in England* (1904, repr 1962). While teaching (1904–17) history and politics at Columbia, he joined James Harvey ROBINSON in promoting the teaching of history that would encompass all aspects of civilization, including economics, politics, the intellectual life, and culture. Together they wrote *The Development of Modern Europe* (1907) and compiled an accompanying book of readings. Beard was especially concerned with the relationship of economic interests and politics. His study of the conservative economic interests of the men at the Federal Constitutional Convention, *An Economic Interpretation of the Constitution* (1913), caused much stir; he also wrote *Economic Origins of Jeffersonian Democracy* (1915, repr 1965) and *The Economic Basis of Politics* (1922). His interest in city government led to *American City Government* (1912) as well as the long standard *American Government and Politics* (1910). After resigning from Columbia in World War I, he helped to found the New School for Social Research, was director (1917–22) of the Training School for Public Service in New York City, and was an adviser on administration in Tokyo after the disastrous Japanese earthquake of 1923. Beard wrote *A Charter for the Social Sciences in the Schools* (1932), which had an enormous influence on the teaching of history. He became widely known to the general reading public through *The Rise of American Civilization* (2 vol., 1927, repr 1933) and its sequels (Vol III and Vol IV), *America in Midpassage* (1939) and *The American Spirit* (1943), all written in collaboration with his wife, Mary Ritter Beard (1876–1958). This panoramic work is an example of the broad historical view that Beard championed, the great store of fact is laid open with easy and graceful literary style. With his wife he also later wrote a brief survey, *The Beards' Basic History of the United States* (1944, rev ed 1960). Mary R. Beard, a historian in her own right, was particularly interested in feminism and the labor movement and wrote a number of works on the subjects, notably *Women's Work in Municipalities* (1915), *A Short History of the American Labor Movement* (1920), *On Understanding Women* (1931), and *Woman as Force in History* (1946). Charles A. Beard, much criticized as a radical in his earlier years, was just as much criticized by the liberals in his later years for his violent opposition to Franklin D. Roosevelt's administration, especially in the struggle over the Supreme Court and in foreign policy. Beard's last work was *President Roosevelt and the Coming of the War, 1941* (1948, repr 1968). See studies by B. C. Borning (1962) and Richard Hofstadter (1968, repr 1970).

Beard, Daniel Carter, 1850–1941, American illustrator and naturalist, b Cincinnati, Ohio, studied at the Art Students League, New York City. He illustrated many books (among them the first edition of Mark Twain's *Connecticut Yankee at King Arthur's Court*) and taught animal drawing. He became interested in work for boys, and his best-known book, *The American Boys' Handy Book*, was published in 1882. One of the founders (1910) of the Boy Scouts of America, he served for the remainder of his life as national scout commissioner. To boys all over the country he was known as Uncle Dan. Mt. Beard, adjoining Mt. McKinley, is named for him. In addition to many articles on woodcraft and nature study, Beard wrote *Boy Pioneers and Sons of Daniel Boone* (1909), *American Boys' Book of Wild Animals* (1921), and *Wisdom of the Woods* (1927). See his autobiography, *Hardly a Man Is Now Alive* (1939).

beard, hair on the lower portion of the face. The term *mustache* refers to hair worn above the upper lip. Attitudes toward facial hair have varied in different cultures. In ancient Egypt, as well as Turkey and India, the beard was regarded as a sign of dignity and wisdom. Beards were continued into the Greek civilization until the 4th cent. B.C., when Alexander the Great ordered his soldiers shaved. The Romans, however, actually introduced the practice of regular shaving. The belief that the beard denotes wisdom was widespread in ancient China, and the cult of the beard has been dominant in Middle Eastern cultures from ancient times to the recent past. As a symbol of virility and status, the beard has often acquired religious significance. Muhammad enjoined his followers to grow beards, the Sikhs of India are not permitted to remove a single hair from

their bodies, and the patriarchs of the tribes of Israel were bearded. Hindus, on the other hand, have traditionally been clean-shaven. Prior to the 7th cent., most Anglo-Saxons wore beards, but with the spread of Christianity, beards were discouraged. However, since that time beards of all sizes and shapes have appeared and disappeared with the cycles of fashion. The guardsman's *mustache* of the 18th and early 19th cent. was the sign of an army man, and after 1830 the beard became the emblem of the French radicals. In the 20th cent. beards and mustaches were generally out of fashion until the 1960s when, together with long hair, they became popular with young people. See Reginald Reynolds, *Beards* (1950).

Bearden, Romare, 1914–, American painter, b Charlotte, N.C. Bearden grew up in Harlem and, in his work, has attempted to come to terms with everyday experiences of blacks in America. His themes are frequently religious and are rendered in vibrant, flat planes of color combined with photographic elements. His work is represented in the Museum of Modern Art, New York City.

Beardsley, Aubrey Vincent, 1872–98, English illustrator and writer, b Brighton. One of the foremost of modern illustrators, Beardsley exemplifies the aesthetic movement in English art of the 1890s (see DECADENTS). Largely self-taught and at first inspired by the Pre-Raphaelites, he was later influenced by art forms ranging from Greek vase painting and Japanese woodcuts to the French ROCCO. In his short working span of only six years, he developed a superbly artificial and graphic manner, expressed in flat, linear black and white designs. His works were often macabre in subject matter, by turns erotic and cruel in emphasis. The art editor of the famous *Yellow Book* quarterly (1894–96), Beardsley also edited and contributed some of his best work to Leonard Smithers's periodical, *The Savoy*, and illustrated many books including Wilde's *Salome* (1894), Pope's *Rape of the Lock* (1896), Aristophanes' *Lysistrata* (privately pub., 1896), and Jonson's *Volpone* (1898). His fiction, distinguished by an elaborate and erudite prose style, was collected and published in 1904 as *Under the Hill*. Criticized for the erotic character of his work and condemned for his association with Oscar Wilde, Beardsley fell from public favor. Ravaged by tuberculosis, he died at the age of 26. Beardsley had many imitators but his work remains unique. See his *Early Works* (1899, repr 1967) and *Later Works* (1901, repr 1967), his letters, ed by J. L. Duncan and W. G. Good (1970), study by B. Reade (1967).

beardtongue: see FIGWORT

bearing, machine part designed to reduce FRICTION between moving parts. It is also used to support moving loads. There are two main kinds of bearings: the antifriction type, such as the roller bearing and the ball bearing, operating on the principle of rolling friction, and the plain, or sliding, type, such as the journal bearing and the thrust bearing, employing the principle of sliding friction. Roller bearings are either cylindrical or tapered (conical), depending upon the application, they overcome frictional resistance by a rolling contact and are suited to large, heavy assemblies. Ball bearings are usually found in light precision machinery where high speeds are maintained, friction being reduced by the rolling action of the hard steel balls. In both types the balls or rollers are caged in an angular grooved track, called a race, and the bearings are held in place by a frame, commonly called a pillow block or plummer block. Ball bearings or roller bearings reduce friction more than sliding bearings do. Other advantages of antifriction bearings include ability to operate at high speeds and easy lubrication. A journal bearing usually consists of a split cylindrical shell of hard, strong metal held in a rigid support and an inner cylindrical part of soft metal, which holds a rotating shaft, or journal. A self-aligning journal bearing has a spherically shaped support that turns in a socket to adjust to movements of the shaft. Slight misalignment of the shaft can be accommodated in the ordinary journal bearing by wearing of the soft bearing material, often an alloy of tin or lead. Less frequently used are aluminum alloys, steel, cast iron, or a thin layer of silver covered with a thin coating of a soft bearing material. Ideally, a film of lubricant, normally oil, separates journal and bearing so that contact is prevented (see LUBRICATION). Bearings that are not split are called bushings. A thrust bearing supports an axial load on a shaft, i.e., a force directed along a shaft's length. It may be a plate at the end of a shaft or a plate against which the collar on the shaft pushes. Large thrust bearings, such as those used to transmit the motive

force of a ship's propeller from the shaft to the hull, have blocks that are separated from the collar on the shaft by wedge-shaped spaces. Oil swept up by these spaces separates the metal surfaces. Graphite bearings are used in high-temperature situations. Certain plastics make satisfactory self-lubricating bearings for low speeds and light loads and, if additionally lubricated, work at higher speeds and carry greater loads. Rubber and a naturally oily wood, *Iignum vitae*, are used in water-lubricated bearings. Watches and other precision instruments have glass or sapphire pivot bearings. In gas-lubricated bearings a film of gas separates the bearings from the moving machine parts.

Bear Island, Svalbard. See BJØRNØYA.

Bear Mountain, peak, 1,284 ft (391 m) high, SE N.Y., overlooking the Hudson River. The Bear Mt. section of the Palisades Interstate Park, with facilities for both summer and winter sports, is popular among New York City residents. The remains of Fort Clinton, dating from the Revolutionary War, are there. The Bear Mt. Bridge crosses the Hudson River. This suspension bridge, 2,257 ft (688 m) long, was opened in 1924 and was acquired by the state of New York in 1940.

Béarn (bārn'), former province, SW France, in the Pyrenees. It is now the inland part of Pyrénées-Atlantiques dept. Its valleys are well cultivated, and cattle are bred. Pau replaced Orthez as the capital in the 15th cent. The Bearnese are related to the Basques but speak French. Bearn was part of Roman Aquitania. It came (6th cent.) under the control of GASCONY, and was made (9th cent.) a county. In 1290 it passed to the counts of Foix, who later became kings of Navarre, and in 1484 to the house of ALBRET. Protestantism was imposed by Jeanne d'Albret. When her son became Henry IV of France, Bearn passed to the crown. However, it remained autonomous until 1620, when Louis XIII annexed it as an anti-Protestant measure. With the Basque districts of French or Lower Navarre, it became a French province under the jurisdiction of the parlement of Navarre, which sat at Pau.

beas's-breech: see ACANTHUS

Beas (bē'as), river, 250 mi (402 km) long, rising in the Himalayas and flowing generally southwest through the fertile Kulu valley and the Siwalik Hills to join the Sutlej River, S of Amritsar, N India, the easternmost of the "five rivers" of the Punjab. The Beas marked the eastern limit of Alexander the Great's invasion of India in 326 B.C.

beast epic: see BESTIARY

beat generation, term applied to certain American artists and writers who were popular during the 1950s. Essentially anarchic, members of the beat generation rejected traditional social and artistic forms. They sought immediate expression in multiple, intense experiences and beatific illumination like that of some Eastern religions (e.g., Zen Buddhism). In literature they adopted rhythms of simple American speech and of so-called progressive jazz. Among those associated with the movement are the novelists Jack Kerouac and Chandler Brossard, numerous poets (e.g., Kenneth Rexroth, Allen Ginsberg, Lawrence Ferlinghetti, and Gregory Corso), and others, many of whom have worked in and around San Francisco. Perhaps the only true nihilist of the group is William Burroughs. During the 1960s "beat" ideas and attitudes were absorbed by other cultural movements, and those who practiced the "beat" life style were called "hippies."

beatification: see CANONIZATION

Beatitudes [Lat., = blessing], eight blessings uttered by Jesus at the opening of the Sermon on the Mount (Mat. 5:3–12). Some, counting verses 11–12 apart from verse 10, say there are nine. In the parallel passage, Luke 6:20–26, only four of the blessings appear, with four corresponding woes. See also Mat. 11:6, Luke 7:23, John 20:9.

Beatles, The, English rock music group formed in the late 1950s and disbanded in 1970. The members were John Lennon (1940–) guitar and harmonica, Paul McCartney (1942–) guitar and piano, George Harrison (1943–) guitar and sitar, and Ringo Starr (Richard Starkey) (1940–) drums. All were born in Liverpool, England. Influenced by such American performers as Chuck Berry, Little Richard, and Elvis PRESLEY, The Beatles dominated ROCK MUSIC in the 1960s, eventually disbanding when they felt their possibilities as a group were exhausted. The lyrics and music for most of their songs were written by Lennon and McCartney. The group burst on the international rock music scene in 1961. Their initial appeal derived as much from their wit, Edwardian clothes, and moplike haircuts as from their music.

By 1963 they were the objects of wild adoration and were constantly followed by crowds of shrieking adolescent girls. By the late 1960s, "Beatlemania" had abated somewhat, and The Beatles were highly regarded by a broad spectrum of music lovers. From 1963 to 1970 the group released 18 record albums that clearly document its musical development. The early recordings, such as *Meet The Beatles* (1964), are remarkable for their solid rhythms and excitingly rich, tight harmony. The middle albums, like *Rubber Soul* (1965) and *Revolver* (1966), evolved toward social commentary in their lyrics ("Eleanor Rigby," "Taxman") and introduce such instruments as the cello, trumpet, and sitar. In 1967, *Sgt. Pepper's Lonely Hearts Club Band* marked the beginning of The Beatles' final period, which is characterized by electronic techniques and allusive, drug-inspired lyrics. The group acted and sang in four films: *A Hard Day's Night* (1964), *Help!* (1965), *Magical Mystery Tour* (1967), and *Let It Be* (1970), all of these are outstanding for their exuberance, slapstick, and satire. The Beatles also supplied voices for the full-length animated cartoon, *Yellow Submarine* (1968). After they disbanded, all The Beatles continued to compose and record songs. See Hunter Davies, *The Beatles* (1968), Richard Dillelo, *The Longest Cocktail Party* (1972), Wilfred Mellers, *Twilight of the Gods* (1974).

Beaton, Cecil Walter Hardy, 1904–, English scenery and costume designer, photographer, writer, and painter. Since designing his first stage show in 1935, Beaton has worked on numerous productions, including *Lady Windermere's Fan*, *Vanessa* (opera), *Gigi* (film, 1951), *My Fair Lady* (stage, 1956, film, 1964), and *Coco* (1969). He has also written and illustrated many books. See his autobiographical *The Wandering Years* (1962) and *Memoirs of the 40s* (1973).

Beaton or Bethune, David (both bē'tan), 1494–1546, Scottish churchman, cardinal of the Roman Catholic Church. He was the nephew of James Beaton, archbishop of St. Andrews. He was made cardinal in 1538 and succeeded his uncle as archbishop and primate of Scotland in 1539. Beaton arranged the marriage of James V and Mary of Guise and tried to assume the regency for Mary Queen of Scots (1542), but James HAMILTON, 2d earl of Arran, seized power. The following year Arran renounced Protestantism and sided with Beaton, who crowned Mary Beaton became chancellor of Scotland and ably opposed the designs of HENRY VIII of England. Beaton's relentless persecution of Scottish reformers led to the execution of George WISHART in 1546, and in reprisal the cardinal himself was murdered in his castle two months later.

Beatrice (bē'ātrīs), city (1970 pop. 12,389), seat of Gage co., SE Neb., on the Big Blue River, inc. as a city 1873. It is on the old OREGON TRAIL and is the trading and industrial center for a grain, dairy, and livestock area. Its manufactures include metal goods, farm and garden equipment, fertilizers, hardware and electric products, store fixtures, and dairy products. John J. Pershing College is in Beatrice. Nearby is the Homestead National Monument (see NATIONAL PARKS AND MONUMENTS, table).

Beatrice Portinari (bē'ātrīs, Ital. bāātrē'chā pōrtēnārē), 1266–90, Florentine woman believed to be the Beatrice of the *Divine Comedy* and *Vita nuova* of DANTE. He first saw Beatrice when he was nine years old and she remained his ideal and inspiration until his death in 1321. Her identity has been the cause of much controversy.

Beatrix, 1938–, crown princess of the Netherlands. The oldest daughter of Queen Juliana of the Netherlands and of Prince Bernhard of Lippe-Biesterfeld, she received a law degree from the Univ. of Leyden in 1961. In 1966 she married a German, Claus von Amsberg, and the following year she gave birth to a son, Willem Alexander Claus, the first prince of Orange in the line of succession since 1884. She now has two other sons.

Beattie, James (bā'tē), 1735–1803, Scottish poet and essayist. Educated at Marischal College, Aberdeen, he later became professor of moral philosophy there. His fame in his own lifetime rested on two works, *Essay on the Nature and Immutability of Truth* (1770), an attack on Hume, and an autobiographical poem, written in Spenserian stanzas, entitled *The Minstrel* (1771–74). In describing the formation of a poet's mind, *The Minstrel* places particular emphasis on the effect of nature, the poem influenced the 19th-century romantics, particularly Lord Byron.

Beatty, David Beatty, 1st Earl (bē'tē), 1871–1936, British admiral. He served with distinction in Egypt

and the Sudan (1896–98) and in the Boxer Uprising (1900) in China. Made rear admiral in 1910, he commanded successful naval actions early in World War I at Heligoland Bight (1914) and at Dogger Bank (1915). His battle cruiser squadron lured the German fleet into position for an engagement with the British grand fleet under Admiral John Jellicoe at the battle of JUTLAND (1916). Beatty commanded (1916–19) the fleet and was (1919–27) first sea lord of the navy. He was created Earl Beatty in 1919.

Beauce (bōs), region, in Orleanais, N France, in the Paris Basin, between the Seine and Loir rivers. It now comprises Eure-et-Loir dept and parts of Loiret and Loir-et-Cher depts. It is the "granary of France"—a vast, limestone plateau covered with wheat fields. Beets, potatoes, barley, and oats are also grown. The region shared the history of the county of Chartres, Chartres is its only important city. Little Beauce, between the Loir and the Loire rivers, is also a rich wheat area, Vendôme is the center.

Beauchamp, Guy de: see WARWICK, GUY DE BEAU CHAMP, EARL OF.

Beauchamp, Richard de: see WARWICK, RICHARD DE BEAU CHAMP, EARL OF.

Beauchamp, Thomas de: see WARWICK, THOMAS DE BEAU CHAMP, EARL OF.

Beaufort, Edmund: see SOMERSET, EDMUND BEAU-FORT, 2D DUKE OF.

Beaufort, François de Vendôme, duc de (fraNswā' də vaNdom' duk də bōfōr'), 1616–69, French courtier and politician, grandson of King Henry IV of France and his mistress Gabrielle d'ESTRÉES. Implicated in the conspiracy of the Marquis de CINQ MARS against Louis XIII's minister Cardinal Richelieu, he fled (1642) to England but returned after Richelieu's death. He was one of the important, a clique opposing Richelieu's successor, Cardinal Mazarin, and was imprisoned from 1643 to 1648. A leader of the FRONDE, he was nicknamed King of the Markets because of his popularity with the Parisian mob. Exiled in 1652, he was later recalled and given command (1666) of the French fleet against the Turks and the Barbary pirates.

Beaufort, Henry (bō'fōrt), 1377?–1447, English prelate and statesman. The son of John of Gaunt, duke of Lancaster, and his mistress (later wife) Catherine Swynford, he was half brother to Henry IV. He was declared legitimate (1397) and made bishop of Lincoln (1398) by Richard II, and under Henry IV, served as chancellor (1403–4) and became (1404) bishop of Winchester. On the accession of his friend Prince Henry as Henry V, Beaufort again was chancellor (1413–17). At the Council of Constance, Beaufort swung (1417) English influence to help elect Pope Martin V, but Henry refused to let him accept the pope's reward of a cardinalate. When in 1422 the infant HENRY VI succeeded to the throne, Beaufort became involved in a vigorous struggle for power with Humphrey, duke of GLOUCESTER. Beaufort's enormous wealth (he loaned money to the government for the war in France) and political skill gave him the advantage, and he served again as chancellor (1424–26). Made a cardinal (1426) and papal legate, he preached a crusade against the Hussites in Bohemia in 1429, but the troops he raised were diverted to join the English army in France. In 1431 he crowned Henry VI as king of France in Paris. Beaufort defeated (1432) an attempt by Gloucester to remove him from the see of Winchester and by 1437 enjoyed complete ascendancy. He and his faction, which was later led by William de la Pole, 4th earl and 1st duke of Suffolk (see under POLE, family), sought to end the French wars.

Beaufort, Margaret, countess of Richmond and Derby (bō'fōrt, dar'bē), 1443–1509, English noblewoman, mother of Henry VII. She was the daughter and heiress of John, 1st duke of Somerset, and great-granddaughter of John of Gaunt, duke of Lancaster. She was married three times to Edmund Tudor, earl of Richmond, who was Henry's father, to Henry Stafford, and to Thomas, Lord Stanley, afterwards earl of Derby. Renowned for her philanthropy, she endowed professorships of divinity at Oxford and Cambridge and with the help of her confessor, John Fisher, founded Christ's College and St. John's College, Cambridge. She was the patron of many religious houses and of William Caxton and Wynkyn de Worde.

Beaufort Sea (bō'fōrt), part of the Arctic Ocean, N of Alaska and Canada, between Point Barrow, Alaska, and the Canadian Arctic Archipelago. The Mackenzie River flows into the sea, which is always covered with pack ice. It was first explored by the Canadian Vilhjalmur Stefansson in 1914.

Beaufort's scale: see WIND.

Beaufort West (bō'fōrt), town (1970 pop. 17,730), Cape Province, S Republic of South Africa, in the Great KARROO. The town has some light industry and is the trade and distribution center for nearby farms where sheep, grain, and fruit are raised. It is also a resort. Beaufort West was founded in 1818 and in 1837 became the first municipality in South Africa.

Beauharnais, Alexandre, vicomte de (alēksaN'dra vēkōNt' də bōarnā'), 1760–94, French general, b. Martinique. He fought with the colonials in the American Revolution and, as a supporter of the French Revolution, was a commander in the French Revolutionary Wars. A moderate member of the National Assembly, he was guillotined in the REIGN OF TERROR. His widow later became the empress JOSEPHINE.

Beauharnais, Eugène de (ozhēn'), 1781–1824, French general, son of Alexandre and Josephine de Beauharnais (Empress JOSEPHINE). He served ably in the campaigns of his stepfather, NAPOLEON I, distinguishing himself at Marengo and Lutzen, where he rallied the outnumbered troops. The emperor made him viceroy of Italy in 1805 and officially adopted him the following year. His court at Milan was brilliant, his administration in Italy capable. Beauharnais married a Bavarian princess, and after Napoleon's downfall he lived in Munich under the titles of duke of Leuchtenberg and prince of Eichstatt.

Beauharnais, Hortense de (ōrtaNs'), 1783–1837, queen of Holland (1806–10), daughter of Alexandre and Josephine de Beauharnais and wife of Louis BO NAPARTE. She was the mother of Napoleon III and—by her lover, the comte de Flahaut—of the duc de MORNAY. See Constance Wright, *Daughter to Napoleon* (1961).

Beauharnais, Josephine de: see JOSEPHINE.

Beauharnois, Charles de la Boische, marquis de (sharl də la bwash markē' də bōarnwa'), 1670–1749, French governor of New France (1726–46). Despite the loss in 1745 of Louisbourg to the British, which caused his replacement, Beauharnois's rule was generally peaceful and prosperous. He returned to France in 1747 and served as a naval official.

Beauharnois (bōhar'nwa), city (1971 pop. 8,704), S Que., Canada, on Lake St. Louis, a broadening of the St. Lawrence River. Furniture, metal alloys, and chemicals are produced in the city. Beauharnois is at the eastern outlet of the Beauharnois Canal, part of the St. Lawrence Seaway System, and is the site of a large hydroelectric development.

Beaujeu, Anne de: see ANNE DE BEAUJEU.

Beaujolais (bōzhōlā'), hilly region, Rhône dept., E central France, W of the Saône between Mâcon and Lyons. It is one of the great wine areas of France, famous for its red wine. Villefranche-sur-Saône, the historic capital, is a leading textile center. Lyons is the industrial hub of the region. Beaujolais was once the fief of the powerful lords of Beaujeu (a small town which gave the region its name). Annexed to the crown in 1531, it was incorporated into Lyonnais prov.

Beaumanoir, Philippe de Remi, sire de (fēlēp' də ramē' sēr də bōmanwar'), c. 1250–1296, French poet and jurist, a writer of medieval law texts. He was a judicial officer at Clermont and Senlis. His *Coutumes de Beauvoisis* [customary laws of the region of Beauvais] is an important source for medieval French law and social customs.

Beaumarchais, Pierre Augustin Caron de (pyēr ōgustāN' karōN' də bōmarshā'), 1732–99, French dramatist. Originally a watchmaker with a scant education, he adopted his title from his first wife, and rose to wealth and position among the nobility. His two successful comedies were *Le Barbier de Séville* (1775), which was the basis of an opera by Rossini, and *Le Mariage de Figaro* (1784), which was the source of an opera by Mozart. Brilliant in their clever dialogue and intricate plots, they satirize the privileges and foibles of the upper class. Beaumarchais was famous as a litigant, and the pamphlets he wrote about his cases were witty and effective. One of them (1774) narrated an incident about his sister, which served as the basis of Goethe's *Clavigo*. Beaumarchais's employment as a secret agent by the monarchy led to his involvement in the American Revolution as a supplier of arms. The payment expected in return was never forthcoming, and the claims of Beaumarchais against the Americans were settled only in 1835 through a grant by Congress to his heirs. Another costly venture was a 70-volume edition of Voltaire (pub. 1785–90, though volumes bear dates 1784–89). See biographies by Paul Frischauer (tr. 1935, repr. 1970) and Cynthia Cox (1963), study by J. B. Ratermanis (1961).

Beaumont, Francis (bō'mōnt), 1584?–1616, English dramatist. Born of a distinguished family, he studied at Oxford and the Inner Temple. His literary reputation is inseparably linked with that of John FLETCHER, with whom he began collaborating about 1606. It is generally agreed that of the two, Beaumont possessed the superior poetic gift and talent for comedy. The plays usually ascribed to him as sole author are *The Woman Hater* (published 1607) and the burlesque *Knight of the Burning Pestle* (c 1607). After his marriage in 1613 he retired to his estate in Kent and ceased writing for the stage.

Beaumont, William, 1785–1853, American physician and army surgeon, b. Lebanon, Conn. He was privately educated and in 1812 was licensed to practice in Vermont. His *Experiments and Observations on the Gastric Juice and the Physiology of Digestion* (1833, fac ed 1929, with biographical essay by Sir William Osler, repr 1941) was an exhaustive account of a case famous in medical history. In 1822, while serving as post surgeon on Mackinac Island, Beaumont was called to treat Alexis St. Martin, a youth of 19 whose abdomen had been torn open by an accidental gunshot at close range. All efforts to close the wound failed, although St. Martin recovered his health and strength. Later, when he realized what a unique opportunity this was to study the digestive process, Beaumont, with the assent of his sometimes rebellious patient, began a series of experiments that completely revolutionized the knowledge of the subject. In all, about 238 experiments were reported, starting at Mackinac Island in 1825 and continuing at intervals over a number of years at Plattsburgh, N.Y., at Fort Crawford (Prairie du Chien, Wis.), and at Washington, D.C. See J. S. Myer, *Life and Letters of Dr. William Beaumont* (1912, new ed 1939).

Beaumont, city (1970 pop 115,919), seat of Jefferson co., Texas, a port of entry on the Sabine-Neches Waterway, inc 1838. A ship channel (completed 1916, reconstructed 1927) provides the facilities of a modern deepwater port, with shipyards and large storage tanks. Beaumont is an important industrial and shipping center and a great oil city, with giant refineries and petrochemical complexes. Other industries are based on the forests and vast farmlands of the area. There are rice mills, granaries, lumber and paper plants, meat-packing houses, and huge metal works. The lush pine forests were the base of the lumbering that began there before the Civil War. Shipbuilding followed, and as livestock raising and rice farming spread in the surrounding area, Beaumont became an important processing and transportation center. Its life was revolutionized in 1901 when the world's first great oil gusher came in at nearby Spindletop, a 58-ft (18-m) granite shaft marks the spot, now a national historic site. The city is the seat of Lamar Univ. It has a pioneer museum, an oil museum, and an art center. Annual events include a horse show, a river festival, and a rodeo.

Beaune (bōn), town (1968 pop 17,377), Côte-d'Or dept., E France, in Burgundy. It is a noted center for Burgundy wines, with a wine school and wine research facilities. Its manufactures include winemaking equipment. Beaune flourished as a residence of the dukes of Burgundy. Its textile industry was ruined when the revocation of the Edict of Nantes expelled (1685) the Protestant craftsmen. Beaune, a circular city with 15th-century ramparts, has a Romanesque church (12th cent.) with 15th-century Flemish tapestries. Its famous *hôtel Dieu* was founded (1443) by Chancellor Nicolas Rolin, a patron of Roger van der Weyden, whose *Last Judgment* it contains.

Beauport (bōpōr'), city (1971 pop 14,681), S Que., Canada, on the St. Lawrence River. It is a suburb of Quebec city. Settled in 1634, it is one of the oldest communities in Canada.

Beauregard, Pierre Gustave Toutant (bō'rigārd), 1818–93, Confederate general, b. St. Bernard parish, La., grad West Point, 1838. As engineer on the staff of Winfield Scott in the Mexican War, he figured prominently in the taking of Mexico City. He later did engineering work in Louisiana, and for five days in Jan., 1861, he was superintendent of West Point. Beauregard, resigning from the army in February, was soon made a Confederate brigadier general and was given command at Charleston, where he ordered the firing on FORT SUMTER. Assuming command of the army in NE Virginia (June), he was second in command to J. E. JOHNSTON at the first battle of BULL RUN (July 16, 1861) and was promoted to full general. He was sent to the West in 1862 and succeeded to the command of the Army of Tennessee upon the death of A. S. JOHNSTON at the battle of SHILOH. He retreated to Corinth, which he shortly

abandoned to Halleck's superior army. Ill health and friction with Jefferson Davis, whom he had criticized after Bull Run, resulted in his removal from command. After a rest he was charged with the defense of the South Carolina and Georgia coast, which he ably held against Union attacks, particularly those on Charleston in 1863. In May, 1864, Beauregard reinforced Lee in Virginia. He defeated B. F. Butler at DREWRY BLUFF and held Petersburg against Grant until Lee arrived. In the closing months of the war he was in the Carolinas with J. E. Johnston. After the war Beauregard was a railroad president, manager of the Louisiana state lottery, and for many years adjutant general of that state. His superior engineering abilities overshadowed his deficiencies as a field commander. See his *Mexican War reminiscences* ed by T. H. Williams (1956, repr 1969), *A Roman, Military Operations of General Beauregard* (1884), biographies by H. Basso (1933) and T. H. Williams (1955).

Beauséjour, Fort: see FORT BEAUSÉJOUR, N 8, Canada.

Beauvais (bōvā'), town (1968 pop 49,347), capital of Oise dept., N France. Tractors, ceramic tiles, textiles, and musical instruments are among its many manufactures. A Roman town and an early episcopal see, it flourished in the Middle Ages and again after the 17th cent., when Colbert established the state tapestry industry there. It was the center of the Jacquerie revolt in 1358, and in 1472 its citizens resisted Charles the Bold of Burgundy. Jeanne Hachette, who earned her surname for the hatchet with which she helped to repel the Burgundians, is commemorated in a yearly celebration. Beauvais was severely damaged in both World Wars, in June, 1940, its tapestry factory was destroyed, and the industry was moved to Paris. The city still retains its Cathedral of St. Pierre, begun in 1227 as the highest building in Christendom but never completed. Its choir vault (154 ft/47 m), the highest of all Gothic vaults, was finished after it fell in 1284, the transept was completed in 1548.

Beauvoir, Simone de (sēmōn' də bōv'vār'), 1908–, French author. A leading exponent of the existentialist movement, she is closely associated with Jean-Paul SARTRE. Beauvoir taught philosophy at several colleges until 1943, after which she devoted herself to writing. Her novels *All Men Are Mortal* (1946, tr 1955), *The Blood of Others* (1946, tr 1948), and *The Mandarins* (1955, tr 1956) are interpretations of the existential dilemma. Among her most celebrated works is the profound analysis of the status of women, *The Second Sex* (1949–50, tr 1953). Her study *The Marquis de Sade* (tr 1953), is a brilliant, perceptive portrait. Her monumental treatise *The Coming of Age* (1970, tr 1972) is an exhaustive historical consideration of the social treatment of the aged in many cultures. Beauvoir's autobiographical writings include *Memoirs of a Dutiful Daughter* (1958, tr 1959), *The Prime of Life* (tr 1962), *Force of Circumstance* (1963, tr 1964), *A Very Easy Death* (1964, tr 1966), and *All Said and Done* (tr 1974). See study by Elaine Marks (1973).

Beaux, Cecilia (bō), 1863–1942, American figure and portrait painter, b. Philadelphia, studied in Philadelphia under William Sartain and Eakins, in Paris in the Julian and Lazar schools. A skilled technician, she won many honors through her long career. She painted, among other celebrities, Henry James, Clemenceaux, and Cardinal Mercier. Well-known paintings include *The Dancing Lesson* (Art Inst., Chicago), *Sita and Sarita* (Corcoran Gall.), *Portrait of Mrs. Dupont* (Mus. of Fine Arts, Boston), and self-portrait (Uffizi). See her autobiography, *Background with Figures* (1930).

Beaux-Arts, École des: see ÉCOLE DES BEAUX-ARTS.

beaver, large aquatic RODENT, *Castor fiber*, known for its engineering feats. It was once widespread in N and central Eurasia except E Siberia, and in North America from the arctic tree line to the S United States. It is the largest living rodent except the capybara, and is distinguished by its extremely broad, horizontally flattened tail. Beavers are 3 to 4 ft (91–120 cm) long, including the tail (12 in/30.5 cm long, 6 in/15.2 cm wide), and about 15 in (38 cm) high at the shoulder, they usually weigh about 60 lb (27 kg). Their long, dense fur is reddish brown to nearly black, the naked, scaly tail is black. Both sexes have scent glands, located in a pouch in the anal region. The musky secretion, castoreum, which may function as a sexual attractant, was once believed to have medicinal properties, and the glands, or castors, were of commercial value. Beavers build lodges up to 3 ft (91 cm) high and 5 ft (1.5 m) wide of sticks and mud, the entrances are below water level, with ramps leading to the living quarters, located on a

platform above water level. They may also build burrows in banks with underwater entrances. They create deep ponds, or maintain the water level in old ones, by building dams across streams. These are made of sticks and logs, and the upper surfaces are reinforced with stones and mud. Materials are gathered by collecting wood and felling small trees by gnawing, often the beavers dig canals for floating these to the right spot. Most, if not all, of these activities are done mechanically, as a result of instinct, captive animals persist in building useless dams, and even in the wild beavers will attempt to reinforce solid, manmade dams with sticks. Although they form monogamous families and live in colonies, there is little social contact among beavers and they work independently. A colony consists of a cluster of lodges, each occupied by a family of the parents and their last two litters. The beavers sleep by day and spend the night foraging for food and building or repairing their structures. They feed on a variety of aquatic and shore plants, surviving in winter largely on bark. Sticks for winter food are stored in the lodges and under water. Excellent swimmers, they can stay under water for up to fifteen minutes. When alarmed, a beaver slaps the water with its tail, making a loud noise that sends other beavers hurrying to the safety of deep water. Females give birth to two to eight young in the spring, these mature in two years. Beavers are responsible for creating many of the woodland ponds that support lush vegetation and eventually become meadows. They have been extensively trapped for their pelts, once considered the most valuable of furs, and were exterminated over a large part of their range. However, because of their great importance in maintaining the natural environment, they have been reintroduced in many areas of North America and Russia, and are now increasing in numbers. The MOUNTAIN BEAVER of W North America is not a true beaver, but a nonaquatic rodent of a different family. Beavers are classified in the phylum CHORDATA, subphylum Vertebrata, class Mammalia, order Rodentia, family Castoridae. See Lars Wilson, *My Beaver Colony* (tr 1968), Grey Owl, *Pilgrims of the Wild* (1935, repr 1971).

Beaverbrook, William Maxwell Aitken, 1st Baron, 1879–1964, British financier, statesman, and newspaper owner, b. Canada. The son of a Scottish Presbyterian clergyman, he grew up near Beaverbrook, N 8. He made a fortune in business and was probably a millionaire when he went to England in 1910. There he immediately entered political life as a member of Parliament and secretary to a fellow Canadian, Conservative leader Andrew Bonar Law. Politically ambitious, he was involved in the intrigues that led to the replacement (1916) of Herbert Asquith as prime minister by David Lloyd George. He was not given a place in the new cabinet, but he received a peerage (1917). Beaverbrook obtained control of the *Daily Express* (1916) and the *Evening Standard* (1923) and began the *Sunday Express* (1918). Both in Parliament and in his newspapers he advocated strong imperial ties and free trade within the empire, regardless of commercial agreements with other countries, but he never succeeded completely in his attempts to have his imperial isolationist policies adopted by the Conservative party. In World War II, Lord Beaverbrook was prominent in Winston Churchill's coalition government as minister of aircraft production (1940–41), minister of supply (1941–42), minister of war production (Feb., 1942), special envoy to the United States on supplies (1942), and lord privy seal (1943–45). After the fall of the Churchill government in 1945, he continued his supervision of his newspapers. His books include *Success* (1922), *Politicians and the War 1914–1916* (1928), *Men and Power 1917–1918* (1956), and *Friends* (1959). See biographies by Thomas Driberg (1956) and A. J. P. Taylor (1972).

Beaver Dam, city (1970 pop 14,265), Dodge co., SE Wis., on Beaver Dam Lake, in a productive farm and dairy area, inc 1856. There is a foundry in Beaver Dam. Stoves, metal goods, and shoes are made, and peas and sweet corn are canned there.

Beaver Falls, city (1970 pop 14,375), Beaver co., W Pa., on falls of the Beaver River near its junction with the Ohio, settled c 1793, inc 1868. A steel center in an area of coal mines, natural gas deposits, and clay pits, it is known especially for its cold-drawn steel. The plates for U.S. currency are manufactured there. The city was founded on an Indian trail that later became a pioneer road. It is the seat of Geneva College.

Beaver Island, 14 mi (23 km) long, from 3 to 6 mi (4.8–9.6 km) wide, off N Mich., in Lake Michigan. It is the largest island of the Beaver Archipelago and

has forests, lakes, beaches, and a harbor at St James village. The island's permanent inhabitants are mostly fishermen. James J. Strang had a Mormon settlement there from 1847 to 1856.

Beaverton, city (1970 pop 18,577), Washington co., NW Oregon, a residential suburb of Portland, in a farm area, inc 1893. It has some electronic manufactures.

Bebai (bēbā'ī), head of a family in Zerubbabel's return. Ezra 2:11, 8:11, 10:28, Neh 7:16, 10:15.

Bebel, August (ou'gōöst bā'bəl), 1840-1913, German Socialist leader. A wood turner by trade, he became a Marxian Socialist under the influence of Wilhelm Liebknecht. At a congress at Eisenach (1869) he was instrumental in founding the German Social Democratic party, which he later represented in the Reichstag and which he led virtually single-handedly for many years. His antimilitarism and his social program earned him the hatred of Bismarck. In 1872, Bebel and Liebknecht, tried on false charges of treason, were sentenced to two years' imprisonment, but Bebel's prison sentence only solidified his control over the Social Democrats, and he was reelected to the Reichstag. In 1875 he helped to unite the Lassalle group with the Social Democrats. Among his writings are *Women and Socialism* (1883, tr 1910), which was highly influential among German workers, and his autobiography (1910-14, abr tr 1912, repr 1973).

Bebington (bēb'īngtən), municipal borough (1971 pop 61,488), Cheshire, W central England. In 1974, it became part of the new metropolitan county of Merseyside. Its frontage on the Mersey River is part of the Port of Liverpool. The borough includes Bromborough and Eastham, both of great antiquity, and Port Sunlight, an industrial area with soap factories. Bebington also has freestone quarries and manufactures chemicals and margarine. The Church of St Andrew, on a site occupied since Saxon times, dates from the 14th and 16th cent.

Bec (bēk), former Benedictine abbey, near the village of Bec-Hellouin, Eure dept., N France, in Normandy. Founded in the 11th cent. by LANFRANC, and later directed by ANSELM, who became (1078) the abbot, it was one of the most famous medieval schools. It declined after the Hundred Years War, was suppressed in the French Revolution, and fell into ruin.

Beccafumi, Domenico di Pace (dōmē'nēkō dē pā'chā bāk-kāfōō'mē), 1486-1551, Italian mannerist painter and sculptor, also called Il Meccherino. He studied painting in Siena and Rome and was a versatile engraver and sculptor. He is best known for his frescoes in the city hall in Siena and for his designs of scenes from the Old Testament for the pavement of Siena Cathedral. Among his other works are *Holy Family* (Pitti Palace, Florence) and some fine sculptural work for the Siena Cathedral. *Nativity of the Virgin*, *Descent into Limbo*, and *St Michael* (all in Siena) exemplify the peculiar spatial and lighting effects of mannerism. *Holy Family with Angels* is in the National Gallery of Art, Washington, D.C.

Beccaria, Cesare Bonesana, marchese di (chē'zārā bōnāzā'nā mār-kā'zā dē bēk-karē'ā), 1738-94, Italian criminologist, economist, and jurist, b Milan. Although of a retiring disposition, he held, in the Austrian government, several public offices, the highest being counselor of state. Through these and through his writings he influenced local economic reforms and stimulated penal reform throughout Europe. As a young man he published (1764) his famous *Essay on Crimes and Punishments* (tr 1767, 2d American ed 1819, repr 1953). The book, widely acclaimed in Western Europe, was one of the first arguments against capital punishment and inhuman treatment of criminals. His ideas especially influenced Jeremy Bentham and the utilitarians. He made original contributions to economic theory, applying mathematics to economics, analyzing population problems, and anticipating the wage and labor theories of Adam Smith. Much of this work appears in *Elementi di economia pubblica* (1804), a posthumous collection of his lectures (1768-70) in political economy at Milan. See Marcello Maestro, *Caesare Beccaria and the Origins of Penal Reform* (1973).

Beccaria, Giambattista (jām'bāt-tē'stā bāk-kārē'ā), 1716-81, Italian physicist. He joined the Priest order in 1732 and studied in Rome and Narni. After teaching at various Italian universities he became professor of physics at Turin in 1748. Against the Cartesians there, he upheld Franklin's electrical theories, which he systematized and disseminated in his important *Dell'elettricità* (1753). His contributions in-

clude a classification of luminous discharges, the invention of the electrical thermometer, and the collection of data on atmospheric electricity.

Béchar (bāshār'), formerly **Colomb-Béchar** (kōlōn'-), town (1966 pop 46,505), capital of La Saoura dept., W Algeria. It is an important administrative center in a mining (coal, copper, magnesium, iron) and industrial region. Béchar also serves as a major shipping point for coal. The town was established in 1905 as a French military post to control the then-turbulent Algerian-Moroccan border.

bêche-de-mer (bēsh-dā-mār') see SEA CUCUMBER.

Becher (bē'kār) 1 Son of Benjamin. Gen 46:21, 1 Chron 7:6,8. In 1 Chron 8:1 "his first-born" should perhaps be read "Becher", cf BOCHERU. See BICHRI. 2 Son of Ephraim. His descendants are called Bachrites. Num 26:35. Bered 1 Chron 7:20.

Becher, Johannes Robert (yōhā'nəs rō'bērt bēkh'-ər), 1891-1958, German poet and essayist. Becher's anti-imperialist poetry, notably *Der Leichnam auf dem Thron* [the corpse on the throne] (1925), led to exile (1935-45) in the USSR. There he continued to write, producing such volumes of poetry as *Wiedergeburt* [rebirth] (1940) and *Deutschland ruft* [Germany calls] (1942). After the war his writings on socialist humanism and the artist's responsibility to society contributed to the literature of East German socialism. They include *Heimkehr* [homecoming] (1946), *Neue deutsche Volkslieder* [new German folk songs] (1950), *Macht der Poesie* [poetic power] (1955), and *Das poetische Prinzip* [poetic principle] (1957).

Bechet, Sidney (bāshā'), 1897-1959, American jazz musician, b New Orleans, La. He began his professional career with his brother Leonard's band in 1911. Later he played with many other bands, including that of King Oliver. Although Bechet played clarinet with vigorous elegance, his most remarkable achievement was his approach to the most difficult of the saxophones, the soprano. His style was marked by a trumpetlike attack, a broad, flaring tone, and a rich vibrato. He lived in Europe for the last 20 years of his life. See his autobiography, *Treat It Gentle* (1959).

Bechorath (bēkō'rāth), ancestor of Saul. 1 Sam 9:1.

Bechuanaland. see BOTSWANA.

Beck, Dave, 1894-, American labor leader, president of the TEAMSTERS UNION (1952-58), b Stockton, Calif. A laundry-truck driver, Beck began his union career in 1924 and was a vice president (1940-47) and then executive vice president (1947-52) of the International Brotherhood of Teamsters. He was elected president of the teamsters in 1952, and by virtue of his office he became a vice president and member of the executive council of the AFL and of its successor, the AFL-CIO. In 1957, after Beck was called before a Senate committee investigating labor racketeering, the AFL-CIO conducted its own investigation and found Beck guilty of misuse of union funds. Expelled from the AFL-CIO, he did not seek another term as president of the international union and was succeeded by James R. Hoffa. In 1957 a Washington state court found Beck guilty of stealing union funds, and in 1959 he was also found guilty of federal income tax evasion. Beck served a prison term of two years, from 1962 to 1964.

Beck, Julian, 1925-, American theatrical director, actor, and producer, b New York City. He married Judith Malina, 1926-, also an American theatrical director, actor, and producer, b Germany. Together they founded the Living Theater in 1947. Their productions are highly imaginative and often involve improvisation. Perhaps their most controversial work is *Paradise Now* (1968), an orgasmic critique of American life that involves nudity and audience participation. Their other productions include *The Connection* (1959), *The Brg* (1963), *Faust Foutu* (1960), *In the Jungle of the Cities* (1960), and *Antigone* (1968). See Judith Malina's autobiography, *The Enormous Despair* (1972), Renfrew Neff, *The Living Theatre USA* (1970).

Beck, Ludwig (lōō'vīkh bēk), 1880-1944, German general, leader of resistance to Hitler. A highly cultivated career soldier, he served on the general staff during World War I and by 1933 had become in effect head of the army general staff. He opposed Hitler's plans for aggression and his attempts to destroy the independence of the army. In 1938 he resigned in protest against the planned attack on Czechoslovakia. With Carl F. GOERDELER he thereafter conspired to overthrow the regime. Their efforts were repeatedly frustrated until July 20, 1944, when a bomb was placed in Hitler's conference room. Hitler escaped. Beck was arrested and shot. See Allen W. Dulles, *Germany's Underground* (1947).

Becker, Carl Lotus, 1873-1945, American historian, b Blackhawk co., Iowa. He taught history at Dartmouth College (1901-02), at the Univ of Kansas (1902-16), and at Cornell Univ (1917-41). After retirement he was professor emeritus and university historian at Cornell. Among his early works were monographs such as his *History of Political Parties in the Province of New York, 1760-1776* (1909), but his real forte was the analysis of thought and philosophy in action, exemplified by his studies on the American Revolutionary period (e.g., *The Declaration of Independence*, 1922, repr 1942) and in the broader study, *The Heavenly City of the Eighteenth-Century Philosophers* (1932). His deep concern with the use of history for the betterment of international relations and of mankind was shown in his *How New Will the Better World Be?* (1944). His works are remarkable as much for the quiet originality of his thought as for the purity and lucidity of his impeccable literary style. See collection of his letters (ed by Michael Kammen, 1974), biographies by C. W. Smith (1956, repr 1973) and B. T. Wilkins (1961, repr 1967), Cushing Strout, *The Pragmatic Revolt in American History* (1958, repr 1966).

Becket, Thomas: see THOMAS À BECKET, SAINT.

Beckett, Samuel, 1906-, Anglo-French playwright and novelist, b Dublin. Beckett studied and taught in Paris before settling there permanently in 1937. He has written primarily in French, frequently translating his works into English himself. His first novel, *Murphy* (1938), typifies his later works. It portrays with precision an individual's entrapment by increasingly grotesque situations in his apparently normal world. The oddity of these situations is intensified in Beckett's subsequent novels including *Watt* (1942-44), the trilogy *Molloy* (1951), *Malone Dies* (1951), and *The Unnamable* (1953), *How It Is* (1961), and *The Lost Ones* (1972). In his theater of the absurd, Beckett combines poignant humor with an overwhelming sense of anguish and loss. Best-known and most controversial of his dramas are *Waiting for Godot* (1952) and *Endgame* (1957), which have been performed throughout the world. Beckett's other works include a major study of Proust (1931), the plays *Krapp's Last Tape* (1959) and *Happy Days* (1961), a screenplay, *Film* (1969), short stories, *Breath* (1966) and *Lessness* (1970), collected shorter prose in *Stories and Texts for Nothing* (tr 1967) and *No's Knife* (1967), volumes of collected writings, *More Pricks than Kicks* (1970) and *First Love and Other Shorts* (1974), and *Poems* (1963). Beckett was awarded the 1969 Nobel Prize in Literature. His *Collected Works* (16 vol.) was published in 1970. See studies by Martin Esslin, ed (1965), John Fletcher (1967, 2d rev ed 1970), Ruby Cohn (1972 and 1973), and High Kenner (1968 and 1973).

Beckford, William, 1760-1844, English author. A wealthy dilettante, Beckford had a great desire to ascend to the nobility. Unfortunately his erratic and strange behavior often worked against his ambitions. About 1796 he built in Wiltshire an extravagant Gothic castle, Fonthill Abbey, where he lived in mysterious seclusion and earned himself the reputation of an eccentric. Although not deeply interested in politics, he served in the House of Commons from 1784 to 1794 and from 1806 to 1820. Beckford is chiefly remembered today for the Oriental romance *Vathek*, a bizarre tale about the adventures of the shockingly cruel Caliph Vathek. The book was written in French but was first published (1786) in English translation. He was also the author of several books of travel and two burlesques on the sentimental novels of his day, *The Elegant Enthusiast* (1796) and *Azemias* (1797). See biography by P. Summers (1966), study by A. Boyd (1962).

Beckley, city (1970 pop 19,884), seat of Raleigh co., W Va., inc 1927. Its major industries are coal mining, agriculture, tourism, and the production of electronic equipment. A state park is nearby. The city holds an annual Appalachian Arts and Crafts Festival.

Beckmann, Max (maks bēk'mān), 1884-1950, German painter. A member of the Berlin SECESSION from 1908 to 1911, he was impressionistic in his early style. A subsequent expressionistic phase was altered c 1917 by the savage NAV OBJECTIVITY of George Grosz. Beckmann developed a richer, more personal, and more symbolic art in the 1920s. The power of his allegorical expression increased through the war years, which he spent in Amsterdam. Beckmann spent his last three years in New York City where he taught at the Brooklyn Museum School. His well-known triptych, *Departure* (1932-35), is in the Museum of Modern Art, New York City.

Becque, Henry François (aNrē' frāNswā' bēk'), 1837-99, French dramatist. His plays, which portrayed Parisian life in realistic detail, influenced French naturalistic drama. Among them are *Les Corbeaux* (1882) and *La Parisienne* (1885), translated in the volume *The Vultures, The Woman of Paris, The Merry-go-round* (1913).

Bécquer, Gustavo Adolfo (gōōstā'vō ādōl'fō bā-kēr'), 1836-70, Spanish poet and writer of romantic tales. Bécquer's work is considered to be among the best 19th-century lyric poetry. Orphaned at 10, unhappy in love and marriage, and living in poverty for most of his brief life, he came to be lonely and introspective. His celebrated *Rimas* (1860, tr. 1908) is a suite of poems characterized by the melancholy and resigned bitterness of the romantics. His finest prose works include the tale *Los Ojos Verdes* [the green eyes], a collection of legends, *Leyendas* (1860-64), and a group of literary letters, *Desde mi celda* [from my cell] (1864). Bécquer died of pneumonia and hepatitis at 34. See Angel Flores, *Anthology of Spanish Poetry* (1961), study by Enrique Ruiz Forrells (1970).

Becquerel (bēkarēl'), family of French physicists. **Antoine Cesar Becquerel**, 1788-1878, was a pioneer in electrochemical science. He was professor of physics at the Museum d'Histoire naturelle from 1838 until his death. Becquerel made a special study of the voltaic cell, telegraphy, and magnetism and wrote several books on these subjects. His second son, **Alexandre Edmond Becquerel**, 1820-91, succeeded his father, in 1878, as professor at the Museum d'Histoire naturelle. Known for his studies in light, photochemistry, and phosphorescence (for which he invented the phosphoroscope), Alexandre wrote *La Lumière, ses causes et ses effets* (1867-68). His son, **Antoine Henri Becquerel**, 1852-1908, was professor at the École polytechnique, Paris, from 1895. He studied atmospheric polarization and the influence of the earth's magnetism on the atmosphere. In 1896 he discovered RADIOACTIVITY in URANIUM, the Curies made further investigations of the phenomenon and shared with Becquerel the 1903 Nobel Prize in Physics (see CURIE, family).

bed. Article of furniture used for sleeping upon. A litter of dried grasses and animal skins placed on the floor or in a shallow depression or chest was used for sleeping by prehistoric and primitive peoples. In ancient Babylonia, Assyria, and Egypt, people of wealth slept on ornate bedsteads of wood, stone, ivory, or metal, laced with wickerwork or other resilient material on which rested rush mattresses. The Greeks used couches and mattresses that were often stuffed with wool or feathers. The Romans developed different types of beds for sleeping and for reclining. In Europe during the Middle Ages only the nobility used bedsteads, these were light frames easily carried on expeditions or sojourns in the lord's various residences. Canopies were suspended from wall or ceiling, covers and draperies were of the richest fabrics. In the 15th cent., separate bed-chambers became common, bedsteads with high, ornately carved headboards had elaborate canopies supported on four posts and were enclosed with rich hangings. Children and servants often slept in cradles or on low pallets or trundle beds, which were concealed by day under the principal bed. In England especially, monumental beds came into fashion in the 15th cent. the Great Bed of Ware (c. 1580) measured 10 by 11 ft (3.1 by 3.4 m). The 17th cent. saw the development of a variety of forms—luxurious great beds with testers (or canopies) of many sizes and shapes, couches with adjustable headpieces, beds that turned up against the wall, cupboard beds concealed by doors or shutters. In the 18th cent. both beds and hangings became lighter and more graceful. In the 19th cent. the sleigh bed with curved ends was popular, and in the latter half of the century cast-iron and brass bedsteads and woven wire, link, and vertical coil springs were common. Modern developments include the inner-spring mattress, a number of space-saving varieties (such as sofa beds), and hospital beds with adjustable parts for raising and lowering patients. An invention of the 1970s is the water bed, which consists of a frame holding a puncture-proof mattress filled with water. In parts of the Orient, rugs piled on the floor serve as beds, the Japanese sleep between quilts spread on the floor matting. Ceremonial beds have been used since ancient Egyptian times. In the 17th cent. it became customary to receive guests while lying in bed. The "Bed of Justice" was a cushioned seat used by the kings of France in the parliament chamber.

Bedad (bē'dād), father of HADAD 2.

Bedan (bē'dān) 1 Otherwise unknown deliverer of Israel 1 Sam 12:11. The Septuagint reading, Barak, may be correct. 2 Manassite 1 Chron 7:17.

Bedaresi or **Bedersi**, **Yedayah ben Abraham** (yēdiā', bādārā'sē, bādēr'-), 1270-1340, Jewish poet and philosopher, b. Beziers, France. His most successful poem was the didactic *Examination of the World*, of which many translations have been made, among them one in English by Rabbi Tobias Goodman (London, 1806).

bedbug, any of the small, blood-sucking BUGS of the family Cimicidae, which includes about 30 species distributed throughout the world. Bedbugs are flat-bodied, oval, reddish brown, and about 1/4 in. (6 mm) long. They emit an unpleasant-smelling oily secretion from two glands on their undersurface. All are parasites of warm-blooded animals. The common human bedbug of temperate regions, *Cimex lectularis*, is largely nocturnal, spending the day in crevices in walls and furniture and in bedding. Its bite causes irritation in many individuals, but it is not known to transmit diseases. It will feed on other mammals and poultry when humans are not available and can live up to a year without feeding. Maturation from egg to adult takes about two months in warm conditions, there may be three or four generations a year. Control methods include steaming, spraying, and fumigating. Another parasite of humans, *C. hemipterus*, is common in the Old World tropics. A North American species, *Haematosiphon inodora*, parasitizing poultry, will also bite humans. Other species attack bats and various kinds of bird. Bedbugs are classified in the phylum ARTHROPODA, class Insecta, order Hemiptera, family Cimicidae. See publications of the U.S. Dept. of Agriculture.

Beddoes, Thomas Lovell, 1803-49, English poet and dramatist. After graduating from Oxford, he studied medicine and anatomy at Göttingen. His writings, inclined toward the macabre and grotesque, include *The Improvisatore* (1821, three stories in verse) and two plays, *The Bride's Tragedy* (1822) and *Death's Jest-Book* (1850). The first collected edition of his poems appeared posthumously in 1851. See his complete works (ed. with an introduction by H. W. Donner, 1950).

Bede, Saint (bēd), or **Baeda** (bē'dā), 673?-735, English historian, a Benedictine monk, called the Venerable Bede. He spent his whole life at the monasteries of Wearmouth (at Sunderland) and Jarrow and became probably the most learned man in Western Europe in his day. His writings, virtually a summary of the learning of his time, consist of theological, historical, and scientific treatises. Like a modern scholar, he consulted many documents, discussed their relative reliability, and duly cited them as sources—practices then most unusual. His theological works are commentaries on the Scriptures in the light of the interpretations of the Church Fathers. He wrote biographical works such as the life of St. Cuthbert (in prose and verse) and the *History of the Abbots* (of Wearmouth and Jarrow). His *Ecclesiastical History of the English Nation*, written in Latin prose, remains an indispensable primary source for English history from 597 to 731. It gives the most thorough and reliable contemporary account of the triumph of Christianity and of the growth of Anglo-Saxon culture in England. He also relates the political events that had bearing on these developments. The *Ecclesiastical History* has been many times translated, the best edition of the text is in *Beda opera historica* (ed. by Charles Plummer, 1896). The best known of Bede's scientific treatises are those on chronology, held as standard for many years. Long venerated in the church, Bede was officially recognized as a saint in 1899 and was named Doctor of the Church, the only Englishman so honored. Feast May 27. See the collection of essays, *Bede: His Life, Times, and Writings* (ed. by A. Hamilton Thompson, 1935, repr. 1966), E. C. Duckett, *Anglo-Saxon Saints and Scholars* (1967), study by P. H. Blair (1970).

Bedeiah, Jew married to a foreign wife. Ezra 10:35.

Bedersi, **Yedayah ben Abraham**: see BEDARES.

Bedford, Brian, 1935-, English actor. Bedford has performed on stage in England and the United States, notably in *Five Finger Exercise* (1958, New York debut), *The Knack*, *The Misanthrope* (1969), *Private Lives* (1969), *Hamlet* (1970), *School for Wives* (1972), and *Jumpers* (1974). His few films include *The Pad* (1966) and *Grand Prix* (1967).

Bedford, Francis Russell, 5th duke of: see RUSSELL, family.

Bedford, Francis Russell, 2d earl of: see RUSSELL, family.

Bedford, Francis Russell, 4th earl of: see RUSSELL, family.

Bedford, Gunning, Jr., 1747-1812, American political leader, b. Philadelphia. Settling in Delaware, Bedford became a member of the local legislature, attorney general (1784-89), and a delegate to the Continental Congress (1783-85). At the Federal Constitutional Convention (1787) he opposed a strong central government and was a vigorous champion of the rights of small states.

Bedford, John of Lancaster, duke of, 1389-1435, English nobleman, third son of Henry IV of England and brother of Henry V. At the death (1422) of his brother and succession of his 9-month-old nephew, Henry VI, Bedford was designated as regent of France and protector of England. While he was in France his duties in England were to be performed by his younger brother Humphrey, duke of Gloucester. Bedford devoted himself to the affairs of France. In his attempt to make permanent the English occupation of France, he gave the country an able, if severe, administration, but his position was undermined by the waverings of his ally, PHILIP THE GOOD, duke of Burgundy, and by the victories of JOAN OF ARC, whose execution during his term of office has injured his reputation. He died shortly after the conclusion of a separate peace between Philip and King Charles VII of France, a major setback to the English. His death deprived England of the only man powerful and respected enough to keep balance between the court's hostile factions.

Bedford, John Robert Russell, 13th duke of: see RUSSELL, family.

Bedford, John Russell, 4th duke of: see RUSSELL, family.

Bedford, John Russell, 1st earl of: see RUSSELL, family.

Bedford, Sybille, 1911-, English writer, b. Charlottenberg, Germany. She has worked as a legal reporter for various publications, covering such events as the Auschwitz trials and the trial of Jack Ruby. Her novels can be called socio-historical and usually concern the interaction between character and events. They include *A Legacy* (1956), *A Favorite of the Gods* (1963), and *A Compass Error* (1968). Bedford was for 35 years a close friend of Aldous Huxley and is the author of his official biography (Vol. 1, 1973).

Bedford, William Russell, 5th earl and 1st duke of: see RUSSELL, family.

Bedford, municipal borough (1971 pop. 73,064), county town of Bedfordshire, central England, on the Ouse River. It is an important industrial center, diesel engines, pumps, turbines, agricultural machinery, electrical equipment, and transistors are the chief manufactures. Bedford, a battlefield for Britons and Saxons in the 6th cent., was the scene of an important Saxon defeat in 571. St. Peter's Church contains examples of Saxon stone carvings. John Bunyan is commemorated by a chapel on the site of a building where he preached in the 17th cent. Bedford School, in existence since the 12th cent., is one of the largest public schools in England. In 1974, Bedford was included in the new nonmetropolitan county of Bedfordshire.

Bedford. 1 City (1970 pop. 13,087), seat of Lawrence co., S Ind., inc. 1889. Bedford limestone, which is shipped all over the world, is quarried there. The city also has several small industrial plants and a foundry. Beside the limestone quarries, points of interest include old stone buildings and houses and many carvings. Nearby is a state fish hatchery. 2 Town (1970 pop. 13,513), Middlesex co., E. Mass., a residential suburb of Boston, settled c. 1637, inc. 1729. Several pre-Revolutionary houses remain. 3 City (1970 pop. 17,552), Cuyahoga co., NE Ohio, a suburb of Cleveland, settled c. 1813 on the site of a Moravian settlement (1786), inc. as a city 1931. Although chiefly residential, it also has plants manufacturing office furniture, china, rubber goods, auto parts, processed foods, tools, and fixtures. 4 City (1970 pop. 10,049), Tarrant co., N. Texas, settled c. 1843, inc. 1954.

Bedford Heights, city (1970 pop. 13,063), Cuyahoga co., N. Ohio, a suburb of Cleveland, inc. 1951.

Bedfordshire or **Bedford**, county (1971 pop. 463,493), 473 sq. mi. (1,225 sq. km), central England. It is also called Beds. The county town is BEDFORD. The terrain is generally flat, with low chalk hills in the south. The region, drained by the Ouse River, is fertile, and more than four fifths of the area is under cultivation, agriculture is the chief occupation. The production of cereals, especially wheat, and the raising of livestock are of equal importance with market gardening for London. Bedford, LUTON, and

DUNSTABLE are the chief manufacturing towns (hats, automobiles, electrical equipment, precision instruments, machinery, and ball bearings). The county was a refuge for Protestants from the European continent during the ENGLISH CIVIL WAR. The Puritan writer and preacher John Bunyan preached at Bedford. Bedfordshire was reorganized (1974) as a non-metropolitan county.

Bédier, Joseph (zhōzēf' bādya'), 1864-1938, French authority on medieval literature. He was professor at the Collège de France and a member of the French Academy. His reconstruction, in modern French, of the Roman de *Tristan et Iseult* (1900) brought him fame for its scholarship and beauty. His theory of the origin of the medieval epic, developed in *Les Légendes épiques* (4 vol., 1908-13), was widely accepted until recent years.

Bedlam: see BETHLEM ROYAL HOSPITAL

Bedlingtonshire, urban district (1971 pop. 28,167), Northumberland, NE England. The district includes the towns of Bedlington, Netherton, and West Sleekburn and part of the port of Blyth. Coal mining, brickmaking, and the manufacture of concrete products, shirts, and gloves are the chief industries. There is also some agriculture. The Bedlington terrier is bred in the district.

Bedlington terrier, breed of long-legged, lithe TERRIER developed in the eastern Border districts of England in the 19th cent. It stands about 16 in. (40.6 cm) high at the shoulder and weighs from 22 to 24 lb (9.9-10.8 kg). Its thick, wiry outercoat is trimmed back to the fleecy undercoat for exhibition. The hair when trimmed is no longer than 1 in. (2.5 cm) on the body, absent on the ears except for a fringe on the tips, and, on the head, formed into a topknot that gradually tapers to the nose. The overall appearance when clipped for show resembles that of a sheep. In color the coat may be solid blue, liver, sandy, or any of these marked with tan. Most authorities believe the Bedlington was produced by crossing the old rough-coated terrier with the whippet. Originally raised to hunt vermin, badger, and fox, and often used in organized dogfights, the Bedlington was later taken into the home as companion and pet. See DOG.

Bedloe's Island: see LIBERTY ISLAND

Bedny, Demyan (dyīmyan' byēd'nyē), 1883-1945, Soviet verse writer, whose original name was Yefim Pridvorov. He wrote a vast number of widely acclaimed topical poems and propaganda jingles, exhorting the peasantry to hate foreign enemies and religious traditions. In 1936, *The Heroes*, his satire on Russian legendary figures, cost him his popularity.

Bedouin (bēd'ōōīn) [Arab, =desert dwellers], primarily nomad Arab peoples of the Middle East, where they form about 10% of the population. They are of the same Semitic stock as their sedentary neighbors (the fellahin, see ARABS) and share with them a devout belief in ISLAM and a distrust of any but their own local traditions and way of life. Camel and sheep breeding provide their main livelihood. Land is divided into recognized tribal orbits within which are roving family groups. The tribe is a community of equals headed by a sheikh. Among the Bedouin, hospitality and simple, immediate justice are first rules of conduct. Although Bedouin have traditionally avoided agricultural work, settlement policies of the various Middle Eastern states in the 20th cent. have forced many of them into a sedentary life. See Emanuel Marx, *Bedouin of the Negev* (1967), Edward Nevins and Theon Wright, *World Without Time* (1969).

Beds, England: see BEDFORDSHIRE

bedstraw: see MADDER

Bedworth, urban district (1971 pop. 40,535), Warwickshire, central England. It is a residential and industrial area. Coal mining and brickmaking are the major economic activities. George Eliot was born nearby at Arbury.

Będzin (bēn'jēn), Ger. *Bendzin* (bēn'tsīn), town (1970 pop. 42,787), SE Poland, on the Czarna Przemsza River, a tributary of the Vistula. It is a coal-mining center and has industries producing metal products, machinery, chemicals, and electrical equipment. Founded in the 14th cent., Będzin was situated on the Wrocław-Kraków trade route. The first coal mine in the Upper Silesian basin opened at Będzin in 1785. The town passed to Prussia in 1795 and to Russia in 1815; it was returned to Poland in 1919. In Będzin are the ruins of a 13th-century castle.

bee, name for flying INSECTS of the superfamily Apoidea, in the same order as the ants and the wasps.

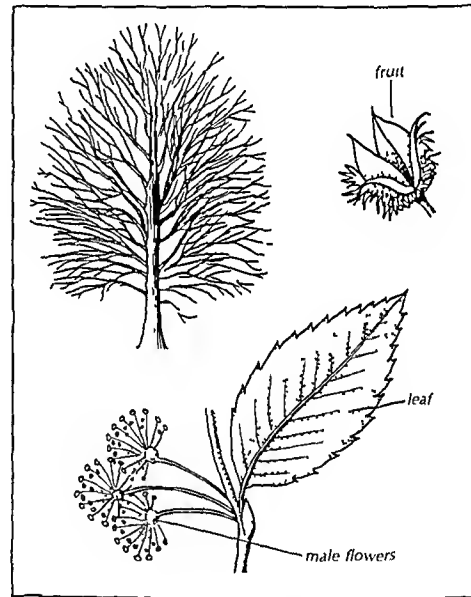
Bees are characterized by their enlarged hind feet, typically equipped with pollen baskets of stiff hairs for gathering pollen. They usually have a dense coat of feathery hairs on the head and thorax. In many, the lip forms a long tube for sucking nectar. Bees feed on pollen and nectar, the latter is converted to HONEY in the bee's digestive tract. There are about 20,000 species of bees. They may be solitary, social, or parasitic in the nests of other bees. The solitary bees (which do not secrete wax) are called carpenter, plasterer, leaf-cutting, burrowing, and mason bees according to the material or method used to construct nests for their young. The groups of social bees, including altogether about 400 species, are the bumblebees, the stingless bees, and the honeybees. Bumblebees belong to the genus *Bombus*. In the tropics, bumblebee colonies continue for many years, but in temperate regions the workers and the drones die in the fall. Only the young, fertilized queens live through the winter, in hibernation. In the spring they begin new colonies, often laying their eggs in the deserted nests of field mice and chipmunks. The stingless bees are chiefly tropical. Some species release a caustic liquid that burns the skin. The honeybee commonly raised for production of honey and wax in many parts of the world is *Apis mellifera*, of Old World origin. Honeybees build nests, or combs, of wax, which is secreted by glands in the abdomen. They store honey for future use in the hexagonal cells of the comb. In the wild the nests are made in caves or hollow trees, but beekeepers provide nesting boxes, called hives. Beekeeping is called apiculture. A typical colony consists of three castes: the large queen, who produces the eggs, many thousands of workers (sexually undeveloped females), and a few hundred drones (fertile males). At the tip of a female bee's abdomen is a strong, sharp lancet, or sting, connected to poison glands. In the queen, who stings only rival queens, the sting is smooth and can be withdrawn easily; in the worker bee the sting is barbed and can rarely be withdrawn without tearing the body of the bee, causing it to die. The workers gather nectar, make and store honey, build the cells, clean, ventilate (by fanning their wings), and protect the hive. They also feed and care for the queen and the larvae. They communicate with each other (for example, about the location of flowers) by performing dances in specific patterns. The workers live for only about six weeks during the active season, but those that hatch (i.e., emerge from the pupa stage) in the fall live through the winter. The drones die in the fall. A newly hatched queen is followed aloft in a nuptial flight by the drones, only one of which impregnates her, depositing millions of sperm that are stored in a pouch in her body. The drone dies, and the queen returns to the hive, where for the rest of her life (usually several years) she lays eggs continuously in the cells. A developing bee goes through the larva and pupa stages in the cell and emerges as an adult. The larva is fed constantly by the worker bees; the pupa is sealed into the cell. Fertilized eggs develop into workers, unfertilized eggs become drones. A fertilized egg may also become a queen if the larva is fed royal jelly, a glandular secretion thought to contain sex hormones as well as nutrients, until she pupates. Worker larvae receive this food only during the first three days of larval life, afterward receiving bee bread, a mixture of pollen and honey. When a hive becomes overcrowded a swarm may leave with the old queen and establish a new colony. The old colony in the meantime rears several new queens. The first queen that hatches stings the others to death in their cells, if two emerge at once, they fight until one is killed. Mating then occurs. Bees are of inestimable value as agents of cross-pollination, and many plants are entirely dependent on particular kinds of bees for their reproduction (such as red clover, which is pollinated by the bumblebee, and many orchids). In many cases the use of insecticides for agricultural pest control has had the unwelcome side effect of killing the bees necessary for maintaining the crop. Bee venom has been found to have medicinal properties. Toasted honeybees are eaten in some parts of the world. Bees are classified in the phylum ARTHROPODA, class Insecta, order Hymenoptera, superfamily Apoidea. See Maurice Maeterlinck, *The Life of the Bee* (1913), E. W. Teale, *The Golden Throng* (1940), Karl von Frisch, *The Dance Language and Orientation of Bees* (1965, tr. 1967), Martin Lindauer, *Communication Among Social Bees* (rev. ed. 1971).

bee balm, name for several herbs, especially *Melissa officinalis* and *Monarda didyma*, both typical perennials of the family Labiatae (MINT family) named for

their aromatic fragrance, attractive to bees and hummingbirds. *Melissa* [Gr., =bee] *officinalis*, called bee balm or lemon balm, was introduced to North America from the Mediterranean area, where it has long been cultivated for its lemonlike odor and flavor and, formerly, as a curative for many ailments. The leaves and the oil distilled from them (known as melissa or balm) are widely used for seasonings and beverages. *Monarda didyma*, called bee balm, or Oswego tea, is native to E North America and was used, along with other species of *Monarda*, by the Indians and colonists for tea. It is also cultivated as an ornamental for its terminal cluster of red blossoms (sometimes pink in garden varieties). Oswego tea is similar and closely related to wild BERGAMOT. The names bergamot and balm are also used for other plants. Bee balm is classified in the division MAGNOLIOPHYTA, class Magnoliopsida, order Lamiales, family Labiatae.

Beebe, Charles William (bē'bē), 1877-1962, American ornithologist, explorer, and author, b. Brooklyn, N.Y., B.S. Columbia, 1898. He became (1899) curator of ornithology and later (1919) director of the department of tropical research at the New York Zoological Society, retiring in 1952. He made expeditions to Central and South America, the Orient, and the West Indies, and in 1934 he made a record descent of 3,028 ft (923 m) in a bathysphere. Among his numerous books are *Galapagos* (1923), *Beneath Tropic Seas* (1928), *Half Mile Down* (1934), and *Unseen Life of New York* (1953).

beech, common name for the Fagaceae, a family of trees and shrubs mainly of temperate and subtropical regions in the Northern Hemisphere. The principal genera—*Castanea* (CHESTNUT and CHINQUAPIN), *Fagus* (beech), and *Quercus* (OAK, including the



American beech, *Fagus grandifolia*

(cork oak)—form a dominant part of temperate woodland vegetation and are highly valued throughout the world for hardwood timber. Some of their species are also cultivated for their edible fruits and as ornamental and shade trees. The beeches have distinctive smooth, silvery gray bark and pale green leaves that turn golden in autumn and are often winter-persistent. The tough, strong, easily worked wood is used for furniture, flooring, crating, and woodenware. Beechnuts have a sweet flavor but are now seldom eaten except locally in poorer areas of Europe. Swine are often loosed in beech forests to fatten on the nuts (called mast). The American beech (*F. grandifolia*) grows in rich soil over much of the NE United States and Canada. A slow-growing tree, it is declining in abundance through lumbering and through beech bark disease, a fungus infection that attacks the tree through holes bored in its bark by a scale insect. The blue, or water, beech is an American HORNBEAM of the birch family. The European beech (*F. sylvatica*) is an important forest tree, especially in S and Central Europe, and is valued for its wood and for an oil extracted from the nuts. Several of its varieties have reddish brown or purplish leaves and are cultivated in America as ornamentals, e.g., the purple and copper beeches. The beeches of the Southern Hemisphere, mostly of the antarctic regions, belong to the small genus *Nothofagus*; several are also used

for timber or grown as ornamentals. The beech family is classified in the division MAGNOLIOPHYTA, class Magnoliopsida, order Fagales.

Beecham, Sir Thomas, 1879-1961, English conductor. Beecham was educated at Oxford but did not attend any formal music school. Early in his career as conductor and producer, he introduced his fellow countrymen to the operas of Richard Strauss, many Russian operas, and the Russian ballet. In 1932 he organized the London Philharmonic Orchestra, forging it into one of the world's finest orchestras, and in 1933 he became artistic director of Covent Garden Opera, London. A frequent conductor, until 1942, of the Halle Orchestra, Manchester, he later appeared (1942-43) with the New York Philharmonic-Symphony Orchestra and with the Metropolitan Opera, New York. In 1946 he organized the Royal Philharmonic Orchestra, London. He wrote a biography (1960) of Delius, whose music he championed, and he also excelled at interpreting Mozart, Handel, and Berlioz. For his services to British music, Beecham was knighted in 1915; he also had enormous international influence. His versatility and high standards of excellence are attested to by numerous recordings. See his autobiography (1943), biography by Charles Reid (1962).

Beecher, Catharine Esther, 1800-1878, American educator, b. East Hampton, N.Y., daughter of Lyman Beecher. She first taught in New London, Conn., and in 1824 founded a girls' school in Hartford. Later she organized the Western Female Institute in Cincinnati (1832) and similar institutions in Quincy, Ill., Milwaukee, and Burlington, Iowa. Author of works on religion, health, and domestic science (which she introduced in her schools), Beecher was indefatigable in the promotion of liberal education for women, although she opposed woman suffrage. See biographies by M. E. Harveson (1932, repr. 1969) and K. K. Sklar (1973).

Beecher, Henry Ward, 1813-87, American Congregational preacher, orator, and lecturer, b. Litchfield, Conn., son of Lyman Beecher and brother of Harriet Beecher Stowe. He graduated from Amherst in 1834 and attended Lane Theological Seminary, Cincinnati. After two pastorates in Indiana, he accepted a call in 1847 to the newly organized Plymouth Church (Congregational) in Brooklyn, N.Y. Every important issue of the day was discussed on his platform. He was a leader in the antislavery movement, a proponent of woman suffrage, and an advocate of the theory of evolution. Beecher became editor of the *Independent* in 1861 and of the *Christian Union* in 1870. In 1863 he visited England, where his lectures were influential in gaining a more sympathetic understanding of the Union cause. Enthusiasm, imaginative insight, a strong interest in his fellow man, ready wit, and an easy command of English produced a convincing eloquence. The sensational lawsuit brought against him by Theodore Tilton for adultery ended after a long trial (1875) with disagreement of the jury. Beecher's friends acclaimed him victor. Despite the trial, Beecher remained influential for the rest of his life. His published works include *The Life of Jesus, the Christ* (1871) and *Evolution and Religion* (1885). See biographies by Lyman Abbott (1904, repr. 1969) and Paxton Hibben (1942, repr. 1973), study by W. G. McLoughlin (1970).

Beecher, Lyman, 1775-1863, American Presbyterian clergyman, b. New Haven, Conn., grad. Yale, 1797. In 1799 he became pastor at East Hampton, N.Y. While serving (1810-26) in the Congregational Church at Litchfield, Conn., he published his six sermons on intemperance, which passed through many American and English editions. Beecher helped to found (1816) the American Bible Society. In 1826 he was called to the Hanover St. Church, Boston, where his revival services created excitement. He was president of Lane Theological Seminary, Cincinnati, from 1832 to 1852. His liberal views not infrequently placed him in sharp opposition to the conservative group in the Presbyterian Church. Of his 13 children, Henry, Charles, Edward, Thomas, Harriet Beecher Stowe, and Catharine Esther Beecher won wide recognition. See his *Collected Works* (1852-53) and his *Autobiography* by B. M. Cross (1864, new ed. 1961), biography by S. C. Henry (1974).

Beechey, Frederick William, 1796-1856, British admiral and Arctic explorer. He accompanied an expedition N of Spitsbergen in 1818 and wrote an account of it in his *Voyage of Discovery towards the North Pole* (1843). He accompanied W. E. Parry to the Canadian arctic regions in 1819, and in 1825-28 he commanded the *Blossom* in its explorations of

the NW Alaska coast and search for the Northwest Passage. On this voyage he reached Point Barrow and explored Hotham inlet. He also surveyed the North African, South American, and Irish coasts.

Beech Grove, city (1970 pop. 13,468), Marion co., central Ind., inc. 1906. Primarily residential, it has some manufacturing.

Beeckman, Isaac (bā'k'mān), 1588-1637, Dutch physicist. An early proponent of mathematical reasoning and experimental verification in natural philosophy, he contributed to the modern conception of inertia and free fall and discovered an important hydrodynamic law concerning the rate of flow of water from a vessel. Although his recorded scientific work is largely confined to his *Journal* (diary) and notes, he influenced scientific development through his personal acquaintance with such famous contemporaries as René Descartes, Pierre Gassendi, and Marin Mersenne, and through his rectorship of the Latin school at Dordrecht.

bee-eater, any of the brightly colored, insect-eating birds of the family Meropidae. They range in length from 6 to 14 in. (15-36 cm). The plumage of many species is predominantly green but usually includes a variety of other bright colors. Many species have a black stripe running from the eye to the base of the long, sharp bill. They are found throughout the tropical and warm-temperate Old World but are most numerous in the tropical regions of Africa and Asia. Some species are migratory, and the few that breed in temperate areas, such as *Merops apiaster*, the common, or European, bee-eater, winter in the tropics. Most of the Meropidae are gregarious, and the birds of some species travel in flocks of hundreds or thousands of individuals. The nests of most species are colonial burrows, excavated in the sand of riverbanks or road grades. Bee-eaters catch insects on the wing; they subsist primarily upon bees and wasps. They are classified in the phylum CHORDATA, subphylum Vertebrata, class Aves, order Coraciiformes, family Meropidae.

beef, flesh of mature cattle prepared for food. It is an excellent source of protein, minerals, and vitamins. It has become one of the chief products of the MEAT PACKING industry and is sold either chilled, frozen, or cured. The leading beef consumers, as well as exporters, are Argentina, Australia, Canada, New Zealand, and the United States. The carcasses, after being dressed, are split in half along the back and then cut into fore- and hindquarters. In the United States, beef usually reaches local dealers in this form and is cut by them into portions, e.g., shank, round, rump, loins (roasts and steaks), flank, rib (roasts), chuck, plate, and brisket. In addition, the heart, kidneys, liver, tongue, stomach wall (tripe), and tail are edible. The best beef comes from steers (castrated males) and heifers (females that have not calved). The meat should be a clear, light-red color, firm and well marbled with fat. Beef from older cattle is converted into various products, such as beef extract, sausage, corned beef, and canned or potted products.

Beefeaters, popular name for the YEOMEN OF THE GUARD and for the warders of the Tower of London. Both wear colorful uniforms modeled after those of the Elizabethan period.

bee fly, name for the small to medium sized FLIES of the family Bombyliidae, many of which resemble bees in appearance and behavior. This MIMICRY provides bee flies with some measure of protection against predators that have learned to avoid the sting of true bees. A bee fly has a stout, hairy body and long proboscis. In many species the body and wings are strikingly marked in yellow and brown. Most are very swift fliers and buzz loudly like a bee if caught in a net. They seek heat and are often found flying close to the ground in dry, sandy regions. The adults feed on nectar and hover above flowers like bees. The larvae feed on larvae or pupae of other insects; they are beneficial as parasites of harmful species. Beelike flies are also found in other families. The syrphid flies (family Syrphidae), also called hover flies and flower flies, are a large, cosmopolitan group of beelike and wasplike flies. Many syrphid flies bear a very close resemblance to a particular bee or wasp species. Many of the robber flies (family Asilidae) resemble bumblebees. All of these are true flies; they are classified in the phylum ARTHROPODA, class Insecta, order Diptera.

Beefmaster cattle: see BRAHMAN CATTLE

Beehive (star cluster): see PRAESEPE

Beeliada (bē'ēlī'ādā), the same as ELIADA 1.

Beelzebub (bēēl'zabab), in the Bible see SATAN

bee moth, greater wax moth, or honeycomb moth, common name for an insect pest of honey-

combs. Bee moths do damage during their larval stages, injuring combs and honey. The moth *Galleria mellonella* belongs to the subfamily Galleriinae of the family Pyralidae, in which the females characteristically lay their eggs in beehives. The adult moths have brownish front wings with wing-spans of about 1 in. (2.5 cm). Eggs are laid in masses in the crevices of the hive. The newly hatched larvae tunnel into the combs, leaving a complex of silken galleries behind; they also puncture the wax caps of honey cells causing honey leakage and making the punctured comb honey unmarketable. Normally, the moths attack only abandoned beehives, or active ones in which the bee colony has been weakened, e.g., as a result of disease or starvation. Another well-known but smaller member of the subfamily is the lesser wax moth, *Achroia grisella*, which has the same type of scavenging habits as the greater wax moth. Bee moths are classified in the phylum ARTHROPODA, class Insecta, order Lepidoptera, family Pyralidae, subfamily Galleriinae.

Beer, George Louis, 1872-1920, American historian, b. Staten Island, N.Y. He was a tobacco importer for 10 years but also lectured on European history at Columbia from 1893 to 1897. After 1903 he devoted himself to continuing his economic historical studies of British colonial policy. His works revolutionized history-writing about the American colonies. These were, notably, *The Commercial Policy of England toward the American Colonies* (1893, repr. 1948), *British Colonial Policy, 1754-1765* (1907), *Origins of the British Colonial System, 1578-1660* (1908, repr. 1959), and *The Old Colonial System, Part I* (1912). He was also a practical expert on colonial problems, and he is sometimes credited with the first employment of the word *mandate* in its modern usage. He was one of the corps of U.S. experts at the Paris Peace Conference and was a member of the League of Nations mandates commission.

Beer, Thomas, 1889-1940, American author, b. Council Bluffs, Iowa, grad. Yale, 1911, and studied law at Columbia, 1911-13. He is best remembered for his biographies of Stephen Crane (1923) and Marcus (Mark) Hanna (1929) and his witty study of American manners in the 1890s, *The Mauve Decade* (1926). Some of his realistic short stories were collected by Wilson Follett in *Mrs. Egg and Other Barbarians* (1947).

Beer (bē'ar) 1 Unidentified place, to which Gideon's son Jotham fled Judges 9:21. 2 Unidentified place, E of the Dead Sea between the Arnon and the Jordan, where Israel camped and dug a well. Num. 21:16-18. The little song quoted is one of the oldest poetic pieces in the Bible. See BEER-ELIM.

beer, alcoholic beverage made by brewing and fermenting cereals, especially malted barley, usually with the addition of HOPS as a flavoring agent and stabilizer. One of the oldest of alcoholic beverages, beer was well known in ancient Egypt. At first brewed chiefly in the household and monastery, it became in late medieval times a commercial product and is now made by large-scale manufacture in almost every industrialized country, especially Great Britain, West Germany, Czechoslovakia, and the United States. It is less popular in southern or wine-producing areas. Although British, European, and American beers differ markedly in flavor and content, brewing processes are similar. A mash, prepared from crushed malt (usually barley), cereal adjuncts such as rice and corn, and water, is heated and rotated in the mash tun to dissolve the solids and permit the malt enzymes to convert the starch into sugar. The solution, called wort, is drained into a copper vessel, where it is boiled with the hops (which provide beer with its bitter flavor), then run off for cooling and settling. After cooling, it is transferred to fermenting vessels where yeast is added, converting the sugar into alcohol. Modern beers, lighter than ancient, contain about 3% to 6% alcohol. The term *ale*, once used for a beer made without hops, is now applied in Great Britain to any light-colored beer. In the United States, ale is a pale, strongly hopped malt beverage. Most American beers are stored for several weeks or months before marketing, hence the name *lager beer* [Ger. *Lager*=storage place]. Bock beer, said to take its name from Einbeck, Prussia, where it was first made, is a heavier, darker beer commonly drunk in the spring. Porter is a strong, dark ale brewed with the addition of roasted malt to give flavor and color. Stout, darker and maltier than porter, has a more pronounced hop aroma and may attain an alcoholic content of 6% to 7%.

Beera (bē-ē'ra), Asherite 1 Chron. 7:37

Beerah (bē-ē'ra), Reubenite 1 Chron. 5:6

Beerbohm, Sir Max (bēr'bōm), 1872–1956, English essayist, caricaturist, and parodist. He contributed to the famous *Yellow Book* while still an undergraduate at Oxford. In 1898 he succeeded G. B. Shaw as drama critic for the *Saturday Review*. A charming, witty, and elegant man, Beerbohm was a brilliant parodist and the master of a polished prose style. His works include *A Christmas Garland* (1912), a collection of parodies on such authors as Joseph Conrad and Thomas Hardy, *Zuleika Dobson* (1911), an amusing satire on Oxford, *Seven Men* (1919), stories, and *And Even Now* (1920) and *Mainly on the Air* (1947), essays. Beerbohm was accomplished at drawing, and he published several volumes of excellent caricatures, including *The Poet's Corner* (1904) and *Rossetti and His Circle* (1922). He was knighted in 1939 on his return from Italy, where he had lived from 1910. See collections ed. by S. C. Roberts (1962) and Lord David Cecil (1971), biographies by S. N. Behrman (1960) and Lord David Cecil (1964), studies by John Felstiner (1972) and Bohun Lynch (1974).

Beer-elim (bē'ar-ē'lim), unidentified place, perhaps the same as BEER 2 and certainly in the same region. Isa 15:8.

Beeri (bē-ē'rī) 1 Father of Esau's wife, Judith. Gen 26:34. 2 Father of Hosea, the prophet. Hosea 1:1.

Beer-lahai-roi: see LAHAI-ROI.

Beernaert, Auguste (ōgust' bārnart', bār'nart'), 1829–1912, Belgian statesman. A member of the liberal wing of the Catholic party, he served in several cabinets and was premier from 1884 to 1894. Beernaert promoted electoral reform and legislation to improve labor conditions. He was a delegate to the Hague Peace conferences (1899, 1907), and he shared the 1909 Nobel Peace Prize with Estournelles de Constant.

Beeroth (bē-ē'rōth, bē'tī-) 1 City important as a road station, now Bireh (Jordan). Joshua 9:17, 18:25, 2 Sam 4:2, 23:37, Ezra 2:25, Neh 7:29. 2 Same as BENE-JAAKAN.

Beers, Clifford Whittingham, 1876–1943, American founder of the mental hygiene movement, b. New Haven, Conn., grad. Sheffield Scientific School, Yale, 1897. After the publication of *A Mind That Found Itself* (1908), an autobiographical account of his confinement in a mental institution, he had the support of the medical profession and others in the work to prevent mental disorders. He was a leader in the field until his retirement in 1939.

Beersheba (bērshē'bā, bē'rshēbā) [Heb., =seven wells or well of the oath], city (1972 pop. 84,100), S Israel, principal city of the Negev Desert. It is the trade center for surrounding settlements and for BEDOUINS, who hold a weekly market in Beersheba. Construction is the city's main industry. Manufactures include chemicals, textiles, ceramics, glass, plastics, and food products. Beersheba is an important rail and road hub for S Israel. The city was one of the southernmost towns of biblical Palestine, hence the expression "from Dan to Beersheba," meaning the whole of Palestine. It is especially connected, in the Bible, with Abraham, Hagar, Isaac, Jacob, and Elijah. A well believed to have been dug by Abraham when he made his covenant with Abimelech is in the city. Beersheba flourished during the late Roman and Byzantine eras but was deserted soon thereafter. It was merely a group of wells for Bedouin flocks when the Ottoman Turks reestablished it c. 1900 as an administrative center for Negev tribes. Beersheba was the first city taken by the British in the Palestine campaign (1917) of World War I. Under the British mandate (1922–48) it was a city (Bir-es-Seba) inhabited by about 4,000 Muslim Arabs. Given to the Arabs in the partition of Palestine (1948), it was retaken by Israel in the Arab-Israeli War of 1948 and grew rapidly thereafter. Beersheba is the seat of the Arid Zone Research Institute, a biological institute and museum concerned with desert plant and animal life, and a municipal museum devoted to the history of the city. Remnants of a fortress and shards of the Bronze Age have been found nearby at Tell el-Sheba, the most ancient site of Beersheba.

Beer's law [for August Beer], physical law stating that the quantity of light absorbed by a substance dissolved in a nonabsorbing solvent is directly proportional to the concentration of the substance and the path length of the light through the solution, the law is sometimes also referred to as the Beer-Lambert law or the Bouguer-Beer law. Beer's law is commonly written in the form $A = \epsilon c l$, where A is the absorbance, c is the concentration in moles per liter, l is the path length in centimeters, and ϵ is a constant of proportionality known as the molar ex-

inction coefficient. The law is accurate only for dilute solutions; deviations from the law occur in concentrated solutions because of interactions between molecules of the solute.

Beesh-terah: see ASHTAROTH.

Beeson, Jack, 1921–, American composer, b. Muncie, Ind. Beeson studied at the Eastman School of Music and privately in New York with Bela Bartok. Since 1967 he has been MacDowell Professor of Music at Columbia Univ. Beeson has written songs and choral pieces, piano sonatas, a symphony (1959), and several operas, including *Hello Out There!* (1954), *The Sweet Bye and Bye* (1957), *Lizzie Borden* (premiered by the New York City Opera in 1965), and *My Heart's in the Highlands* (premiered on television in 1970). His vocal works, set to a catholic choice of texts, are marked by a varied stylistic approach unified by attention to contrapuntal lines and instrumental color.

Beeston and Stapleford, urban district (1971 pop. 63,498), Nottinghamshire, central England. There are large pharmaceutical plants and factories that produce boilers, telecommunication equipment, fluorescent lights, textiles, pencils, cardboard boxes, and clothing. The Stapleford churchyard has an ancient Saxon cross, thought to be the oldest Christian memorial in the country.

beeswax: see WAX.

beet, biennial or annual root vegetable of the family Chenopodiaceae (GOOSEFOOT family). The beet (*Beta vulgaris*) has been cultivated since pre-Christian times. Among its numerous varieties are the red, or garden, beet, the sugar beet, Swiss chard, and several types of mangel-wurzel and other stock feeds. Both the roots and the foliage of the red beet are edible, as is the foliage of Swiss chard and similar varieties. The easily stored roots of the mangel-wurzel [Ger., =beet root] are much used for fodder in Europe and Canada and to a lesser extent in the United States. The biennial beet is one of the root crops most often used in crop rotation. The foliage of the sugar beet and of several other beet varieties is also used as feed. The sugar beet, cultivated commercially throughout the temperate zone, today provides about one third of the world's sugar. Since the 18th cent. selective breeding has raised the root's sucrose content from 2 or 4% to 15 and even 20% and has increased its resistance to disease. In the United States the sugar beet is grown extensively in the West from Michigan to Idaho and California, and mechanical harvesting has reduced production costs sufficiently for beet sugar to compete with cane sugar. The solution of extracted beet sugar in water is treated similarly to cane juice for refinement and granulation, but it has no valuable by-products. Beets are classified in the division MAGNOLIOPHYTES, class Magnoliopsida, order Caryophyllales, family Chenopodiaceae.

Beethoven, Ludwig van (lūd'wīg vān bāt'ōvən, Ger. lōt'vīkh fan bāt'hōfən), 1770–1827, German composer. He is universally recognized as one of the greatest composers who ever lived. Beethoven's work crowned the classical period and also effectively initiated the romantic era in music. He is one of the few artists who genuinely may be considered revolutionary. Born in Bonn, Beethoven showed remarkable talent at an early age. His father, a court musician, subjected him to a brutal regimen, hoping to exploit him as a child prodigy. While this plan did not succeed, young Beethoven's gifts were recognized and nurtured by his teachers and by members of the local aristocracy. In 1787, Beethoven first visited Vienna, at that time the center of the music world. There he performed for Mozart, whom he greatly impressed. In 1792, Haydn invited him to become his student, and Beethoven returned to Vienna, where he was to remain permanently. However, Beethoven's unorthodox musical ideas offended the old master, and the lessons were terminated. Beethoven studied with several other eminent teachers, including Antonio Salieri, but was developing according to his own singular genius and could no longer profit greatly from instruction. Both his breathtaking piano virtuosity and his remarkable compositions won him favor among the enlightened aristocracy congregated at Vienna, and he enjoyed their generous support throughout his life. They were tolerant, too, of his notoriously boorish manners, careless appearance, and towering rages. His work itself was widely accepted, if controversial, and from the end of the 1790s Beethoven was not dependent on patronage for his income. The year 1801 marked the onset of Beethoven's tragic affliction, his deafness, which became progressively worse and, by 1817, total. Public performance even-

tually became impossible, but his creative work was not restricted. Beethoven never married, however, he was stormily in and out of love all his life, always with women unattainable because of marriage or station. His personal life was further complicated when he was made the guardian of his nephew Karl, who caused him much anxiety and grief but to whom he nevertheless remained fondly attached. Beethoven's work may be divided into three fairly distinct periods. The works of the first period include the First (1800) and Second (1802) Symphonies, the first three piano concertos (1795–1800), the first group of string quartets (1800), and a number of piano sonatas, among them the Pathétique (1798) and the Moonlight Sonata (1801). Although the compositions of the first period have Beethoven's unmistakable breadth and vitality, they are dominated by the tradition of Haydn and Mozart. Beginning about 1802, Beethoven's work took on new dimensions. The premiere in 1805 of the massive Third Symphony, known as the Eroica (composed 1803–4), was a landmark in cultural history. It signaled a definitive break with the past and the birth of a new era. The length, structure, harmonies, and orchestration of the Eroica all broke the formal conventions of classical music, unprecedented too was its intention—to celebrate human freedom and nobility. The symphony was originally dedicated to Napoleon, who at first symbolized to Beethoven the spirit of the French Revolution and the liberation of mankind, however, when Napoleon proclaimed himself emperor, the disillusioned composer renamed his work the "Heroic Symphony to celebrate the memory of a great man." The works of Beethoven's middle period, his most productive, include the Piano Concertos No. 4 (1806) and No. 5 (Emperor Concerto, 1809), the Razumovsky Quartets (1806), his Ninth Sonata for violin, the Kreutzer Sonata (1803), and his one Violin Concerto (1806), the Fourth through Eighth Symphonies (1806–12), a number of piano sonatas, among them the Waldstein and the Appassionata (both 1804). His sole opera, *Fidelio*, was produced in its first version in 1805 and in its final form in 1814. Beethoven wrote four overtures for the opera, three of them known as the Leonore Overture. He also composed overtures to Collin's *Coriolan* (1807) and to Goethe's *Egmont* (1810). From about 1813 to 1820 there was some slackening in Beethoven's productivity, probably due in part to difficulties concerning his nephew. Beethoven's final period dates from about 1816 and is characterized by works of greater depth and complexity. They include the demanding, nearly symphonic Hammerklavier sonata (1818) and the other late piano sonatas, the monumental Ninth Symphony (1817–23) with its choral finale based on Schiller's *Ode to Joy*, and the *Missa Solemnis* (1818–23). The last five string quartets and the Grosse Fuge (also for quartet), composed in his last years, are considered by many music lovers to be Beethoven's supreme creations, and by some the most sublime music ever composed. Beethoven died, after a long illness, in the midst of a fierce thunderstorm, and legend has it that the dying man shook his fist in defiance of the heavens. A prolific composer, Beethoven produced, in addition to the works mentioned, sonatas for violin and piano and for cello and piano, string and piano trios, music for wind instruments, miscellaneous piano works, including the popular bagatelle *Fur Elise* (1810), over 200 songs, a number of shorter orchestral works, and several choral pieces. His influence on subsequent composers was immeasurable. Aside from his architectonic innovations and expansion of the classical sonata and symphony, he brought to music a new depth and intensity of emotion which was emulated by later romantic composers but probably never surpassed. See his letters, ed. by Emily Anderson (3 vol., tr. 1961), biographies by A. F. Schindler (tr. 1966) and Martin Cooper (1970), studies by D. F. Tovey (1945) and W. S. Newman (1971), Elliot Forbes, ed., *Thayer's Life of Beethoven* (2 vol., rev. ed. 1967), H. C. R. Landon, ed., *Beethoven: A Documentary Study* (1970), Denis Arnold and Nigel Fortune, ed., *The Beethoven Reader* (1971).

beetle, common name for INSECTS of the order Coleoptera, which, with over 250,000 described species, is the largest of the insect orders. Beetles have chewing mouthparts and well-developed antennae. They are characterized by a front pair of hard, opaque, waterproof wings called elytra, which usually meet in a straight line down the middle of the back. The elytra cover the rear pair of membranous flight wings, protecting them and the body from mechanical damage and desiccation. Beetles are poor flyers compared with many other insects, but

they are well adapted for surviving rigorous conditions. They are found everywhere except in oceans and near the poles, and they occupy nearly every kind of habitat. Most are terrestrial, but some are underground tunnelers and some live in water. These WATER BEETLES are often confused with water bugs, but the latter all have sucking mouthparts. Beetles range in size from under 1 mm ($\frac{1}{32}$ in.) to over 15 cm (6 in.) long; tropical species are the largest. Most are dull, but members of several beetle families are brilliantly colored, some with a metallic or iridescent sheen. The majority of beetles are plant eaters, but there are also many predators and scavengers and a few parasites. Many beetles are highly destructive pests of crops and gardens (e.g., JAPANESE BEETLE, POTATO BEETLE, BOLL WEEVIL), but others are beneficial predators of harmful insects (e.g., LADYBIRD BEETLES). The largest of the many beetle families is the SCARAB BEETLE family, with over 20,000 species, among these are the dung beetles, which are invaluable scavengers. WEEVILS are plant-eating beetles with mouthparts elongated into snouts bearing jaws at their ends. The FIREFLIES are luminescent beetles. BLISTER BEETLES, including the so-called Spanish fly, produce irritating secretions. Beetles are classified in the phylum ARTHROPODA, class Insecta, order Coleoptera.

Beets, Nicolaas (nē'kōlas bāts), 1814-1903, Dutch author. He translated Byron into Dutch and was fairly well known as a poet when his *Camera Obscura* (1839), published under the pseudonym Hildebrand, won great popularity. This series of nostalgic sketches of everyday life reflected Beets's wide powers of observation.

beet sugar. see BEET, SUCROSE

Beeville, city (1970 pop. 13,506), seat of Bee co., S Texas, settled in the 1830s, inc. 1908. Long a cow town, Beeville is the trade center of an agricultural county. A junior college is there, and a naval air training station is nearby.

Beggars of the Sea. see GUEUX

beggar-tick: see BUR MARIGOLD

beggarweed or tick trefoil, leguminous plant (*Desmodium purpureum*) native to the West Indies and sown in the S United States for green manure and for forage; it has high nutritive value and is palatable to stock. The pods are covered with tiny hooked hairs and cling as burs. Other species of the genus are weeds often called by the same names, as are some other weeds with burs. Beggarweed is classified in the division MAGNOLIOPHYTA, class Magnoliopsida, order Rosales, family Leguminosae.

Beghards (bē'gārdz), religious associations of men in Europe, organized similarly to the BEGUINES. They resembled a Franciscan group, with whom they were later often confused. Of unknown origin, they first appeared at Louvain in 1220 and soon spread throughout the Netherlands and into Germany, France, and Italy. Although they survived into the 15th cent., they were from the beginning unpopular and mistrusted. The Beghards were condemned by the Council of Vienne (1311), allegedly for teaching that those who gain perfection in this life cannot commit sin and therefore cannot be blamed for any act. This idea was foreshadowed in the Albigensian teachings. The Beghards were also influenced by the pantheism of a mystical sect, the Brothers of the Free Spirit, which flourished about Cologne.

begonia (bīgōn'yə), any plant of the large genus *Begonia* and common name for the family Begoniaceae, mostly succulent perennial herbs of the American tropics cultivated elsewhere as bedding or pot plants and easily propagated by stem and leaf cuttings as well as by seed. Some kinds are grown as house plants for their showy, variously colored leaves—red, pink, or yellow flowers, sometimes double. There are a large number of hybrids. Begonias are classified in the division MAGNOLIOPHYTA, class Magnoliopsida, order Violales, family Begoniaceae.

Begovat. see BEKABAD, USSR

Begunes (bā'gēnz'), religious associations of women in Europe, established in the 12th cent. The members, who took no vows and were not subject to the rules of any order, were usually housed in individual cottages and devoted themselves to charitable works; their community was called a beguinage. Until the 14th cent., numerous women of high social standing went into the communities. From Belgium and the Netherlands the movement extended across France and Germany. During the earlier years, their services to society brought the Begunes favor and protection from secular and church authorities, but in the 13th and 14th cent.

accusations of heresies and immorality among them as well as among the BEGHARDS, the corresponding bands of men, led to the scattering of the members. The character of the surviving communities eventually changed, in some localities taking the form of almshouses for needy spinsters. See study by E. W. McDonnell (1954, repr. 1969).

Behaim, Behem, or Boeheim, Martin (all bā'hīm), b. 1436? or 1459?, d. 1506?, German traveler and cosmographer. He studied (possibly under Regiomontanus) astronomy, navigation, and mathematics. He went to Portugal as a merchant c. 1480 and may have gone on an expedition along the west coast of Africa. In 1486 he went to Fayal in the Azores. He is believed to have developed an astrolabe and other devices for the use of navigators, but is best known for the terrestrial globe that he made in 1492 and gave to his native city Nuremberg (it is now in the Germanic Museum there). The globe is inaccurate and does not represent the best geographical information of the period.

Beham (bā'hām) or **Peham** (pā-), name of two German Renaissance artists, brothers, who were both influenced by Dürer and later by Italian art. **Hans Sebald Beham**, 1500-1550, engraver, etcher, and miniaturist, with his brother was banished from Nuremberg for freethinking in 1525. After some vicissitudes he settled in Frankfurt c. 1532. His rare paintings have less interest than his engravings, of which he executed about 300, together with hundreds of etchings and woodcuts in a delicate technique. The subject matter varies from a *Virgin and Child* (1520) to the *Labors of Hercules and Farmers' Dances*. His brother, **Barthel Beham**, 1502-40, painter, engraver, and woodcut designer, worked, as did Hans Sebald for a time, for the dukes of Bavaria. His painted portraits are well known, that of Leonhard von Eck is in the Metropolitan Museum. His mature prints show clear composition and excellent technique. They include *Virgin at the Window* and portraits of King Ferdinand I and his brother, Emperor Charles V.

Behan, Brendan (bē'hān), 1923-64, Irish dramatist. A notoriously outspoken and uninhibited man, he joined the Irish Republican Army in 1937 and was twice imprisoned for political offenses. His first play, *The Quare Fellow* (1956), a somewhat somber drama of prison life, was followed by *The Hostage* (1958), a wild and joyous farce set in a brothel. *Brendan Behan's Island: an Irish Sketch-Book* (1962) is a miscellaneous collection. See his autobiographical *Borstal Boy* (1958), biographies by his brother Dominic Behan (1966) and Ulick O'Connor (1971).

Behar, India. see BIHAR

behavior, in biology. see ETHOLOGY

behavior group therapy: see GROUP PSYCHOTHERAPY

behaviorism, school of psychology seeking to explain animal and human behavior entirely in terms of observable and measurable responses to stimuli. Introduced by the American psychologist J. B. WATSON in 1913, it is based on the early mechanistic concepts of Democritus and Epicurus and the later beliefs of Hobbes. Behaviorism is modern, however, in its subjection of psychology to the laboratory technique. Watson, in his insistence that behavior is a physiological reaction to environmental stimuli, denied the value of introspection and of the concept of consciousness as unscientific and saw mental processes as bodily movements, even when unperceived, in this view, thinking is subvocal speech. The conditioned-reflex experiments of the Russian physiologists Pavlov and Bekhterev had a central place with the behaviorists, who considered that all emotions—aside from rage, fear, and love—were conditioned by habit and could be learned or unlearned. Behaviorism became influential in the United States between World War I and World War II, and was an important antidote to philosophical speculation. The American behaviorist B. F. Skinner rejects the unobservable completely and concerns himself purely with the relationship of observable behavior patterns to stimuli or rewards. See J. B. Watson, *Behaviorism* (1930) and *Behavior* (1967), B. F. Skinner, *The Behavior of Organisms* (1938), Walden Two (1948), *Beyond Freedom and Dignity* (1971), and *About Behaviorism* (1974), B. B. Wolman, ed., *Dictionary of Behavioral Science* (1973).

Behem, Martin: see BEHAİM, MARTIN

behemoth (bē'hīmōth, bīhē'-) [Heb., =plural of *beast*], animal mentioned in Job 40:15-24, probably the hippopotamus.

Behistun Inscription (bāhīstōon', bā-, bēhīs'tōon) or **Bisitun Inscription** (bēsītōōn', bēsa-), cuneiform text, the decipherment of which was the key

to all cuneiform script and opened to scholars the study of the written works of ancient Mesopotamia. The inscription in Old Persian, in Susian (the Iranian language of Elam), and in Assyrian is chiseled on the face of a mountainous rock c. 300 ft (90 m) above the ground at Behistun, Persia (modern W Iran). A bas-relief depicting Darius I with a group of captive chiefs is carved together with the inscription. Although the rock was known in ancient times (Diodorus attributed the carvings to Semiramis), it was not until 1835 that Sir Henry RAWLINSON scaled it and copied the inscriptions. Rawlinson translated the Persian section of the inscription, which later led to the entire decipherment of the Assyrian text.

Behmen, Jakob. see BOEHME, JAKOB

Behmenites: see BOEHME, JAKOB

Behn, Aphra (ā'frā bān, bēn), 1640-89, first professional female English author. Little is known of her early life, but there is evidence that c. 1658 she married a London merchant of Dutch descent named Behn. After the death of her husband, Aphra Behn became an English spy in the Dutch Wars (1665-67), adopting the pseudonym Astrea, under which she later published much of her verse. Her career as a secret agent was unsuccessful, and she returned to England exhausted and penniless, forced even to serve time in debtors' prison. By 1670 her first play had been performed, and by 1677 she gained her much desired fame with the eminently successful production of *The Rover*. All her plays are noted for their broad, bawdy humor. Despite her success as a playwright, however, her best literary achievement can be found in her novels. The most notable of these is *Oroonoko* (1688), a heroic love story, the first philosophical novel in English. Aphra Behn was famous for her life style as well as her works, her denial of woman's subservience to man and her high-living, bohemian existence has led critics to describe her as the George Sand of the Restoration and a forerunner of the feminist movement. Her literary reputation declined rapidly in the 18th cent., but Montague Summers's collected edition of her work (6 vol., 1915) revived an interest in her. See study by G. Woodcock (1948) and biography by F. M. Link (1968).

Behrens, Peter (pā'tər bā'rəns), 1868-1940, German architect, influential in Europe in the evolution of the modern architectural style. He established before World War I a predominantly utilitarian type of architecture that at the same time achieved qualities of clarity and impressiveness. His factory buildings were among the earliest European works to base a simple and effective style upon the frank terms of modern construction. Behrens is known also for residences, for workers' apartment houses in Vienna, for the Abbey of St. Peter at Salzburg, and for his pioneering work in industrial design. Among his pupils were the Swiss architect Le Corbusier and the Germans Walter Gropius and Ludwig Mies van der Rohe.

Behring, Emil Adolph von (ā'mēl ā'dōlf fən bār'īng), 1854-1917, German physician. He worked with Kitasato at Koch's laboratory in Berlin and from 1895 was professor of hygiene at Marburg. A pioneer in serum therapy, following the work of P. P. É. Roux, he demonstrated immunization against diphtheria (1890) and tetanus (1892) by injections of antitoxins (a word he introduced) that he developed with Kitasato. For this work he received the 1901 Nobel Prize in Physiology and Medicine.

Behrman, S. N. (Samuel Nathaniel Behrman) (bār'mən), 1893-1973, American dramatist, b. Worcester, Mass., grad. Harvard 1916. His sophisticated comedies often reflect the turbulence of 20th-century society. They include *The Second Man* (1927), *Serena Blandish* (1928), *Ram from Heaven* (1934), *No Time for Comedy* (1939), *Fanny* (1954) with Joshua Logan, and *Lord Pengo* (1962). His books include an autobiography, *The Worcester Account* (1954), and a biography of Max Beerbohm (1960).

Beida: see AL BAYDA, Libya

Beiderbecke, Leon Bismarck (Bix Beiderbecke), (bī'dərbēk), 1903-31, American jazz cornetist, pianist, and composer, b. Davenport, Iowa. Mainly self-taught, he was influenced by recordings of the Original Dixieland Jazz Band and by the music of King Oliver, Louis Armstrong, and Jimmie Noone. His cornet playing, noted for its brilliant phrasing and its clarity of tone, soon won him a reputation. A sensitive, lonely man driven by artistic ambition, he was forced to play in the large commercial bands. Unhappy and restless, he changed jobs often, drank heavily, was frequently ill, and finally died of pneumonia. His piano compositions, including *In a Mist*,

were influenced by Debussy. See C. H. Wareing and George Garlick, *Suglas for Be de Beckle* (1953), biographies by Burnett James (1951) and R. M. Sponer and P. R. Evans (1974).

Beira (bā'ra), region and former province, N central Portugal, S of the Douro River. The old capital was GOVIA. The province extended to the Atlantic coast between the Douro and the Mondego and SE of the Mondego to the upper Tagus. The region is now occupied by the provinces of Beira Alta (capital VISEU), Beira Baixa (capital Castelo Branco) and part of Beira Litoral (capital Coimbra) and is further subdivided into the districts of Aveiro, Viseu, Coimbra, Guarda, and Castelo Branco. The region is traversed by the Serra da Estrela, Portugal's highest mountain range. Grapes, fruits and olives are grown. Industries include fishing and the manufacture of textiles and forest products. The area had been recovered from the Moors even before Portugal was formed, but Moorish attacks continued into the 13th cent. Later Beira was contested in the incessant Portuguese-Castilian wars.

Beira (bē'ra), city (1950 pop. 58,970), capital of Manica e Sofala district, E central Mozambique, a seaport on the Mozambique Channel (an arm of the Indian Ocean) at the mouth of the Punguô River. A commercial center, the city grew (beginning in 1891) as the terminus of a railroad into the interior, and it handles the foreign trade of Rhodesia and Malawi as well as of Mozambique. It is also a popular beach resort.

beira: see *ANTHONY*.

Beirut (bē'rūt), Arab *Bayrut*, Fr. *Beirut*, city (1972 est. pop. 720,000), W Lebanon, capital of Lebanon on the Mediterranean Sea at the foot of the Lebanon Mts. Beirut is an important port and financial center with food processing industries. It is a Phoenician city and was called in ancient times Berytus. It became known after 1500 B.C. as a trade center. Beirut was prominent under the Seleucids but became more important under the Romans when it was not only a commercial town—with a large trade in wine and linens—but also a colony with some territory. In the 3d cent. A.D. Beirut had a famous school of Roman law. It declined after an earthquake in 551. Beirut was captured by the Arabs in 635. The Crusaders under Balwin I took the city in 1110, and it was part of the Latin Kingdom of Jerusalem until 1291, despite a siege by Saladin and the Egyptians in 1182. After 1517 the Druses controlled the city under the Ottoman Empire. In the 19th cent. it was one of the centers of the revolt of Muhammad Ali of Egypt against the Turks. Ibrahim Pasha took it for the Egyptians (1830) but in 1840 the French and British bombarded and captured the city, enabling the Turks to return. It was taken (1918) by French troops in World War I. Beirut became the capital of Lebanon in 1920 under the French mandate. It is the seat of the American Univ. of Beirut (1866) and Lebanese Univ. (1951).

beisa: see *OSY*.

Beisan: see *EET-S-E-N, Is'ra'el*.

Beissel, Johann Conrad (vō'hān kōn'rāt bī'sel) 1690–1768, founder of the Seventh-Day Baptist community at Ephrata, Pa. Emigrating (1720) from Germany, he settled first with the German Baptists or Dunkards, in Germantown, Pa. He soon moved to the Conestoga Valley, where he preached to the German settlers. Beissel published (1728) a tract on his conviction that Saturday was the true Sabbath. With his followers he established (c.1728–1733) at EPHRATA a semimonastic religious community that became well known in colonial times. Over 400 of Beissel's hymns were printed, most of them in the *Turtel-Taupe* (1747), the Ephrata hymnal. See biography by W. C. Klein (1942).

Beit, Alfred (bit) 1853–1905, South African financier, b. Hamburg. He went to South Africa in 1875, grew rich from the development of diamond mines and was a colleague and lieutenant of Cecil Rhodes in Rhodesia. A philanthropist, he founded a chair for colonial history at Oxford Univ. and made many gifts for educational purposes in London, Hamburg and South Africa.

Beja (bā'zha), town (1970 municipal pop. 37,205), S Portugal, capital of Beja dist. and Baixa Alentejo. It is an important trade and manufacturing center. Beja was important under the Romans, who called it Pax Julia. The Moors used it as a fortress city, until the Portuguese recovered it in 1162. Notable landmarks are the 14th-century citadel and the 15th-century Monastery of the Conception.

Bejaia (bē'jā), formerly *Bougie* (bōōzhē'), city (1956 pop. 49,930), N Algeria, a port on the Gulf of

Bejaia (an arm of the Mediterranean Sea). The northern terminus of the Hassi Messaoud oil pipeline from the Sahara. Bejaia is the principal port of the W. Mediterranean. Exports as well as crude petroleum, include iron, phosphates, wines, dried figs and plums. The city also has textile and cork industries. A minor port in Cartagena and Roman times, Bejaia was the Roman Sadia. It became the capital of the Vandals in the 5th cent. It later disappeared but was re-founded by the Berbers in the 11th cent. and became an important port and cultural center. After Spanish occupation (1510–55) the city was taken by the Ottoman Turks. Until it was captured by the French in 1833, Bejaia was a stronghold of the Barbary pirates (see *BARBARY STATES*). City landmarks include a 15th-century mosque and a casbah (fortress) built by the Spanish in 1545.

Béjart or Bèjard (bō'hē bēzhār'), French name of actors associated with MOLIERE who joined their amateur company, Les Enfants de Famille. Their professional debut in Paris (1643) was as the *l'usurier* in *Théâtre*. This failed (1645) and the company returned to the provinces only to triumph on their return in 1653. The eldest of the family was Joseph Béjart, c.1616–1659. His sister Madeleine Béjart, 1618–72, a fine actress and virtual manager of the company, was Molieres' mistress. The sister Genevieve Béjart, 1624–75, and brother Louis Béjart, 1633–78, were also actors in the company. Louis retired in 1670 and was the first of Molieres' actors to receive a pension. Armande Grésinde Béjart, c.1640–1700, Madeleine's sister or daughter, married Moliere in 1662 and trained on him, played most of his heroines. The death of Moliere (1673) caused a momentary collapse of the Kings' Troupe, as the company was called, but Molieres' widow and the actor La Grange procured the absorption by their group of one of the two rival Parisian companies, the troupe of the Théâtre du Marais. At the same time they lost the Palais Royal, the theater they had had since 1660. From its new quarters the company was known as the Hôtel Guénégaud troupe. In 1693 the troupe was merged with its only rival, the company of the Hôtel de Bourgogne. The resultant company was called the *Comédie Française*. See Rosamond Gilder, *Enter the Actress* (1931).

Bekabad (bēk'ābād), formerly Begovat (bēgōvāt'), city (1959 est. pop. 60,000), Tashkent oblast, Uzbekistan, Central Asia, on the Syr Darya River. It is an important industrial center, with large iron and steel mills and cement works. The Farshand dam and hydroelectric plant, just upstream from Bekabad, is a major source of electricity and irrigation water for Uzbekistan.

Bek-Budi, USSR, see *KARST*.

Beke, Charles Tiltstone (pēk) 1820–1874, English explorer and author. In Ethiopia in 1840–43 he mapped c.70,000 sq mi (181,300 sq km) of the country, determined the approximate course of the Blue Nile and compiled vocabularies of 14 languages and dialects. He wrote *Origines Soudanaises* (1834), *The Sources of the Nile* (1860), and *The British Captives in Abyssinia* (1865). His *Discoveries of Sirai in Arabia and of Arabian* appeared posthumously, and his widow published (1874) a summary of his works.

Békéscsaba or Csaba (bēk'ēshchō'bō) city (1970 pop. 55,403), SE Hungary. The commercial center for a silk-raising, tobacco-growing and hog-breeding region, Békéscsaba has meat-packing plants and flour and hemp mills. Other industries produce textiles, farm implements, and cement. The city is also a road and rail hub. It was founded in the 13th cent. but later destroyed by the Turks. In the 18th cent. Slovak settlers helped restore Békéscsaba, and the city still has a large Slovak population. Landmarks include a 13th-century Roman Catholic church, a Lutheran cathedral (testifying to the city's tradition of Lutheranism), and a museum.

Bekesy, Georg von (gā'ōrk fōn bēk'ēshē), 1899–1972, American physiologist, b. Budapest, Hungary, grad. Univ. of Budapest (Ph.D. 1923). He was (1923–45) a physicist in the research laboratory of the Hungarian telephone system and also taught (1932–45) at the Univ. of Budapest. From 1947 to 1949 he was a research professor at the Caroline Institute, Stockholm. In 1949 he became senior research fellow in the psychoacoustic laboratory at Harvard. He was awarded the 1951 Nobel Prize in Medicine and Physiology for his work on the physical mechanism of stimulation within the cochlea, a snail-shaped cavity of the inner ear.

Bel (bāl, bēl), deity of the MIDDLE EASTERN RELIGIONS. The name is a cognate of that of BAL. For Bel, see *Bible*, see *ESL AND THE DRAGON*.

Bela IV (bē'la, bē'la), 1205–70, king of Hungary (1235–70), son and successor of Andrew II. He tried to curtail the power of the magnates and set out to recover the crownlands his father had given to supporters. Confronted by the menace of the Mongol invasion, he sent unheeded appeals to Pope Gregory IX and Holy Roman Emperor Frederick II, but he was crushingly defeated at Mohács on the Sava River in 1241. Perishing after the withdrawal of the invaders, he repopulated the country by inviting foreign colonization. In a battle (1245) with the last Babenberg duke of Austria, the duke was killed but the Austrians were victorious. Bela's long struggle for OTTOMAN king of Bohemia for Austria and Styria ended (1260), and his last years were disturbed by the rebellion of his son, later king STEPHEN V.

Bela (bē'la) 1. First king of Edom. Gen. 36:32, 1 Chron. 1:43. 2. Benjamin's first son. Num. 26:38, 1 Chron. 7:6–8. 3. Belshazzar. Gen. 40:21, 3. Belshazzar. 1 Chron. 5:8. 4. City. See *ESL AND THE DRAGON*.

Belah (bē'la), the same as BELA 2.

Bela Kun: see *KUN, BELA*.

Belalcázar, Sebastián de: see *EL MOCHAL, SEBASTIÁN DE*.

Bel and the Dragon, custom name for Dan. 14, a chapter placed in the Apocrypha in the Authorized Version of the Bible (see *DANIEL*). Verses 1–22 tell of the Babylonian fool Bel, ministered to by priests who secretly consume food left for it, thus deceiving the king and the people. Daniel reveals the fraud, and priests and fool are destroyed on the king. Verses 23–42 tell of a dragon, i.e., a great beast or monster, worshiped as a god. Daniel kills him and is thrown to the lions. The prophet Habakkuk is brought miraculously to the den by an angel to minister to him. Daniel is preserved and the Babylonian king recognizes the power of the God of Daniel.

Belasco, David, 1853–1931, American theatrical manager and producer, b. San Francisco. He was actively connected with the theater from his youth and while associated with Dion Boucicault in Virginia City, Nev. He was first exposed to scenic realism. At 19 he became stage manager of the Baldwin Theatre in San Francisco. His first venture as a playwright was when in 1880 in association with James A. Hume, he toured the country in *Hearts of Oak*, a play adapted by them from an old melodrama. Connections with the Frohman brought him to New York City in association (1882–84) with the Madison Square Theatre and later (1886–90) as stage manager of the Lyceum. He became an independent producer in 1895. Known for his minute details and spectacular stage settings, Belasco showed inventiveness in his use of stage lighting. A creator of stars, he was lucratively associated with Mrs. Leslie Carter, David Warfield, Blanche Bates, Frances Starr, Ina Claire and Lenore Lavinia. His plays most adaptations were vehicles for his actors and for his lavishly settings. His most successful writing combinations were with Hume, Franklin Fols, Fern C. De Ville and John Luther Long. In 1907 he built the Stuyvesant Theatre, later known as the Belasco, during his fight against the Theatrical Syndicate of the 1890s. The New York Public Library has his collection of theatrical materials. He wrote *The Theatre through Its Stage Door* (1919, repr. 1959). See his plays, ed. by R. H. Bal (1943, repr. 1965) biographies by Craig Timberlake (1954) and William Winter (2 vol., 3d ed. 1925, repr. 1972).

Belaúnde Terry, Fernando (fām'ān'ōs bēlō'undē tā'rē) 1912–, president of Peru (1963–68). A successful architect, he served in the chamber of deputies (1945–48), formed the Popular Action party in 1956 and ran unsuccessfully for president the same year. In the 1962 elections he ran a close second behind Victor Raúl Haya de la Torre; the elections were annulled and rescheduled for 1963, at which time Belaúnde won. Despite an opposition congress, he effected social, educational, and land reforms, opening up the rich interior to settlement by constructing a vast highway system across the Andes, established a self-help program for the Indians and encouraged industrial development. However, an inflationary spiral set in and Belaúnde antagonized nationalist army leaders by failing to expatriate U.S.-controlled oil fields and operations. Deposed by an army coup in 1968, he fled to the United States, where he subsequently taught architecture at Harvard and Columbia. See his autobiography, *Peru's Own Conquest* (1959, tr. 1955).

Belaya (bē'lā'ya) [Rus. =white], river, c.680 mi (1,100 km) long, Bashkir Autonomous Republic, E European USSR. It rises in the Ural mts. and winds generally NW past Beloretsk, Serikhtamak where it

becomes navigable), and Ufa to join the Kama River. There are important oil fields in the Belaya River valley near Ufa.

Belaya Tserkov (tser'kof), Ukrainian *Bila Tserkva*, city (1970 pop 109,000), W central European USSR, in the Ukraine, on the Ros River. It is a rail junction and an industrial and commercial center. Industries include food processing and the manufacture of machinery, shoes, and building materials. The city was founded in 1032 and was the headquarters of the Ukrainian Cossacks in the 17th cent. It passed to Russia in 1793.

Belcher Islands, c 1,110 sq mi (2,870 sq km), in E Hudson Bay, SE Keewatin dist., Northwest Territories, Canada, off W Quebec. Flaherty Island is the largest of the tundra-covered group.

Belém (bal'AN') or **Pará** (pará'), city (1970 pop 603,267), capital of Para state, N Brazil, on the Para River. Belém, the chief commercial center and port of the vast Amazon River basin, handles the Amazonian produce (chiefly rubber, Brazil nuts, cacao, and timber) and has processing plants. An airport and a coastal railroad enhance the trade of Belém, which is also connected with Brasília by a railroad and highway. Belém [Port. = Bethlehem] was founded by Portuguese in 1616 as Santa Maria de Belém do Grão Para and was a military post for the defense of N Brazil against French, English, and Dutch pirates. It reached a peak of feverish prosperity during the wild-rubber boom in the late 19th and early 20th cent., then suffered a depression that was alleviated by diversification and planned development in the 1930s. Prosperity increased also after World War II with the improvement of communications within the Amazon region. The city is known for its Goeldi museum, with ethnological and zoological collections of the Amazon basin. It also has an open air market, a botanical garden brilliant with exotic flowers, a modern leprosarium, and a state university. The government palace and the cathedral were built in the 18th cent., and there is a 17th-century Jesuit church.

Belfast (belfást'), county borough (1971 pop 360,150), capital of Northern Ireland, county town of Co. Antrim, mainly in Co. Antrim but partly in Co. Down. It is on Belfast Lough, an inlet of the North Channel of the Irish Sea, and at the mouth of the Lagan River. The harbor, 8.5 mi (13.7 km) long, is navigable to the largest ships. The great shipyards of the Harland and Wolff Company in Belfast have built some of the world's largest ocean liners. The city is also the center of the Irish linen industry; other industries include tobacco and food processing, packaging, and the manufacture of rayon, aircraft, tools and machinery, yarn, clothing, carpets, and rope. Agricultural and livestock products are the chief exports. Belfast was founded in 1177 when a castle in defense of a ford over the Lagan was built, but the present city is a product of the Industrial Revolution. French HUGUENOTS, coming there after the revocation of the Edict of NANTES (1685), stimulated the growth of the town's linen industry. Serious rioting between Catholics and Protestants has scarred the city many times since the 19th cent. Belfast and the surrounding country were subjected to heavy air raids in 1941. Queen's Univ. (founded 1845), a college of technology, and Victoria College (founded 1859), a pioneer in women's education, are in Belfast. The Protestant Cathedral of St. Anne is notable. The Parliament House of Northern Ireland is at Stormont, a suburb of Belfast.

Belfort (bäfor', bē-, bēl-), city (1968 pop 55,833), capital of the Territory of Belfort (a department), E France, in Alsace. An important industrial and transportation center, it has large cotton mills and metalworks. A major fortress town since the 17th cent., it commands the Belfort Gap, or Burgundy Gate, between the Vosges and the Jura mts., thus dominating the roads from France, Switzerland, and Germany. An Austrian possession, Belfort passed to France by the Peace of Westphalia (1648) and was fortified by Vauban. During the Franco-Prussian War (1870-71) the garrison withstood a siege of 108 days. Partly in acknowledgment of this heroism, the Germans left Belfort and the surrounding territory to France when they annexed the rest of Alsace. The many Alsations who then took refuge in the town contributed significantly to its industrial growth. The siege is commemorated by a huge statue, the *Lion of Belfort*, by Bartholdi.

Belfort, Territory of, department (1968 pop 118,450), E France, in Alsace, on the Swiss border. The city of Belfort is the capital.

Belgae see GAUL

Belgaum (bēlgoum'), town (1971 pop 213,830), Karnataka state, SE India. It is an educational and district administrative center and agricultural market that trades in food grains, sugarcane, cotton, tobacco, oilseed, and milk products. Belgaum also has a military cantonment.

Bel Geddes, Norman. see GEDDES, NORMAN BEL

Belgian Congo: see ZAIRE

Belgian horse, one of the largest breeds of DRAFT HORSES of pure European descent. It has a long history, antedating the Christian era, but became especially popular during the Middle Ages. In the 15th and 16th cent. the breed was exported from Belgium to many European countries and became popular as a general working horse. It was not imported to the United States until the 1800s and it was slow to gain favor there because of its ungainly appearance. The breed is characterized by a husky, barrel-like appearance and brute strength. It is generally sorrel or chestnut in color, stands just under 17 hands (68 in / 170 cm) and weighs over 2,000 pounds (900 kg).

Belgian literature. For literature in Flemish (Dutch), see DUTCH and FLEMISH LITERATURE. The writings of French-speaking Belgians, of whom the chief are MAETERLINCK and VERHAEREN, belong to FRENCH LITERATURE. See also WALLOONS.

Belgian Malinois (mālinwā'), a breed of medium-sized WORKING DOG developed in Belgium at the turn of the 20th cent. It stands from 22 to 26 in (55.9-66 cm) high at the shoulder and weighs from 50 to 60 lb (22.6-27.2 kg). The smooth, straight coat is short except for longer hair around the neck, on the back of the thighs, and on the tail. It is brindled fawn in color with a black mask. One of three closely related types of sheepherding dogs from Belgium, the Malinois is distinguished from the other two, the Belgian sheepdog and the Belgian Tervuren, by coat and color only. In addition to being used for its herding abilities, the Malinois has frequently been trained as a police dog. See DOG.

Belgian sheepdog, sometimes called Groenendael, breed of sturdy WORKING DOG developed from a wide assortment of sheepherding dogs in Belgium in the early 20th cent. It stands from 22 to 26 in (55.9-66 cm) high at the shoulder and weighs from 50 to 60 lb (22.6-27.2 kg). Its long, straight coat is black, sometimes with white markings on the chin, forehead, and feet. As a result of such developments as the widespread use of fencing, the increasing availability of rail transportation, and a decline in the threat of marauding animals, the necessity for sheepherding dogs began to decline in Belgium toward the end of the 19th cent. Dog breeders began to turn their attention to the show ring. Of the widely divergent types of herding dogs in existence, three varieties differing only in coat and color were finally bred true, i.e., the Belgian Malinois, Belgian sheepdog, and Belgian Tervuren. All were shown under the name "Belgian sheepdog" until 1959 when they were designated separate breeds by the American Kennel Club. See DOG.

Belgian Tervuren (tāvūn'), breed of medium-sized WORKING DOG perfected in Belgium in the early 20th cent. It stands from 22 to 26 in (55.9-66 cm) high at the shoulder and weighs from 50 to 60 lb (22.6-27.2 kg). Its long, straight, dense coat may vary in shade from fawn to russet mahogany; the hair tips are always black. Developed from a widely interbred stock of Belgian sheepherding dogs, the Tervuren emerged as one of several distinct varieties, differing from the Groenendael BELGIAN SHEEPDOG in color only. It is a relatively rare breed in the United States today. See DOG.

Belgium (bēl'jam), Flemish *Belgie*, Fr *La Belgique*, constitutional kingdom (1970 pop 9,694,991), 11,781 sq mi (30,513 sq km), NW Europe. BRUSSELS is the capital. ANTWERP is the chief commercial center and one of the world's great ports. Other important cities are GHENT and LIÈGE. Belgium is bordered on the N by the Netherlands and the North Sea, on the E by West Germany and the Grand Duchy of Luxembourg, and on the W and SW by France. The terrain is low lying except in the Ardennes mts. in the south. Belgium comprises two ethnic and cultural regions, generally called Flanders and Wallonia—Flanders embracing the northern provinces of EAST FLANDERS, WEST FLANDERS, ANTWERP, LIMBURG, and part of BRABANT, and Wallonia comprising the remainder of Brabant, HAINAUT, LIÈGE, LUXEMBOURG, and NAMUR. The dividing line runs roughly east-west just S of Brussels. Flemish (a Dutch dialect) is the official language in Flanders, while French is official in the south. The French-speaking people are now com-

monly called WALLOONS, although the term once referred chiefly to those people in the Liège area who spoke Walloon, a French dialect. Brussels is bilin-



gual, and German is spoken in a small section of Liège prov., notably at Eupen and Malmédy. Belgium is one of the most densely populated and highly industrialized areas in Europe, emphasis is on heavy industry. Coal mining and the production of steel, chemicals, and cement are concentrated in the Sambre and Meuse valleys, in the BORINAGE around Mons, Charleroi, Namur, and Liège, and in the Campine coal basin. Liège is a great steel center. Iron and steel constitute Belgium's largest single export item (in 1972 the country ranked ninth in world production of crude steel). Belgium also has an old, established metal-products industry; manufactures include bridges, heavy machinery, industrial and surgical equipment, motor vehicles, rolling stock, machine tools, and munitions. Shipbuilding is centered in Antwerp. Chemical products include fertilizers, dyes, pharmaceuticals, and plastics; the petrochemical industry, concentrated near the oil refineries of Antwerp, has mushroomed since World War II. Textile production, which began in the Middle Ages, now includes cotton, linen, wool, and synthetic fibers; carpets and blankets are important manufactures. Ghent, KORTRIJK, TOURNAI, and VERVIERS are all textile centers; MECHELEN, BRUGES, and Brussels are celebrated for their lace. Other old and important industries include diamond cutting (Antwerp is the world's largest diamond center), glass production, and the processing of leather and wood. Belgian industry is heavily dependent upon imports for its raw materials. Some iron is mined in the southeast, but most is imported, especially from the Lorraine basin in France and its extension in Luxembourg. Zinc deposits once supported an active nonferrous metal industry, but the deposits have been exhausted, and the industry now utilizes imported materials. Other nonferrous metal products, made from imported raw materials, include copper, lead, and tin. Coal is Belgium's only significant mineral resource, but production has recently declined in favor of other fuels and cheaper imported coal. Native limestone supports the cement industry. Industrial centers are linked with each other and with the main ports of Antwerp and Ghent by the Meuse and Scheldt rivers and their tributaries, by a network of canals (notably the ALBERT CANAL), and by the densest railroad net of continental Europe. In shipping and transit trade Belgium is among the world's leading countries, the economy depends upon its exports. Agriculture, while engaging only a small percent of the working force, is important. Except in the marshy Campine and in the heavily forested Ardennes there is much fertile and well-watered soil. The chief crops are cereals (oats, rye, wheat, barley). Sugar beets, potatoes, and flax are also grown, and there is truck farming near the large cities. Cattle raising and dairying (especially in Flanders) are important. Flowers and chicory, grown as a winter vegetable, are valuable crops. Processed foods include beet sugar, cheese and other dairy items, and canned vegetables. Beer is made from rich hops. Many cities (most notably Bruges and Ghent) have preserved their medieval architecture and art, which attract thousands of tourists annually. The North Sea coast is also popular in summer, but the once fashionable spas in the Ardennes are less frequented now.

were influenced by Debussy See C H Wareing and George Garlick, *Bugles for Beiderbecke* (1958), biographies by Burnett James (1961) and R M Sudhalter and P R Evans (1974)

Beira (bã'ra), region and former province, N central Portugal, S of the Douro River The old capital was COIMBRA The province extended to the Atlantic coast between the Douro and the Mondego and SE of the Mondego to the upper Tagus The region is now occupied by the provinces of Beira Alta (capital VISEU), Beira Baixa (capital Castelo Branco) and part of Beira Litoral (capital Coimbra) and is further subdivided into the districts of Aveiro, Viseu, Coimbra, Guarda, and Castelo Branco The region is traversed by the Serra da Estrela, Portugal's highest mountain range Grains, fruits, and olives are grown Industries include fishing and the manufacture of textiles and forest products The area had been recovered from the Moors even before Portugal was formed, but Moorish attacks continued into the 13th cent Later Beira was contested in the incessant Portuguese-Castilian wars

Beira (bã'y'ra), city (1960 pop 58,970), capital of Manica e Sofala district, E central Mozambique, a seaport on the Mozambique Channel (an arm of the Indian Ocean), at the mouth of the Pungoe River A commercial center, the city grew (beginning in 1891) as the terminus of a railroad into the interior, and it handles the foreign trade of Rhodesia and Malawi as well as of Mozambique It is also a popular beach resort

beira' see ANTELOPE

Beirut (bārōō't'), Arab Bayrut, Fr Beyrouth, city (1972 est pop 720,000), W Lebanon, capital of Lebanon, on the Mediterranean Sea, at the foot of the Lebanon Mts Beirut is an important port and financial center with food processing industries It was a Phoenician city and was called in ancient times Berytus It became known after 1500 B C as a trade center Beirut was prominent under the Seleucids but became more important under the Romans, when it was not only a commercial town—with a large trade in wine and linens—but also a colony with some territory In the 3d cent A D Beirut had a famous school of Roman law It declined after an earthquake in 551 Beirut was captured by the Arabs in 635 The Crusaders under Baldwin I took the city in 1110, and it was part of the Latin Kingdom of Jerusalem until 1291, despite a siege by Saladin and the Egyptians in 1182 After 1517 the Druses controlled the city under the Ottoman Empire In the 19th cent it was one of the centers of the revolt of Muhammad Ali of Egypt against the Turks Ibrahim Pasha took it for the Egyptians (1830), but in 1840 the French and British bombarded and captured the city, enabling the Turks to return It was taken (1918) by French troops in World War I Beirut became the capital of Lebanon in 1920 under the French mandate It is the seat of the American Univ of Beirut (1866) and Lebanese Univ (1951)

beisa' see ORYX

Beisan, see BET SHEAN, Israel

Beissel, Johann Conrad (yō'han kōn'rat bī'səl), 1690-1768, founder of the Seventh-Day Baptist community at Ephrata, Pa Emigrating (1720) from Germany, he settled first with the German Baptists, or Dunkards, in Germantown, Pa He soon moved to the Conestoga Valley, where he preached to the German settlers Beissel published (1728) a tract on his conviction that Saturday was the true Sabbath With his followers he established (c 1728-1733) at EPHRATA a semimonastic religious community that became well known in colonial times Over 400 of Beissel's hymns were printed, most of them in the *Turtel-Taube* (1747), the Ephrata hymnal See biography by W C Klein (1942)

Beit, Alfred (bīt), 1853-1906, South African financier, b Hamburg He went to South Africa in 1875, grew rich from the development of diamond mines, and was a colleague and lieutenant of Cecil Rhodes in Rhodesia A philanthropist, he founded a chair for colonial history at Oxford Univ and made many gifts for educational purposes in London, Hamburg, and South Africa

Beja (bã'zha), town (1970 municipal pop 37,205), S Portugal, capital of Beja dist and Baixa Alentejo It is an important trade and manufacturing center Beja was important under the Romans, who called it Pax Julia The Moors used it as a fortress city, until the Portuguese recovered it in 1162 Notable landmarks are the 14th-century citadel and the 15th-century Monastery of the Conception

Bejaia (bēj'ā), formerly **Bougie** (bōōzhē'), city (1966 pop 49,930), N Algeria, a port on the Gulf of

Bejaia (an arm of the Mediterranean Sea) The northern terminus of the Hassi Messaoud oil pipeline from the Sahara, Bejaia is the principal oil port of the W Mediterranean Exports, aside from crude petroleum, include iron, phosphates, wines, dried figs, and plums The city also has textile and cork industries A minor port in Carthaginian and Roman times, Bejaia was the Roman Saldae It became the capital of the Vandals in the 5th cent It later disappeared but was refounded by the Berbers in the 11th cent and became an important port and cultural center After Spanish occupation (1510-55), the city was taken by the Ottoman Turks Until it was captured by the French in 1833, Bejaia was a stronghold of the Barbary pirates (see BARBARY STATES) City landmarks include a 16th-century mosque and a casbah (fortress) built by the Spanish in 1545

Béjart or **Bejard** (both bāzhar'), French family of actors associated with MOLIÈRE, who joined their amateur company, Les Enfants de Famille Their professional debut in Paris (1643) was as the Illustre-Théâtre, this failed (1645) and the company returned to the provinces only to triumph on their return in 1658 The eldest of the family was **Joseph Béjart**, c 1616-1659 His sister **Madeleine Béjart**, 1618-72, a fine actress and virtually the manager of the company, was Molière's mistress Their sister, **Genevieve Béjart**, 1624-75, and brother, **Louis Béjart**, 1630-78, were also actors in the company Louis retired in 1670, and was the first of Molière's actors to receive a pension **Armande Gresinde Béjart**, c 1640-1700, Madeleine's sister or daughter, married Molière in 1662 and, trained by him, played most of his heroines The death of Molière (1673) caused a momentary collapse of the King's Troupe, as the company was called, but Molière's widow and the actor La Grange procured the absorption by their group of one of the two rival Parisian companies, the troupe of the Théâtre du Marais At the same time they lost the Palais Royal, the theater they had had since 1660 From its new quarters the company was known as the Hôtel Guenegaud troupe In 1680 the troupe was merged with its only rival, the company of the HÔTEL DE BOURGOGNE The resultant company was called the COMÉDIE FRANÇAISE See Rosamond Gilder, *Enter the Actress* (1931)

Bekabad (byēkabad'), formerly **Begovat** (byēgōvat'), city (1969 est pop 60,000), Tashkent oblast, Uzbekistan, Central Asian USSR, on the Syr Darya River It is an important industrial center, with large iron and steel mills and cement works The Farkhand dam and hydroelectric plant, just upstream from Bekabad, is a major source of electricity and irrigation water for Uzbekistan

Bek-Budi, USSR see KARSHI

Beke, Charles Tilstone (bēk), 1800-1874, English explorer and author In Ethiopia in 1840-43 he mapped c 70,000 sq mi (181,300 sq km) of the country, determined the approximate course of the Blue Nile, and compiled vocabularies of 14 languages and dialects He wrote *Origines Biblicae* (1834), *The Sources of the Nile* (1860), and *The British Captives in Abyssinia* (1865) His *Discoveries of Sinai in Arabia and of Midian* appeared posthumously, and his widow published (1874) a summary of his works

Békéscsaba or **Csaba** (bā'kăshchō'bō), city (1970 pop 55,408), SE Hungary The commercial center for a silk-raising, tobacco-growing, and hog-breeding region, Bekescsaba has meat-packing plants and flour and hemp mills Other industries produce textiles, farm implements, and cement The city is also a road and rail hub It was founded in the 13th cent but later destroyed by the Turks In the 18th cent Slovak settlers helped restore Bekescsaba, and the city still has a large Slovak population Landmarks include a 13th-century Roman Catholic church, a Lutheran cathedral (testifying to the city's tradition of Lutheranism), and a museum

Bekesy, Georg von (gā'ōrk fən bēk'ishē), 1899-1972, American biophysicist, b Budapest, Hungary, grad Univ of Budapest (Ph D 1923) He was (1923-46) a physicist in the research laboratory of the Hungarian telephone system and also taught (1932-46) at the Univ of Budapest From 1947 to 1949 he was a research professor at the Caroline Institute, Stockholm In 1949 he became senior research fellow in the psychoacoustic laboratory at Harvard He was awarded the 1961 Nobel Prize in Medicine and Physiology for his work on the physical mechanism of stimulation within the cochlea, a snail-shaped cavity of the inner ear

Bel (bāl, bēl), deity of the MIDDLE EASTERN RELIGIONS The name is a cognate of that of BAAL For Bel in the Bible, see BEL AND THE DRAGON

Bela IV (bā'la, bē'la), 1206-70, king of Hungary (1235-70), son and successor of Andrew II He tried to curtail the power of the magnates and set out to recover the crownlands his father had given to supporters Confronted by the menace of the Mongol invasion, he sent unheeded appeals to Pope Gregory IX and Holy Roman Emperor Frederick II, but he was crushingly defeated at Mohi on the Sajó River in 1241 Returning after the withdrawal of the invaders, he repopulated the country by inviting foreign colonization In a battle (1246) with the last Babenberg duke of Austria, the duke was killed but the Austrians were victorious Bela's long struggle with OTTOCAR II, king of Bohemia, for Austria and Styria ended (1260) in defeat His last years were disturbed by the rebellion of his son, later King STEPHEN V

Bela (bē'la) 1 First king of Edom Gen 36 32, 1 Chron 143 2 Benjamin's first son Num 26 38, 1 Chron 7 6, 81 Belah Gen 46 21 3 Reubenite 1 Chron 5 8 4 City later called ZOAR

Belah (bē'la), the same as BELA 2

Béla Kun: see KUN, BÉLA

Belalcázar, Sebastián de. see BENALCÁZAR, SEBASTIÁN DE

Bel and the Dragon, customary name for Dan 14, a chapter placed in the Apocrypha in the Authorized Version of the Bible (see DANIEL) Verses 1-22 tell of the Babylonian idol Bel, ministered to by priests who secretly consume food left for it, thus deceiving the king and the people, Daniel reveals the fraud, and priests and idol are destroyed by the king Verses 23-42 tell of a dragon, i e , a great beast or monster, worshiped as a god, Daniel kills him and is thrown to the lions The prophet Habakkuk is brought miraculously to the den by an angel to minister to him, Daniel is preserved, and the Babylonian king recognizes the power of the God of Daniel

Belasco, David, 1853-1931, American theatrical manager and producer, b San Francisco He was actively connected with the theater from his youth, and while associated with Dion Boucicault in Virginia City, Nev , he was first exposed to scenic realism At 19 he became stage manager of the Baldwin Theatre in San Francisco His first venture as a playwright was when, in 1880, in association with James A Herne, he toured the country in *Hearts of Oak*, a play adapted by them from an old melodrama Connections with the Frohmans brought him to New York City in association (1882-84) with the Madison Square Theatre and later (1886-90) as stage manager of the Lyceum He became an independent producer in 1895 Known for his minutely detailed and spectacular stage settings, Belasco showed inventiveness in his use of stage lighting A creator of stars, he was lucratively associated with Mrs Leslie CARTER, David Warfield, Blanche Bates, Frances Starr, Ina Claire, and Lenore Ulric His plays, mostly adaptations, were vehicles for his actors and for his lavish settings His most successful writing combinations were with Herne, Franklyn Fyles, Henry C De Mille, and John Luther LONG In 1907 he built the Stuyvesant Theater, later known as the Belasco, during his fight against the Theatrical Syndicate of the 1890s The New York Public Library has his collection of theatrical materials He wrote *The Theatre through Its Stage Door* (1919, repr 1969) See his plays, ed by R H Ball (1940, repr 1965), biographies by Craig Timberlake (1954) and William Winter (2 vol, 3d ed 1925, repr 1972)

Belaúnde Terry, Fernando (fārnā'dō bālaōn'dā tā'rē), 1912-, president of Peru (1963-68) A successful architect, he served in the chamber of deputies (1945-48), formed the Popular Action party in 1956, and ran unsuccessfully for president the same year In the 1962 elections, he ran a close second behind Víctor Raúl HAYA DE LA TORRE, the elections were annulled and rescheduled for 1963, at which time Belaunde won Despite an opposition congress, he effected social, educational, and land reforms, opened up the rich interior to settlement by constructing a vast highway system across the Andes, established a self-help program for the Indians, and encouraged industrial development However, an inflationary spiral set in, and Belaunde antagonized nationalistic army leaders by failing to expropriate U S-controlled oil fields and operations Deposed by an army coup in 1968, he fled to the United States, where he subsequently taught architecture at Harvard and Columbia See his autobiography, *Peru's Own Conquest* (1959, tr 1965)

Belaya (byēl'aya) [Rus , =white], river, c 880 mi (1,420 km) long, Bashkir Autonomous Republic, E European USSR It rises in the Ural mts and winds generally NW past Beloretsk, Sterlitamak (where it

omes navigable), and Ufa to join the Kama. There are important oil fields in the Belaya valley near Ufa.

Yva Tserkov (tsēr'kaf), Ukrainian *Bila Tserkva*, (1970 pop 109,000), W central European USSR, on the Ukraine, on the Ros River. It is a rail junction, an industrial and commercial center. Industries include food processing and the manufacture of tinware, shoes, and building materials. The city was founded in 1032 and was the headquarters of Ukrainian Cossacks in the 17th cent. It passed to Russia in 1793.

Yukon Islands, c.1,110 sq mi (2,870 sq km), in Edson Bay, SE Keewatin dist., Northwest Territories, Canada, off W Quebec. Flaherty Island is the best of the tundra-covered group.

Belém (balān') or **Pará** (parā'), city (1970 pop 326,700), capital of Pará state, N Brazil, on the Pará River. Belem, the chief commercial center and port of the vast Amazon River basin, handles the Amazonian produce (chiefly rubber, Brazil nuts, cacao, and timber) and has processing plants. An airport and a coastal railroad enhance the trade of Belem, which is also connected with Brasília by a railroad and highway. Belem [Port. = Bethlehem] was founded by Portuguese in 1616 as Santa Maria de Belém do Para and was a military post for the defense of Brazil against French, English, and Dutch pirates. It reached a peak of feverish prosperity during the wild-rubber boom in the late 19th and early 20th cent., then suffered a depression that was alleviated by diversification and planned development in the 1930s. Prosperity increased also after World War II with the improvement of communications within the Amazon region. The city is known for its Goeldi museum, with ethnological and zoological collections of the Amazon basin. It also has an open air market, a botanical garden brilliant with exotic flowers, a modern leprosarium, and a state university. The government palace and the cathedral were built in the 18th cent., and there is a 17th-century Jesuit church.

Belfast (belfāst'), county borough (1971 pop 360,150), capital of Northern Ireland, county town of Co. Antrim, mainly in Co. Antrim but partly in Co. Down. It is on Belfast Lough, an inlet of the North Channel of the Irish Sea, and at the mouth of the Lagan River. The harbor, 8.5 mi (13.7 km) long, is navigable to the largest ships. The great shipyards of the Harland and Wolff Company in Belfast have built some of the world's largest ocean liners. The city is also the center of the Irish linen industry; other industries include tobacco and food processing, packaging, and the manufacture of rayon, aircraft, tools and machinery, yarn, clothing, carpets, and rope. Agricultural and livestock products are the chief exports. Belfast was founded in 1177 when a castle in defense of a ford over the Lagan was built, but the present city is a product of the Industrial Revolution. French HUGUENOTS, coming there after the revocation of the Edict of Nantes (1685), stimulated the growth of the town's linen industry. Serious rioting between Catholics and Protestants has scarred the city many times since the 19th cent. Belfast and the surrounding county were subjected to heavy air raids in 1941. Queen's Univ. (founded 1845), a college of technology, and Victoria College (founded 1859), a pioneer in women's education, are in Belfast. The Protestant Cathedral of St. Anne is notable. The Parliament House of Northern Ireland is at Stormont, a suburb of Belfast.

Belfort (bāfōr', bē-, bēl-), city (1968 pop 55,833), capital of the Territory of Belfort (a department), E France, in Alsace. An important industrial and transportation center, it has large cotton mills and metalworks. A major fortress town since the 17th cent., it commands the Belfort Gap, or Burgundy Gate, between the Vosges and the Jura mts., thus dominating the roads from France, Switzerland, and Germany. An Austrian possession, Belfort passed to France by the Peace of Westphalia (1648) and was fortified by Vauban. During the Franco-Prussian War (1870-71) the garrison withstood a siege of 108 days. Partly in acknowledgment of this heroism, the Germans left Belfort and the surrounding territory to France when they annexed the rest of Alsace. The many Alsations who then took refuge in the town contributed significantly to its industrial growth. The siege is commemorated by a huge statue, the *Lion of Belfort*, by Bartholdi.

Belfort, Territory of, department (1968 pop 118,450), E France, in Alsace, on the Swiss border. The city of Belfort is the capital.

Belgae. see GAUL.

Belgaum (bēlgoum'), town (1971 pop 213,830), Karnataka state, SE India. It is an educational and district administrative center and agricultural market that trades in food grains, sugarcane, cotton, tobacco, oilseed, and milk products. Belgaum also has a military cantonment.

Bel Geddes, Norman. see GEDDES, NORMAN BEL.

Belgian Congo: see ZAIRE.

Belgian horse, one of the largest breeds of DRAFT HORSES of pure European descent. It has a long history, antedating the Christian era, but became especially popular during the Middle Ages. In the 15th and 16th cent. the breed was exported from Belgium to many European countries and became popular as a general working horse. It was not imported to the United States until the 1800s and it was slow to gain favor there because of its ungainly appearance. The breed is characterized by a husky, barrel-like appearance and brute strength. It is generally sorrel or chestnut in color, stands just under 17 hands (68 in/170 cm) and weighs over 2,000 pounds (900 kg).

Belgian literature. For literature in Flemish (Dutch), see DUTCH and FLEMISH LITERATURE. The writings of French-speaking Belgians, of whom the chief are MAETERLINCK and VERHAEREN, belong to FRENCH LITERATURE. See also WALLOONS.

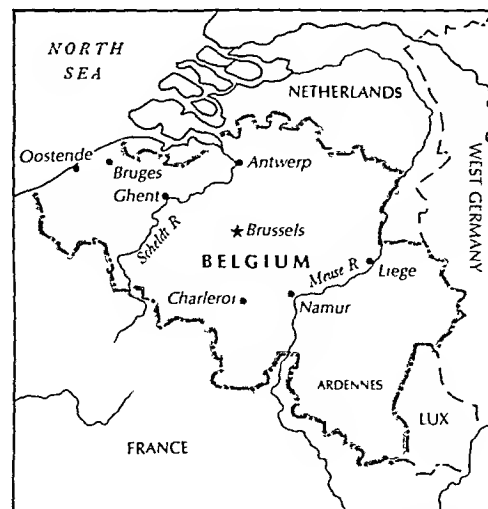
Belgian Malinois (mālinwa'), a breed of medium-sized WORKING DOG developed in Belgium at the turn of the 20th cent. It stands from 22 to 26 in (55.9-66 cm) high at the shoulder and weighs from 50 to 60 lb (22.6-27.2 kg). The smooth, straight coat is short except for longer hair around the neck, on the back of the thighs, and on the tail. It is brindled fawn in color with a black mask. One of three closely related types of sheepherding dogs from Belgium, the Malinois is distinguished from the other two, the Belgian sheepdog and the Belgian Tervuren, by coat and color only. In addition to being used for its herding abilities, the Malinois has frequently been trained as a police dog. See DOG.

Belgian sheepdog, sometimes called Groenendael, breed of sturdy WORKING DOG developed from a wide assortment of sheepherding dogs in Belgium in the early 20th cent. It stands from 22 to 26 in (55.9-66 cm) high at the shoulder and weighs from 50 to 60 lb (22.6-27.2 kg). Its long, straight coat is black, sometimes with white markings on the chin, forechest, and feet. As a result of such developments as the widespread use of fencing, the increasing availability of rail transportation, and a decline in the threat of marauding animals, the necessity for sheepherding dogs began to decline in Belgium toward the end of the 19th cent. Dog breeders began to turn their attention to the show ring. Of the widely divergent types of herding dogs in existence, three varieties differing only in coat and color were finally bred true, i.e., the Belgian Malinois, Belgian sheepdog, and Belgian Tervuren. All were shown under the name "Belgian sheepdog" until 1959 when they were designated separate breeds by the American Kennel Club. See DOG.

Belgian Tervuren (tāvūrn'), breed of medium-sized WORKING DOG perfected in Belgium in the early 20th cent. It stands from 22 to 26 in (55.9-66 cm) high at the shoulder and weighs from 50 to 60 lb (22.6-27.2 kg). Its long, straight, dense coat may vary in shade from fawn to russet mahogany, the hair tips are always black. Developed from a widely interbred stock of Belgian sheepherding dogs, the Tervuren emerged as one of several distinct varieties, differing from the Groenendael BELGIAN SHEEPDOG in color only. It is a relatively rare breed in the United States today. See DOG.

Belgium (bēljəm), Flemish *Belgie*, Fr. *La Belgique*, constitutional kingdom (1970 pop 9,694,991), 11,781 sq mi (30,513 sq km), NW Europe. BRUSSELS is the capital. ANTWERP is the chief commercial center and one of the world's great ports. Other important cities are GHENT and LIÈGE. Belgium is bordered on the N by the Netherlands and the North Sea, on the E by West Germany and the Grand Duchy of Luxembourg, and on the W and SW by France. The terrain is low lying except in the Ardennes mts. in the south. Belgium comprises two ethnic and cultural regions, generally called Flanders and Wallonia—Flanders embracing the northern provinces of EAST FLANDERS, WEST FLANDERS, ANTWERP, LIMBURG, and part of BRABANT, and Wallonia comprising the remainder of Brabant, HAINAUT, LIÈGE, LUXEMBOURG, and NAMUR. The dividing line runs roughly east-west just S of Brussels. Flemish (a Dutch dialect) is the official language in Flanders, while French is official in the south. The French-speaking people are now com-

monly called WALLOONS, although the term once referred chiefly to those people in the Liege area who spoke Walloon, a French dialect. Brussels is bilin-



gual, and German is spoken in a small section of Liege prov., notably at Eupen and Malmedy. Belgium is one of the most densely populated and highly industrialized areas in Europe, emphasis is on heavy industry. Coal mining and the production of steel, chemicals, and cement are concentrated in the Sambre and Meuse valleys, in the BORINAGE around Mons, Charleroi, Namur, and Liège, and in the Campine coal basin. Liège is a great steel center. Iron and steel constitute Belgium's largest single export item (in 1972 the country ranked ninth in world production of crude steel). Belgium also has an old, established metal-products industry, manufactures include bridges, heavy machinery, industrial and surgical equipment, motor vehicles, rolling stock, machine tools, and munitions. Shipbuilding is centered in Antwerp. Chemical products include fertilizers, dyes, pharmaceuticals, and plastics, the petrochemical industry, concentrated near the oil refineries of Antwerp, has mushroomed since World War II. Textile production, which began in the Middle Ages, now includes cotton, linen, wool, and synthetic fibers, carpets and blankets are important manufactures. Ghent, KORTRIJK, TOURNAI, and VERVIERS are all textile centers, MECHELEN, BRUGES, and Brussels are celebrated for their lace. Other old and important industries include diamond cutting (Antwerp is the world's largest diamond center), glass production, and the processing of leather and wood. Belgian industry is heavily dependent upon imports for its raw materials. Some iron is mined in the southeast, but most is imported, especially from the Lorraine basin in France and its extension in Luxembourg. Zinc deposits once supported an active nonferrous metal industry, but the deposits have been exhausted, and the industry now utilizes imported materials. Other nonferrous metal products, made from imported raw materials, include copper, lead, and tin. Coal is Belgium's only significant mineral resource, but production has recently declined in favor of other fuels and cheaper imported coal. Native limestone supports the cement industry. Industrial centers are linked with each other and with the main ports of Antwerp and Ghent by the Meuse and Scheldt rivers and their tributaries, by a network of canals (notably the ALBERT CANAL), and by the densest railroad net of continental Europe. In shipping and transit trade Belgium is among the world's leading countries, the economy depends upon its exports. Agriculture, while engaging only a small percent of the working force, is important. Except in the marshy Campine and in the heavily forested Ardennes there is much fertile and well-watered soil. The chief crops are cereals (oats, rye, wheat, barley). Sugar beets, potatoes, and flax are also grown, and there is truck farming near the large cities. Cattle raising and dairying (especially in Flanders) are important. Flowers and chicory, grown as a winter vegetable, are valuable crops. Processed foods include beet sugar, cheese and other dairy items, and canned vegetables. Beer is made from rich hops. Many cities (most notably Bruges and Ghent) have preserved their medieval architecture and art, which attract thousands of tourists annually. The North Sea coast is also popular in summer, but the once fashionable spas in the Ardennes are less frequented now.

The Beginnings of Belgium Belgium takes its name (in general use only since the late 18th cent.) from the Belgae, a people of ancient GAUL. The Roman province of Belgica was much larger than modern Belgium. There the FRANKS first appeared in the 3d cent. A.D. The Carolingian dynasty had its roots at HERSTAL, in Belgium. After the divisions (9th cent.) of Charlemagne's empire Belgium became part of LOTHARINGIA and later of the duchy of Lower Lorraine, which occupied all but the western part of the LOW COUNTRIES. In the 12th cent. Lower Lorraine disintegrated, the duchies of Brabant (see BRABANT, DUCHY OF) and LUXEMBOURG and the bishopric of Liege took its place. The histories of these feudal states and of FLANDERS and Hainaut constitute the medieval history of Belgium. The salient development was the rise of the cities (e.g., Ghent, Bruges, and Ypres) to virtual independence and to economic prosperity through their wool industry and their trade. In the 15th cent. all of present Belgium passed to the dukes of BURGUNDY, who strove to curtail local liberties. At the same time the wool industry declined, mainly because of English competition. With the death (1482) of MARY OF BURGUNDY a period of foreign domination began (see NETHERLANDS, AUSTRIAN AND SPANISH for the period from 1477 to 1794). Belgium was occupied by the French during the FRENCH REVOLUTIONARY WARS and transferred from Austria to France by the Treaty of CAMPO FORMIO (1797). After the defeat (1815) of Napoleon at Waterloo, just S of Brussels, Belgium was given to the newly formed kingdom of the Netherlands (the decision had been made at the Congress of Vienna, see VIENNA, CONGRESS OF). Under King WILLIAM I of the Netherlands, the Belgians resented measures that discriminated against them in favor of the Dutch, especially in the areas of language and religion. A rebellion broke out in Brussels in 1830, and Belgian independence was declared. William I invaded Belgium but withdrew when France and England intervened in 1832. *The Kingdom of Belgium* Belgian independence was approved by the European powers at the London Conference of 1830-31 (see under LONDON CONFERENCE). In 1831, Prince Leopold of Saxe-Coburg-Gotha was chosen king of the Belgians and became LEOPOLD I. A final Dutch-Belgian peace treaty was signed in 1839, and the "perpetual neutrality" of Belgium was guaranteed by the major powers, including Prussia, at the London Conference of 1838-39. The new country was among the first in Europe to industrialize and soon led the continent in the development of railways, coal mining, and engineering. Under the rule (1865-1909) of LEOPOLD II rapid industrialization and colonial expansion, notably in the Congo, were accompanied by labor unrest and by the rise of the Socialist party in opposition to the reactionary and clerical groups. Social conditions improved under ALBERT I (reigned 1909-34), who also granted universal and equal male suffrage (the vote was extended to all women only in 1948). After the outbreak of World War I (Aug., 1914), Germany invaded Belgium in order to attack France by the easiest route, this flagrant violation of Belgian neutrality shocked much of the world and brought Great Britain, as one of Belgium's guarantors, into the war. The unexpected resistance of the Belgians against heavy odds won widespread admiration, and German atrocities in Belgium, publicized by the Allies, played an important part in consolidating U.S. opinion against Germany. All of Belgium except a small strip in West Flanders, which served as a battle front throughout the war (see, e.g., YPRES), was conquered by Oct. 10, 1914, and the people suffered under a harsh occupation regime. The Belgian army, under the personal leadership of Albert I, fought in West Flanders and France throughout the war. Under the Treaty of Versailles after the war, Belgium received the strategically important posts of Eupen, Malmedy, and Moresnet, and a mandate over the northwestern corner of former German East Africa. In World War II, Germany, which in 1937 had guaranteed Belgian neutrality, attacked and occupied Belgium in May, 1940. King LEOPOLD III (reigned 1934-51) surrendered unconditionally on May 28, but the Belgian cabinet, in exile at London, continued to oppose Germany. German occupation inaugurated a reign of terror. Liberation by British and American troops, aided by a Belgian underground army, came in Sept., 1944. The unsuccessful German counteroffensive of Dec., 1944-Jan., 1945 (see BATTLE OF THE BULGE), caused much destruction, adding to damage previously wrought by invasion and by Allied air raids. However, the industrial plant remained relatively intact, enabling the Belgian economy to recover far more rapidly than the

others of Western Europe. The immediate political issue after the war was the return of Leopold III, who was barred from Belgium until July, 1950. Popular discontent following his return led to his abdication (July, 1951) in favor of his eldest son, BAUDOUIN. In 1960 the Belgian Congo was given its independence, with subsequent economic and political turmoil in Belgium, especially after the eruption of violence in the Congo. Long-standing tensions between the Flemish- and French-speaking elements also flared into crises throughout the 1960s, toppling several governments and making it increasingly difficult to form new ones. Sweeping constitutional reform in 1971 in effect federalized the country by creating three regions—Flanders, Wallonia, and Brussels—with a degree of autonomy in each and provisions for equal political power. The country remains culturally and linguistically divided, but unifying factors include the monarchy, which is widely respected and liked, and the Roman Catholic church, which embraces virtually the entire population and plays a powerful part in Belgian life, especially in education. There are universities in Brussels, Ghent, Liege, Louvain, Mons, and Antwerp. The country also has numerous colleges, and schools of music, architecture, and art. An economic union between Belgium and Luxembourg, formed in 1921 (the first of its kind in 20th-century Europe), has been largely superseded by the BENELUX ECONOMIC UNION, which also includes the Netherlands. An early proponent of a united Europe and a firm advocate of collective security, Belgium is headquarters for the European Common Market, for Supreme Headquarters Allied Powers Europe (SHAPE), and for the North Atlantic Treaty Organization (NATO). See Adrien de Meuse, *History of the Belgians* (tr. 1962), Henri Pirenne, *Early Democracies in the Low Countries* (tr. 1963), Theo Aronson, *The Coburgs of Belgium* (1969), F. E. Huggett, *Modern Belgium* (1969), Vernon Mallinson, *Belgium* (1969), Robert Senelle, *The Political, Economic and Social Structures of Belgium* (1970), Margot Lyon, *Belgium* (1971), D. O. Kieft, *Belgium's Return to Neutrality* (1972).

Belgorod (byél'garəd), city (1970 pop. 151,000), capital of Belgorod oblast, Ukraine, S central European USSR, on the Northern Donets River. It is a railway junction and one of the chief centers in the USSR for the manufacture of cement and construction materials. These industries are based on nearby limestone deposits, one of the world's largest iron ore deposits is also located in the area. Known since the 13th cent., Belgorod was the center of the Muscovite southern defense against Crimean Tatar attacks in the 17th cent.

Belgorod-Dnestrovsky (byél'garət-dənyěstrōf'skē), city (1967 est. pop. 29,000), SW European USSR, in the Ukraine, a port at the mouth of the Dnestr River. It is also a rail junction and a trade center for wine. Industries include fishing and fish processing, winemaking, and meat and dairy processing. Founded by Greek colonists in the 6th cent. B.C., it later passed to Rome and Byzantium. In the 9th cent. it was a Slavic trade and political center called Belgorod. The city belonged to the duchy of Galich-Volhynia in the 13th cent., to Genoa in the 14th cent., and to Moldavia in the 15th cent. The Turks acquired it in 1484 and renamed it Akkerman. It was ceded to Russia in the early 19th cent., but was held by Rumania from 1918 to 1940 and by the Germans during World War II. It has been called by its old Slavic name since its liberation by the Soviet army in 1944. The city has medical and pedagogical institutes, a 15th-century church, and the remains of a medieval fortress.

Belgrade (bél'grād), Serbo-Croatian *Beograd*, city (1971 pop. 793,072), capital of Yugoslavia and of its republic of Serbia, at the confluence of the Danube and Sava rivers. It is the commercial, industrial, political, and cultural center of Yugoslavia, as well as a transportation and communications hub. Belgrade's industries include the manufacture of metals, textiles, chemicals, machine tools, and food products. Strategically situated athwart land and river routes between Central Europe and the Balkans, Belgrade has been the target of numerous conquerors throughout history. The city grew around fortresses built by the Celts (3d cent. B.C.), Illyrians, and Romans. Under the name of Singidunum it served as the harbor for much of Rome's Danubian fleet. Captured by the Huns, Goths, Sarmathians, and Gepids, who destroyed its forts, the city was retaken by the Eastern Roman, or Byzantine, emperor Justinian in the 6th cent. A.D. It was held in the late 8th cent. by the Franks and from the 9th to 11th cent. by the Bulgars, who refortified it and named it Beligrad

("white fortress"). It was then ruled again by Byzantium before becoming the capital of Serbia in 1122. Before it fell to the Ottoman sultan Sulayman I in 1521, it was under Hungarian control. The Ottoman Turks made Belgrade their chief strategic fortress in Europe. Although the Austrians stormed it in 1688, 1717, and 1789, they were able to hold on to it only from the Treaty of Passarowitz (1718) until the Treaty of Belgrade (1739). Liberated by Karageorge and Miloš Obrenović during the Serbian uprising of 1806, Belgrade was recaptured by the Turks in 1813. The Turks finally left in 1815 but kept a garrison in the fortress until 1867. Belgrade became the capital of the kingdom of Serbia in 1882. Occupied by Austrian troops during World War I, the city was made the capital of the new kingdom of the Serbs, Croats, and Slovenes (Yugoslavia) from 1918 after the war. During World War II, Belgrade suffered much damage and extreme hardship under the German occupation. It was liberated by Yugoslav partisans, with Soviet aid, in 1944. Belgrade is noted for its fine parks, palaces, museums, and churches. The former Kalemegdan citadel is now a military museum. The 16th-century Barjak Mosque was built by Sulayman I. The city is the home of the Serbian Academy of Sciences, a university (founded 1863), a Roman Catholic archbishop, and an Orthodox Eastern patriarch.

Belgrano, Manuel (manwél' bēlgrā'nō), 1770-1820 Argentine revolutionist. Important as a political figure, he was appointed secretary of the commercial tribunal of Buenos Aires in 1794. He vigorously championed popular education and proposed economic reforms. Belgrano contributed to *Telegraf mercantil*, the first periodical (founded 1801) of the Rio de la Plata, and published (1810-11) *Correo de comercio*. He served under LINIERS against the British invaders (1806-7). A leader in the revolution of May, 1810, he was a member of the first patriot governing junta and commander of the unsuccessful expedition to Paraguay. In 1812 he succeeded Pueyrredon as commander of the Army of the North and won decisive battles at Tucuman (1812) and Salta (1813). Later in 1813 he invaded Upper Peru (now Bolivia), but after defeats at Vilcapugio and Ayohuma he was superseded (1814) by San Martín. In 1815 Belgrano was in Europe on an unsuccessful diplomatic mission. He again commanded the Army of the North from 1816 to 1819.

Belgravia (bēlgrā'vēā), fashionable residential section of Westminster, London, England. Belgravia surrounds stately Belgrave Square and touches Grosvenor Place on the east.

Belial (bē'lēāl), name applied to SATAN.

Belidor, Bernard Forest de (bērnar' fōrē' də bālē-dōr'), 1693-1761, French engineer. He wrote numerous books dealing with mathematics, artillery, and hydraulic, civil, and military engineering. One of his engineering works, a manual of rules and tables, was reprinted until 1830. His four-volume *Architecture hydraulique* (1737-53) was the first work of its kind to apply integral calculus to practical problems, its influence for the next hundred years was international in scope.

belief, in philosophy, commitment to something, involving intellectual assent. Philosophers have disagreed as to whether belief is active or passive. Rene Descartes held that it is a matter of will, while David Hume thought that it was an emotional commitment, and C. S. Peirce considered it a habit of action. Compared to faith and probability, the concept of belief has received little attention from philosophers. See Jaakko Hintikka, *Knowledge and Belief* (1962).

Belinsky, Vissarion Grigoryevich (visāryōn' grīgōr'yāvich byilyin'skē), 1811-48, Russian writer and critic. He was prominent in the group that believed Russia's hope to lie in following European patterns. Under Hegel's influence he condoned czarism and reaction for a time but returned in the 1840s to his early liberalism and repudiated the doctrine of art for art's sake. As critic for four major reviews he became the principal champion of the realistic and socially responsible new Russian literature. His emphasis on the use of literature to express social and political ideas is the basis of present-day Soviet literary criticism. Among the authors whose talents he recognized and encouraged were Gogol, Lermontov, and Dostoyevsky. A selection of his philosophical and sociological works was published in English in 1948. It includes *Letter to Gogol* (1847), a summation of his beliefs. Belinsky lived in profound poverty and died at 37 of tuberculosis. See studies by Herbert Bowman (1954, repr. 1969) and Victor Terras (1973).

Belisarius (bēlīsār'ēās), c 505-565, Byzantine general under JUSTINIAN I. After helping to suppress (532) the dangerous Nika riot (see **BLUES AND GREENS**), he defeated (533-34) the Vandals of Africa, and captured their king. In 535 he was given command of the expedition to recover Italy from the Ostrogoths. He took Naples and Rome (536) and, after some delays occasioned by a conflict of authority with NARSES, captured Milan and Ravenna (540). He fought an indecisive campaign (541-42) against KHOSRU I of Persia, and in 544 was sent back to Italy against the Goths led by TOTILA. Handicapped by Justinian's jealousy and distrust, he could do little more than hold his enemies in check, he was recalled in 548 and replaced by Narses. In 559 he emerged from retirement to drive the Bulgarians from Constantinople. He was accused (562) of a conspiracy and temporarily imprisoned but was shortly restored to favor.

Belitung (bēlēt'ōng), island (1961 pop 102,375), 1,866 sq mi (4,833 sq km), Indonesia, in the Java Sea midway between Sumatra and Borneo. It has valuable tin mines (government-owned), worked chiefly by Chinese labor. Belitung is also known for its pepper. Ceded to the British by the sultan of Palembang in 1812, it later became a Dutch possession. The chief town and port is Tanjungpandan. It was formerly called Billiton.

Belize (bālēz'), city (1970 pop 39,257), capital of British Honduras (Belize), at the mouth of the Belize River, on the Caribbean Sea. The river flows c 180 mi (290 km) generally west and is navigable almost to Guatemala, outlying cays exclude deep-draft vessels from its good harbor. Timber and wood products are exported from Belize city. Fish packing is the main industry. The city was devastated by hurricanes in 1931 and 1961.

Belknap, Jeremy (bēl'nāp), 1744-98, American historian, b Boston. A Congregational minister, he wrote history out of antiquarian interest, but showed great diligence and skill in research and considerable ability in writing. His *History of New Hampshire* (3 vol., 1784-92, repr., 2 vol., 1970) was a model of early local history. He was a leader in the founding (1794) of the Massachusetts Historical Society, the first such organization in the United States.

Belknap, William Worth, 1829-90, U.S. Secretary of War (1869-76), b Newburgh, N.Y. After practicing law in Iowa, he served in the Civil War, was a division commander under Sherman in Georgia and the Carolinas, and became a major general in 1865. An internal revenue collector in Iowa (1865-69), he was made Secretary of War by Grant. In 1876 a political scandal broke when a House committee found evidence that Belknap had indirectly received annual bribes from the trader at an Indian post. Impeachment was unanimously voted. Grant accepted Belknap's resignation. At the Senate trial, the vote was 35 "guilty," 25 "not guilty"—falling short of the two thirds necessary to convict. Of the 25, 22 declared that they voted "not guilty" on the ground that the Senate lacked jurisdiction after Belknap's accepted resignation. He later practiced law in Washington, D.C.

Bell, Alexander Graham, 1847-1922, American scientist, inventor of the telephone, b Edinburgh, Scotland, educated at the Univ of Edinburgh and University College, London, son of Alexander Melville Bell. He worked in London with his father, whose system of visible speech he used in teaching the deaf to talk. In 1870 he went to Canada, and in 1871 he lectured, chiefly to teachers of the deaf, in Boston and other cities. During the next few years he conducted his own school of vocal physiology in Boston, lectured at Boston Univ., and worked on his inventions. His teaching methods were of lasting value in the improvement of education for the deaf. As early as 1865, Bell conceived the idea of transmitting speech by electric waves. In 1875, while he was experimenting with a multiple harmonic telegraph, the principle of transmission and reproduction came to him. By March 10, 1876, his apparatus was so far developed that the first complete sentence transmitted, "Watson, come here, I want you," was distinctly heard by his assistant. The first demonstration took place before the American Academy of Arts and Sciences in Boston on May 10, 1876, and a more significant one, at the Philadelphia Centennial Exposition the same year, introduced the telephone to the world. The Bell Telephone Company was organized in July, 1877. A long period of patent litigation followed in which Bell's claims were completely upheld by the U.S. Supreme Court. With the 50,000 francs awarded him as the Volta Prize for his

invention, he established in Washington, D.C., the Volta Laboratory, where the first successful phonograph record was produced. Bell invented the phonograph, which transmitted speech by light rays, the audiometer, another invention for the deaf, the induction balance, used to locate metallic objects in the human body, and the flat and the cylindrical wax recorders for phonographs. He investigated the nature and causes of deafness and made an elaborate study of its heredity. The magazine *Science*, which became the official organ for the American Association for the Advancement of Science, was founded (1880) largely through his influence. He was president of the National Geographic Society from 1896 to 1904 and was made a regent of the Smithsonian Institution in 1898. After 1895 his interest was occupied largely by aviation. He invented the tetrahedral kite. The Aerial Experiment Association, founded under his patronage in 1907, brought together G.H. Curtiss, F.W. Baldwin, and others, who invented the aileron principle and developed the hydroplane. See biographies by C.D. Mackenzie (1928, repr. 1971) and R.V. Bruce (1973).

Bell, Alexander Melville, 1819-1905, Scottish-American educator, b Edinburgh. Bell worked out a physiological or visible alphabet, with symbols that were intended to represent every sound of the human voice. He taught elocution in Edinburgh (1843-65), lectured at the Univ of London and in Boston, and engaged in the education of deaf-mutes in Washington, D.C. He wrote about education and the science of speech. Alexander Graham Bell was his son.

Bell, Andrew, 1753-1832, British educator, b St Andrews, Scotland. After seven years in Virginia as a tutor, he returned to England, was ordained a deacon, and later (1789) became superintendent of an orphan asylum in Madras, India. Here he developed the MONITORIAL SYSTEM, which he described in a pamphlet, *Experiment in Education*, published upon his return to London (1797). Joseph Lancaster, a Quaker, established a school on similar principles, which was copied by large numbers of nonconformists. Bell organized a system of monitorial schools that taught the principles of the Established Church. See biography by Robert Southey and C.C. Southey (3 vol., 1844), J.M.D. Meiklejohn, *An Old Educational Reformer* (1881).

Bell, Clive, 1881-1964, English critic of art and literature. He was a member of the Bloomsbury group. His works include *Art* (1914), *Since Cézanne* (1922), *Landmarks in Nineteenth-Century Painting* (1927), and *Proust* (1929). Bell's wife Vanessa was the sister of Virginia Woolf. See his *Old Friends* (1956).

Bell, Sir Charles, 1774-1842, Scottish anatomist and surgeon. He became professor of anatomy and surgery at the Royal College of Surgeons, London, in 1824 and was professor of surgery at the Univ of Edinburgh from 1836. He was the first to distinguish between the motor and the sensory functions of the nerves; this work was confirmed and elaborated by Magendie in 1822. Among Bell's works is *The Nervous System of the Human Body* (1830). See his letters (ed. by his wife, 1870), biographies by Edwin Bramwell (1935) and Sir Gordon Gordon-Taylor and E.W. Walls (1958).

Bell, Gertrude Margaret Lowthian, 1868-1926, English traveler and author, one of the builders of modern Iraq, grad Oxford, 1887. From 1899 she journeyed extensively in Persia, Anatolia, and Syria and early in 1914 reached Hail in the Arabian Desert. In World War I she placed her unmatched knowledge of Middle Eastern conditions at the disposal of the British government and in 1915 was appointed to the intelligence service. As liaison officer of the Arab Bureau in Iraq and assistant political officer, her aid was invaluable. She knew and worked with T.E. Lawrence and was largely responsible for the selection of Faisal I as king of Iraq. She founded and directed the national museum of Baghdad. Her writings include *Poems from the Divan of Hafiz* (1897), *The Desert and the Sown* (1907), *Amurath to Amurath* (1911), *Palace and Mosque at Ukhaidir* (1914), *The Arab of Mesopotamia* (1917), and *Persian Pictures* (1928, pub. anonymously as *Safar Nameh*, 1894). See her *Letters* (new ed. 1947), *Earlier Letters* (ed. by Elsa Richmond, 1937), biographies by Josephine Kamm (1956) and Anne Northgrave (1958).

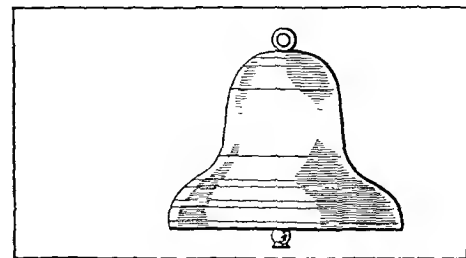
Bell, John, 1797-1869, American statesman, b near Nashville, Tenn. A leading member of the Nashville bar, he served in the U.S. House of Representatives (1827-41), was speaker in 1834, and for a few weeks in 1841 was Secretary of War under President William Henry Harrison. At first a Jacksonian, Bell broke with Jackson in the fight over the Bank of the United

States and ultimately became the chief leader of the Whigs in Tennessee, dominating state politics for nearly two decades. As U.S. Senator (1847-59), he was the leader of the conservative Southern element that, though supporting slavery, placed the Union first. He admitted the right of Congress to prohibit slavery in the territories, supported the Compromise of 1850, objected to the Kansas-Nebraska Bill, and opposed the admission of Kansas under the Le-compton Constitution. In 1860, Bell was the presidential candidate of the moderate CONSTITUTIONAL UNION PARTY and won the electoral votes of Tennessee, Kentucky, and Virginia. The lower South seceded with Lincoln's election, but Bell held Tennessee in the Union until after the firing on Fort Sumter. Bell counseled resistance to the Union invasion, but, disheartened and in ill health, he took no active part in the Civil War. See biography by J.H. Parks (1950).

Bell, John Joy, 1871-1934, Scottish author. He wrote a number of humorous stories and plays, frequently in dialect, of life in Glasgow, but is best remembered for his story *Wee Macgregor* (1902).

Bell, city (1970 pop 21,836), Los Angeles co., S Calif., inc. 1927. It is chiefly residential, with many small businesses and some light manufacturing.

bell, in music, a percussion instrument consisting of a hollow metal vessel, often cup-shaped with an outward-flaring rim, damped at one end and set into vibration by a blow from a clapper within or from a hammer without. A portable set of bells, usually not more than 15 in number, tuned to the intervals of the major scale, is today called a chime. A carillon is a larger stationary set with chromatic intervals and as many as 70 bells, which are played from a keyboard. Harmonies and effects of shading, not possible on a chime, are part of the art of carillon playing—an art for which there is a school in Belgium. The bells of a carillon must be tuned with more accuracy than those of a chime, the best modern craftsmen can tune the fundamental (known as the hum note), the octave (known as the strike note), the twelfth, and the fifteenth with perfect accuracy. An interesting and unexplained illusion manifest in bells is their apparent pitch (strike note); the pitch the observer hears can often be scientifically proved to be different from any of the pitches produced by the bell. Bells have been known in all metal-using cultures and civilizations and have been used in connection with all major religions except Muhammadanism. Many legends and traditions are associated with bells, which have been used for signaling, in dancing, and as protective charms. Apparently originating in Asia, bells were early employed for religious purposes and by the 6th cent. were used in Christianity. Early bells were baptized, in the belief that dedication to Christian service gave power to ward off lightning. A set of bells tuned to a musical scale and called *cymbala* were used in the Middle Ages for musical instruction and to accompany chant in churches. In the 13th cent., tower bells were attached to clocklike mechanisms to strike the hours, the carillon developed out of the Belgian *voorslag* of the 15th cent., a set of bells attached to a large tower clock that played a tune before striking the hour. In the Low Countries, where the making and playing of carillons centered, the principal cities vied over the size and complexity of their instruments. A peak in carillon making was reached in the work of the brothers Frans (1609-67) and Pieter (1619-80) Hemony of Amsterdam. The carillonneur's art flourished until the 18th cent., declining during the French Revolution, when many carillons were melted to make armaments. In England carillon playing was overshadowed by the science of change ringing, which became popular in the 17th cent. In this practice a group of ringers, using a peal (or set) of bells tuned to the diatonic scale, ring the bells in various stated



Bell

orders, not repeating any order. The result is a complex but not melodious sound. The bell is swung full circle, being sounded by a clapper within, thus giving a more resonant sound than in carillon playing, wherein a hammer strikes a stationary bell. Toward the end of the 19th cent. English bellmakers rediscovered the secrets of tuning that had been used by the 17th-century Dutch and Flemish craftsmen. This, with improvements in methods of striking, in placement of the bells, and in action of the keyboard, has made 20th-century carillons the finest in existence. Active in a renaissance of carillon music was Jef Denijn (1862-1941), carillonneur of Mechlin. Since World War I many carillons have been installed in the United States, outstanding is that of the Riverside Church, New York (1930), whose 20.5-ton bourdon bell is the largest ever cast in England. The largest bell in the world was the Great Bell of Moscow, cast in 1734, it was broken in a fire in 1737. See R. P. Price, *The Carillon* (1933), P. D. Peery, *Chimes and Electric Carillons* (1948), W. G. Wilson, *Change Ringing* (1965), S. N. Coleman, *Bells* (1928, repr. 1971).

Bella, Stefano della (stāfa'nō dēl'la bēl'la), 1610-64, Italian engraver, b. Florence. First copying the manner of Jacques Callot, his style changed somewhat when he traveled to Rome, Paris, and the Netherlands. He was adept at landscapes, battle pieces, and animal portraits, although most of his numerous works were designs for festivities and ballets. French theatrical design was considerably influenced by his light, sophisticated style. His drawings are well represented in the Royal Library at Windsor.

belladonna (bēlādōn'ə) or **deadly nightshade**, poisonous perennial plant, *Atropa belladonna*, of the family Solanaceae (NIGHTSHADE family), which also includes the potato. Native to Europe and now grown in the United States, the plant has reddish, bell-shaped flowers and shining black berries. Extracts of its leaves and fleshy roots act to dilate the pupils of the eye and were once used cosmetically by women to achieve this effect. (The name *belladonna* is from the Italian meaning "beautiful lady.") The plant extract contains the alkaloids ATROPINE, SCOPOLAMINE, and hyoscyamine. Belladonna has also been used since ancient times as a poison and as a sedative, in medieval Europe large doses were used by witchcraft and devil-worship cults to produce hallucinogenic effects (see PSYCHOTOMIMETIC DRUGS). Other species of the potato family such as henbane (*Hyoscyamus niger*), mandrake (*Mandragora officinarum*), and Jimson weed (*Datura stramonium*) also contain one or more of the alkaloids present in belladonna. The active substances act physiologically to depress the parasympathetic NERVOUS SYSTEM. Belladonna is classified in the division MAGNOLIOPHYTES, class Magnoliopsida, order Polemoniales, family Solanaceae.

belladonna lily: see AMARYLLIS

Bellaire (bēl'ār'), city (1970 pop. 19,009), Harris co., SE Texas, inc. 1918. It is a suburb of Houston.

Bellamy, Edward (bēl'āmē), 1850-98, American author, b. Chicopee Falls (now part of Chicopee), Mass. After being admitted to the bar he tried his hand at journalism and contributed short stories of genuine charm to various magazines. These were later collected as *The Blind Man's World* and *Other Stories* (1898). His novels—*Dr. Heidenhoff's Process* (1880), *Miss Ludington's Sister* (1884), and *The Duke of Stockbridge* (1900)—were followed by *Looking Backward, 2000-1887* (1888), which overshadowed his other work and brought him fame. This utopian romance pictured the world in A.D. 2000 under a system of state socialism. Much of the book's appeal lies in its unpretentious style and its vivid picture of the imagined society. The work sold over a million copies in the next few years and resulted in the formation of "Nationalist" clubs throughout the nation and the founding of the *Nationalist* monthly (1888-91). Bellamy himself founded and edited the *New Nation* (1891-94), a weekly. *Equality*, a sequel to *Looking Backward*, appeared in 1897. See biographies by S. E. Bowman (1958) and A. E. Morgan (1944, repr. 1974).

Bellamy, Joseph, 1719-90, New England clergyman, b. Cheshire, Conn. A follower of Jonathan Edwards and a powerful revivalist of the GREAT AWAKENING, he preached in Bethlelem, Conn., for 52 years. Bellamy wrote *True Religion Delineated* (1750) and pamphlets in opposition to the Half-Way Covenant.

Bellarmino, Saint Robert (bēlār'mīn), 1542-1621, Italian theologian, cardinal, Doctor of the Church, and a principal influence in the Catholic REFORMATION. His full name was Roberto Francesco Romolo

Bellarmino. He joined the Jesuits (1560) and taught at Louvain (1569-76) and at the Roman College (1576). In 1599 he was made cardinal and from 1601 to 1605 he was archbishop of Capua. His theological works (in Latin) were polemical and widely noticed. One, the most lucid modern exposition of Catholic doctrine, called forth many Protestant replies. In another, a reply to the work of William Barclay, Cardinal Bellarmine uses the analogy, taken from THOMAS AQUINAS, of body and soul to show the relative interdependence and importance of the state and the church. As Jesuits nearly always were, Cardinal Bellarmine was uncompromisingly ultramontane (see ULTRAMONTANISM). He was an admirer of Galileo and a moderating influence at his trial. His devotional works have been translated frequently into English. Pope Pius XI canonized him in 1930 and declared him a Doctor of the Church the following year. Feast May 13. See biography by James Brodrick (rev. ed. 1966).

Bellary (bālār'ē), town (1971 pop. 125,127), Karnataka state, SE India. It is a district administrative center. Iron and manganese deposits are nearby. Its manufactures include cotton textiles, brassware, and agricultural implements. Until the 16th cent. it was the center of the Hindu kingdom of Vijayanagar.

Bellatrix, bright star in the constellation ORION, Bayer designation Gamma Orionis, 1970 position R.A. 5^h23^m5^s, Dec. +6°19'. A bluish-white giant of SPECTRAL CLASS B2 III, its apparent MAGNITUDE of 1.63 makes it one of the 25 brightest stars in the sky. Its distance from the earth is about 500 light-years. Bellatrix marks the left shoulder of Orion. The name is Latin for "female warrior."

Bellay, Du': see DU BELLAY

bellbird: see COTINGA

Belle-Alliance (bēl'-alyāns'), village, central Belgium, near Waterloo. The battle of Waterloo (see WATERLOO CAMPAIGN), where Napoleon I was defeated in June, 1815, is sometimes known, particularly in Germany, as the battle of Belle-Alliance.

Belleau, Remy (rāmē' bēlō'), 1528-77, French poet of the Pleiade (see under PLEIAD). His *Bergerie* (1565), a collection of poems in a framework of prose, celebrates nature in sonnets, odes, eclogues, and hymns.

Belleau Wood (bēl'ō, bēlō'), forested area in Aisne dept., N France, E of Château-Thierry. The scene of a victory over the Germans after hard fighting (June 6-25, 1918), involving chiefly U.S. troops, it was dedicated in 1923 as a permanent memorial to the American war dead.

Belleek ware (bālēk'), pottery with a highly lustrous and often iridescent glaze. It is made at Belleek, Co. Fermanagh, Northern Ireland.

Bellefontaine (bēlfōn'tīn, -fōn'tīn), city (1970 pop. 11,255), seat of Logan co., W central Ohio, settled 1818, inc. 1835. It is a trade and rail center for a farm area. Its industries include printing and the manufacture of automobile bearings, small motors, tools, and electrical equipment. East of the city is Campbell Hill, the highest point in Ohio (1,550 ft/472 m).

Bellefontaine Neighbors, city (1970 pop. 13,987), St. Louis co., E Mo., a residential suburb of St. Louis, founded c. 1819, inc. 1950.

Belle Fourche (bēl'fōʃh), river, c. 290 mi (470 km) long, rising in NE Wyo., flowing NE and then E to the Cheyenne River in W 5 Dak. The Belle Fourche project provides flood control and recreation facilities as well as irrigating c. 57,000 acres (23,070 hectares) in South Dakota. DEVILS TOWER NATIONAL MONUMENT overlooks the Belle Fourche River in Wyoming.

Bellegarde, Heinrich, Count von (hīn'rīkh, fən bēlgard'), 1756-1845, Austrian soldier and statesman. He fought against the French in the French Revolutionary and Napoleonic Wars in Germany, Italy, and Switzerland, rising to general of cavalry in 1800. In 1806 he was made field marshal. From 1809 to 1813, Bellegarde was governor general of Galicia. He commanded (1813-15) Austria's armies in Italy and also served (1814-15) as governor of Lombardy and Venetia. From 1820 to 1825 he was president of the Austrian council of war and minister of state.

Belle Glade, city (1970 pop. 15,949), Palm Beach co., SE Fla., near the southern tip of Lake Okeechobee, inc. 1928. Belle Glade is a trade and processing center for a truck farm, sugarcane, and cattle area. An agricultural experiment station is nearby.

Belle-Isle, Charles Louis Auguste Fouquet, duc de (sharl lwē ōgust' fōōkă' duk də bēl-ēl'), 1684-1761, marshal of France and diplomat, grandson of Nicolas Fouquet. His support of the claims of

Charles of Bavaria (Holy Roman Emperor Charles VII) was in part responsible for France's entry into the War of the AUSTRIAN SUCCESSION. The war's outcome made him unpopular, although his masterly retreat from Prague had saved the French army from surrender (1742-43). As minister of war (1758-61) he did much to reorganize the army.

Belle Isle, Strait of (bēl'il'), c. 35 mi (60 km) long and from 10 to 15 mi (16-24 km) wide, between the island of Newfoundland and Labrador, Canada. The northern entrance to the Gulf of St. Lawrence, it is deep and free of rocks and shoals, ice blocks it from November to June. There is a strong tidal current. The tiny rock island Belle Isle (700 ft/213 m high), at the Atlantic entrance, has a lighthouse and is the first land sighted by ships from Europe.

Bellerophon (bēlēr'āfōn, -fən), in Greek mythology, son of Glaucus, originally called Hippocoon. He changed his name after he murdered a countryman and was forced to flee to exile. He became a suppliant at the court of King Proetus of Argos, whose wife fell in love with him. When he rejected her advances, she vengefully told Proetus that Bellerophon had tried to seduce her. Proetus sent him to Iobates, king of Lycia, with a sealed message requesting the death of its bearer. Iobates gave Bellerophon the seemingly impossible task of killing the Chimera, a beast that was part lion, part goat, part dragon. Bellerophon, however, with the aid of the flying horse Pegasus, killed the monster. Iobates sent him on other difficult missions, but finally decided that Bellerophon was favored by the gods and gave him his daughter in marriage. At the height of his prosperity, however, Bellerophon tried to ride Pegasus to the throne of the gods atop Mt. Olympus, and Zeus in anger caused Pegasus to throw him to the ground. Bellerophon then wandered alone, crippled, blind, and humiliated, until he died.

belles-lettres [from the French for literature, literally "fine letters"], literature that is appreciated for the beauty, artistry, and originality of its style and tone rather than for its ideas and informational content. Earlier the term was synonymous with *literature*, referring particularly to fiction, poetry, drama, criticism, and essays. However, *belles-lettres literature* has come to mean light, artificial writing and essays extolling the beauties of literature.

Belleville, city (1971 pop. 35,128), SE Ont., Canada, on Lake Ontario. Machinery, automotive accessories, optical lenses, and cheddar cheese are made there. Belleville is the seat of Albert College and the Ontario School for the Deaf.

Belleville 1 City (1970 pop. 41,699), seat of St. Clair co., SW Ill., inc. 1819. Coal mines there produce more than 5 million tons a year. Belleville also has farm-related industries and a great variety of manufactures, including mining equipment, industrial furnaces, machinery, dies and castings, beer, stoves, and clothing. It is the seat of a junior college. Scott Air Force Base (est. 1917 for flight instruction, now headquarters of the Military Air Transport Service) is to the northeast. 2 Town (1970 pop. 34,643), Essex co., NE N.J., on the Passaic River, settled c. 1680, set off from Newark 1839, inc. 1910. Electrical equipment, fire extinguishers, water pumps, and precision instruments are among its manufactures. John Stevens's boat, built there in 1798 for the run to New York, contained one of the country's first steam engines.

Bellevue (bēl'vyōō) 1 City (1970 pop. 19,449), Sarpy co., E Nebr., a suburb of Omaha, on the Missouri River, inc. 1855. It has a meat-packing plant. The oldest city in the state, Bellevue was a trading post in the early 1800s and the site of a Presbyterian Indian mission in the 1840s and '50s. The Strategic Aerospace Museum is in the city. 2 Borough (1970 pop. 11,586), Allegheny co., SW Pa., a residential suburb of Pittsburgh, on the Ohio River, settled 1802, inc. 1867. 3 City (1970 pop. 61,102), King co., W Wash., opposite Seattle on Lake Washington, inc. 1953. Concrete and gravel, control systems, food products, and electronics parts are manufactured there. It is connected with Seattle by two four-lane floating bridges. A junior college is there.

Bellevue Hospital, municipal, in New York City. Bellevue developed from a "Publick Workhouse and House of Correction" commissioned in 1734. The establishment changed sites several times before 1811, when the site upon which it now stands was purchased. In 1860 the Bellevue Hospital Medical College, the first of its kind in the United States, was founded. The first nurses' training school in the United States was established there in 1873 and grew into one of the best-known nursing schools in

the nation. The largest U.S. city hospital, Bellevue is a noted psychiatric therapy and research center. Other programs of note include radiation therapy and physical and occupational rehabilitation programs. Until 1968, Bellevue was affiliated with the medical schools of Columbia Univ. (from 1882), New York Univ. (1882), and Cornell Univ. (1898), in that year Columbia and Cornell withdrew, leaving the hospital in sole affiliation with the New York Univ. Medical Center. See Page Cooper, *The Bellevue Story* (1948).

Bellflower, city (1970 pop. 51,454), Los Angeles co., S Calif.; inc. 1957. It is mainly residential with some light industry.

bellflower or **bluebell**, name commonly used as a comprehensive term for members of the Campanulaceae, a family of chiefly herbaceous annuals or perennials of wide distribution, characteristically found on dry slopes in temperate and subtropical areas. Members of the largest genus (*Campanula*), predominantly of the Northern Hemisphere, are called campanulas, bellflowers (for the delicate, bell-shaped blossoms), or bluebells (for the prevailing color of the flowers). Among the most popular cultivated species are the harebell, or bluebell of Scotland (*C. rotundifolia*), native to Eurasia and North America, and the Canterbury bells (*C. medium*), native to S. Europe. (The names bluebell and harebell are also used for *Scilla nonscripta* of the lily family.) Venus's looking-glass (genus *Specularia*) is found in the Mediterranean area and throughout North America. The giant bellflower (*Ostrowskya magnifica*), native to central Asia, attains a height of 8 ft (2.4 m); it is cultivated in the Puget Sound region. The family Lobeliaceae (lobelia family) is sometimes grouped with the bellflower family as a single taxonomic unit. The bellflower family is classified in the division MAGNOLIOPHYTES, class Magnoliopsida, order Campaniales.

Bell Gardens, city (1970 pop. 29,308), Los Angeles co., S Calif., a suburb of Los Angeles, inc. 1961. Manufactures include paper products and electrical equipment.

Belli, Giuseppe Gioacchino (jōōzēp'pā jōāk-kē'nō bēl'ī), 1791-1863, Italian poet. Born in Rome into poverty, Belli earned his living as a government clerk. He drew from his knowledge of plebeian life in writing more than two thousand humorous and satirical sonnets. Belli described the vast panorama of Roman society in colorful dialect. His poetry is noted for its vigorous realism. Little known outside Rome, Belli's work was not published during his lifetime.

belligerency (balī'arənsē), in international law, status of parties legally at war. Belligerency exists in a war between nations or in a civil war if the established government treats the insurgent force as if it were a sovereign power. The rules of international law as formulated at the HAGUE CONFERENCES require that belligerency between states be preceded by an absolute declaration of war or an ultimatum prescribing the terms on which the issuing power will refrain from war. When belligerency has been established, the relations between the warring powers are determined by the laws of war (see WAR LAWS). In civil wars if the insurgent force is granted belligerency rights, neutral nations generally abstain from supplying or helping either the established government or its opponent. An example of this practice is found in the NEUTRALITY proclamations issued by European powers in the American Civil War. Neutral nations may refuse to recognize the belligerency of an insurgent, however, and in this way preserve the right to claim any damages that may accrue against the established government for having failed to suppress the rebellion without delay. Under its charter, the United Nations recognizes as legitimate only wars that are fought in self-defense, or for the collective enforcement of the UN Charter. All other wars are regarded as illegal acts of aggression. The United Nations also considers civil wars as threatening to international peace, and, when possible, takes measures to end such hostilities (e.g., Kashmir, Palestine, Korea, Congo, Cyprus). See W. L. Gould, *An Introduction to International Law* (1957).

Bellingham 1. Town (1970 pop. 13,967), Norfolk co., S Mass., in a farm region, inc. 1719. 2. City (1970 pop. 39,375), seat of Whatcom co., NW Wash., a port of entry on Bellingham Bay, one of the best landlocked harbors on the Pacific coast, near Canada, inc. 1904. It is an important shipping point for lumber, pulp, paper, and canned and frozen fruit. Settled in 1852 as Whatcom, it merged with three adjoining towns to form Bellingham in 1903. Western Washington State College, Bellingham Technical

School, and Whatcom Museum of History and Art are in the city, which also has many scenic parks. An Indian reservation is nearby, and Moran State Park is on Orcas Island in Bellingham Bay.

Bellini (bēl-lē'nē), illustrious family of Venetian painters of the Renaissance. **Jacopo Bellini** (yā'-kōpō), c. 1400-1470, was a pupil of Gentile da Fabriano. He worked in Padua, Verona, Ferrara, and Venice. Many of his greatest paintings, including the enormous *Crucifixion* for the Cathedral of Verona, have disappeared. Several of his Madonnas (Uffizi, Louvre, Academy, Venice) are still extant. Jacopo's sketches in two notebooks (Louvre and British Mus.) are his most important legacy. They reveal a variety of interests, including problems of perspective, landscapes, and antiquity. His son **Gentile Bellini** (jāntē'lā), 1429-1507, studied with him and with Mantegna, working in Padua and then in Venice. He excelled in portraiture and in depicting ceremonial processions. His paintings, such as *The Procession in the Piazza of San Marco* and *The Miracle of the True Cross* (both Academy, Venice), are valued for their faithful representation of contemporary Venetian life. In 1479 Gentile was sent by the state to the court of Muhammad II in Constantinople. Subsequently an Oriental flavor appeared in several of his paintings, including the portrait of Muhammad II (National Gall., London), the portrait of a Turkish artist (Gardner Mus., Boston), and *St. Mark Preaching at Alexandria* (Brera, Milan). The last was completed by his brother, **Giovanni Bellini** (jōvān'nē), c. 1430-1516, who was first active in Padua where he worked with his father and brother. Also influenced by Mantegna, who became his brother-in-law in 1454, Giovanni painted the *Agony in the Garden* (National Gall., London), the *Crucifixion* (Correio Mus., Venice), and several Madonnas (Philadelphia Mus. and Metropolitan Mus.). Whereas Mantegna and Jacopo and Gentile Bellini were known chiefly as admirable draftsmen, Giovanni developed another style. His sumptuous coloring and fluent, atmospheric landscapes had a great effect upon Venetian painting, especially upon his pupils Giorgione and Titian. He created several imposing altarpieces, best known are those of the Frari and San Zaccaria in Venice and the *St. Job* (now in the Academy, Venice). Other examples of his art are several fine portraits such as the *Doge Loredano* (National Gall., London). He painted *St. Francis in Ecstasy* (Frick Coll., New York City) and *St. Jerome* (National Gall. of Art, Washington, D.C.), as well as some allegorical fantasies such as the *Restello* series (Academy, Venice). He also created mythological scenes, including *The Myth of Orpheus* and *The Feast of the Gods* (both National Gall. of Art, Washington, D.C.). The zestful *Feast*, one of his last pictures, was painted in 1514 for Isabella d'Este, with finishing touches added by Titian. See Giles Robertson, *Giovanni Bellini* (1968). Hans Tietze, *The Drawings of the Venetian Painters* (1944, repr. 1970).

Bellini, Vincenzo (vēnchān'tsō bēl-lē'nē), 1801-35, Italian opera composer. He acquired his musical training from his grandfather and father, and began composing religious and secular music in his childhood. His first opera, *Adelson e Salvini*, was successfully performed in 1825. His most celebrated works are the operas *La Sonnambula* and *Norma* (both 1831). In their profusely melodic style they exemplify the bel canto tradition of the 18th cent., and their roles demand great virtuosity of the singers. Bellini's last opera, *I Puritani* (1835), was influenced by the dramatic style of French grand opera.

Bellinzona (bēl-lēntō'nā), town (1970 pop. 16,979), capital of Ticino canton, S. Switzerland, on the Ticino River, near the Italian border. It is a picturesque old town and a hub of transalpine traffic. Beverages and linoleum are produced. Possibly a Roman settlement, Bellinzona belonged at times to Lombardy, Como, Milan, France, and the Four Forest Cantons. In 1798 it became the capital of the Bellinzona canton under the HELVETIC REPUBLIC and the capital of Ticino in 1803. The town is dominated by three castles (13th-15th cent.) of the dukes of Milan.

Bell Island, island (1971 pop. 658), SE N.F., Canada, in Conception Bay. The island is 6 mi (9.7 km) long and 3 mi (4.8 km) wide. Its famous undersea iron mines were closed in 1966 after having been worked for 72 years.

Bellman, Carl Michael (mē'kāl bēl'mān), 1740-95, Swedish poet, protégé of Gustavus III. His early poetry was chiefly religious. His dithyrambic odes in *Fredmans Epistlar* (1790) and *Fredmans Sångar* (1791) include bacchanals, pastorals, and comic pieces. Sometimes Bellman wrote music for his

verse, but more often he borrowed French melodies and music from contemporary plays. See H. W. Van Loon and Grace Castagnetta, *The Last of the Troubadours* (1939).

Bellmawr (bēlmār'), residential borough (1970 pop. 15,618), Camden co., SW N.J., inc. 1926.

bell metal: see BRONZE.

Bellmore, uninc. residential town (1970 pop. 18,431), Nassau co., SE N.Y., on SW Long Island.

Bello, Andrés (āndrās' bā'yō), 1781-1865, South American intellectual leader, b. Venezuela. In 1810 he was sent with Bolívar on a mission to London, where he remained for 19 years as a diplomat, teacher, and writer. Politically, he was influenced by Jeremy Bentham. He reflected a new attitude in Hispanic-American letters, initiating the movement for intellectual independence from Europe. Called to a governmental post in Chile, he soon became a leader in Chilean education and reorganized the university at Santiago, becoming (1843) its rector. Many of his learned works, such as *Gramática de la lengua castellana* (1847) and *Principios de derecho internacional* (1844, revised from an earlier work), became textbooks, and he was author of a code of civil law for Chile. He wrote many poems in the neoclassical style.

Belloc, Hilaire (Joseph Hilaire Pierre Belloc) (bēl'ōk), 1870-1953, English author, b. France. He became a British subject in 1902, and from 1906 to 1910 was a Liberal member of Parliament for South Suffolk. Poet, essayist, satirist, and historian, he wrote from the Roman Catholic viewpoint. Among his works are *The Bad Child's Book of Beasts* (1896), *The Path to Rome* (1902), *Marie Antoinette* (1910), *The Jews* (1922), *The Cruise of the Nona* (1925), and *Napoleon* (1922). He was a close friend of G. K. Chesterton and with him founded the *New Witness*, a weekly political newspaper. Christened "the Chesterbelloc" by G. B. Shaw, the two were the inventors and propagators of distributism, a medieval, anticapitalist, and anti-Fabian socialist philosophy.

Bellmont, Richard Coote, earl of, 1636-1701, colonial governor of New York, Massachusetts, and New Hampshire, b. Ireland. He arrived (1698) in New York at a time when a more unified administration of colonial affairs was being attempted. His administration was uneventful, but his endeavors to enforce the trade laws and to suppress piracy brought him the enmity of the aristocratic party in New York. He was noted for his arrest of William Kidd, whom he had originally commissioned as a pirate hunter.

Bellona: see MARS.

Bellotto, Bernardo (bērnār'dō bāl-lōt'ō), 1720-80, Venetian architectural and landscape painter, also called Canaletto, after his uncle and teacher CANALETO. His paintings, at first resembling those of his master, are numerous and may be seen in most of the leading European museums. They usually depict scenes in the cities in which Bellotto resided. In 1747 he was appointed court painter at Dresden and in 1770 painter to Stanislaus II at Warsaw. See Stefan Kozakiewicz, *Bernardo Bellotto* (tr., 2 vol. 1972).

Bellow, Saul, 1915-, American novelist, b. Lachine, Que., grad. Northwestern Univ., 1937. Born of Russian-Jewish parents, he grew up in the slums of Montreal and Chicago. His writings, reflecting an intellectual and moral approach to life, are marked by a concern for the struggles of the individual in an indifferent society. His best-known novels include *The Adventures of Augie March* (1953), *Herzog* (1964), and *Mr. Sammler's Planet* (1970). Among his other works are the novels *Dangling Man* (1944), *The Victim* (1947), *Seize the Day* (1956), *Henderson the Rain King* (1959), and a play, *The Last Analysis* (1964). See studies by K. M. Opdahl (1967), J. J. Clayton (1968), and Irving Malin (1969).

Bellows, George Wesley, 1882-1925, American painter, draftsman, and lithographer, b. Columbus, Ohio, son of an architect and builder. In his senior year he left Ohio State Univ. to study painting under Robert Henri in New York City. Bellows never visited Europe and seemed uninfluenced by the currents affecting his European contemporaries, but he actively supported independent art movements in New York City. His work has a direct, self-conscious realism and has survived because of its humanity and sincere conviction. *Forty-two Kids* (Corcoran Gall., Washington, D.C.), *Up the River* (Metropolitan Mus.), *Stag at Sharkey's* (Mus. of Art, Cleveland), and a portrait of the artist's mother (Art Inst., Chicago) are characteristic paintings. Bellows revived lithography in the United States, and his prints are as important as his paintings. *Billy Sunday*, *Dance in a Mad House*, and *Dempsey and Firpo* are

American classics. He was a noted teacher at the Art Students League, New York City. See collection of his lithographs by Emma S. Bellows (1927), studies by Peyton Boswell, Jr. (1942), C. H. Morgan (1965), and M. S. Young (1973).

Bellows, Henry Whitney, 1814-82, American clergyman, b. Boston. From 1839 until his death he was pastor of the First Congregational Society, Unitarian (later Church of All Souls) in New York City. Bellows organized and administered the U.S. Sanitary Commission, which served the sick and wounded of the Civil War. He was one of the founders of Antioch College. Among his books are *The Treatment of Social Diseases* (1857) and *Restatements of Christian Doctrine* (1860).

bellows, expandable, gas-tight chamber used to pump or store a gas. One of the simplest and most familiar types of bellows is the manual one used for providing a forced draft to a fire. The expandable chamber consists of a leather bag with pleated sides. The bag is fixed between handles in such a way that they can be used to make it expand and contract. The inlet and outlet vents are provided with valves so that air must enter through the first and leave through the second. The device thus comprises a simple air pump. One of the major uses of the bellows has been to provide a draft for fires that are used to help extract a metal from its ore. In a device such as an aneroid barometer a small bellows is filled with a known amount of gas that expands and contracts in response to changes in external pressure. This small bellows is coupled to some form of indicating or recording device. Another use of the bellows has been to provide wind for such musical instruments as the accordion and older pipe organs.

Belluno (bĕl-lōō'nō), city (1971 pop. 34,520), capital of Belluno prov., Venetia, NE Italy, on the Piave River at the foot of the Dolomites. It is an agricultural and manufacturing center. A Roman town, it later belonged to various lords and was a free commune before voluntarily submitting to Venetian rule (1404-1797). The city has a 16th-century cathedral with a beautiful baroque bell tower and a Renaissance city hall.

Belluschi, Pietro (pyĕ'trō bālōō'skĕ), 1899-, Italian-American civil engineer, designer, and architect. Belluschi served as dean and professor at the Massachusetts Institute of Technology's school of architecture and planning (1951-65). He has designed numerous residential and office buildings, including the Equitable Building in Portland, Ore. (1948) and the Juilliard School of Music, part of the LINCOLN CENTER FOR THE PERFORMING ARTS in New York City. The latter reveals an interesting use of dark glass.

Bellville, town (1970 pop. 48,494), Cape Prov., 5 South Africa, a suburb of Cape Town. Situated in a major wheat-growing region, the city ships wheat and manufactures processed lumber and synthetic textiles. Bellville was founded in 1861 and named for Charles Bell, surveyor general of Cape Colony (1848-72). The Univ. of the Western Cape and Peninsula Technical College there are primarily for Coloured students.

Bellwood, village (1970 pop. 22,096), Cook co., NE Ill., inc. 1900. Among its manufactures are electrical equipment and metal and asphalt products.

Belmondo, Jean-Paul (zhaN-pōl bĕlmōNdō'), 1933-, French film actor, b. Neuilly-sur-Seine. He was an amateur boxer before turning to acting. Belmondo first gained fame in *Breathless* (1960), playing a restless, flippant young hoodlum. His other films include *Moderato Cantabile* (1960), *That Man from Rio* (1964), *Pierrot le Fou* (1965), *The Mississippi* (1968), *Borsolino* (1970), and *Stavisky* (1974).

Belmont. 1 City (1970 pop. 23,667), San Mateo co., W Calif., a residential suburb midway between San Francisco and San Jose, laid out 1851, inc. 1926. The College of Notre Dame (est. 1851) is there. 2 Town (1970 pop. 28,285), Middlesex co., E Mass., a residential suburb of Boston, settled 1636, inc. 1859. James Russell Lowell often visited the region.

Belmonte, Juan (hwan bĕlmōn'tā), 1892-1962, Spanish matador, b. Seville. He is generally considered the greatest matador of all time, as remarkable for the poetry of his motion in the bullfight as for his speed and dexterity. He is said to have "invented" modern bullfighting with his daring, revolutionary style, which kept him almost constantly within a few inches of the bull. Between 1913 and 1936, when he finally retired (he had retired twice before, in 1922 and 1934), he was gored and slashed innumerable times. In 1919 he fought 109 corridas, a record number. His years of rivalry (1914-20) with the great JOSÉ LITO, known as the Golden Age of Bull-

fighting, ended with José Lito's fatal goring. See his autobiography (as told to Manuel Chaves Nogales, tr. 1937), biography by Henry P. B. Baerlein (1934).

Belo Horizonte (bāl'ōōrēzōN'tī) [Port. = beautiful horizon], city (1970 pop. 1,235,001), capital of Minas Gerais state, E Brazil. The distributing and processing center of a rich agricultural and mining region, Belo Horizonte is the nucleus of a burgeoning industrial complex, its chief manufactures are steel, steel products, and textiles. Gold, manganese, and precious stones (including diamonds) of the surrounding region are processed in the city. Belo Horizonte is also a transportation hub, with direct highway connections with Brasília, São Paulo, and Rio de Janeiro. One of the most important inland cities of the republic, it was Brazil's first planned metropolis and was built (1895-97) to replace Ouro Preto as the state capital. With its wide, tree-lined avenues, skyscrapers, and spacious parks, and with its beautiful surroundings and bracing climate, Belo Horizonte is a fashionable resort. It is also a leading cultural center, with a historical museum, three universities, and numerous libraries and sports stadiums. The Chapel of São Francisco, with paintings by Cândido Portinari, is famous.

Beloit (bĕlōit'), city (1970 pop. 35,729), Rock co., 5 Wis., on the Rock River, inc. 1846. It lies in an agricultural area. Beloit's manufactures include shoes, papermaking machinery, diesel engines, desalinization equipment, electrical equipment, and pumps. A trading post was established on the site in 1824 for trade with the Winnebago Indians, and in 1837 the first permanent settlers arrived from New England. Beloit College, founded in 1846, is in the city. Roy Chapman Andrews, the U.S. naturalist and explorer, was born in Beloit.

Belon, Pierre (pyĕr bālōN'), 1517-64, French naturalist. Besides an account of his travels in the Middle East, he wrote monographs on fishes and other aquatic animals, on conifers, and on birds. In *L'Histoire des oyseaux* (1555) his comparison of the skeletons of birds and man foreshadows comparative anatomy.

Belopolsky, Aristarkh Apollonovich (ārī'stārkh āpālōn'āvich byalōpōl'skĕ), 1854-1934, Russian astrophysicist, grad. Univ. of Moscow (1877). He worked at the Moscow Observatory and from 1888 at the Pulkovo Observatory, where he became vice director in 1908. He was among the first Russians to study the sun and stars spectroscopically. He discovered important features of pulsating stars and studied the rotation of Jupiter and of Saturn's rings. A tireless observer, he determined the nature of various binary star systems and the radial velocities of many stars.

Beloretsk (byĕlōrĕtsk'), city (1969 est. pop. 66,000), W Siberian USSR, in the Urals and on the Belaya River. One of the oldest industrial cities of the Urals region, Beloretsk is a metallurgical center, with industries that produce steel wire and cables. The city was founded in 1762.

Belorussia (byĕ'lārōō'sĕā) or **Belorussian Soviet Socialist Republic**, constituent republic (1970 pop. 9,003,000), c. 80,150 sq. mi. (207,600 sq. km), W central European USSR. MINSK is the capital, other important cities are Gomel, Vitebsk, Mogilev, Bobruysk, Grodno, and Brest. Belorussia borders on Poland in the west, on the Lithuanian and Latvian republics in the north, on the Russian Soviet Federated Socialist Republic in the east, and on the Ukraine in the south. Much of Belorussia is a hilly lowland, drained by the Dnepr, Western Dvina, and Neman rivers. The climate is moderate humid continental, with warm summers and cold winters. More than one third of the land is covered with peat and other swampy soils, notably in the Pripyat Marshes in the south; peat, the republic's most valuable mineral resource, is used for fuel, for fertilizer, and in the chemical industry. Belorussia also has deposits of limestone, clay, sand, chalk, dolomite, phosphorite, and rock and potassium salt. Forests cover another third of the land, and lumbering is an important occupation. Potatoes, flax, hemp, sugar beets, rye, oats, and wheat are the chief agricultural products. The main branches of industry produce machinery, motor vehicles, chemicals, textiles, and electrical equipment. About 80% of the population are Belorussians, Russians, Poles, Jews, Ukrainians, and Lithuanians are the republic's largest minorities. Eastern Orthodoxy is the predominant religion, but there are some Roman Catholics. The region now constituting Belorussia was colonized by East Slavic tribes from the 5th to the 8th cent. It fell (9th cent.) under the sway of Kiev and was later (12th cent.) subdivided into several Belorussian principalities forming part of the Kievan state. Kiev's destruction by the

Mongols in the 13th cent. facilitated the conquest (early 14th cent.) of Belorussia by the dukes of Lithuania. The region became part of the grand duchy of Lithuania, which in 1569 was merged with Poland. The large Jewish population (later decimated by the Germans during World War II) settled in Belorussia in the 14th cent. The region flourished under Lithuanian rule, but after the Polish-Lithuanian union Belorussia lost its relative importance, and its ruling classes became thoroughly polonized. Through the Polish partitions of 1772, 1793, and 1795, all Belorussia passed to the Russian Empire. It suffered greatly during the wars (16th-18th cent.) between Poland and Russia and in the Napoleonic invasion of 1812 (during which it was laid waste by retreating Russian forces). Great poverty under Russian rule, notably among the Jews, led to mass emigration to the United States in the 19th cent. A battlefield in World War I and in the Soviet-Polish War of 1919-20, Belorussia experienced great devastation. In March, 1918, the Belorussian National Rada in Minsk proclaimed the region an independent republic, but in Jan., 1919, the Soviet government proclaimed a Belorussian Soviet Socialist Republic at Smolensk, and soon the Red Army occupied all of Belorussia. In 1921 the Treaty of Riga, which ended the Soviet-Polish War, awarded W Belorussia to Poland. The eastern and larger part formed the Belorussian SSR, which joined the USSR in 1922. In Sept., 1939, the Soviet army overran W Belorussia and incorporated it into the Belorussian SSR. Occupied by the Germans during World War II, Belorussia was one of the most devastated areas of the USSR. In 1945 its western border was adjusted slightly in favor of Poland, but the 1939 frontier remained essentially unchanged. The republic has a separate seat in the United Nations. Its name also appears as Byelorussia or Bielorussia, and it is sometimes called White Russia.

Belovo (byĕlō'va), city (1970 pop. 108,000), S central Siberian USSR. One of the largest industrial centers of the Kuznetsk Basin, it has a zinc plant and a thermal power station. There are coal mines nearby.

Belphegor: see BAAL-PEOR.

Belshazzar (bĕlshāz'ār), according to the Bible, son of NEBUCHADNEZZAR and last king of Babylon. Dan. 5.1. At his feast, handwriting appeared on the wall, and Daniel interpreted it as a prophecy of doom, that night Babylonia fell to Cyrus. Dan. 5.

Belt, Great, and Little Belt, straits: see STORE BÆLT, strait, Denmark.

belt, girdle or band worn around the body, originally to confine loose garments. Later the girdle became a decorative accessory and was used to carry belongings. The Greeks and Romans wore ornamental cords and bands of many materials, including metal. The medieval belt displayed brilliant goldwork and gems, it carried the purse, dagger, sword, and other personal belongings of the wearer. Since then the belt has varied in style and importance. It has been symbolic of strength, of alertness, and of integrity. In folklore belts have often been accorded supernatural power.

Beltshazzar (bĕltshāz'ār), in the book of DANIEL, Babylonian name of the prophet Daniel.

Belfraffio, Giovanni Antonio: see BELTRAFFIO.

Beltrami, Eugenio (āōōjĕnyō bāltra'mē), 1835-99, Italian mathematician. He is famous for his work on non-euclidean geometry, electricity, and magnetism.

Beltville swine, two breeds of swine developed at the agricultural research center of the U.S. Department of Agriculture in Beltville, Md. The breeds are designated Beltville No. 1 and Beltville No. 2. Beltville No. 1 was developed by crossing Danish Landrace and Poland China swine. It is black in color with uniformly distributed white markings. Beltville No. 2 was developed from crosses using Danish Yorkshire, Duroc, Landrace, and Hampshire breeds. Its color is solid red with a white underline and occasional black spotting; its length is about the same as that of a Yorkshire.

beluga (bālōō'gā) or **white whale**, small, toothed northern WHALE, *Delphinapterus leucas*. The beluga may reach a length of 19 ft (5.8 m) and a weight of 4,400 lb (2,000 kg). It has a small, round head, with a short, broad, beaklike snout, and a flexible neck; its flippers are short, broad, and rounded, and it lacks a dorsal fin. It produces a variety of noises and is sometimes called a sea canary. The young are born with dark fur but become almost pure white in maturity. Belugas winter in the Arctic Ocean, feeding upon crustaceans, fish, and squid; they are often found in groups of several hundred individuals. They mate in spring, and in summer they enter

northern rivers. The young are born after a gestation period of 14 months, one calf every second year. The beluga is hunted by the Eskimo for food and by commercial whalers for its hide, which is known as porpoise hide. Beluga is also the common name of the largest of the STURGEONS. Beluga whales are classified in the phylum CHORDATA, subphylum Vertebrata, class Mammalia, order Cetacea, family Monodontidae.

Belvedere (bĕl'vĕdĕr, Ital. bĕlvĕdĕ'rĕ), court of the Vatican named after a villa built (1485–87) for Innocent VIII. The villa was decorated with frescoes by Pinturicchio and others; a chapel painted by Mantegna was demolished when the villa was made part of the Museo Pro-Clementino at the end of the 18th cent. The Belvedere court, connecting the villa and the Vatican, was designed (1503–4) by Bramante for Julius II to include an architectural garden, a permanent theater, a museum building, and a statue court. The Laocoön, discovered in 1506, was placed in the statue court; in 1511 the Apollo Belvedere (see under APOLLO, in Greek religion) was installed in a special niche. When Bramante died in 1514, only a portion of the Belvedere was completed; many modifications were made under a succession of architects including Giuliano Sangallo, Raphael, Peruzzi, and Antonio Sangallo. Now a museum, the Belvedere still contains the Laocoön and the Apollo as well as other rare works of classical antiquity. See study by James S. Ackerman (1954).

Belvidere (bĕl'vīdĕr'), city (1970 pop. 14,061), seat of Boone Co., N Ill., on the Kishwaukee River, inc. 1847. It is a farm trade center with food-processing industries, machine shops, and a huge automobile assembly plant.

Bely, Andrei (andrĕ' byĕ'lĕ), pseud. of Boris Nikolayevich Bugayev, 1880–1934, Russian writer. A leading SYMBOLIST, he had a close but stormy relationship with Aleksandr BLOK. His poems are collected in the four-volume *Symphonies* (1901–8), his best prose is in the novels *The Silver Dove* (1910) and *Petersburg* (1912, tr. 1959) and in *Kotik Letayev* (1920), an autobiographical novel in the manner of James Joyce. He was an experimenter—his involved style often mixes realism and symbolism in complex forms. In his later years Bely was influenced by Rudolph STEINER's anthroposophy. He accepted the Soviet regime, but his works were not well received by Soviet critics. By the mid-1970's Western critics had discovered Bely, and several proclaimed him the most important Russian writer of the 20th cent. In 1974 new translations of *The Silver Dove* and *Kotik Letayev* were published in the United States, and a section of the International Slavic Conference, held in Banff, Canada, was devoted to Bely's works.

Belzoni, Giovanni Battista (jōvĕn' nĕ bāt-tĕs'tā bĕl'sōn'), 1778–1823, Italian archaeologist. He lived (1803–12) in England and there invented a hydraulic machine, which he introduced into Egypt in 1815. Becoming interested in archaeology, he opened (1817) the rock temple of Abu-Simbel, and he discovered (1817) the tomb of Seti I at Thebes. His discoveries are recorded in his *Narrative* (1820). See biography by Stanley Mayes (1961).

Bembo, Pietro (pyĕ'trō bĕm'bō), 1470–1547, Italian humanist, cardinal of the Roman Catholic Church. A favorite of the Medici, he was secretary to Pope Leo X and was made a cardinal by Paul III. Bembo was for many years the arbiter of Italian letters, insisting that classical traditions be preserved. He was responsible for editions of Petrarch and Dante and helped establish the language of Tuscany as the standard literary Italian. He wrote the *History of Venice* (1551), a disquisition on platonic love, *Gli Asolani* (1505, tr. 1954), inspired by Plato's *Symposium*, a book of lyric verse (Rime, 1530) in Latin and Italian, and *Prose della volgar lingua* [prose in the vernacular] (1525).

Bemidji (bami'jĕ), city (1970 pop. 11,490), seat of Beltrami Co., N central Minn., on lakes Bemidji and Irving, through which flows the Mississippi River, inc. 1896. It is in a summer and winter resort and sport fishing area; tourism is the major industry. The city is also a trade and marketing center for the dairy farms of the region, and has lumber, wood-product, and boat manufactures. On the lakeshore stands an 18-ft (5.5-m) figure of Paul Bunyan and his ox. Bemidji State College is in the city.

Bemis, Samuel Flagg, 1891–1973, American historian, b. Worcester, Mass. He received his Ph.D. from Harvard in 1916 and taught history at various schools before becoming Farnum professor of diplomatic history at Yale (1935). In 1945 he was appointed Sterling professor of history and interna-

tional relations. Considered one of the nation's leading diplomatic historians, he twice received the Pulitzer Prize, once for history, *Pinckney's Treaty* (1926, rev. ed. 1960), and once for biography, *John Quincy Adams and the Foundations of American Foreign Policy* (1950). His other works include *Jay's Treaty* (1923, 2d ed. 1962), *The Diplomacy of the American Revolution* (1935), *A Diplomatic History of the United States* (1936, 5th ed. 1965), *The Latin American Policy of the United States* (1943), and *John Quincy Adams and the Union* (1956). He was the editor of *The American Secretaries of State and Their Diplomacy* (18 vol., 1963–72).

Bemis Heights, battle of: see SARATOGA CAMPAIGN

Ben, Levite porter under David. 1 Chron. 15:18.

Ben-abinadab (bĕn-abĭn'adĕb) see ABINADAB 4.

Benaiah (bĕnĕ'ya) 1 One of David's warriors, faithful in David's old age to Solomon. 2 Sam. 8:18, 20:23, 23:20–23, 1 Kings 1:2, 1 Chron. 11:22–25, 18:17, 27:5, 6. 2 Warrior under David. 2 Sam. 23:30, 1 Chron. 11:31, 27:14. 3 Levite. 1 Chron. 15:18, 20:16, 5. 4 Priest. 1 Chron. 15:24, 16:6. 5 Simeonite. 1 Chron. 4:36. 6 Asaphite. 2 Chron. 20:14. 7 Levite of the reign of Hezekiah. 2 Chron. 31:13. 8 Father of Pelatiah. Ezek. 11:1, 13:9, 10, 11, 12. Jews who had married foreign wives. Ezra 10:25, 30, 35, 43.

Benalcázar or **Belalcázar**, Sebastián de (sábĕstyan' dĕ bĕnĕlká'thār, bĕlĕl-), c.1479–1551, Spanish conquistador. After accompanying Columbus on his third voyage (1498), Benalcázar served in Darien and Nicaragua before joining Francisco PIZARRO in the conquest of Peru (1532). Setting out from PIURA, he forestalled Pedro de Alvarado in support of Diego de ALMAGRO, the elder, and entered (1533) the Indian stronghold of Quito, founded Guavaquil, and marched (1535) into SW Colombia in search of EL DORADO. While in Colombia he founded Pasto and Cali. In 1539 he tried unsuccessfully to ally himself with FEDERMANN against JIMÉNEZ DE QUESADA. Journeying to Spain with them to settle accounts, Benalcázar returned (1541) as governor of Popayan prov. Between 1541 and 1548 he aided Vaca de Castro against Diego de Almagro, the younger, and then helped Nuñez Vela and Pedro de la Gasca against Gonzalo Pizarro. For executing the leader of a neighboring province that he claimed as his, Benalcázar was tried (1550) and convicted. On his way to appeal to the Council of the Indies he died of fever in Cartagena.

Ben-ammi (bĕn-ām'ī), son of Lot by his younger daughter, eponym of the Ammonites. Gen. 19:38.

Benares, India see VARANASI

Benavente y Martínez, Jacinto (hāthĕn'tō bĕn'āvēn'tā ē mār'tĕnĕth), 1866–1954, Spanish dramatist, b. Madrid. He was awarded the 1922 Nobel Prize in Literature. His best-known play is *Los intereses creados* (1907, tr. *Bonds of Interest*, 1917), a farce written on the pattern of the Italian commedia dell'arte. In 1916 he wrote a second part to this play, *La ciudad alegre y confiada* [the gay and confident city]. *La malquerida* (1913, tr. *The Passion Flower*, 1920), on the Phaedra theme, was popular with the public and the critics. His plays fall into four classes: social satires, psychological dramas, children's plays, and allegorical-morality plays. He was at his best in sparkling satires of aristocratic and upper middle-class life. See study by Marcelino Peñuelas (tr. 1969).

Ben Bella, Ahmed (ākhmĕd' bĕn bĕl'ĭā), 1919–, Algerian statesman. After World War II he joined the Algerian nationalist movement and soon became a leader of its terrorist faction. He later (1952–56) served as director of the movement. Imprisoned (1956–62) for his activities, he became Algeria's first premier after independence was declared in 1962. In 1965, Ben Bella's government was toppled in a coup led by Houari BOUMÉDIENE.

Benbow, John (bĕn'bō), 1653–1702, English admiral. Some of the stories of his exploits seem to be legendary, but he did command the fleet and successfully fight the French at Saint-Malo (1693) and Dunkirk (1696) and the Spanish in the West Indies (1698). In 1702 he engaged in a four-day running fight with a French fleet in the Caribbean off Santa Marta. During this battle his flagship, the *Breda*, was deserted by all but one of his fleet, and Benbow himself was fatally wounded. Several of the disobedient captains were later court-martialed and shot.

Benchley, Robert Charles, 1889–1945, American humorist, b. Worcester, Mass., grad. Harvard, 1912. He was drama critic of *Life* (1920–29) and of the *New Yorker* (1929–40). Benchley was known for a series of short satirical films that he wrote, directed, and acted in himself. His books, which are rich in anecdotes and clever interpretations of everyday

situations, include *Of All Things* (1921), *My Ten Years in a Quandary* (1936), and *Benchley beside Himself* (1943).

Bend, city (1970 pop. 13,710), seat of Deschutes Co., W. central Oregon, on the Deschutes River, at the eastern foot of the Cascade Range, inc. 1904. Lumbering is the primary industry, and tourism is also important. It is the seat of a junior college and the headquarters for Deschutes National Forest. A U.S. silviculture laboratory is in Bend, and nearby pumice fields offer moon-like terrain for a lunar base research facility, which carries on study and training projects there.

Benda, Georg Franz (gĕ'ōrkh frānts bĕn'dā), 1722–95, Bohemian composer. Benda, whose Bohemian name was Jiří Antonín Benda, came from a musical family that moved to Prussia in 1742. His brother, the violinist Franz (in Bohemian, František) Benda, became a favorite of Frederick II. Benda is best known for his melodramas—dramatic works in which a speaking part is set against orchestral music—and singspiels.

Benda, Julien (zhūlyān' bān'dā'), 1867–1956, French novelist and critic. A humanist and rationalist, he led a sustained attack against the romantic philosophy of his time, especially that of Bergson. The novel *The Yoke of Pity* (1912, tr. 1913) won him recognition. In *The Treason of the Intellectuals* (1927, tr. 1928) he accused his contemporary thinkers of abandoning truth and succumbing to political passions. *La Jeunesse d'un clerc* (1936) and *Un Régulier dans le siècle* (1938) recapitulate his intellectual life.

Benda, Wladyslaw Theodor (vlād'islāf), 1873–1948, Polish American painter and illustrator, b. Poland. He studied at the Art Academy in Cracow and in Vienna, San Francisco, and New York City. In addition to decorative works and many illustrations for magazines and books, he created modern masks, used in the theater, they were first seen in Greenwich Village Follies (1920). Benda wrote *Masks* (1945).

Ben Day, or Benday, process: see PRINTING

Bendery (bĕndĕ'yĕrĕ), city (1969 est. pop. 68,000), SW European USSR, in Moldavia, a port on the Dniestr River. It is a rail hub and a trade center for timber, fruits, and tobacco. Industries include the production of foodstuffs, electrical apparatus, footwear, and textiles. Historically important as the gateway of Bessarabia, the city was founded on the site of a 14th-century Genoese colony that the Rumanians called Tigî. Captured from Moldavia by the Turks in 1538 and renamed Bendery, it became a fortress on the Dniestr. It was captured by Russia in 1812. Between the world wars, Bendery belonged to Rumania; it was transferred to the USSR in 1940 but was occupied by Rumanian troops from 1941 to 1944.

Bendigo (bĕn'dĭgō), city (1971 pop. 31,927), Victoria, SE Australia. Founded in 1851 during the gold rush, Bendigo was the center for the greatest goldfield in Victoria. Mining continues, but the city is now an industrial, railroad, and commercial center in a livestock and dairy-farming region. Textiles, bricks, and pottery are manufactured in Bendigo.

bends: see OXCOMPRESSION SICKNESS

Bene-herak (bĕ'nĕ-bĕ'rāk), town, central Israel, near Tel Aviv. Joshua 19:45. It was famous for its academy under Rabbi Akiba's direction; today it has six Talmudic academies. The name is also spelled Bene Herak.

Benedek, Ludwig von (lōōt'vĭkh fən bā'nĕdĕk'), 1804–81, Austrian general. Entering the army in 1822, he served in the suppression of the Polish insurrection of 1846, in the Austrian campaigns of 1848–49 in Italy and Hungary, and in the Italian War of 1859. In the Austro-Prussian War (1866), he reluctantly accepted, under imperial pressure, an appointment to command the army of the North, although he felt inadequately prepared to direct troops in the unfamiliar territory of Bohemia. He suffered a crushing defeat at the battle of Königgratz (Sadowa). After his court-martial was stopped by imperial command, von Benedek was permitted to retire to Graz, provided he would make no attempt to rehabilitate himself.

Benedetti, Giovanni Battista (jōvĕn' nĕ bāt-tĕs'tā bĕnĕdĕt'tĕ), 1530–90, Italian mathematician and physicist. An important forerunner of Galileo, Benedetti had diverse interests, including mechanics, music, hydrostatics, astronomy, astrology, and gnomonics (the science of sundials). His work on falling bodies, first outlined in 1552, helped lay the basis for the overthrow of Aristotelian physics in the 17th cent. Like Galileo, he held that bodies of the same

material fall through a given medium at the same speed, regardless of their weight. His most important scientific work is the *Diversarum speculationum* (1585).

Benedetti, Vincent (vāNsaN'), 1817–1900, French diplomat, b. Corsica, made a count by Napoleon III. He was ambassador to Prussia from 1864 to 1870. In an interview (1870) at Ems with King William I (later German emperor), he asked the king to disapprove formally and permanently the candidacy of a Hohenzollern prince for the Spanish throne. The episode was so altered in Bismarck's version of the EMS DISPATCH that it became an immediate cause of the Franco-Prussian War.

Benedetto da Majano (bānādēt'tō da maya'nō), 1442–97. Italian sculptor and architect of the Florentine school. His pulpits, altarpieces, and other church furniture are beautifully executed. Examples of his work are in Santa Croce and the Palazzo Vecchio, Florence, and in San Domenico, Siena. He completed the tomb of Mary of Aragon (Naples), begun by Antonio Rossellino.

Benedict, Saint, d. c. 547, Italian monk, founder of the BENEDICTINES, called Benedict of Nursia, b. Norcia (E of Spoleto), Italy. He went to Rome to study, then withdrew to Subiaco to live as a hermit, after three years he was renowned for his holiness. He started an establishment of monks, a set of cells of 13 monks each. This he finally left, and at MONTE CASSINO, in an old pagan holy place, he started the first truly Benedictine monastery. The product of Benedict's experience appears in the Rule of St. Benedict (in Latin), the chief rule in Western MONASTICISM, used always by Benedictines and by Cistercians as well. Its 73 chapters (with Prologue) are original, personal, and full of a spirit of common sense. They set forth the central ideas of Benedictine monasticism. St. Benedict's sister, St. Scholastica, was a religious also. Feast March 21. See St. Gregory I, *Life and Miracles of St. Benedict* (tr. by O. J. Zimmerman and B. R. Avery, 1969), Dom John Chapman, *Saint Benedict and the Sixth Century* (1929, repr. 1971), Paul Delatte, *The Rule of St. Benedict* (tr. 1950), Theodore Maynard, *Saint Benedict and His Monks* (1954), Leonard von Matt, *Saint Benedict* (1961).

Benedict XI, d. 1304, pope (1303–4), an Italian (b. Treviso) named Niccolò Boccasini, successor of Boniface VIII. Prior to his election he had been master general of the Dominican order. As pope he was able to conciliate many of the enemies Boniface had made, chiefly Philip IV of France, whose excommunication he rescinded. However, he would not yield on the excommunication of Boniface's assassins, Sciarra Colonna and Philip's emissary, Nogaret. The Colonna faction controlled Rome, and Benedict withdrew to Perugia, a prelude to the flight of the papacy to Avignon under Benedict's successor, Clement V, in 1309. Benedict was beatified in 1638.

Benedict XIII, antipope. See LUNA PEDRO DE.

Benedict XIV, 1675–1758, pope (1740–58), an Italian (b. Bologna) named Prospero Lambertini, successor of Clement XII. Long before his pontificate he was renowned for his learning. In 1728 he became a cardinal. He was much interested in the Eastern churches and began (with the bull *Etsi pastoralis*, 1742) the modern papal legislation that favors the Eastern rites and prohibits activity that is likely to Latinize them. He beautified Rome and restored monuments, and he was munificent to Bologna. He patronized learning and welcomed scholars and artists to his court. He denounced the cruelty to the Indians in the disbanding of the Paraguay REDUCTIONS. He was succeeded by Clement XIII.

Benedict XV, 1854–1922, pope (1914–22), an Italian (b. Genoa) named Giacomo della Chiesa, successor of Pius X. He was made archbishop of Bologna in 1907 and cardinal in 1914, two months before his election as pope. His conduct in World War I was one of the strictest neutrality, and he had the respect of all belligerents. He originated several proposals for peace. Benedict was lavish in charity toward war victims, and he founded the Vatican service for prisoners of war. During his pontificate France and England resumed diplomatic relations with the Holy See. He was succeeded by Pius XI. See biography by W. H. Peters (1959).

Benedict, Ruth Fulton, 1887–1948, American anthropologist, b. New York City, grad. Vassar, 1909, Ph.D. Columbia, 1923. She was a student and later a colleague of Franz Boas at Columbia, where she taught from 1924. She did fieldwork among American Indians and studied contemporary European and Asian cultures. Her works emphasize the con-

cepts of cultural configuration, national character, and the role of culture in individual personality formation. Her widely read books helped popularize the concept of CULTURE and attacked racism and ethnocentrism. She is the author of *Concept of the Guardian Spirit in North America* (1923), *Patterns of Culture* (1934), *Zuni Mythology* (1935), *Race Science and Politics* (rev. ed. 1943), and *The Chrysanthemum and the Sword: Patterns of Japanese Culture* (1946). A collection of her work and biographical data was edited by Margaret Mead under the title *An Anthropologist at Work* (1959, repr. 1966). See biography by Margaret Mead (1974).

Benedict Biscop (bīś'kəp), c. 628–690, English monk. He founded the monasteries of Wearmouth (at Sunderland) and Jarrow, and he was abbot of St. Peter's, Canterbury. Bede was his pupil.

benedictine (bēnədīk'tēn), sweet LIQUEUR originated in 1510 by Benedictine monks at Fecamp, France, and now manufactured by a secular concern on the grounds of the old abbey. Every bottle bears the initials of the Latin dedication *Deo Optimo Maximo* [to God most good, most great]. The exact formula of benedictine remains a secret.

Benedictines, monks of the Roman Catholic Church, following the rule of St. BENEDICT [Lat. abbr., = O S 8]. Their first establishment was at MONTE CASSINO, Italy, which came to be regarded as the symbolic center of Western MONASTICISM. St. Benedict's rule was novel in monastic life in replacing austerity by moderation. The monastery, or ABBEY, was conceived as a devout Christian family of men, with the abbot as father. The monks swore to live in the house until death. The whole of Benedictine life was experienced in common, the waking hours being devoted principally to worship and work, especially manual labor. The greatest of the early Benedictines was Pope St. Gregory I, whose espousal of the life had great influence. He sent St. Augustine of Canterbury to convert Anglo-Saxon England to Christianity and to introduce Benedictine life. In the 8th cent. the English Benedictines St. Willibrord and St. Boniface evangelized Frisia and Germany. In this expansion of Christendom the abbey served as an outpost, a unit of both Latin culture (including Western agricultural methods) and Christian religion. The Benedictines were also active within the area that had been Latin for centuries—their preservation of books was a critical service. In the 10th cent. a reform began at the abbey of Cluny, France, although this led to the setting up of a separate organization (see CLUNIAN ORDER), it deepened the long-standing Benedictine tendencies to emphasize the liturgy, study, and education. A Benedictine reform, or reaction, in 1098, resulted in a new foundation, the CISTERCIANS. Throughout the centuries, however, the Benedictine houses have occupied a central position in Western religious orders. They are organized as a loose federation of congregations, each congregation being a collection of geographically related abbeys or monasteries that are mainly autonomous. Benedictine work in liturgy has been outstanding. The abbeys at Solesmes and Beuron in particular have established a spiritual life centered around sung liturgy. They are responsible for the restoration of Gregorian melodies (plain chant) and their universal use today in the Roman Catholic Church. Permanent Benedictine establishments in the United States began in the 1840s. There are presently over 10,000 male Benedictines, with some 2,300 living in 42 foundations in the United States. There are also Benedictine nuns. See E. C. Butler, *Benedictine Monachism* (2d ed. 1924, repr. 1962), L. J. Daly, *Benedictine Monasticism* (1965).

benediction [Lat., = blessing], solemn blessing usually administered in the name of God by a priest or a minister. The temple worship at Jerusalem had fixed forms of benedictions, and Christians have always given them an important place in ceremony, especially at the end of a ritual. Protestants have abandoned many of the blessings of the Roman Catholic Church, such as the apostolic benediction by the pope and his delegates and benediction of the dying. **Benediction of the Blessed Sacrament**, a popular extralitururgical service of Roman Catholics, consists of a blessing of the people by the priest with the Host exposed in a monstrance.

Benedict's solution, deep-blue alkaline solution used to test for the presence of the ALDEHYDE functional group, —CHO. The substance to be tested is heated with Benedict's solution, formation of a brick-red precipitate indicates presence of the aldehyde group. Since simple sugars (e.g., glucose) give a positive test, the solution is used to test for the presence of glucose in urine, a symptom of diabe-

tes. One liter of Benedict's solution contains 173 grams sodium citrate, 100 grams sodium carbonate, and 17.3 grams cupric sulfate pentahydrate. It reacts chemically like Fehling's solution, the cupric ion (complexed with citrate ions) is reduced to cuprous ion by the aldehyde group (which is oxidized), and precipitates as cuprous oxide, Cu₂O.

Benedict the Black, Saint, d. 1589, Sicilian Negro friar. Born a slave, he became a hermit and later a Franciscan lay brother. Although illiterate, his humility and extraordinary powers as spiritual director caused him to be made Superior. He has erroneously been called Benedict the Moor. He was canonized in 1807. Feast April 4.

Benedictus (bēnədīk'tas), hymn of Zachary, taken from Luke 1:68–79. It begins in Latin, "Benedictus Dominus Deus Israel" [blessed be the Lord God of Israel]. It is used at funerals and at lauds in the Roman Catholic Church and at morning prayer in the Church of England. Part of the SANCTUS is also called *Benedictus*.

Benediktsson, Bjarni (bīyar'nē bēnēdīkt'sōn), 1908–70, Icelandic statesman. A lawyer, he was a vocal advocate of Iceland's independence from Denmark, and became a member of the central committee of the Independence party in 1936. Elected mayor of Reykjavik in 1940, he held a number of important government and diplomatic posts after World War II. He was minister of foreign affairs and justice (1947–53), minister of justice and education (1953–56), and minister of justice (1959). The head of the Independence party from 1961, he served as prime minister from 1963 until 1970, when he was killed in a fire.

benefice, in canon law, a position in the church that has attached to it a source of income, also, more narrowly, that income itself. The occupant of a benefice receives its revenue (temporalities) for the performance of stipulated duties (spiritualities), e.g., the celebration of Mass. He receives the free use of such revenue but is expected to convert into good works any income in excess of his personal needs. Benefices are normally bestowed for life. Canon law forbids plurality of benefices, i.e., the holding of more than one benefice, but papal dispensations have made many exceptions to this rule. Benefices were originally in the form of land donations made to the church by wealthy laymen. Today the revenue of a benefice may come also from government salaries, investments, or the offerings of the faithful. Benefices are common in Europe but are practically unknown in the United States. The Church of England makes extensive use of the beneficiary system, the benefice in England is also called a living. The value of benefices led to many abuses (see SIMONY) and frequent conflict between secular and ecclesiastical authorities in the Middle Ages.

benefit of clergy, term originally applied to the exemption of Christian clerics from criminal prosecution in the secular courts. The privilege was established by the 12th cent., and it extended only to the commission of felonies. The ecclesiastical courts did not inflict capital punishment except in rare cases, in which event those adjudged guilty were turned over to local secular authorities for enforcement of the sentence (see CANON LAW). In the ecclesiastical courts the severest sentences usually were degradation and the imposition of penances. Many criminals posed as clerics to obtain benefit of clergy. In England the privilege was soon extended to all clerks, i.e., literate persons. Since the first verse of Psalm 51 was the test of literacy, violators of the law would memorize the text. The ecclesiastical courts lost all jurisdiction over criminal acts in 1576, and thereafter clerics were tried by the secular courts and, under statute law, were either discharged or sentenced to a year's imprisonment. Early in the 18th cent. the reading test was abolished and all persons were allowed to claim this privilege for the first conviction of felony, later the privilege was extended generally to peers and women. Benefit of clergy thus mitigated the severities of English criminal law, which imposed the death penalty for many offenses now deemed trivial. Criminal law was ameliorated in the early 19th cent., and in 1827 benefit of clergy was abolished as being no longer necessary. In the United States it was abolished in 1790 for all Federal crimes, and c. 1850 it disappeared from the state courts. The term "benefit of clergy" has come in popular usage to mean sanction of the clergy, particularly in the phrase "marriage without benefit of clergy." See L. C. Gabel, *Benefit of Clergy in England in the Later Middle Ages* (1929, repr. 1969), Lincoln Bouscaren and A. C. Ellis, *Canon Law* (1946), J. R. Cameron, *Frederick William Maitland and the History of English Law* (1961).

Bene Israel or Beni Israel (both bā'nē) [Heb. = sons of Israel], Jewish community of India, numbering some 12,000 persons living mostly in and near Bombay city and about 12,000 who have settled in Israel since 1948. According to their own legend, they are descended from Jews who fled persecutions in Palestine in the 2d cent. B.C. Some scholars believe, however, that they are descended either from Babylonian Jews who migrated for reasons of trade or from Yemenite Jews who fled the persecutions of Muhammad, the latter hypothesis would explain the use of the name Bene Israel, which is found in the Koran as a favorable reference to Jews. The Bene Israel are referred to in the travel accounts of Benjamin of Tudela (10th cent.) and Marco Polo (13th cent.). When the Bene Israel were rediscovered by Westerners in the late 18th cent. their customs were substantially like those of the Hindus except that they kept the Sabbath and several Jewish festivals and circumcised boys on the eighth day after birth. The only Hebrew they were said to know was the prayer, "Hear, O Israel, the Lord our God, the Lord is one!" Wealthy Jews established schools to instruct the Bene Israel in Hebrew and Judaism, and in time their religious practices became similar to those of Jews throughout the world. See Schifra Stinzow, *The Bene Israel of Bombay* (1971).

Bene-jaakan (bēn'ē-jā'kän), halting place in the wilderness Num. 33:31, 32. Beeroth Deut. 10:6.

Benelux Economic Union, economic treaty among Belgium, Luxembourg, and the Netherlands, established in 1958 by a 50-year treaty. The treaty represented years of efforts aimed at establishing an economic union among these countries. As early as 1922, the Belgium-Luxembourg Economic Union was formed. In 1944 these two countries and the Netherlands concluded a customs union that went into force in 1948. The treaty of 1958 brought together all of the previous agreements, and in 1960, when it took effect, a fully integrated Benelux was formed. The goal of the union was the free movement of workers, capital, goods, and services among the countries involved.

Beneš, Eduard (ē'dō'art bē'nēsh), 1884-1948, Czechoslovakian president (1935-38, 1946-48). As a student at Prague Univ. he adopted the political and social philosophy of T. G. Masaryk. Later he studied in France, taught sociology and economics at Prague, and joined (1915) Masaryk in exile in Paris to work for Czechoslovak independence. After the breakup of the Austro-Hungarian Monarchy at the end of World War I, he represented Czechoslovakia at the Paris Peace Conference of 1919. As foreign minister (1918-35), premier (1921-22), leader of the Czech National Socialist party (a liberal and nationalist party, unlike its German namesake), and right-hand man of Masaryk, Beneš influenced both national and European politics. The *LITTLE ENTENTE* and the Czech alliance with France were essentially his work. He became (1935) president of Czechoslovakia at Masaryk's retirement but resigned (1938) after the dismemberment of his country by the *MUNICH PACT* and went into exile. After the outbreak of World War II he resumed (1940) the title president and headed, in London, a provisional government at war with Germany. Returning to Prague in 1945, he was confirmed in office and was reelected (1946) president. After the Communist coup of Feb. 1948, he reluctantly endorsed the new regime, but resigned in June on the ground of illness, refusing to sign the new constitution. He died shortly afterward. Among his writings are *My War Memoirs* (tr. 1928, repr. 1971), *Democracy Today and Tomorrow* (1939, in English), and *Memoirs of Dr. Eduard Beneš* (tr. 1954, repr. 1972).

Benét, Stephen Vincent (bēnā'), 1898-1943, American poet and author, b. Bethlehem, Pa., grad. Yale, 1919, brother of William Rose Benét. Benét is most famous for *John Brown's Body*, a long narrative poem of the Civil War, which won a Pulitzer Prize in 1929. By the time he left college Benét had already published several volumes of verse. After graduation he rapidly produced more poetry—*Heaven and Earth* (1920), *A Ballad of William Sycamore* (1923), and other volumes—and several novels, of which *Jean Huguonot* (1923) and *The Spanish Bayonet* (1926) are the best. In 1928 he published *John Brown's Body*. A vivid, impressionistic, patriotic poem, it reveals not only Benét's mastery of the ballad form but also his detailed knowledge of Civil War history. Later volumes of verse include *Ballads and Poems* (1931) and *The Burning City* (1936). His short stories, particularly "The Devil and Daniel Webster," are among the best of their time. Al-

though much of Benét's work has been criticized for its unevenness and lack of depth, his writings exhibit a genuine passion for America and a deep interest in its folklore and history. *Western Star*, a long narrative poem about the westward migration left unfinished at his death, was published in 1943 (Pulitzer Prize, 1944). See his selected works (2 vol., 1942), letters, ed. by C. A. Fenton (1960), biographies by C. A. Fenton (1958) and P. E. Stroud (1962).

Benét, William Rose, 1886-1950, American poet and editor, b. Brooklyn, grad. Yale, 1907, brother of Stephen Vincent Benét. He was associated as editor or assistant editor with the *Century Magazine*, the *Literary Review* of the New York *Evening Post*, and the *Saturday Review of Literature* (which he helped found in 1924). His books include such collections of poetry as *Merchants from Cathay* (1913), *The Great White Wall* (1916), and *Man Possessed* (1927), a novel, *The First Person Singular* (1922), a volume of essays, *Wild Gossings* (1927), and an anthology, *The Reader's Encyclopedia* (1948). He also coedited *The Oxford Anthology of American Literature* (1938). His autobiographical verse-narrative, *The Dust Which Is God* (1941), won the 1942 Pulitzer Prize in poetry. His second wife was the poet, Elinor Wylie, whose poems he edited in 1932.

Benevento (bānāvā'nō), city (1971 pop. 59,016), capital of Benevento prov., in Campania, S. Italy. It is a trade center for wine and tobacco. Farm machinery, optical instruments, liqueur, and nougat are manufactured. A leading town of Samnium, Benevento became under the Romans an important trade center on the Apennine Way. It was the capital of a powerful Lombard duchy (6th-11th cent.) that extended over much of S. Italy. Except for short periods of foreign occupation, the city was under papal rule from the 11th cent. to 1860. In 1266, Charles of Anjou defeated Manfred, King of Sicily, near Benevento. Noteworthy structures of the city include the cathedral (11th-13th cent., restored after being severely damaged in World War II), a triumphal arch erected (114 A.D.) for Trajan, a Roman theatre (2d cent. B.C.), and the Church of Santa Sofia, with a 12th-century cloister.

Benevoli, Orazio (ō'ra'tsyō bānāvō'lē), 1605-72, Italian composer. From 1646 until his death Benevoli was *maestro di cappella* at the Vatican. He wrote a large quantity of sacred music, much of it scored for many vocal parts—a mass (1628) for Salzburg Cathedral has 52 vocal parts. Benevoli was strongly influenced by Palestrina in his use of harmony.

Ben Ezra, see IBN EZRA, ABRAHAM BEN MEIR.

Bengal (bēng-gōl', bēn-), region, 77,442 sq. mi. (200,575 sq. km), E. India and Bangladesh, on the Bay of Bengal. The inland sections are mountainous, with peaks up to 12,000 ft (3,660 m) high in the northwest, but most of Bengal is the fertile land of the Ganges-Brahmaputra alluvial plains and delta. Along the coast are richly timbered jungles, swamps, and islands. The heavy monsoon rainfall and predominantly warm weather make possible two harvests a year. In the 3d cent. B.C., Bengal belonged to the empire of ASOKA. It became a political entity in the 8th cent. A.D. under the Buddhist Pala kings. In the 11th cent. the Hindu Sena dynasty arose from the remnants of the Pala empire. Bengal was conquered (c. 1200) by Muslims of Turki descent. When the Portuguese began their trading activities (late 15th cent.), Bengal was a part of the Muslim MUGOL empire. The British East India Company made its first settlement in 1642 and extended its occupation by conquering the native princes and expelling the Dutch and French. Muslim control of Bengal ended with the defeat of Siraj-ud-Daula by British forces under Robert CLIVE at the Battle of Plassey in 1757. Under British control, Bengal was a presidency of India. At various times the neighboring provinces of Assam, Bihar, and Orissa were administered under the Bengal presidency. The population, which speaks mainly Bengali, is ethnically quite homogeneous but is almost equally divided between Muslims and Hindus. When India was partitioned in 1947, the presidency was divided along the line approximately separating the two main concentrations of the religious communities. **West Bengal** (1971 pop. 44,440,095), 33,928 sq. mi. (87,874 sq. km), with its capital at CALCUTTA, became a state of India. It is bordered by Bangladesh and the state of Assam on the east, Bhutan and Sikkim on the north, the states of Bihar and Orissa on the west, and the Bay of Bengal on the south. A highly industrialized region, it has jute mills, steel plants, and chemical industries, all mainly centered in the Hooghlyside industrial complex. Coal is mined and petroleum is exploited. In 1950, West Bengal absorbed the state of

Cooch Behar. In more recent years, disputes between Hindus and Muslims, further complicated by droves of refugees from Bangladesh (formerly East Pakistan) and agitation by Maoist groups called Naxalites, have created political instability. **West Bengal** is governed by a chief minister and cabinet responsible to a bicameral legislature with one elected house and by a governor appointed by the president of India. In the 1972 local elections Prime Minister Gandhi's New Congress party ended the decade-old dominance of the Communist Party of India-Marxist, also known as the Left Communists, who broke away from the more conservative and pro-Soviet Communist party **East Bengal**, overwhelmingly Muslim in population, became East Pakistan in 1947 and the independent nation of Bangladesh in 1971.

Bengal, Bay of, arm of the Indian Ocean, c. 1,300 mi. (2,090 km) long and 1,000 mi. (1,610 km) wide, bordered on the W by Sri Lanka (Ceylon) and India, on the N by Bangladesh, and on the E by Burma and Thailand, the Andaman and Nicobar Islands separate it from the Andaman Sea, its eastern arm. The bay receives many large rivers including the Irrawaddy, Ganges-Brahmaputra, Mahanadi, Godavari, Krishna, and Cauvery, all forming fertile, heavily populated deltas. Sediment from the rivers has made the bay a shallow sea, and the waters have reduced the salinity of surface waters along the shore. Monsoon rains and destructive cyclone storms have caused great loss of life along the bay's northern coast. The main ports are Visakhapatnam, Madras, and Calcutta, India, Chittagong, Bangladesh, and Sittwe, Burma.

Bengali (bēngāl'ē), language belonging to the Indic group of the Indo-Iranian subfamily of the Indo-European family of languages. See INDO-IRANIAN LANGUAGES.

Bengasi or Benghazi (both bēngā'zē), city (1970 est. pop. 170,000), capital of Bengasi district, NE Libya, the main city of Cyrenaica and a port on the Mediterranean Sea. It is primarily an administrative and commercial center. Manufactures include processed food, beverages, textiles, and cement. On the site of Bengasi the Greeks founded (7th cent. B.C.) the colony of Hesperides, which was later (3rd cent. B.C.) renamed Berenice after the wife of Ptolemy III of Egypt. Under the Romans, who conquered it in the mid-1st cent. B.C., Bengasi had a large Jewish colony. In the 5th cent. A.D. the Vandals severely damaged the city, and in the 7th cent. it was captured by the Arabs. The Ottoman Turks took the city in the mid-16th cent., and they held it until it was captured by Italy in 1911. The Italians modernized the city and enlarged its port. At the start of World War II, Bengasi had about 22,000 Italian inhabitants, but they were evacuated before the city fell to the British in late 1942. From 1951 to 1972 Bengasi was the copcapital (with Tripoli) of Libya. The city is the site of the Univ. of Libya, founded in 1955.

Bengel, Johann Albrecht (yō'hān āl'brēkht bēng'a-l), 1687-1752, German Lutheran theologian and biblical scholar. He was appointed (1713) professor in charge of a theological training school at Denkerdorf and remained there for 28 years. In this period he produced his most important works—a carefully prepared Greek text of the New Testament (1734), with an *Apparatus criticus*, which formed the point of departure for modern New Testament textual criticism, and his *Gnomon Novi Testamenti* (1742), an exegetical commentary, later translated into German and English.

Benghazi: see BENGASI, Libya.

Benguela (bēngē'lā, bēng-), city (1969 est. pop. 35,000), W. Angola, on the Atlantic. It is a rail terminus, an export point, and a commercial and fishing center. A fort was built on the site in the late 16th cent., and the city was founded in 1617. Benguela's port played an important role in slave trading.

Ben-Gurion, David (bēn-gōō'rēōn), 1886-1973, Israeli statesman, b. Poland as David Grün. He settled in Palestine in 1906. He was an active Zionist and during World War I helped to organize the Jewish Legion in support of the British. In the struggle to found an independent Jewish state in Palestine he followed a policy of cooperation with the British during World War II. After the war, however, he led the political struggle against them, authorizing the sabotage activities of the Hebrew resistance movement. During the struggle for independence (1947-48) he headed the defense effort. A founder and leader of the Mapai party and an early leader of the Histadrut, he was made (1948) the first prime minister of the newly created state of Israel, holding the

post until 1953. In 1955 he returned to the cabinet as defense minister under Moshe Sharett and later that year again became prime minister. His replacement of Sharett reflected the shift in Israeli policy toward confrontation with Israel's hostile Arab neighbors. Amid growing controversy he resigned the premiership in Feb., 1961, but was quickly returned to office. He again resigned in June, 1963. In retirement Ben-Gurion continued to be politically active, forming a splinter party from the dominant labor party, Mapai, in 1965. A selection of his writings was published as *Rebirth and Destiny of Israel* (1954), he also wrote *Israel: Years of Challenge* (1965), *Israel's Security* (1960), *The Jews in their Land* (1966), *Memoirs* (1970), *Israel: A Personal History* (1971), and *My Talks with the Arabs* (1973). See biographies by Maurice Edelman (1964), Michael Bar-Zohar (tr 1967), Ohad Zmora, ed. (1967), and Robert St. John (rev. ed. 1971).

Benha: see BANHA, Egypt

Benhadad (bēnhā'dād), kings of Damascus. 1 The son of Tabrimon, ally of ASA of Judah against Baasha of Israel. 1 Kings 15:17-20. 2 Probably the son and successor of 1, leader of the coalition that withstood Shalmaneser III of Assyria at Karkar on the Orontes, he continued the traditional enmity of his kingdom with Israel and defeated AHAAB and Jehoshaphat. He was murdered and succeeded by Hazael. 1 Kings 20, 22, 2 Kings 8:15. 3 Son of Hazael and contemporary of Jehoash of Israel, who defeated him in war. He also was Assyria's vassal. 2 Kings 13:25, Amos 1:4.

Ben-hail (bēn-hā'il), one of Jehoshaphat's princes. 2 Chron. 17:7.

Ben-hanan (bēn-hā'nān), Judahite. 1 Chron. 4:20.

Ben-hur: see HUR, 4

Beni Hasan: see BANI HASAN, village, Egypt

Beni Israel: see BENE ISRAEL

Benin (bēnēn'), city (1969 est. pop. 117,000), S Nigeria, a port on the Benue River. Rubber, palm nuts, and timber are produced nearby and processed in Benin. Furniture and carpets are also made in the city. Benin served as the capital of a black African kingdom that was probably founded in the 13th cent. and flourished from the 14th through the 17th cent. The kingdom was ruled by the *oba* (to whose family human sacrifices were made) and a sophisticated bureaucracy. From the late 15th cent. Benin traded slaves as well as ivory, pepper, and cloth to Europeans. In the early 16th cent. the *oba* sent an ambassador to Lisbon, and the king of Portugal sent missionaries to Benin. The kingdom of Benin declined after 1700, but revived in the 19th cent. with the development of the trade in palm products with Europeans. Britain conquered and burned the city in 1898 following conflicts between black African and European traders. The iron work, carved ivory, and bronze portrait busts made (perhaps as early as the 13th cent.) in Benin rank with the finest art of Africa. CIRE PERDUE casting is still practiced there. Examples of Benin art are displayed in museums in the city.

Benin, Bight of, northern arm of the Gulf of Guinea, c. 550 mi (885 km) wide, W Africa, between Cape Three Points, S Ghana, and the Niger River delta, SW Nigeria.

Beninu (bēnī'nyōō), Levite sealer of the covenant. Neh. 10:13.

Beni Suef: see BANI SUWAYF, Egypt

Benjamin. 1 Youngest son of Jacob and Rachel and ancestor of one of the 12 tribes of Israel. His mother, dying, named him Benoni (bēnō'nī) [Heb. =son of my sorrow]. He was the favorite of his family. The tribe of Benjamin was allotted the plateau of E. central Palestine lying W of the Jordan between Jerusalem and Bethel. The tribesmen were famous archers. The name survived in the High Gate of Benjamin of the Temple at Jerusalem. Saul was the most noted man of the house of Benjamin. Gen. 35:18, 42-46, 49-27, Num. 1:36, 13:9, 26:38-41, 34:21, Deut. 33:12, Joshua 18:11-28, Judges 3:15, 20-21, 1 Chron. 8:40, 12:2, 2 Chron. 14:8, 17:17. 2 Descendant of Benjamin. 1 Chron. 7:10. 3 One who was separated from a foreign wife. Ezra 10:32. 4 Repairer of the wall. Neh. 3:23. 5 Dedicator of the wall. Neh. 12:34. He may be the same person as 3 and as 4.

Benjamin, Asher, 1773-1845, American architect, b. Greenfield, Mass. His *Country Builder's Assistant* was published in 1797 and *The American Builder's Companion*, with Daniel Reynard, in 1806. Benjamin designed houses and churches in many New England towns, but his greater influence was through his books, which popularized the details of the late colonial style. His later books, *The Rudiments of Architecture* (1814) and *The Practical House Carpenter* (1830), show more Greek design.

Benjamin, Judah Philip, 1811-84, Confederate statesman and British barrister, b. Christiansted, St. Croix, Virgin Islands, of Jewish parents. His family moved (c. 1813) to Wilmington, N.C., and finally settled (1822) in Charleston, S.C. A precocious youth, Benjamin entered Yale at the age of 14 but left (1827) early in his junior year. He went to New Orleans in 1828, worked for a notary, taught English, and studied French and the law in his spare time. Admitted to the bar in Dec., 1832, he published (1834), with his friend Thomas Slidell, a digest of Louisiana appeal cases that enhanced his reputation as a rising young lawyer. His practice soon made him rich enough to become a sugar planter as well. Benjamin, a prominent Whig, served in both branches of the state legislature, was a delegate to two state constitutional conventions, and in 1852 was elected to the U.S. Senate. On the dissolution of the Whig party because of the slavery issue, he publicly proclaimed himself a Democrat (May 2, 1856), and two years later he was reelected Senator. One of the ablest defenses of Southern policy was presented in the Senate by Benjamin on Dec. 31, 1860. On Feb. 4, 1861, after Louisiana's secession, he resigned his seat. In the new Southern government, Benjamin first served as attorney general, was appointed secretary of war in Nov., 1861 (he had been acting secretary since September), and from March, 1862, to the end of the Civil War was secretary of state. Though not popular with the public, he was an intimate friend of Jefferson Davis and was known in the North as "the brains of the Confederacy." As secretary of war he was an able administrator, but was severely criticized—for the most part unjustly—for Confederate defeats early in 1862, particularly the loss of Roanoke Island, N.C. After Davis promoted him to head the state department, Benjamin worked unceasingly but unsuccessfully to secure European recognition of the Confederacy. In Feb., 1865, he proposed that slaves who willingly joined the Confederate ranks be freed. Upon the collapse of the Confederacy, Benjamin escaped by way of Florida and the West Indies to England and there established a new career in the law. He was called to the bar in 1866 and won immediate recognition with *A Treatise on the Law of Sale of Personal Property* (1868). On his retirement early in 1883 he was universally acknowledged to have been in the front rank of his profession. He died and was buried in Paris, where his wife, who was a Louisiana Creole, and his daughter had made their home since the 1840s. See biography by R. D. Meade (1943), A. L. Goodhart, *Five Jewish Lawyers of the Common Law* (1949, repr. 1971).

Benjamin, Park, 1809-64, American journalist, b. British Guiana. As owner and editor of the *New England Magazine*, he merged it (1835) with the *American Monthly Magazine* of New York and became associate editor with C. F. Hoffman. A prominent journalist of his day, he is best known as the founder (1839) of the *New World*, a weekly periodical that ran until 1845. See biography by M. M. Hoover (1948).

Benjamin Constant, Paul Henri: see ESTOURNELLES DE CONSTANT

Benjamin Franklin National Memorial, Pa. see NATIONAL PARKS AND MONUMENTS, table

Benjamin of Tudela (tōdā'la), d. 1173, Jewish traveler, b. Tudela, Spain. He traveled from 1159 to 1173 and is considered to be the first European to have reached China. His account, *Massa'oth Schel Rabbi Benjamin*, sheds light on the history of the times. An English translation was published in 1840 as *The Itinerary of Rabbi Benjamin of Tudela*. See the critical text, tr. and ed. by M. N. Adler (1964).

Ben Macdhu (măkdōō'), peak, 4,296 ft (1,309 m) high, SW Aberdeenshire, Scotland, in the Cairngorm mts., second highest peak in Scotland.

Benn, Anthony Wedgwood, 1925-, British politician. After working as a producer for the British Broadcasting Corporation (1949-50), he was elected a Labour member of Parliament in 1950. He inherited the title of Viscount Stansgate (1960) after two unsuccessful attempts to disclaim it in order to retain his seat in the House of Commons. With the passage of the Peerage Act (1963), for which he was largely responsible, he was able to renounce the title for his lifetime and regain his seat in the Commons. In Harold Wilson's first Labour government he served as postmaster general (1964-66) and minister of technology (1966-70), and he was opposition spokesman on trade and industry (1970-74). In the 1974 Labour government he was made secretary of state for industry and minister of posts and telecommunications. See his *Regeneration of Britain* (1965) and *The New Politics* (1970).

Benn, Gottfried (gôt'frēt bēn), 1886-1956, German poet and critic, a physician. His early verse and poetic dramas, such as *Der Vermessungsdingent* [the surveyor] (1919), were strongly expressionistic and even nihilistic. His later poems, among them the collection *Statische Gedichte* (1948), and his autobiography, *Doppelleben* [double life] (1950), reflect the agony and conflict of the National Socialist era. Benn's essays on aesthetics and politics are well known, and his fictional works, including *Der Ptolemaer* (1949), are more philosophical prose than tales. See study by J. M. Ritchie (1973).

Bennet, Henry: see ARLINGTON, HENRY BENNET, 1ST EARL OF

Bennett, Arnold (Enoch Arnold Bennett), 1867-1931, English novelist and dramatist. One of the great 20th-century English novelists, Bennett is famous for his realistic novels about the "Five Towns," an imaginary manufacturing district in northern England. Bennett's early career included editing the fashionable magazine *Woman* and writing literary reviews and articles. About 1900 he began to devote himself industriously to his own work, producing a series of excellent regional novels. Influenced by the NATURALISM of Zola, he depicted in great detail the grim, sometimes sordid, lives of shopkeepers and potters. His attitude toward his characters was one of affectionate sympathy, and he always managed to make their mundane lives interesting. Bennett's best work is contained in his novels of the "Five Towns," which include *Anna of the Five Towns* (1902), *The Old Wives' Tale* (1908), the trilogy *Clayhanger* (1910), *Hilda Lessways* (1911), and *These Twain* (1916). Bennett also achieved considerable success as a playwright, most notably with *Milestones* (1912), written with Edward Knoblock, and *The Great Adventure* (1913). See his journal (3 vol., 1932-33), biography by Margaret Drabble (1974), studies by John Wain (1967), K. E. Roby (1972), and James G. Hepburn (1963, repr. 1973).

Bennett, Hugh Hammond, 1881-1960, American soil scientist, b. near Wadesboro, N.C. Known as the father of soil conservation, he first proposed the theory of sheet erosion of soils in 1905. He directed national programs of soil and water conservation and wrote many articles on the subject, laying the groundwork for consideration of soil conservation by Congress. His books include *Soil Conservation* (1939) and *This Land We Defend* (1942).

Bennett, James Gordon, 1795-1872, American newspaper proprietor, b. Keith, Scotland. He came to America in 1819 and won a reputation as Washington correspondent of the *New York Enquirer* and later (1829-32) as assistant editor of the combined *Courier and Enquirer*. On May 6, 1835, he launched his *New York Herald*, a new penny paper of four four-column pages. His capital totaled \$500 and his office was a Wall St. cellar, yet in less than a year the paper sold almost 15,000 copies daily. Bennett's innovations made the *Herald* a landmark in the history of American journalism. In his brief editorials he criticized all political parties, he included new fields of news, notably that of Wall St. finance, he first established (1838) European correspondents for his paper, he first used the telegraph extensively in newspaper work, and he first used illustrations for news articles. Although the *Herald* initially gained an audience by playing up sensational and cheap news, it later earned a reputation as a full and accurate paper, particularly in the period of the Civil War, when Bennett employed 63 war correspondents and spent \$525,000 on war reporting. See Oliver Carlson, *The Man Who Made News*. James Gordon Bennett (1942).

Bennett, James Gordon, 1841-1918, American newspaper proprietor, b. New York City, son of James Gordon Bennett. Educated mostly in France, he took over (1867) from his father the management of the *New York Herald* and maintained the paper's reputation as a news gatherer. In 1869-71 he financed Henry Stanley's expedition into Africa to find David Livingstone, and from 1879 to 1881 he supported the ill-fated expedition of G. W. De Long to the arctic region. In reporting international news the *Herald* scored repeated triumphs. Its staff of brilliant reporters was famous. After 1877, Bennett lived mostly in Paris, directing his newspapers by cable, and with John W. Mackay he organized (1883) the Commercial Cable Company to handle European dispatches. He established London and Paris daily editions of the *Herald*, the Paris paper was an unprofitable, sincere attempt to promote international good will. Bennett was fond of sports, especially of

yachting, and established the James Gordon Bennett cup as a trophy in international yacht races and similar cups for balloon and airplane races. See Richard O'Connor, *The Scandalous Mr Bennett* (1962), D C Seitz, *The James Gordon Bennetts* (1928, repr 1973).

Bennett, Richard Bedford, 1870-1947, Canadian prime minister, b Hopewell, N.B. In 1927 he succeeded Arthur Meighen as leader of the Conservative party, upon the defeat of the Liberals in 1930, he became prime minister. At the imperial conference in London in 1930, he strongly urged a preferential tariff for the empire, at the conference held in Ottawa in 1932, over which he presided, his policy was partly adopted with the signing of 12 separate trade agreements of Great Britain with the dominions and of the dominions with each other. As prime minister during the depression, Bennett proposed social legislation in 1934 to lessen the widespread dissatisfaction with his government. Nevertheless, his Conservative party was defeated in 1935 and Bennett resigned. He was leader of the opposition until 1938, when he retired from politics and went to live in England. In 1941 he was raised to the peerage as 1st Viscount Bennett of Calgary, of Mickleham, and of Hopewell.

Bennett, Sir William Sterndale, 1816-75, English musician. Bennett was a friend of Mendelssohn and Schumann, both of whom influenced his work. Besides composing, he was active as a pianist and conductor. He founded the Bach Society and in 1854 gave the first public British performance of the St Matthew Passion. Bennett's compositions include a symphony, four piano concertos, and much solo piano music.

Ben Nevis (nē'vīs, nēv'īs), peak, 4,406 ft (1,343 m) high, Inverness-shire, W Scotland, overlooking Glen Nevis, highest peak of Great Britain. Ruins of an observatory are on the summit, from which there is an impressive view, especially on the northeastern side with its precipice of more than 1,450 ft (442 m).

Bennewitz, Peter: see APIANUS, PETRUS

Bennigsen, Rudolf von (rōō'dōlf fən bēn'tsən), 1824-1902, German political leader. A liberal and a nationalist from Hanover, he favored German unification under a democratic Prussian state. After Bismarck's initial successes in unifying Germany, however, he supported the chancellor and helped found (1867) the National Liberal party. President of the party until 1898, he was an important figure in the Reichstag and in the Prussian lower house.

Bennington, town (1970 pop 14,586), seat of Bennington co., SW Vt., chartered 1749, settled 1761. It includes the villages of North Bennington and Old Bennington. Major manufactures of the town are automotive batteries, paper products, electronic components, air-conditioning equipment, lubricating equipment, furniture, and lithographic products. The surrounding area has dairy farms and several ski resorts. Points of interest in Bennington include a monument that is 300 ft (91 m) high commemorating the Revolutionary War battle of Bennington (see SARATOGA CAMPAIGN), the site of the first schoolhouse in Vermont, Catamount Tavern, meeting place of the Green Mountain Boys, the site of abolitionist William Lloyd Garrison's printing shop, the Old First Church (1805), and the Walloomsac Inn, opened in 1763. Bennington College is in the town.

Bennington College, at Bennington, Vt., coeducational (originally for women), chartered 1925, opened 1932. Its curriculum is based on individual interests and needs. All students are required to devote part of their time to off-campus employment, usually relating to their course of study. Many faculty members are practicing artists, and a close relationship between students and faculty is encouraged.

Benno, Saint, d 1106, German prelate. He was bishop of Meissen and an ardent supporter of Pope Gregory VII against Holy Roman Emperor Henry IV, and the emperor had him deposed. He was reinstated on Gregory's death by GIBERT OF RAVENNA (the antipope Clement III). He later shifted his allegiance to Gilbert's adversary, Pope Urban II. Luther was greatly displeased at the canonization (1523) of Benno. St Benno is a patron of Munich. Feast June 16.

Beno (bē'nō), Levite 1 Chron 24:26,27

Benoît de Sainte-More or **Benoît de Sainte-Maure** (bēnwā' də sānt-mōr'), 1154-73, French trouvère. He was the author of the *Roman de Troie*, a romance in 30,000 verses based on historical accounts by Dares and Dictys. It became a primary source of medieval versions of the Trojan legend,

notably the story of *TROILUS*. At the order of Henry II of England, Benoît also wrote a rhymed *Chronique des ducs de Normandie*.

Benoni (bēnō'nī) see BENJAMIN 1

Benoni (bānō'nē), town (1970 pop 149,563), Transvaal, NE South Africa, on the WITWATERSRAND. It is the distribution center for a gold-mining district. The chief manufacture is electrical equipment. Benoni was founded in 1904. During the violent Witwatersrand miners' strike of 1922, through which white miners sought in vain to prevent mine owners from employing cheaper black African labor, heavy fighting occurred in the town between miners and the South African military. Benoni has commercial and technical schools.

Benozzo Gozzoli: see GOZZOLI, BENOZZO

Bensenville, village (1970 pop 12,833), Cook and Du Page counties, NE Ill., a suburb of Chicago, inc 1894. It has varied light manufactures. O'Hare International Airport is nearby.

Benson, Arthur Christopher, 1862-1925, English author, eldest son of Archbishop Benson. He was master at Eton (1885-1903) and at Magdalene College, Cambridge (1915-25). His works include poetry, novels, essays, notably from *A College Window* (1902), critical studies, and biographies of his father and brother Hugh. See his *Memoirs and Friends* (1924), selections from his diary (ed. by Percy Lubbock, 1926).

Benson, Edward Frederic, 1867-1940, English author, 3d son of Archbishop Benson. He wrote several biographies and reflections on contemporary society, but he is chiefly remembered for his lightly satirical novels, notably *Dodo* (1893) and the series about Lucia Pillson, the first of which was *Queen Lucia* (1920). His archaeological work in Athens (1892-95) resulted in two novels on Greece, *The Vintage* (1898) and *The Capsina* (1899).

Benson, Edward White, 1829-96, archbishop of Canterbury, educated at Trinity College, Cambridge. He was appointed (1877) the first bishop of Truro, and in 1882 he was appointed archbishop of Canterbury. His clerical writings include *Cyprian* (1897) and *Apocalypse* (1900). Three of his four sons became notable literary figures—A C Benson, E F Benson, and R H Benson. See biography by A C Benson (1899).

Benson, Ezra Taft, 1899-, U.S. Secretary of Agriculture (1953-61), b Whitney, Idaho. An extension economist and marketing specialist at the Univ of Idaho (1930-38) and executive secretary of the National Council of Farmer Cooperatives (1939-44), he was chairman of the board of trustees of the American Institute of Cooperatives when appointed Secretary of Agriculture. His policies—among other things he opposed rigid price supports at 90% of parity in favor of flexible price supports—brought him much criticism, even from Republican Congressmen. In 1959 farm belt members of the Republican National Committee sought Benson's resignation. He refused, stating that he would continue to fight to oust government from agriculture. A devout Mormon, he became (1943) a member of the Council of Twelve (the Apostles). Benson wrote *Farmers at the Crossroads* (1956), *Freedom to Farm* (1960), *Title of Liberty* (1964), and *An Enemy Hath Done This* (1969). See his *Cross Fire: The Eight Years with Eisenhower* (1962), biography by Wesley McCune (1958).

Benson, Robert Hugh, 1871-1914, English author and clergyman, 4th son of Archbishop Benson. He was converted to Roman Catholicism in 1903 and ordained the next year. In 1911, as a monsignor, he became privy chamberlain to Pope Pius X. His works include the novels *By What Authority?* (1904) and *Richard Raynal* (1906), and *Paradoxes of Catholicism* (1913). See biography by A C Benson (1915).

Bent, Charles, 1799-1847, American frontiersman, b St Louis. He entered the fur trade of the Missouri River and became one of the mountain men. His interests turned to the Southwest, and he led expeditions on the Santa Fe Trail. Charles Bent was the senior partner of a trading firm that included Ceran St Vrain as well as William Bent and others of the seven Bent brothers. The company was one of the most prominent on the frontier, and BENT'S FORT was one of the most famous American trading posts. Because of his high standing, Charles Bent was chosen as governor of New Mexico after the American occupation in the Mexican War. He was murdered at Taos in an uprising of Indians and Mexicans.

Bent, James Theodore, 1853-97, English explorer and archaeologist. He engaged in archaeological research on the coast of Asia Minor (1888-89), the

Bahrein Islands (1889), Cilicia Trachia (1890), Mashonaland (1891), Ethiopia (1893), and the Arabian peninsula (1893-97), where he mapped the Hadramaut region. He wrote *The Ruined Cities of Mashonaland* (1892), *The Sacred City of the Ethiopians* (1893), and *Southern Arabia* (1900).

Bent, William, 1809-69, American frontiersman, b St Louis. One of the younger brothers of Charles Bent, he was for many years the manager of BENT'S FORT, while Charles Bent lived mainly in Taos. William Bent was one of the most widely known and highly respected traders in the West. He scouted for Stephen W. Kearny and Sterling Price in the Mexican War. In 1849 he destroyed the fort, building another farther down the Arkansas River (1853).

bent grass, any species of the genus *Agrostis* of the family Gramineae (GRASS family), chiefly slender, delicate plants native to cool climates. Many are used for forage or lawns. Important species naturalized from Europe include the creeping bent (*A. palustris*), a lawn and putting-green grass, colonial bent (*A. tenuis*), frequently used in lawn mixtures, and especially, redtop (*A. alba*), called also fionn and herd's-grass. Redtop, a perennial with reddish panicles, is much used (often mixed with clover) for pasture and hay in NE America; it is also effective in erosion control. The cloud grass (*A. nebulosa*), native to Spain, is cultivated for use as an EVERLASTING. Bent grass is classified in the division MAGNOLIOPHYTES, class Liliatae, order Cyperales, family Gramineae.

Bentham, George (bēn'tham), 1800-1884, one of the greatest of English systematic botanists, nephew of Jeremy Bentham. He wrote *Handbook of British Flora* (1858) and (with W J Hooker) *Genera Plantarum* (1862-83) and handbooks on the flora of several British possessions.

Bentham, Jeremy, 1748-1832, English philosopher, jurist, political theorist, and founder of UTILITARIANISM. Educated at Oxford, he was trained as a lawyer and was admitted to the bar, but he never practiced; he devoted himself to the scientific analysis of morals and legislation. His greatest work was his *Introduction to the Principles of Morals and Legislation* (1789), which shows the influence of Helvetius and won Bentham recognition throughout the Western world. His utilitarianism held that the greatest happiness of the greatest number is the fundamental and self-evident principle of morality. This principle should govern our judgment of every institution and action. He identified happiness with pleasure and devised a moral arithmetic for judging the value of a pleasure or a pain. He argued that self-interests, properly understood, are harmonious and that the general welfare is bound up with personal happiness. Bentham's contribution to theoretical ethics has had less lasting effect than his thorough application of utilitarian principles to economics, jurisprudence, and politics. Devoting himself to the reform of English legislation and law, he demanded prison reform, codification of the laws, and extension of political franchise. The 19th-century reforms of criminal law, of judicial organization, and of the parliamentary electorate owe much to the influence of Bentham and his disciples. See his *Correspondence*, ed. by T L Sprigge and L R Christie (3 vol., 1968-71), John MacCunn, *Six Radical Thinkers* (1964), studies by M P Mack (1963) and David Lyons (1973).

benthos. see MARINE BIOLOGY

Bentinck, William. see PORTLAND WILLIAM BENTINCK, 1ST EARL OF

Bentinck, Lord William Cavendish (bēn'tingk, -tik), 1774-1839, British administrator in India. He served in the Napoleonic Wars and was (1803-7) governor of Madras. He was appointed governor general of Bengal in 1827, assuming the title governor general of India in 1833. Bentinck was strongly influenced by British utilitarianism and introduced many reforms in the interest of the people. He admitted Indians to important office, fostered communication and education, and revised the system of landholding. He also abolished SUTTEE and began suppression of the THUGS. See biography by John Rosselli (1974).

Bentinck, Lord William George Frederick Cavendish, 1802-48, English politician and sportsman, known as Lord George. Although he entered Parliament in 1826, he was known primarily for his horse-racing activities until in 1846 he emerged as a leading opponent of the repeal of the corn laws. His brilliant leadership, with DISRAELI, of the protectionists was cut short by his sudden death.

Bentinck, William Henry Cavendish: see PORTLAND, WILLIAM HENRY CAVENDISH BENTINCK 3D DUKE OF

Bentivoglio (bān'tēvō'lyō), Italian noble family, one of several powerful clans in the struggle for control of BOLOGNA during most of the 15th cent. Its greatest member was Giovanni II, who was lord—in fact if not in name—from 1462 until 1506, when Pope Julius II took Bologna. Giovanni II maintained a splendid court and beautified his city. After its exile from Bologna the family resided in Ferrara and produced several important prelates.

Bentley, Eric, 1916–, American critic, editor, and translator, b. England, grad. Oxford, 1938, Ph.D. Yale, 1941. A highly regarded critic, particularly of the drama, Bentley is the author of *A Century of Hero-Worship* (1944), *The Playwright as Thinker* (1946), *Bernard Shaw* (1947), *What Is Theatre?* (1956), *The Importance of Scrutiny* (1964), and *Theatre of War* (1972). He is also known for his translations of plays of Bertolt Brecht and Luigi Pirandello and for his editions of collected plays, including *The Classic Theatre* (4 vol., 1958–61). He was drama critic for the *New Republic* from 1952 to 1956. From 1953 to 1969 he was Brander Matthews professor of dramatic literature at Columbia.

Bentley, Richard, 1662–1742, English critic and philologist. He was largely responsible for the high standards of textual criticism in the work of his many followers, and he is generally considered the greatest of English classical scholars. His exposure of a 14th-century forgery, *The Epistles of Phalaris*, is his most celebrated work. See biography by Adam Fox (1954).

Bentley, William, 1759–1819, American Unitarian clergyman, b. Boston. From 1783 until his death he was pastor of East Church, Salem, Mass. His *Diary* (4 vol., 1905–14), covering the years 1784–1819, is a valuable historical source.

Benton, Thomas Hart, 1782–1858, U.S. Senator (1821–51), b. Hillsboro, N.C. He moved to Tennessee in 1809, was admitted to the bar in 1811, and served (1809–11) in the state senate. In 1815, Benton went to St. Louis, where he became editor of the *Missouri Enquirer*, established a thriving law practice, and won political prestige. He entered the U.S. Senate on Missouri's admission to the Union in 1821 and was four times reelected. A supporter from 1824 of Andrew Jackson, with whom he had been at odds, Benton was a power in the administrations of Jackson and Martin Van Buren. He played one of the most prominent parts in the successful war on the Bank of the United States. A rigid "hard money" man (he delighted in the sobriquet "Old Bullion"), Benton had the ratio of silver to gold revised from 15 to 1 to 16 to 1 in 1834 and thus brought gold into circulation again. Congress defeated his resolution requiring that the public lands be paid for in hard money only, but Jackson immediately legalized the idea in an executive order (1836), the famous Specie Circular, which Benton drew up. His currency measures, intended to discourage continued land speculation and thereby encourage actual settlement of the West, were supported by Eastern workingmen, who wished to be paid in specie rather than in notes of uncertain value. Benton also supported all legislation that aided settlers and favored the development of the West, including reduction in the price of government lands, suppression of land speculation, westward removal of the Indians, and internal improvements. He advocated government support of Western exploration, with which he was intimately connected through the expeditions of John Charles FRÉMONT, who married one of his four daughters, Jessie Benton FRÉMONT. The Oregon country especially interested him, and he protested the joint occupation with Britain. Yet he insisted that the 49th parallel (the line established) was the only boundary the United States could rightfully claim and deplored the Democratic campaign slogan of 1844—"Fifty-four forty or fight." As to Texas, although he had protested the 1819 treaty with Spain as one in which the United States gave up its rights to that region, he could not acquiesce in the intrigues that led to the annexation of Texas and the Mexican War. Benton had early come to favor the gradual abolition of slavery, and with the ascendancy of the proslavery Democrats he lost influence in the party. His antislavery sentiments ran counter to majority opinion in Missouri at that time, and with his opposition to the proslavery features of the Compromise of 1850 he was defeated for a sixth term. He returned to Congress as a U.S. Representative (1853–55) but after voting against the Kansas-Nebraska Act in 1854 he was again defeated for reelection. In 1856 he was also defeated for the governorship of Missouri. He compiled *An Abridgment of the Debates of Congress from 1789 to 1856* (16 vol.,

1857–61) and wrote the autobiographical *Thirty Years' View* (2 vol., 1854–56). See biographies by Theodore Roosevelt (1886, repr. 1968), W. N. Chambers (1956, repr. 1970), and W. M. Meigs (1904, repr. 1970).

Benton, Thomas Hart, 1889–1975, American regionalist painter, b. Neosho, Mo., grandnephew of Sen. Thomas Hart Benton and son of Congressman Maecenas E. Benton. In 1906 and 1907 he attended the Art Institute of Chicago and at 19 went to Paris, where he remained five years. On his return to the United States, he designed movie sets, managed an art gallery, and continued to paint. The best-known American muralist of the 1930s and early 40s, he executed murals for the New School of Social Research and the Whitney Museum, both in New York City, the Missouri statehouse, Jefferson City, Mo., and the Post Office Dept. and Dept. of Justice buildings, Washington, D.C. He is noted for his dramatization of American themes. His style is graphic, strong in color, repetitious and insistent in the use of rhythmic line. *July Hay* (1943) is in the Metropolitan Museum. Benton taught painting at several colleges and art schools. See his autobiographical *An Artist in America* (1951, rev. ed. 1968) and *An American in Art* (1969).

Benton, city (1970 pop. 16,499), seat of Saline co., central Ark., founded 1836. Its chief industry, aluminum mining and refining, is based on the extensive high-grade bauxite deposits found in the area. Nearby is a state hospital.

Benton Harbor, city (1970 pop. 16,481), Berrien co., SW Mich., on Lake Michigan at the mouth of the St. Joseph River and opposite its twin city, St. Joseph, Ind. 1869. Its temperate climate has made it the center of Michigan's fruit industry. Fruit is canned and shipped, and home appliances, metal products, cranes, and machine tools are made. The nearby lake and beaches attract vacationers, and the city itself is a popular health resort. The House of David, a religious colony founded there in 1903, has numerous business and farm holdings. The city is the seat of a junior college. A fish hatchery and Warren Dunes State Park are nearby.

bentonite (bēn'tānīt) see CLAY

Bent's Fort, trading post of the American West, on the Arkansas River in present-day SE Colorado, E of Rocky Ford and La Junta and several miles above the mouth of the Purgatoire. The trading company headed by Charles BENT and Ceran St. Vrain, one of the most successful in the West, also included William BENT and two other Bent brothers. They had their first post in the area in 1826 and in 1833 moved to the completed fort, often called Bent's Old Fort. Because William Bent was the manager and chief trader in all the years of its prosperity, it is also sometimes called Fort William. Within its adobe walls came all the famous mountain men of the later period, as the fort on the mountain branch of the Santa Fe Trail came to dominate the trade of all the Indian tribes S of the Black Hills as well as that of the Mexicans and the arriving Americans. Kit Carson was a hunter there from 1831 to 1842. S. W. Kearny and Sterling Price each briefly used the fort for their troops in the Mexican War. According to the generally accepted story, the Indian trade fell off and William Bent attempted to sell the fort to the U.S. government, he reached no satisfactory conclusion and in anger abandoned the fort and set the powder in it on fire, partially destroying it. In any case the fort was abandoned by 1852. William Bent erected a new establishment farther down the Arkansas in 1853. That post (Bent's New Fort) he leased to the government in 1860. Fort Lyon was afterward built around it. See D. S. Lavender, *Bent's Fort* (1954, repr. 1968).

Bent's Old Fort National Historic Site: see NATIONAL PARKS AND MONUMENTS (table)

Benue (bānwā'), river, W Africa, chief tributary of the Niger. It flows c 670 mi (1,080 km) W from the United Republic of Cameroon into the Niger River at LOKOJA, Nigeria. The Benue, which carries much commercial traffic, is almost entirely navigable by power-driven boats in August and September, the height of the rainy season. In 1854, William B. Baikie piloted a steamer c 400 mi (640 km) upstream from Lokoja.


Ben Yehudah, Elezer (ēlī'zār bēn yēhōō'dā), 1858–1922, Jewish scholar and leader, b. Lithuania. He settled in Palestine as early as 1881, where he dedicated himself to the revival of Hebrew as the national language. His outstanding scholarly achievement is the *Dictionary of Ancient and Modern Hebrew* (16 vol.), which includes all the Hebrew words used throughout the various periods of He-

brew literature, omitting the words of Aramaic and foreign origin and adding new words that he coined to meet modern needs. He also founded the Hebrew Language Council, an institution devoted to promoting and regulating the development of the Hebrew language. In 1953 it was transformed into the Academy of Hebrew Language. See Robert St. John, *Tongue of the Prophets: the Life Story of Elezer Ben Yehuda* (1952).

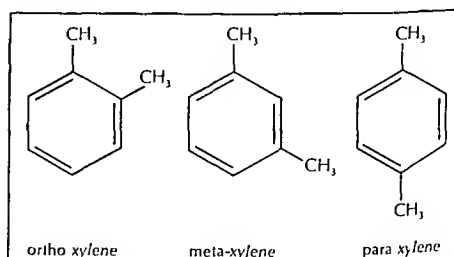
Benz, Karl (bēnts), 1844–1929, German engineer, credited with building the first automobile powered by an internal-combustion engine. The car, driven in Mannheim in 1885 and patented in 1886, had three wheels, an electric ignition, and differential gears and was water-cooled. As a result of a merger in 1926, Benz's company became Daimler-Benz AG, the manufacturer of the Mercedes-Benz automobile. See St. J. C. Nixon, *The Invention of the Automobile* (Karl Benz and Gottlieb Daimler) (1936), Eugen Diesel, *From Engine to Autos* (tr., 1960).

benzaldehyde (bēnzāl'dahīd) or **benzenecarbon-al** (bēn'zēnkar'bānəl), C_6H_5CHO , colorless liquid ALDEHYDE with a characteristic almond odor. It boils at $180^\circ C$, is soluble in ethanol, but is insoluble in water. It is formed by partial oxidation of benzyl alcohol, and on oxidation forms benzoic acid. It is called oil of bitter almond, since it is formed when amygdalin, a glucoside present in the kernels of bitter almonds and in apricot pits, is hydrolyzed, e.g., by crushing the kernels or pits and boiling them in water, glucose and hydrogen cyanide (a poisonous gas) are also formed. It is also prepared by oxidation of toluene or benzyl chloride or by treating benzal chloride with an alkali, e.g., sodium hydroxide. Benzaldehyde is used in the preparation of certain aniline dyes and of other products, including perfumes and flavorings.

Benzedrine (bēnz'īdrēn'), trade name for the drug AMPHETAMINE

benzene (bēn'zēn, bēnzēn'), colorless, flammable, toxic liquid with a pleasant aromatic odor. It boils at $80.1^\circ C$ and solidifies at $5.5^\circ C$. Benzene is a HYDROCARBON, with formula C_6H_6 . The simplest picture of the benzene molecule, proposed by the German chemist Friedrich Kekulé (1865), is a hexagon of six carbon atoms joined by alternating single and double bonds and each bearing one hydrogen atom, symbolized by . However, modern studies have

shown that the six carbon-carbon bonds are all of equal strength and distance, thus the double-bond electrons do not belong to any particular bonds but rather are delocalized about the ring, with the result that the strength of each bond is between that of a single bond and that of a double bond (see CHEMICAL BOND). Benzene is the parent substance of the AROMATIC COMPOUNDS, a large and important group of organic compounds. It is the first of a series of hydrocarbons known as the benzene series, formed by the substitution of methyl groups, CH_3 , for the hydrogen atoms of the benzene molecule. The second member of the series is TOLUENE, $C_6H_5CH_3$, from which TRINITROTOLUENE is derived, and the third member is XYLENE, $C_6H_4(CH_3)_2$, a solvent. In xylene and other benzene derivatives in which two of the hydrogens have been replaced, there are three possible arrangements of the substitution groups, in the *ortho* (o) configuration the groups are on adjacent carbon atoms, in the *meta* (m) configuration the groups are separated by one carbon atom, and in the *para* (p) configuration the groups are on opposite sides of the ring. The three forms of xylene (dimethylbenzene) are shown below.



In addition to derivatives formed by the substitution of other groups for one or more of the hydrogen atoms of the benzene ring, two or more rings may be joined together, as in NAPHTHALENE, ANTHRACENE, and PHENANTHRENE, or other atoms, such as nitrogen, may be substituted for carbon atoms in the ring, as in PYRIDINE (C_5H_5N) and PYRIMIDINE ($C_4H_4N_2$). Among the important derivatives of benzene are PHENOL, ANILINE, and PICRIC ACID. Benzene and the other aro-

matic hydrocarbons are obtained for industrial purposes from the distillation of coal tar, a by-product in the manufacture of coke, and from petroleum by special cracking methods. They are used in the manufacture of plastics and synthetic rubber and of dyes and drugs.

benzene, dimethyl: see XYLENE

benzene, 1,2,3-trihydroxy-, IUPAC name for pyrogallol. See GALLIC ACID

benzenecarbonal, IUPAC name for BENZALDEHYDE

benzene hexachloride: see INSECTICIDE

benzine (bĕn'zĕn, bĕnzĕn'), colorless, highly flammable liquid. It is used as a cleaning agent because it is a solvent for organic substances such as fats, oils, and resins and is also used in the preparation of certain dyes and paints. Benzine is a mixture of hydrocarbons, chiefly alkanes such as pentane and hexane. It is obtained by the fractional distillation of PETROLEUM.

benzoate of soda: see SODIUM BENZOATE

Ben-zoheth (bĕn-zō'hĕth), Judahite 1 Chron 4:20
benzoic acid (bĕnzō'ik), C₆H₅CO₂H, crystalline solid organic acid that melts at 122°C and boils at 249°C. It is the simplest aromatic carboxylic acid (see ARYL GROUP and CARBOXYL GROUP). In addition to being synthesized from a variety of organic compounds (e.g., benzyl alcohol, benzaldehyde, toluene, and phthalic acid), it may be obtained from resins, notably gum BENZOIN. It is used largely for making its salts and esters, most notably sodium benzoate, which is widely used as a preservative in foods and beverages and as a mild antiseptic in mouthwashes and toothpastes.

benzoic acid, 2-hydroxy-, IUPAC name for SALICYLIC ACID

benzoic acid, 3,4,5-trihydroxy-, IUPAC name for GALLIC ACID

benzoin (bĕn'zōin, -zō'īn) or **benzoinum** (bĕnzōin'əm), balsamic RESIN, the dried exudation from the pierced bark of various species of the benzoin tree (*Styrax*) native to Sumatra, Java, and Thailand, appearing as red-brown to yellow-brown tears. Because of its fragrant odor it is used in perfume and sometimes in incense. The benzoic acid present in it gives it value in medicine as an antiseptic, as a stimulant, and, in certain respiratory diseases, as an inhalant. Among the several varieties are Siam benzoin and Sumatra benzoin. Siam benzoin is considered finer, since it has a high content of benzoic acid; Sumatra benzoin contains cinnamic acid.

Ben-Zvi, Yizhak (yī'tsh'hak bĕn-tsvĕ), 1884-1963, president of Israel (1952-63), b. Russia, originally named Issac Shimshelevitz. A Zionist, he fled Russia in 1905 because of his activities in the Jewish self-defense movement and settled (1907) in Palestine. With David Ben-Gurion and other Zionist leaders he helped create the Jewish state. In 1952 he succeeded Chaim Weizmann as president of Israel; he was reelected in 1958 and again in 1962. He died in office in 1963. He was a historian and a scholar of note in the field of Jewish ethnology. His writings include *The Moslem World and the Arab World* (1937), *The Exiled and the Redeemed* (new ed. 1961), and *The Hebrew Battalions* (Letters (1969)).

Beograd: see BELGRADE, Yugoslavia

Beolco, Angelo (anjĕ'lō bāōl'kō), 1502-42, Italian actor and playwright. While managing farms belonging to his family, Beolco had much contact with Paduan peasants, with whom he was deeply sympathetic. Their way of life formed the background for his rustic comedies featuring the peasant "Ruzzante," the name commonly given Beolco himself. Using the Paduan dialect, he brought great descriptive powers to his witty depiction of country life.

Beon (bĕ'ōn) see BETH-BAAL-MEON

Beor (bĕ'ōr) 1 Father of Balaam Num 22:5 Bosor 2 Peter 2:15 2 Father of BELA 1

Beowulf (bĕ'awōōlf), oldest English epic, probably composed in the early 8th cent. by an Anglian bard in the vicinity of Northumbria. It survives in only one manuscript, written A.D. c. 1000 by two scribes and preserved in the British Museum in the collection of Sir Robert Cotton. The materials for the poem are derived mainly from Scandinavian history, folk tale, and mythology. Its narrative consists of two parts: the first relates Beowulf's successful fights with the water monster Grendel and with Grendel's mother, the second narrates the hero's victory in his old age over a dragon and his subsequent death and funeral at the end of a long life of honor. These events take place entirely in Denmark and Sweden. The poem contains a remarkable fusion of pagan

and Christian elements and provides a vivid picture of old Germanic life. It is written in a strongly accentual, alliterative verse. See *The Beowulf Poet: A Collection of Critical Essays*, ed. by D. K. Fry (1968), studies by Kenneth Sisam (1965), J. C. Pope (rev. ed. 1966), E. B. Irving (1968), and Ritchie Girvan and Rupert Bruce-Mitford (1971).

Beppu (bĕp'pōō), city (1970 pop. 123,786), Ōita prefecture, NE Kyushu, Japan, on Beppu Bay. It is a major fishing port and a tourist resort noted for its numerous hot springs.

Beqa, El see BIQA, AL

bequest: see LEGACY

Bera (bĕ'rā), king of Sodom Gen 14:2

Berachah (bĕrā'kā) Beracah RSV 1 One who joined David at Ziklag 1 Chron 12:3 2 Valley, N of Hebron, running roughly east-west 2 Chron 20:26

Berachiah (bĕr'ākī'ā), variant form of BERECHIAH

Berachya ben Natronai ha-Nakdan: see BEREKHAH

Beraiah (bĕr'ā'ā), Benjamite 1 Chron 8:21

Béranger, Pierre Jean de (pyĕr zhaN də bāraN-zhā'), 1780-1857, French lyric poet. He was a protégé of Lucien Bonaparte and a friend of some of the most eminent men of his day. His first collection of songs, published in 1815, was immediately popular. He fitted his verse to popular melodies, and he used his poems largely to express republican and Bonapartist ideas, for which he was twice imprisoned. Some of his most popular pieces are "Le Roi d'Yvetot," "Ce n'est plus Lisette," "Le Grenier," and "Le Dieu des bonnes gens." See translations by William Walsh (1888) and Beranger's autobiography (1857).

Berar, India: see MADHYA PRADESH

Berat (bĕrat') or **Berati** (bĕratĕ), town (1970 pop. 25,700), capital of Berat prov., S central Albania. It is a commercial center (producing foodstuffs, textiles, and leather products) and the seat of a bishop of the Albanian Orthodox Church. There is an oil field nearby. Built probably on the site of ancient Antipatrea, Berat fell to the Serbs in 1345 and to the Turks in 1440. A citadel, rebuilt by the Byzantines in the 13th cent., overlooks the town, which has a 15th-century mosque and several old churches. The autocephalic Albanian Orthodox Church was proclaimed there in 1922.

Berbera (bŭrbəra), city (1963 est. pop. 12,000), N Somalia, a port on the Gulf of Aden. The city, which was first described in the 13th cent. by Arab geographers, was taken in 1875 by the rulers of Egypt, when they withdrew in 1884 to fight the Mahdi in Sudan. Britain took Berbera. It served until 1941 as the winter capital of British Somaliland.

Berbers, aboriginal Caucasoid peoples of N Africa. They inhabit the lands lying between the Sahara and the Mediterranean Sea and between Egypt and the Atlantic Ocean. The Berbers form a substantial part of the populations of Libya, Algeria, and Morocco. Except for the nomadic TUAREG, the Berbers are small farmers, living under a loose tribal organization in independent villages. They have developed local industries (iron, copper, lead, pottery, weaving, and embroidery). The Berbers are Sunni Muslims, and their native languages are of the Hamitic group, but most literate Berbers also speak Arabic, the language of their religion. Berber languages are spoken by over 10 million people, not all of whom are considered ethnic Berbers. Despite a history of conquests, the Berbers have retained a remarkably homogeneous culture, which, on the evidence of Egyptian tomb paintings, derives from earlier than 2400 B.C. The alphabet of the only partly deciphered ancient Libyan inscriptions is close to the script still used by the Tuareg. The origins of the Berbers are uncertain, although many theories have been advanced relating them to the Canaanites, the Phoenicians, the Celts, the Basques, and the Caucasians. In classical times the Berbers formed such states as MAURETANIA and NUMIDIA. Until their conquest in the 7th cent. by Muslim Arabs, most of the Berbers were Christian (also, a sizable minority had accepted Judaism), and many heresies of the early African church, particularly Donatism, were essentially Berber protests against the rule of Rome. Under the Arabs, the Berbers became Islamized and soon formed the backbone of the Arab armies that conquered Spain. However, the Berbers repeatedly rose against the Arabs, and in the 9th cent. they supported the FATIMID dynasty in its conquest of N Africa. After the Fatimids withdrew to Egypt, N Africa was plunged into an anarchy of warring Berber tribes that ended only when the Berber dynasties, the ALMORAVIDS and the ALMOHAIDS, were born. With the disintegration of these dynasties, the Berbers of

the plains were gradually absorbed by the Arabs, while those who lived in inaccessible mountain regions, such as the Aures, the Kabylia, the Rif, and the Atlas, retained their culture and warlike traditions. When the French and the Spanish occupied much of N Africa, it was the Berbers of these mountainous regions who offered the fiercest resistance. In more recent times the Berbers, especially those of the Kabylia, assisted in driving the French from Algeria. See Ernest Gellner, *Saints of the Atlas* (1969), Ernest Gellner and Charles Micaud, ed., *Arabs and Berbers* (1972), John Waterbury, *North for the Trade* (1972).

Berbice: see GUYANA

Berceo, Gonzalo de (gŏntha'lō thā bārthā'ō), c. 1198-1265?, earliest known Spanish medieval poet. He was a religious in a Benedictine monastery who wrote prolifically on saints and other figures important in the history of the church. His devotion to the Virgin is expressed in 25 poems entitled *Milagros de Nuestra Señora* [miracles of Our Lady] (c. 1245-60). See study by J. E. Keller (1972).

Berchem (bĕr'khəm), city (1970 pop. 50,241), Antwerp prov., N Belgium, an industrial suburb of Antwerp.

Berchet, Giovanni (jŏvan'nĕ bĕrkĕt'), 1783-1851, Italian patriot and poet. He conspired to free Lombardy from Austria and was exiled. He wrote stirring patriotic ballads of a romantic type and rhymed romances, such as *Giulia* and *Matilde*.

Berchtesgaden (bĕrkht'sgā'dən), town (1970 est. pop. 4,300), Bavaria, SE West Germany, in the Bavarian Alps. It is a popular winter and summer resort. Salt has been mined there since the 12th cent. At the nearby Obersalzberg is the site of Hitler's residence, the Berghof.

Berchtold, Leopold, Graf von (lā'ōpōlt graf fən bĕrkht'ōlt), 1863-1942, Austro-Hungarian foreign minister (1912-15). During the BALKAN WARS he successfully worked for the creation of an independent Albania to block Serbian access to the Adriatic Sea. After the assassination (June 28, 1914) of Archduke Francis Ferdinand at Sarajevo, he directed the reckless policy that precipitated World War I. Although Serbia made a conciliatory reply to his harsh ultimatum, Berchtold pressed for full acceptance; he probably even magnified a border incident in order to secure Emperor Francis Joseph's signature to the declaration of war on Serbia. See S. B. Fay, *The Origins of the World War* (2d ed. 1936).

Berdichev (byīrdyĕ'chĭf), Ukrainian *Berdychiv*, city (1969 est. pop. 61,000), SW European USSR, in the Ukraine, on the Gnolopyat River. It is a rail junction and the industrial and trade center of an area where sugar beets are raised. Engineering, sugar refining, tanning, and the manufacture of foodstuffs are the major industries. Founded in the 14th cent., Berdichev passed to Lithuania in 1546 and to Poland in 1569; Russia acquired it in 1793. During the 18th cent., Berdichev was an important Ukrainian commercial city and a center of Jewish Hasidism. Landmarks include a fortified Carmelite monastery (17th cent.) that is now a museum.

Berdyaev, Nicholas (bĕrdyĕ'āf), 1874-1948, Russian theologian and religious philosopher, b. Kiev. After an early period as a Marxist, Berdyaev became prominent in a brilliant circle of Russian intellectuals famous in their time for their interest in Russian Orthodoxy. Forced into exile in 1922, Berdyaev attracted similar circles in Berlin and Paris. He wrote prolifically and gained wide recognition. He decried the dehumanization of man by modern technology and believed that man fulfills himself in the free, creative act. Fond of dichotomies, Berdyaev discussed history in terms of eschatology and the human in terms of the divine. He believed in the ideal of the Godmanhood. Among his many works are *The End of Our Time* (tr. 1933), *The Destiny of Man* (tr. 1937), *Slavery and Freedom* (tr. 1944), *Dream and Reality: an Essay in Autobiography* (tr. 1950), *Truth and Revelation* (tr. 1953). See biographies by Donald Lowrie (1960), Michael Vallon (1960), and M. M. Davy (1964, tr. 1967), studies by Fuad Nucho (1966) and C. S. Calian (1968).

Berdiansk (bĕr'dyānsk'), city (1970 pop. 100,000), S European USSR, in the Ukraine on the Berdiansk Gulf of the Sea of Azov. It is a port and a rail terminus. Industries include fishing and fish processing, flour milling, oil refining, and the production of machinery, cables, and clothing. Berdiansk is also a health and seaside resort. The city was founded in 1827. From 1939 to 1958 it was called Osipenko. Medical and teachers colleges are in the city.

Berea or **Beroea** (both *bērē'a*) 1 Town, near Jerusalem 1 Mac 9:4 It is probably identical with **BEROTH** 1. 2 See **VEROIA**, Macedonia 3 See **ALEPPO**, Syria

Berea (*bārē'a*), city (1970 pop 22,396), Cuyahoga co., NE Ohio, a suburb of Cleveland, settled 1809, inc as a city 1930 Berea was once famous for its sandstone quarries Baldwin-Wallace College is in the city

Berea College, at Berea, Ky., coeducational, founded 1855 by John G. Fee as a one-room district school, chartered 1866 and became a college in 1869 Each student works a minimum of 10 hours a week to help pay expenses The school owns and the students operate a bakery, laundry, printing shop, and hotel The campus includes extensive farm and forest lands

Bereans or **Beroeans** (both *bārē'anz*), members of a Protestant religious sect founded in Scotland by John BARCLAY c 1773 They took their name from the community mentioned in Acts 17:10-13 They held the main Calvinist doctrines and placed great emphasis on the study of the Scriptures The sect is almost extinct

Berechiah (*bēr'ākī'a*) 1 Son of Zerubbabel 1 Chron 3:20 2 Father of MESHULLAM 3, 4 Levites, perhaps the same person 1 Chron 9:16, 15:23 5 Important Ephraimite 2 Chron 28:12 6 Father of Asaph the psalmist 1 Chron 15:17 Berachiah 1 Chron 6:39 7 Father of Zechariah the Minor Prophet Zech 1:1, 7 In Mat 23:35 the name Barachias is probably a textual insertion, for the Zechariah being referred to is almost certainly ZECARIAH 2, not Zechariah the Minor Prophet

Bered (*bēr'ed*) 1 Unidentified place, S Palestine Gen 16:14 2 See **BECHER** 2

Berechiah ben Natronai ha-Nakdan (*bērākī'a bēn natrōnī' ha-nak'dan*), fl 12th or 13th cent., French Jewish fabulist, biblical commentator, philosopher, grammarian, and translator His first name also appears as Berachya He is best known for his collection of fables in rhymed prose, *Mishlei Shualim* (tr. by Moses Hadas, *Fables of a Jewish Aesop*, 1967), derived from the French collection *Ysopet* of Marie de France (c 1170), from the now lost Latin translation of Aesop, *Romulus*, and from several oriental sources His *Sefer Mazref* (tr. by Sir Herman Gollancz, *The Ethical Treatises of Berachya*, 1902) is a summary of the ethical views of Saadia and several other GAONIM

Berengar II (*bēr'ing-gār*), d 966, marquis of Ivrea In 950 he made himself and his son joint kings of Italy, but his great unpopularity and his attempt to force ADELAIDE, his predecessor's widow, to marry his son, brought the intervention (951) of OTTO I of Germany Berengar swore fealty to Otto in 952 Later he ravaged Italy and intrigued with Pope JOHN XII against Otto, who captured and imprisoned Berengar in 963

Berengar of Tours (*bēr'ing-gār*), c 1000-1088?, French theologian, also called Berenger and Berengarius, b Tours He was archdeacon of Angers (c 1040-1060) After studying at Chartres, he returned to Tours to become head of its cathedral school Berengar is said to have denied the Real Presence in the EUCHARIST His defiance of authority angered his contemporaries, particularly LANFRANC Berengar was defended by Pope GREGORY VII and Peter Damian He wrote a reply to Lanfranc, *De Sacra Coena*, which was condemned He was declared a heretic, but became reconciled with the church before his death Berengar's controversy with the church brought about a more explicit formulation of the doctrine of the Eucharist See A J Macdonald, *Berengar and the Reform of Sacramental Doctrine* (1930)

Berenice (*bērānī'sē*), b c 340 B.C., d 281 or 271 B.C., consort and half sister of Ptolemy I, king of ancient Egypt A Macedonian, she was the widow of Philip, one of the officers of Alexander the Great, and was by this marriage the mother of Magas, king of Cyrene, Antigone, wife of Pyrrhus of Epirus, and Theoxena, wife of Agathocles, ruler of Syracuse She was a niece of Ptolemy's first wife, Eurydice, whom she accompanied to Egypt and soon supplanted in Ptolemy's affections Berenice, whose portrait appears with that of Ptolemy on many medals, was the mother by him of Ptolemy II and Arsinoe II

Berenice, c 273-221 B.C., queen of ancient Cyrene and Egypt She was the daughter and successor of King Magas of Cyrene Objecting to her mother's choice of a husband for her after her father's death, Berenice led a successful revolt and put her suitor to death In 247 B.C. she married Ptolemy III, thereby effectively annexing Cyrene to Egypt According to

Callimachus and Catullus, he named a constellation after her, Berenice's Hair (Coma Berenices) After her husband's death she ruled jointly with their son, Ptolemy IV, until he had her put to death

Berenice, c 280-246 B.C., queen-consort of ancient Syria, wife of Antiochus II She was called Berenice Syria She was the daughter of Ptolemy II, and her marriage (252) to Antiochus II marked a temporary cessation in the wars between the Egyptian monarchs and the Seleucids On the death of Antiochus, however, Laodice, the king's divorced first wife, brought about the death of Berenice and her infant son before Berenice's brother, Ptolemy III, could arrive New war resulted

Berenice, fl 6 B.C., Jewish princess, daughter of Costobarus and Salome, sister of Herod the Great She was married to her cousin Aristobulus and bore him a son, Herod Agrippa I She was accused of having instigated the murder of her husband by Herod the Great in 6 B.C. Later she married Theudion, a brother-in-law of Herod the Great After Theudion was put to death for plotting against Herod, she married Archelaus

Berenice, b. A.D. c 28, Jewish princess, daughter of Herod Agrippa I A very beautiful woman, she was often involved in intrigue After her first husband died, she was married to her uncle Herod of Chalcis After his death (A.D. 48) she lived in incest with her brother, Herod Agrippa II, causing some scandal Her third husband was Polemon II, a king in Cilicia, whom she abandoned, returning to Herod Agrippa II It was before her and Agrippa that Paul appeared at Caesarea (Acts 25:23) In the struggle between Rome and Judaea both she and her brother espoused the Roman cause She attracted the attention of the emperor Titus, and after the destruction of Jerusalem (A.D. 70) he apparently planned to marry her The great unpopularity of the Jews with the Romans forced him to withdraw from the match Titus' dilemma is the subject of Racine's play *Berenice*

Berenice, city of ancient Cyrenaica see **BENGASI**

Berenice, ancient city of Egypt, on the Red Sea Founded by Ptolemy II and named in his mother's honor, it commanded the trade with Arabia

Berenson, Bernard (*bēr'ənsən*), 1865-1959, American art critic and connoisseur of Italian art, b Lithuania, grad Harvard, 1887 An expert and an arbiter of taste, he selected for art collectors innumerable paintings, many of which are now in museums A testament to his taste may be seen in the Gardner Museum in Boston He was associated for many years with the British art dealer Lord Duveen as chief art adviser Berenson settled (c 1900) in Settignano, near Florence, Italy, where he built up a fine art collection and library He was noted as a brilliant conversationalist and wit His home, I Tatti, became a mecca for European and American intellectuals and was willed to Harvard Univ Some of Berenson's early publications are still used in the study of art history, though later scholars have criticized many of his judgments Among his many writings are *Venetian Painters of the Renaissance* (1894), *Lorenzo Lotto* (1895), *Florentine Painters of the Renaissance* (1896), *Central Italian Painters of the Renaissance* (1897), *Drawings of the Florentine Painters* (1903), *North Italian Painters of the Renaissance* (1907), *Sketch for a Self-Portrait* (1949), *Rumor and Reflection* (1952), *The Passionate Sightseer* (1960), *Sunset and Twilight* (1967), *Diaries 1947-1958*, ed. by Nicky Mariano (1963), and *Italian Pictures of the Renaissance* (repr 1972) See biographies by Sylvia Sprigge (1960) and Nicky Mariano (1966)

Beresford, John (*bēr'zīfərd, -īs-*), 1738-1805, Anglo-Irish Protestant politician He entered the Irish Parliament in 1760, became a privy councillor (1768), a commissioner of revenue (1770), and chief revenue commissioner (1780) Committed to the continued political dominance of his own class in Ireland, he was a strong supporter of and chief adviser on Irish affairs to William Pitt He advocated both a commercial treaty that emphasized economic dependence on England and the parliamentary union of England and Ireland, the eventual passage (1800) of which he steered through the Irish Parliament The extent of his personal power and patronage provoked his brief dismissal (1795) by the 2d earl of FITZWILLIAM, who was attempting to reassert the role of the lord lieutenant, but Fitzwilliam was recalled and Beresford reinstated He sat in the united British Parliament until 1802

Beresford, William Carr Beresford, Viscount, 1768-1854, British general He served with distinction in Egypt (1801-3) and participated (1806) in the

capture of Cape Colony (Cape Province, South Africa) from the Dutch He captured Buenos Aires in 1806 but held it only briefly before it was retaken by Jacques de LINIERS Beresford occupied Madeira (1807) and for a time was governor of the island Joining Arthur Wellesley (later duke of Wellington) in Portugal (1808), he successfully reorganized the Portuguese army and was prominent throughout the PENINSULAR WAR Created viscount in 1823, he was master general of ordnance in Wellington's cabinet from 1828 to 1830

Berezina (*byērāzēna'*), river, c 380 mi (610 km) long, rising in NW Belorussia, E central European USSR It flows generally S past Borisov and Bobruysk into the Dnepr River It is navigable for most of its length The heroic retreat across the Berezina of the remnants of Napoleon's Grand Army took place near Borisov from Nov 26 to Nov 29, 1812 Despite the loss of more than 20,000 men, the crossing—effected under heavy Russian attack—saved Napoleon and his forces from capture

Berezniki (*bīryēznīkē'*), city (1970 pop 145,000), E European USSR, a port on the Kama River Situated in an area rich in potassium salts, Berezniki is one of the main industrial centers of the Urals and contains a huge chemical combine The city was founded as a sodium plant in 1883

Berg, Alban (*al'ban bērk*), 1885-1935, Austrian composer In his youth he taught himself music but in 1904 he became the pupil and close friend of Arnold Schoenberg Later Berg himself taught privately in Vienna He adopted atonality and later the 12-tone technique of Schoenberg, although he tempered it with the lyric and dramatic qualities of the Viennese romantic tradition His masterpiece, the opera *Wozzeck* (based on the play by Georg Buchner, Berlin, 1925), aroused strenuous protest, but it has since been acclaimed as a major work of the 20th-century musical stage He left unfinished another symbolic and erotic opera, *Lulu* (based on two plays by Wedekind, Zurich, 1937), which adhered more strictly to the 12-tone principle than did *Wozzeck* His Violin Concerto (Barcelona, 1936) was his last completed work He also wrote songs and chamber music See his letters to his wife, ed and tr by Bernard Grun (1971), biographical studies by H. F. Redlich (1957) and Willi Reich (tr 1965)

Berg (*bērk*), former duchy, W West Germany, along the right bank of the Rhine River between the Ruhr and Sieg rivers Dusseldorf was its chief city A county in the 12th cent., Berg passed (1348) to the dukes of JÜLICH and in 1380 was made a duchy In 1423 the duchies of Berg and Jülich were united On the extinction (1511) of the Berg-Jülich line, Berg passed to Duke John III of Cleves (see **CLEVES, DUCHY OF**), whose line died out in 1609, setting off a virulent struggle over succession that contributed to the outbreak of the Thirty Years War (1618-48) In 1614, Berg was awarded to the Palatinate-Neuburg branch of the Bavarian house of Wittelsbach, the award was confirmed in the Treaty of Cleves (1666) Ceded to France in 1806, Berg was raised to a grand duchy by Napoleon I in favor of Joachim Murat The Congress of Vienna assigned (1815) the duchy to Prussia

Bergamo (*bēr'gamō*), city (1971 pop 127,181), capital of Bergamo prov., in Lombardy, N Italy, in the foothills of the Alps It is an industrial center and an agricultural market Manufactures include machinery, textiles, and cement Originally a Gallic town, Bergamo became an independent commune in the 12th cent It came under the rule (1329-1427) of the Visconti and then of Venice until 1797, when it was included in the Cisalpine Republic Bergamo is divided into two sections the old, hilltop town and the modern, lower sector Noteworthy buildings in the old town include a Romanesque church (12th cent.), the beautiful Renaissance Colleoni chapel (15th cent.), and a 14th-century baptistery

bergamot (*būrgəmət'*) [from Bergamo, Italy], citrus tree (*Citrus bergamia*) grown chiefly in Italy, belonging to the family Rutaceae (RUE family) From the rind of the bergamot orange is extracted an essential oil used in perfumes and eau de Cologne Various North American plants of the Labiatae (MINT family) are also called bergamot because of their bergamotlike fragrance Chief among these is *Monarda fistulosa*, or wild bergamot, closely related to the Oswego tea, or **BEE BALM**, which it resembles The name bergamot is also applied to a variety of pear True bergamot is classified in the division MAGNOLIOPHYTES, class Magnoliopsida, order Sapindales, family Rutaceae

Bergen, East Germany see **RÜGEN**

Bergen (bĕr'gən), city (1970 pop. 113,351), capital of Hordaland co., SW Norway, situated on inlets of the North Sea. It is Norway's third largest city and a major shipping and shipbuilding center. Other manufactures include processed food, textiles, steel, machinery, and electrical equipment. Founded c 1070 by Olaf III (Olaf Kyrre), Bergen soon became the largest city of medieval Norway. It was often the royal seat, and the earliest coronations took place there. The city became an establishment of the HANSEATIC LEAGUE in the mid-14th cent. The Hansa merchants, enjoying extraterritorial privileges, imposed their unpopular rule on Bergen until 1560, and thereafter continued to have influence until the late 18th cent. During the disturbances accompanying the Reformation (16th cent.), most of the city's old churches and monasteries were destroyed. However, Bergen remained Norway's leading city until the rise of Oslo in the 19th cent. The center of Bergen was rebuilt after a severe fire in 1916. Nevertheless, the city retains many impressive monuments of its medieval past. One of its most famous buildings is Bergenhus fortress, which contains Haakon's Hall (1261), it was rebuilt after being heavily damaged in World War II. Other old buildings include the Quay, a group of wooden quayside houses rebuilt in their medieval style after a fire in 1702, St. Mary's Church (12th cent.), Fantoft Stavkirke (12th cent.), and, just south of Bergen, the 12th-century ruins of Norway's first Cistercian monastery. One of the chief cultural and educational centers of Norway, Bergen has a university (founded 1948), a school of economics and business administration, several scientific institutes, and a Hanseatic museum. Bergen's theater was founded (1850) by the composer and violinist Ole Bull and gained international recognition under such directors as Ibsen and Bjørnson. The dramatist Ludvig Holberg (1684) and the composer Edvard Grieg (1843) were born in Bergen.

Bergen, N.J. see JERSEY CITY

Bergenfield, borough (1970 pop. 33,131), Bergen co., N.E. N.J., inc. 1894. It is mainly residential with some light industry. Its Old South Church was built in 1799.

Bergen op Zoom (bĕr'gən ȯp zōm'), town (1971 pop. 39,612), North Brabant prov., SW Netherlands, on the Zoom River near its confluence with the Eastern Scheldt. It is a commercial and fishing port and its industries manufacture chemicals, machinery, and refined sugar. Bergen op Zoom was chartered c 1260 and was a major commercial rival of Antwerp until the 16th cent. It was repeatedly besieged by the Spanish and French in the wars that took place from the 16th to the 18th cent. and by the English in 1814. There are several historic buildings, notably the town hall (14th cent.), a 15th-century church (Groote Kerk), and the Markiezenhof palace.

Berger, Victor Louis, 1860-1929, American Socialist leader and Congressman, b. Austria-Hungary. After studying at the universities of Budapest and Vienna, he emigrated (1878) to the United States and settled in Milwaukee. After 1892 he devoted himself to Socialist politics and journalism, editing the Milwaukee *Vorwärts* (1892-98) and a weekly that became (1911) the influential Milwaukee *Leader*. With Eugene V. Debs he pioneered in creating the American Socialist party. His leadership brought (1910) the Socialists control of Milwaukee for many years and made Berger the first Socialist member of Congress (1911-13). Reelected twice (1918, 1919), he was excluded by Congress on grounds of sedition, for which he was sentenced (1918-19) to a 20-year prison term. The decision was reversed by the U.S. Supreme Court in 1921, and he was allowed to take his seat when reelected in 1922. Again elected in 1924 and 1926, he was defeated in 1928. *Voice and Pen* (1929) is a collection of his speeches and editorials. See U.S. Congress, House, Special Committee on Victor L. Berger Investigation, *Case of Victor L. Berger of Wisconsin* (Hearings (1919 and 1921, repr. 1972), study by S. M. Miller (1973)).

Bergerac, Cyrano de, see CYRANO DE BERGERAC

Bergerac (bĕrzhă'k'), town (1968 pop. 28,015), Dordogne dept., SW France, in Périgord, on the Dordogne River. It is a farm-trade and processing center. It also has boiler works, foundries, and shoe and clothing plants. Possessed by the English in the 14th cent., it was recovered in 1450 by the French. It became a Protestant stronghold and was taken (1621) by Louis XIII. A tobacco museum and an experimental tobacco institute are there.

Bergh, Henry, 1811-88, American philanthropist, b. New York City. His abhorrence of human cruelty toward animals led him to found (1866) the American Society for the Prevention of Cruelty to Animals.

This organization, the first of its kind in the country, was granted the authority to enforce local animal protection laws by the New York state legislature in the same year. In 1875, with Elbridge T. Gerry and others, he helped form the Society for the Prevention of Cruelty to Children. See Zulma Steele, *Angel in Top Hat* (1942).

Bergisch-Gladbach (bĕr'gish-glăt'bakh'), city (1970 pop. 49,558), North Rhine-Westphalia, W. West Germany, chartered 1856. Manufactures of this industrial city include paper and metal goods, wool, pharmaceuticals, and electrical equipment.

Bergman, Hjalmar (yal'mär bĕr'yămän), 1883-1931, Swedish novelist, dramatist, and short-story writer. A popular and prolific writer, Bergman wrote from the background of an unhappy childhood and chronic mental depression. His works are characterized by insight into the ambivalence of human emotions. Bergman's individual style combines a basically pessimistic view with ironic humor, as in the play *Swedenhielms* [the Swedenhielm family] (1925) and the novels *God's Orchid* (1919, tr. 1924) and *The Head of the Firm* (1924, tr. 1936). See his *Four Plays* (tr. 1968).

Bergman, Ingmar (ing'mar bĕr'yămän), 1918-, Swedish film and stage writer, director, and producer. Bergman is esteemed as creator of numerous films remarkable for their Nordic expressionism, sensuous imagery, and irony. Not long after his first film script, for *Torment* (1945), he was allowed complete creative control over his films, working within small budgets. He assembled a group of players and technicians whom he used repeatedly in films and stage works. Although his films are largely concerned with man's search for God and the triumph of evil, none of them is without humor. Some, like *The Devil's Eye* (1960), treat the comic vagaries of love. His foremost films include *The Seventh Seal* (1956), *Wild Strawberries* (1957), *The Virgin Spring* (1959), and the trilogy *Through a Glass Darkly* (1961), *Winter Light* (1962), and *The Silence* (1963). Later films, *Persona* (1966), *Shame* (1968), *The Passion of Anna* (1970), *Cries and Whispers* (1972), and *Scenes from a Marriage* (1974), reflect a growing pessimism, an emphasis on personal relationships, and an increasingly lyric and personal visualization. See *Four Screenplays of Ingmar Bergman* (tr. 1960), *Ingmar Bergman's Trilogy* (1968), biography by Birgitta Steene (1967), study by Vernon Young (1971).

Bergman, Ingrid, 1915-, Swedish actress, b. Stockholm. Bergman acted first in Sweden, then in Hollywood after 1939. She specialized in portrayals of strong, dignified, and sophisticated women. Her performance in *Joan of Lorraine* (1946) on stage was widely acclaimed. After 1949 she appeared in Italian, German, and French films. Her most notable films include *Intermezzo* (1939), *Casablanca* (1942), *For Whom the Bell Tolls* (1943), *Notorious* (1946), and *The Visit* (1964). She won Academy Awards for *Gaslight* (1944) and *Anastasia* (1956). Bergman was married to Roberto Rossellini. See L. J. Quirk, *Films of Ingrid Bergman* (1970).

Bergman, Torbern Olof (tōōr'bärn ȯlōv bĕr'yămän), 1735-84, Swedish chemist, physicist, and mineralogist. A professor at the Univ. of Uppsala from 1758, he developed a theory of chemical affinity, made improvements in the methods of chemical analysis (especially blowpipe analysis) and in the classification of rocks, and did important research in crystallography. He wrote a Dissertation on Elective Attractions (1775, tr. 1785). His collected works, *Essays, Physical and Chemical*, appeared in six volumes (1779-81, tr. 1791).

Bergognone (bĕrgōnyō'nā) or **Borgognone** (bōr-), fl. 1450-1523, Italian painter, known also as Ambrogio Stefani da Fossano. His most important works are the frescoes in the Certosa di Pavia. His luminous and often charming paintings are in the National Gallery, London, the Louvre, the Metropolitan Museum, and the National Gallery of Art, Washington, D.C. Other works have remained in the churches of Bergamo, Lodi, Milan, and Pavia.

Bergson, Henri (āNré' bĕrgsōN'), 1859-1941, French philosopher. He became a professor at the Collège de France in 1900, devoted some time to politics, and, after World War I, took an interest in international affairs. He is well known for his brilliant and imaginative philosophical works, which won him the 1927 Nobel Prize in Literature. Among his works that have been translated into English are *Time and Free Will* (1889), *Matter and Memory* (1896), *Laughter* (1901), *Introduction to Metaphysics* (1903), *Creative Evolution* (1907), *The Two Sources of Morality and Religion* (1932), and *The Creative Mind* (1934). Bergson's philosophy is dualistic—the world con-

tains two opposing tendencies—the life force (*élan vital*) and the resistance of the material world against that force. Man knows matter through his intellect, with which he measures the world. He formulates the doctrines of science and sees things as entities set out as separate units within the stream of becoming. In contrast with intellect is intuition, which derives from the instinct of lower animals. Intuition gives us an intimation of the life force which pervades all becoming. Intuition perceives the reality of time—that it is duration directed in terms of life and not divisible or measurable. Duration is demonstrated by the phenomena of memory. See H. W. Carr, *The Philosophy of Change* (1914, repr. 1970), H. M. Kallen, *William James and Henri Bergson* (1914), Ben-Ami Scharfstein, *Roots of Bergson's Philosophy* (1943), I. W. Alexander, *Bergson, Philosopher of Reflection* (1957), Thomas Hanna, ed., *The Bergsonian Heritage* (1962), P. A. Y. Gunter, *Bergson and the Evolution of Physics* (1969).

Berhampur (bār'həmpōr), town (1971 pop. 117,635), Orissa state, E central India. Rice, sugarcane, silk, gold-embroidered turbans, and leather goods are the main products. Berhampur was formerly a British military post.

Beri (bĕr'i), Asherite 1 Chron. 7:36

Beria, Lavrenti Pavlovich (lavrĕn'tyĕ pav'lāvich bār'ĕā), 1899-1953, Russian Communist leader, b. Georgia (now Georgian SSR). He rose to prominence in the Cheka (secret police) in Georgia and the Transcaucasus, became party secretary in these areas, and in 1938 became head of the secret police. As commissar (later minister) of internal affairs, Beria wielded great power, and he was the first in this post to become (1946) a member of the politburo. After Stalin's death (March, 1953), Beria was made first deputy premier under Premier Malenkov, but the alliance was shaky, in the ensuing struggle for power Beria was arrested (July) on charges of conspiracy. He and six alleged accomplices were tried secretly and shot in Dec., 1953. See biography by Thaddeus Wittlin (1972).

Beriah (bĕr'īā) 1 Son of Asher, eponym of the Berites Gen. 46:17, Num. 26:44, 51. 1 Chron. 7:30. 2 Son of Ephraim 1 Chron. 7:23. 3 Benjamite 1 Chron. 8:13, 16. 4 Levite 1 Chron. 23:10, 11.

beriberi (bĕr'ĕbĕr'ē), deficiency disease occurring when the human body has insufficient amounts of thiamine (vitamin B₁). The deficiency may result from improper diet (e.g., ingestion of highly refined grains instead of the whole kernels), from poor absorption of thiamine (as in chronic diarrhea), from conditions which increase the vitamin requirements of the body (e.g., hyperthyroidism, pregnancy, fever), or from poor utilization (as in liver disease). In some instances (e.g., alcoholism) the deficiency arises from a combination of several or of all of these factors. Since thiamine is essential for the proper metabolism of carbohydrate and fat and for the normal functioning of enzymes and nervous tissue, the symptoms of the disorder are primarily those of neurological and gastrointestinal disturbances. In severe cases the heart becomes affected, and the nervous disorder may lead to paralysis and death. The disorder is rarely found in the West, occurring only among alcoholics and other groups who exist on grossly inadequate diets. It is a common malady in parts of Asia where the diet consists mainly of polished white rice. The usual treatment is administering dosages of thiamine.

Bering, Vitus Jonassen (vē'tōōs yō'nāsən bār'ing), 1681-1741, Danish explorer in Russian employ. In 1725 he was selected by Peter I to explore far NE Siberia. Having finally got men and supplies across Siberia, Bering in 1728 sailed N through Bering Strait but sighted no land and did not recognize the importance of the strait. Later in 1728, setting out from Kamchatka, he was driven from his course and discovered the southern route around Kamchatka. He returned to St. Petersburg, arriving in 1730. Bering then drew up a large scheme of exploration, which gained the support of the government. Under his general command various units of a huge expedition set out to map the far reaches of the Siberian arctic regions. Much was accomplished, but at great expense and with no immediate prospects of profit. Bering himself headed an expedition across the sea to Alaska. In 1741 he commanded the *St. Peter* while Aleksey Ilich Chirikov (d. 1748) commanded the *St. Paul*. They set out, rounded Kamchatka, founded the town of Petropavlovsk, and then sailed west. The vessels were separated. Bering sighted the St. Elias Mts. in Alaska on July 16, and the scientist Georg Wilhelm Steller led a landing party. Bering

then sailed W past the Aleutian Islands. The weather was bad, and almost all the crew had scurvy when the ship was wrecked on the shore of Bering Island, which they mistook for the coast of Kamchatka. There on Dec 8 Bering died. The few survivors of his crew repaired a small vessel from the *St Peter* and managed to reach Kamchatka in the summer of 1742. The *St Paul* under Chirikov had also sighted land and had halted on the way westward at one of the Aleutian Islands, possibly Attu, before returning to Kamchatka in Oct., 1741. See F. A. Golder, *Bering's Voyages* (2 vol., 1922-25, Vol. II is a translation of Steller's journal), studies by C. Goodhue (1944), R. W. Murphy (1961), and P. Lauridsen (tr. 1969).

Bering Island (bĕr'ĭng, bĕr'-), Rus. *Beringa*, largest of the Komandorski Islands, c 55 mi (90 km) long and up to c 15 mi (20 km) wide, off Kamchatka peninsula, E Far Eastern USSR, in the Bering Sea. It is low and treeless and is subject to severe windstorms. Nikolskoye is the chief town. Vitus Bering, sailing in the *St Peter*, was shipwrecked and died there.

Bering Sea, c 878,000 sq mi (2,274,020 sq km), northward extension of the Pacific Ocean between Siberia and Alaska. It is screened from the Pacific proper by the Aleutian Islands. The Bering Strait connects it with the Arctic Ocean. The sea's largest embayments are the Gulf of Anadyr, Norton Sound, and Bristol Bay. The Anadyr River enters the sea from the west and the Yukon River from the east. The warm Japan Current has little influence on the Bering Sea, which has much ice, it can usually be traversed only from June to October. The sea has many islands, notably Nunivak, St. Lawrence, Hall, St. Matthew, and the Pribilof Islands (all owned by the United States) and the Komandorski Islands (USSR). The sea was explored by the Russian Dezhnev in the 17th cent., but not until after the voyages of Vitus Bering (1728, 1741) was the fur-seal wealth of the Bering Sea made widely known. The whole region was under the control of the Russian American Company, but it proved impossible to prevent mariners from other nations from getting the skins of the seals and the sea otters. The question of protecting the seals became (1886) the subject of a bitter international incident called the **Bering Sea Fur-Seal Controversy**. The seal herd that summered in the Pribilof Islands wintered farther south, when returning north in the spring they could be taken in the open sea. The pelagic (open-sea) sealing, practiced by Canadian and other sealing vessels, greatly reduced the herd and threatened its extinction. The Alaska Commercial Company, which had a U.S. monopoly on the sealing, protested to the U.S. government, and in 1886 several Canadian vessels were seized and were condemned by a court at Sitka, Alaska. The legal basis for such action was the claim that Russia had controlled all the Bering Sea and that the control had passed to the United States with the purchase of Alaska in 1867, by claiming to exercise jurisdiction beyond the three-mile limit the United States had invoked the doctrine of *mare clausum* (closed sea) for the first time. This was not accepted by the British, and a move to settle the matter of protection by international agreement was blocked by the Canadians. The matter was referred to an international court of arbitration, which, meeting in Paris, declared in 1893 against the U.S. claim and awarded \$473,151 in damages to the owners of the seized vessels. It also imposed some restrictions on pelagic sealing, but these were ineffective. In 1911, Great Britain, Russia, Japan, and the United States agreed to prohibit pelagic sealing, sealing in the Pribilofs was put completely under U.S. supervision. For several years sealing was stopped completely, and then it was resumed but only under careful restrictions. Gradually the herd has been built up again. The 1911 agreement also prohibited the killing of sea otters, which are, however, almost extinct today.

Bering Strait, c 55 mi (90 km) wide, between extreme NE Asia and extreme NW North America, connecting the Arctic Ocean and the Bering Sea. It is usually completely frozen over from October to June. The Diomed Islands are in the strait. The narrowness of the strait makes it possible for small boats to cross from Chukchi Peninsula, NE USSR, to Seward Peninsula in Alaska. Since Alaska and Siberia were connected in the distant past, the usual theory is that the ancestors of the American Indians crossed the land bridge to North America. The strait is named for the Danish explorer Vitus Bering, who traversed it in 1728.

Berio, Luciano (lōō'cha-nō bĕr'yō), 1925-, Italian composer, b. Oneglia. After studying at the Milan Conservatory and working as coach and conductor

in Italian opera houses, Berio was introduced to SERIAL MUSIC by Luigi DALLAPICCOLA in 1952. A non-dogmatic use of serialism pervades all of his music for traditional instruments. In 1954, Berio began working in ELECTRONIC MUSIC at the Milan Radio with Bruno MADERNA. Among his works are *Sequenzas I-VI* (1958-70), each for a different solo instrument, *Circles*, for mezzo, harp, and percussion to poems of E. E. Cummings, several pieces with texts by James Joyce, *Visage* (1961), for electronically manipulated voice, *Sinfonia* (1968), for orchestra and voices, and *Opera* (1970), for mixed media.

Berites (bĕr'ĭt) see BICHR

Berith (bĕr'ĭth), abbreviation of BAAL-BERITH

Berkeley, George (bär'klē, būr-), 1685-1753, Anglo-Irish philosopher and clergyman, b. Co. Kilkenny, Ireland. Educated at Trinity College, Dublin, he became a scholar and later a fellow there. Most of Berkeley's important work in philosophy was done in his younger years. His *Essay Towards a New Theory of Vision* (1709), *A Treatise Concerning the Principles of Human Knowledge* (1710), and the famous *Three Dialogues Between Hylas and Philonous* (1713) are among his more important works. At considerable personal sacrifice he organized a movement to establish a college in the Bermudas to convert the American Indians, going to Rhode Island in 1728 to wait for promised support. This support never came, and after three years he returned to England. He was made bishop of Cloyne in 1734. Berkeley in his subjective idealism went beyond Locke, who had argued that such qualities as color and taste arise in the mind while primary qualities of matter such as extension and weight have existence independent of the mind. Berkeley held that both types of qualities are known only in the mind and that therefore there is no existence of matter independent of perception (*esse est percipi*). The observing mind of God makes possible the continued apparent existence of material objects. God arouses sensations in us in a regular coherent order. Selves and God make up the universe. Berkeley felt that his argument constituted a complete disproof of atheism. He believed that qualities, not things, are perceived and that the perception of qualities is relative to the perceiver. See edition of his works by A. A. Luce and T. E. Jessop (9 vol., 1948-57), biography by A. A. Luce (1949), studies by D. M. Armstrong (1960) and I. C. Tipton (1974).

Berkeley, John, 1st Baron Berkeley of Stratton, 1602-78, English army officer and courtier. A royalist, he fought in numerous engagements in the English civil war and later, through association with the duke of York (later James II), won great political advancement. Raised to the peerage in 1658, he was appointed lord president of Connaught for life in 1661 and one of the proprietors of NEW JERSEY in 1664. From 1670 to 1672 he was lord lieutenant of Ireland.

Berkeley, Sir William, 1606-77, colonial governor of Virginia. Appointed governor in 1641, he arrived in Virginia in 1642. Berkeley defeated the Indians and the Dutch, extended explorations, and encouraged agriculture, but so persecuted dissenters that many of them left the colony. An uncompromising royalist, he made Virginia a haven for supporters of Charles I and declined to recognize the Commonwealth. Berkeley was deposed by a Puritan force from England in 1652 and lived quietly on his Virginia plantation until the Restoration in 1660, when he was reappointed governor. His second term as governor was marred by great domestic discontent and strife. A drop in tobacco prices brought great economic suffering to the colony. At the same time it was charged that Berkeley was showing favoritism toward a small group of friends and depriving the freemen of their rights. When, in addition, Berkeley refused to take the measures demanded by the frontiersmen for protection against the Indians, BACON'S REBELLION broke out. Temporarily forced to flee, Berkeley regained power after Bacon's premature death and ordered the hanging of many of Bacon's followers. The executions were carried out in defiance of a royal commission that had arrived with pardon for all except Bacon. Finally he yielded to the commission's order that he return to England, where he died discredited. See T. J. Wertenbaker, *Virginia under the Stuarts, 1607-1688* (1914), Wilcomb Washburn, *The Governor and the Rebel* (1957).

Berkeley (bŭrk'lē) 1 City (1970 pop. 116,716), Alameda co., W Calif., on the eastern shore of San Francisco Bay, inc. 1878. Originally part of the Rancho San Antonio granted to the Peralta family in 1820 by the Spanish crown, the site was purchased by

Americans in 1853. The settlement, at first called Oceanview, was named Berkeley in 1866. The city's industries include food processing and the manufacture of chemicals, pharmaceuticals, and metal products. A campus of the Univ. of California and several divinity schools are in Berkeley. Points of interest include a marina, Tilden Park, University Museum, Lawrence Hall of Science, and Zellerbach Hall, an auditorium. Lawrence Radiation Laboratory, an atomic research center, is nearby. 2 City (1970 pop. 19,743), St. Louis co., E Mo., inc. 1937. Its manufactures include aircraft, truck bodies, and brake fluid. The first International Air Meet in the United States was held in Berkeley in 1910.

berkelium (bŭr'klēm) [from Berkeley], synthetic, radioactive chemical element, symbol Bk, at no. 97, mass no. of most stable isotope 247, m.p. and b.p. unknown, sp. gr. 14 (estimated), valence +3 or +4. Because pure berkelium has not been isolated in significant quantities, its physical properties are not known. It is believed to be similar to the other members of the ACTINIDE SERIES and to TERBIUM, its homolog in the lanthanide series. It is found in group IIIB of the PERIODIC TABLE. Nine isotopes of berkelium are known. Berkelium-247, the most stable isotope (half-life about 1,400 years), is difficult to produce; berkelium-249 (half-life 314 days) is more easily produced in weighable quantities and is used in studies of berkelium chemistry. The chloride, fluoride, sulfide, nitrate, sulfate, perchlorate, oxide, and dioxide have been produced. Berkelium was discovered late in 1949 by G. T. Seaborg, S. G. Thompson, and Albert Ghiorso, who produced it by bombarding americium-241 with alpha particles in the cyclotron of the Univ. of California at Berkeley. Weighable quantities of the pure element were first isolated by B. B. Cunningham and S. G. Thompson in 1958.

Berkhamstead, formerly also **Great Berkhamstead** (both bŭrk'əmstēd, bärk'-), urban district (1971 pop. 15,439), Hertfordshire, central England. Berkhamstead is mainly residential but has clothing, timber, and chemical industries. It is the site of an 11th-century royal castle in which Edgar Atheling, a claimant to the throne, submitted to William the Conqueror. Thomas a Becket lived in the castle, and Henry II held court there. John II of France was briefly imprisoned in the castle after the battle of Poitiers (1356) in the Hundred Years War. Berkhamstead also has a 16th-century grammar school.

Berkley, city (1970 pop. 22,618), Oakland co., SE Mich., a residential suburb of Detroit, inc. 1932.

Berkman, Alexander, 1870?-1936, anarchist, b. Vilna (then in Russian Poland). He emigrated to the United States c. 1887. At the time of the Homestead, Pa., strike (1892) Berkman attempted to kill Henry Clay Frick, but succeeded only in wounding him. He served 14 years of a 22-year sentence imposed for this attack. His association with Emma GOLDMAN, begun before his imprisonment, was resumed after his release. In 1917 they were arrested for obstructing the draft and in 1919 were deported to Russia. Disappointed in his hope of finding under the Bolshevik government the freedom that he sought, Berkman left Russia and in various European cities supported himself by translation. He committed suicide in Nice. His writings include *Prison Memoirs of an Anarchist* (1912, repr. 1970), *The Bolshevik Myth* (1925), *The Anti-Climax* (1925), and *Now and After the A.B.C. of Communist Anarchism* (1929).

Berkovits, Eliezer (ēl'ēā'zār bŭr'kōvĭts), 1908-, rabbi, theologian, and educator, b. Rumania. He served in the rabbinate in Berlin (1934-39), in Leeds, England (1940-46), in Sydney, Australia (1946-50), and in Boston (1950-58). In 1958 he became chairman of the department of Jewish philosophy of the Hebrew Theological College in Chicago. His writings touch upon the tensions created in the thought of a modern Orthodox Jew and Zionist between the claims of religious tradition and secular nationalism, among them are *Towards Historic Judaism* (1943), *God, Man, and History* (1959), and *A Jewish Critique of the Philosophy of Martin Buber* (1962).

Berkshire (bärk'shīr, -shar, bŭrk'-) or **Berks** (bärks), county (1971 pop. 633,457), S central England. The county town is READING. Berkshire lies almost entirely in the basin of the Thames River, which forms its northern border. It is largely agricultural, the Vale of the WHITE HORSE in the north and the Vale of Kennet in the south are the most productive areas. Chalk downs extend across the center of the county. Dairying and poultry farming are important, and Berkshire hogs are famous. Barley is the chief crop, wheat, oats, potatoes, cabbage, and kale for fodder are also raised. Industry in Berkshire has

grown rapidly since World War II. There are nuclear-research centers at Harwell and Aldermaston. Berkshire has been a transportation hub since Roman times. Modern highways run W from London through Berkshire. Part of the ancient kingdom of Wessex, Berkshire was the birthplace of King Alfred At Windsor is the famous Windsor Castle, chief residence of English monarchs for centuries. Berkshire was reorganized (1974) as a nonmetropolitan county.

Berkshire Festival, summer music festival, held since 1937 at "Tanglewood," a former estate in the adjoining towns of Stockbridge and Lenox, Mass. The Berkshire Festivals were begun in 1934 at a farm in Stockbridge. Henry Hadley conducted an orchestra composed largely of members of the New York Philharmonic-Symphony for two summers. In 1936, Serge Koussevitzky and the Boston Symphony Orchestra took over the festival. Charles Munch became musical director of the festival in 1951 and was followed by William Steinberg who conducted there through the summer of 1959. In 1974 the artistic director was Seiji Ozawa. The music shed at Tanglewood, designed by Eiel Saarinen, was opened in 1938. It seats 6,000 people and accommodates thousands of additional listeners on its vast lawns. In 1943 a summer school, the Berkshire Music Center, was begun in combination with the festival. See M. A. De Wolfe Howe, *The Tale of Tanglewood* (1945); R. Holland, *Tanglewood* (1973).

Berkshire Hills, region of wooded hills with many small lakes and streams, W Mass. The Berkshires are a southern extension of the Green Mts., but the name is generally applied to all highlands in W Massachusetts. Mt. Greylock, 3,491 ft (1,064 m), is the highest point in the hills and in the state. The Berkshire Hills have numerous summer and winter resorts, state parks, and forests. The Housatonic, Hoosic, and Westfield rivers drain the region and supply water power to manufacturing towns. Pittsfield, North Adams, Great Barrington, and Lenox are the largest towns in the Berkshires.

Berkshire swine, one of the oldest of the improved breeds of swine, originating in the county of Berkshire in S central England. The breed was imported to the United States in large numbers between 1830 and 1850 and has adapted itself to all parts of the country. Berkshires are of medium size, generally smooth, and somewhat longer in proportion to depth than other breeds. Their ears stand erect, their noses are short, and their color is black with white feet, nose, and tail.

Berlage, Hendrik Petrus (hēn'drək pā'trūs berlä-gə), 1836-1934, Dutch architect. In both his writings and architectural practice, Berlage advocated a return to simplicity of form and clarity of structure. In his Amsterdam Stock Exchange (1898-1903) and the Diamond Workers' Union Bldg. (Amsterdam 1899-1900), he introduced a flat wall surface within a Romanesque framework suggestive of the works of H. H. Richardson. Berlage took part in city planning projects for the Hague (1908) and Amsterdam (1915). His publications, e.g., *Gedanken über den Stil in der Baukunst* (1905), won him ideas great favor with the rising generation of modern architects, including the Amsterdam school and the architects of the *de Stijl*.

Berle, Adolf Augustus, Jr. (būr lē), 1895-1971, American lawyer and public official, b. Boston. Admitted to the bar in 1916, he served in World War I and was a member of the American delegation to the Paris Peace Conference. Resigning in protest against the terms of the Versailles Treaty, Berle returned to practice law in New York City and later became (1927) professor of corporate law at Columbia. As a specialist in corporation law and finance, he was a member of Franklin Delano Roosevelt's Brain Trust and helped shape much of the banking and securities legislation of the New Deal. As Assistant Secretary of State for Latin American affairs (1933-44), Berle attended many inter-American conferences and acted as spokesman for Roosevelt's Good Neighbor Policy. After serving (1945-46) as ambassador to Brazil, he resumed his professorship at Columbia and was a founder and chairman (1952-55) of the Liberal party. In 1961, Berle headed a task force for President John F. Kennedy that recommended the Alliance for Progress. His well-known writings include the classic study *The Modern Corporation and Private Property* (with G. C. Means, 1933, rev. ed. 1968), *The 20th Century Capitalist Revolution* (1954), *Tides of Crisis* (1957), *Power without Property* (1959), and *Power* (1969). A selection of his papers was edited by B. B. Berle and T. B. Jacobs (1973).

Berlichingen, Götz von (gōts' fən bër'likhīng-an), 1480-1562, German knight and adventurer. The head of a band of free soldiers, he lost (1504) his right hand in the battle of Landshut and wore an iron one in its place. His forays against various cities earned him popular fame. He reluctantly agreed to lead the peasants of Franconia during the Peasants' War (1524-26) but deserted them before their defeat. In 1542 he served with Holy Roman Emperor Charles V against the Turks and two years later fought against the French. His memoirs inspired Goethe's drama *Götz von Berlichingen* (1773).

Berlin, Irving, 1888-, American songwriter, b. Russia. Berlin's surname was originally Baline. Of his nearly 1,000 songs, *Alexander's Ragtime Band* (1911) was his first outstanding hit. In 1918, while he was in the army, he wrote, produced, and acted in *Yip, Yip, Yaphank*, which he rewrote in 1942 as *This Is the Army*. Berlin wrote songs for several of the *Ziegfeld Follies* and the *Music Box Revue* (1921-24) as well as the Broadway musicals *As Thousands Cheer* (1933), *Annie Get Your Gun* (1946), *Miss Liberty* (1949), *Call Me Madam* (1950), and *Mr. President* (1952). He was the composer of numerous film scores, and several of his stage musicals were filmed. Among the best known of his songs are "God Bless America" and "There's No Business Like Show Business." See biography by Michael Freedland (1974).

Berlin, Sir Isaiah, 1909-, English political scientist, b. Latvia. He was educated at Oxford, where he became (1932) a fellow and was later (1957-67) professor of social and political theory. In 1966 he was appointed president of Wolfson College, Oxford. In *The Hedgehog and the Fox* (1953) Berlin explored Leo Tolstoy's view of irresistible historical forces, and in *Historical Inevitability* (1954) he attacked both determinist and relativist approaches to history as superficial and fallacious. His other works include *Karl Marx* (3d ed. 1963) and *Four Essays on Liberty* (1969). He was knighted in 1957.

Berlin (būr 'līn, Ger bër'lēn'), city, former capital of Germany and of Prussia, NE Germany, on the Spree and Havel rivers. It is located within the German Democratic Republic (East Germany). In 1945 it was divided into four occupation zones. The Soviet sector, known as East Berlin, is now the capital of the German Democratic Republic. The zones assigned to the British, American, and French occupation forces now constitute West Berlin. The French occupied the northwestern part of the city, and the Americans and the British occupied the southern districts.

Historic Berlin. Berlin had its beginning in two Wendish villages, Berlin and Kölln, which were chartered in the 13th cent. and merged in 1307. It assumed importance as a Hanseatic town in the 14th cent. and became the seat of the electors of Brandenburg (after 1701, kings of Prussia). In 1486 Berlin suffered severely from the Thirty Years War (1618-48), but Frederick William (reigned 1640-88), the Great Elector, restored and improved the city. Occupied in the Seven Years War by Austrian (1757) and Russian (1760) troops and in the Napoleonic Wars by the French (1806-8), Berlin emerged from the conflicts as a center of German national feeling and an increasingly serious rival of Vienna. From the 18th and early 19th cent. date many of the distinguished monuments and buildings of the city (chiefly by Andreas SCHLÖTER and Karl Friedrich SCHINKEL), nearby POTSDAM became famous as the favorite residence of Frederick II (Frederick the Great, reigned 1740-86). The monumental Brandenburg gate, a triumphal arch in classical style, was erected during his reign. Frederick William Univ. was founded in 1810 and attracted many outstanding scholars, including Humboldt, Fichte, Hegel, and Ranke. Berlin was the center of the Revolution of 1848 against King Frederick William IV. The construction of railroads (1840-61) gave Berlin additional importance as an industrial and commercial center. In 1866 it became the seat of the North German Confederation. After Berlin was made the capital of the German Empire in 1871, it prospered and expanded rapidly and became one of the great cities of the world. The city's population had increased from 201,000 in 1819 to 914,000 in 1871, by 1900 it was 2,712,000. The German military defeat of 1918 brought on a period of social and political unrest. After the establishment (Nov., 1918) of a Socialist government, Berlin was the scene of the abortive uprising of the communist SPARTACUS PARTY (Jan., 1919) and of the conservative putsch of 1920 (see KAPP, WOLFGANG). As the capital of the Weimar Republic, Berlin suffered severe economic crises in the 1920s, but it was also a brilliant cultural capital. After

the Nazis came to power in 1933, German culture declined. Berlin remained, however, the second largest city of Europe, a notable economic, political, and educational center, and a huge inland port with a flourishing world trade. Textiles and clothing, iron and steel, chemicals, and electrical machinery were among its chief industries. It was also a large publishing center and the major communications hub of Central Europe, with six railroad stations and the airport at Tempelhof. A suburban railroad system and a large subway system facilitated internal communication. During World War II, Berlin was repeatedly bombed from the air by the Allies, but the heaviest destruction was caused by a Soviet artillery barrage of unprecedented intensity that preceded the capture (May 2, 1945) of the city by Marshal Zhukov. On May 8, Germany's unconditional surrender to the Allies was signed in Berlin.

Divided Berlin. The division of the city into sectors by the Potsdam Conference resulted in severe tension between the Soviet Union and the Western powers. The joint Allied military government (*Kommandatura*) was not successful and virtually ceased to function when the USSR informally withdrew in 1948. The status of Berlin became a major cold war issue, and attempts at international agreement ended in deadlock (see FOREIGN MINISTERS, COUNCIL OF) as the USSR sought to remove all Western (including West German) control from West Berlin and the Western powers maintained that settlement of the Berlin problem depended on reunification of Germany. In 1948, Soviet authorities established a blockade on all land and water communications between West Berlin and West Germany. The Western powers, foremost among them the United States, successfully undertook to supply West Berlin by a large-scale airlift through three air "corridors" left open to them. The blockade was withdrawn in May, 1949, and the airlift ended in Sept., 1949. In that year East Berlin was proclaimed the capital of the new German Democratic Republic, and in 1950 West Berlin was established as one of the states of the Federal Republic of Germany (of which Berlin is the de jure capital and Bonn the de facto capital). Workers rioted in East Berlin in June, 1953, and were suppressed by Soviet tanks. In the following years there were several Berlin crises, as the USSR in unilateral declarations, often accompanied by harassing actions, contested the legal basis for the Western powers' presence in and access to West Berlin. Meanwhile better living conditions in the western zone had led to a massive exodus of refugees from East to West Berlin, which was both a great embarrassment for the Communists and a serious drain on the East German labor supply. To stop the flow, the Communists in Aug., 1961, gave the division of the city a shockingly physical form by erecting a 29-mi (47-km) fortified wall along the partition line, leaving only a few closely guarded crossing points. The Western powers protested vigorously but ineffectively. East German border guards killed dozens of persons attempting to break through the barrier. War seemed near as Soviet and American tanks faced each other at the border crossings, but after 1962 the crisis eased. In Dec., 1963, the first of several agreements was reached permitting West Berliners to visit relatives in the eastern zone. Visits across the wall and access to West Berlin from West Germany were finally regularized in the Berlin accords reached among the four powers and the two Germans in 1972.

West Berlin. A state of West Germany. West Berlin (1971 est. pop. 2,130,000; 185 sq mi/479 sq km) is situated more than 100 mi (161 km) inside East Germany. Although it is theoretically the West German capital, all the institutions of government are in Bonn and its representatives in the federal parliament have no vote. West Berlin's recovery from World War II, with American and West German aid, has been impressive and has far outpaced that of East Berlin. The chief manufactures are electrical equipment, foodstuffs, clothing, and machinery. There is a large tourist industry. At the center of the city, on the elegant street the Kurfürstendamm, is the gutted tower of the Kaiser Wilhelm Memorial Church, left unrestored as a reminder of the war. To the northeast, the large Tiergarten park contains the famous Reichstag building and the Berlin zoo and the American-designed Kongress Halle. Nearby is the concert hall of the Berlin Philharmonic. West of the Tiergarten is Potsdam Square, with the new opera house and Schiller Theater. To the south is John F. Kennedy Plaza, with the Schöneberg Rathaus, housing the city government offices, and the Freiheitsglocke, a copy of the Liberty Bell. Among West

Berlin's many museums is the Dahlem Gallery in the Charlottenberg Palace, which has the bust of Nefertiti and many Rembrandts. The Free University of Berlin was founded in 1948, and many of old Berlin's educational institutions have reopened in West Berlin.

East Berlin The capital of East Germany, East Berlin (1970 est. pop. 1,085,441, 156 sq mi/404 sq km) has been far slower than West Berlin in recovering from wartime damage and achieving prosperity. Electrical goods are the leading products, and chemicals, machinery, and clothing are also produced. An extensive rebuilding program was begun in the 1960s. At the border with West Berlin, opposite the Tiergarten, is the imposing Brandenburg gate. It is the western terminus of the famous tree-lined avenue, Unter den Linden. To the E along Unter den Linden are the state opera, Humboldt Univ. (the old Frederick William Univ.), and St. Hedwig's Cathedral. At its eastern end is the immense Marx-Engels Square, where formerly stood the Royal Palace. The square is often the scene of political rallies. Across the Spree River, radiating from the Alexander Square, are Karl-Marx-Allee and Frankfurter-Allee (until 1961 Stalin-Allee), lined with ornate Moscow-style apartment buildings with shops at street level. To the south, in Trep-tow, is the Soviet Military Cemetery, with a massive statue of a Soviet soldier built partly from the ruins of Hitler's Chancellery. East Berlin also has a fine zoo (at Friedrichsfelde) and many museums. The Pergamon Museum, on Museum Island in the Spree, has an outstanding collection of classical art. See Philip Windsor, *City on Leave, a History of Berlin, 1945-1962* (1963), Henry Vizetelly, *Berlin under the New Empire* (2 vol., 1879, repr. 1968), W. H. Nelson, *The Berliners, Their Saga and Their City* (1969), Gerhard Masur, *Imperial Berlin* (1971), Otto Friedrich, *Before the Deluge. A Portrait of Berlin in the 1920s* (1972), Anne Armstrong, *Berliners. Both Sides of the Wall* (1973).

Berlin, 1 Town (1970 pop. 14,149), Hartford co., central Conn., an industrial suburb of Hartford, settled 1686, inc. 1785. Tools, metal products, and lacquers are among its manufactures. The first tinware in the United States was made there in 1740. Emma Hart Willard was born in the town. **2** (bûr'lîn) City (1970 pop. 15,256), Coos co., NE N.H., in the White Mts. at falls of the Androscoggin, inc. 1829. In a heavily forested region, it early became the site of pulp and paper mills. Rubber products are also made. Berlin, a winter sports center, has the first ski club organized (1872) in the United States. Nearby are White Mountain National Forest, several state parks, and a U.S. fish hatchery.

Berlin, Conference of, 1884-85, international meeting aimed at settling the problems connected with European colonies in Africa. At the invitation of the German chancellor Otto von Bismarck, representatives of all European nations, the United States, and Turkey met at Berlin to consider problems arising out of European penetration of W. Africa. The stated purpose of the meeting was to guarantee free trade and navigation on the Congo and on the lower reaches of the Niger. In fact, the territorial adjustments made among the powers were the important result. The sovereignty of Great Britain over S. Nigeria was recognized. The claims of the International Association, a private corporation controlled by King Leopold II of Belgium, were more or less recognized, these applied to the greater part of the Congo. These territorial awards ignored French claims to parts of the Congo and of Nigeria and the historical claim of Portugal to the mouth of the Congo. The attempts to guarantee free trade and the neutrality of the region in wartime and to set up rules for future colonial expansion in Africa were halted, but soon the agreements proved too vague to be workable. See S. E. Crowe, *The Berlin West African Conference* (1942).

Berlin, Congress of, 1878, called by the signers of the Treaty of Paris of 1856 (see PARIS, CONGRESS OF) to reconsider the terms of the Treaty of SAN STEFANO, which Russia had forced on the Ottoman Empire (Turkey) earlier in 1878. Great Britain and Austria-Hungary were the powers most insistent on revision; Russia submitted the treaty to revision only after Great Britain threatened war and Bismarck had offered to mediate as "honest broker." He was chairman of the congress. Disraeli represented Great Britain, Count Andrassy, Austria-Hungary, William Henry Waddington, France, Aleksandr Gorchakov, Russia, Count Corti, Italy, and Alexander Karatheodorî, Turkey. The agreements reached in the Treaty of Berlin and the accompanying British-Turkish pact deeply modified the Treaty

of San Stefano. Montenegro, Serbia, and Rumania were recognized as independent states, Rumania, however, was forced to cede S. Bessarabia to Russia in return for the less favored Dobruja. Greater Bulgaria, which had been created at San Stefano, was divided into N. Bulgaria, a principality under nominal Turkish suzerainty, Eastern RUMELIA, to be governed, with certain autonomous rights, by a Christian appointee of the Ottoman emperor, and Macedonia (including Adrianople), under unrestricted Turkish sovereignty. BOSNIA AND HERZEGOVINA, original cause of the Russo-Turkish War of 1877-78, were assigned to Austria-Hungary for administration and military occupation. In Asia, Russia acquired Ardahan, Batum, and Kars from Turkey. Cyprus was to be under temporary occupation by Great Britain through a separate agreement, and Crete was promised constitutional government. Other provisions included an important rectification of the Greco-Turkish boundary, the demilitarization of the lower Danube, and the protection of the Armenians and other religious minorities in Turkey. Russia was antagonized by Bismarck's handling of the conference, thereby bringing to an end the first THREE EMPERORS' LEAGUE. See C. D. Hazen, W. R. Thayer, and R. H. Lord, *Three Peace Congresses of the 19th Century* (1917), R. Albrecht-Carrie, *The Concert of Europe* (1968).

Berlin airlift, 1948-49, supply of vital necessities to West Berlin by air transport primarily under U.S. auspices. It was initiated in response to a land and water blockade of the city that had been instituted by the Soviet Union in the hope that the Allies would be forced to abandon West Berlin. The massive effort to supply the 2 million West Berliners with food and fuel for heating began in June, 1948, and lasted until Sept., 1949, although the Russians lifted the blockade in May of that year. During the around-the-clock airlift some 277,000 flights were made, many at 3-min intervals. By spring, 1949, an average of 8,000 tons was being flown in daily. More than 2 million tons of goods—of which coal accounted for about two thirds—were delivered.

Berlin Decree, 1806, decree issued in Berlin by Napoleon I on Nov. 21 in answer to the British blockade. Claiming that the British blockade of purely commercial ports was contrary to international law, Napoleon retaliated by declaring the British Isles under blockade and forbidding any trade to or from them. The Berlin Decree initiated the CONTINENTAL SYSTEM.

Berlin Wall, 29-mi (47-km) fortified concrete and wire barrier along the border between East and West Berlin, it was erected in Aug., 1961, by the East German government to halt the vast numbers of East Berliners defecting to the West and to prevent East Berliners from commuting to jobs in West Berlin, thus depleting the supply of labor in the East. The building of the wall came at a time of increased tension between the United States, Great Britain, France, and West Germany on one side, and the USSR and East Germany on the other, concerning the future status of the divided city of Berlin. Thousands of families were separated as a result of the border closing, after 1963, however, limited passage between East and West Berlin was allowed by the East German government on various holidays.

Berlioz, Louis-Hector (lwě ěktôr bërlyôz'), 1803-69, French romantic composer. He abandoned medical study to enter the Paris Conservatory as a composition student. In 1830 his *Symphonie fantastique* was first performed in Paris, marking a bold new development in program music. This work, with its recurring basic theme, departed from traditional symphonies in its loose form and highly emotional, personal style. That same year Berlioz won the coveted Prix de Rome. During the next decade in Paris he wrote the symphonies *Harold in Italy* and *Romeo and Juliet*, the opera *Benvenuto Cellini*, and a requiem. In 1842-43 he conducted concerts in Germany, Austria, England, and Russia. His outstanding "concert opera" *The Damnation of Faust* (1846) met with failure in his lifetime but is now considered a masterpiece. Another dramatic work is the gigantic opera *The Trojans*, first performed in its entirety in 1890 and successfully revived after 1920. The nonliturgical oratorio *The Childhood of Christ*, for which he also wrote the text, was completed in 1854, and it was performed with great success for almost a century. Some of Berlioz's works are scored for large numbers of instruments, not only for volume but for richness of tone color even in delicate passages. His ideas of orchestration influenced many later composers. A passionate and impetuous man, Berlioz had several love affairs and was twice

married, first to Harriet Smithson, an Irish actress. He was librarian at the Paris Conservatory, and wrote music criticism, his memoirs (ed. by David Cairns, 1969), and *Evenings with the Orchestra* (tr. 1956). His treatise on instrumentation (1844) was widely recognized as a text. See his letters, ed. by Jacques Barzun (1954), his memoirs, ed. by David Cairns (1973), biographies by J. H. Elliot (rev. ed. 1967) and Jacques Barzun (2 vol., 3d ed. 1969), studies by Ernest Newman (1910, repr. 1969), T. S. Wotton (1935, repr. 1969), and Brian Primmer (1973).

berm: see BEACH

Bermuda (bûrmyôo'da), British crown colony (1970 pop. 52,700), 20 sq mi (52 sq km), comprising some 300 coral rocks, islets, and islands (of which some 20 are inhabited), in the Atlantic Ocean, c. 570 mi (920 km) SE of Cape Hatteras, North Carolina. The capital is HAMILTON, on Bermuda (or Great Bermuda), the largest island. Smaller islands are Somerset, Ireland, and St. George. Bermuda, with its fine beaches, excellent climate, and picturesque sites, is a fashionable and popular year-round resort. Its coral reefs are the northernmost in the world. Although tourism is the economic mainstay, ship repairing and light industries are also important. Perfume concentrates, pharmaceuticals, textiles, and cut flowers are the chief exports. The population is about three-quarters black. Reputedly the first person to set foot on the islands was the Spanish navigator Juan de Bermudez (1515), but they remained uninhabited, despite visits by Spaniards and Englishmen, until Sir George Somers and a group of colonists on their way to Virginia were shipwrecked there in 1609. This incident was known to Shakespeare when he wrote *The Tempest*. Long called Somers Islands, the Bermudas were first governed by chartered companies but were acquired by the crown in 1684. The harbor of St. George was a base for privateers during the War of 1812, and the island was a center for Confederate blockade runners during the American Civil War. During World War II the islands played an important strategic role. The United States, under a 99-year lease, operates a naval and air force base. Internal self-government was granted in 1968. See William Zuill, *Bermuda Journey* (1959), Richard Joseph, *Bermuda* (1967), H. C. Wilkinson, *Adventures in Bermuda* (1933), *Bermuda in the Old Empire* (1950), and *Bermuda from Sail to Steam* (2 vol., 1973).

Bermuda chub: see RUDDERFISH

Bermuda grass, perennial pasture, lawn, and hay grass (*Cynodon dactylon*) of the family Gramineae (GRASS family), native to Africa and Asia and now common in warm regions of both hemispheres. It is the standard pasture grass in the S. United States. It is heat- and drought-resistant and grows in almost any soil that is not too wet or shady, spreading rapidly and often becoming a weed. Bermuda grass is classified in the division MAGNOLIOPHYTES, class Liliatae, order Cyperales, family Gramineae.

Bermuda Hundred, fishing village, on the peninsula at the confluence of the Appomattox and James rivers, SE Va., NE of Petersburg, founded 1613. During the Civil War the Union Army of the James was bottled up there after its defeat at Drewrys Bluff.

Bern or **Berne** (bërn), canton (1970 pop. 983,296), 2,658 sq mi (6,883 sq km), W. central Switzerland. The second most populous canton of the country, Bern comprises three sections—the Bernese Alps, or Oberland [Ger., =highlands], with many resorts and peaks, notably the Finsteraarhorn and Jungfrau, and with meadows and pastures in the valleys, the Mittelland [midlands], in the fertile northern foothills of the Alps, and including the Emmmental, and the Seeland [lake country], in the northwest, with Biel and the Bernese Jura mts. Crop and cattle raising, dairying, and tourism are the chief means of livelihood in the Oberland and the Mittelland, the Seeland is more industrialized and has manufactures of watches, wood and metal products, and textiles. The population of the canton (except in the Jura) is predominantly Protestant and German-speaking, the Jura is mostly Roman Catholic and French-speaking. The history of the canton is largely that of its capital, Bern or Berne (1970 pop. 162,405), which is also the capital of Switzerland. Situated within a loop of the Aare River, the city is a university, administrative, transportation, and industrial center. Its manufactures include precision instruments, textiles, machinery, chemicals and pharmaceuticals, and chocolate. It is also the seat of numerous international agencies, notably the Universal Postal Union (since 1875), the International Telecommunication Union (since 1869), and the International Copyright Union (since 1886). Bern was founded, according to tradition, in 1191 by Berchtold V of Zähringen as a

military post. It was made (1218) a free imperial city by Emperor Frederick II when Berchtold died without an heir. Bern grew in power and population and in 1353 joined the Swiss Confederation, of which it became the leading member. Its conquests included AARGAU (1415) and VAUD (1536), besides numerous smaller territories. The area was governed until 1798 by an autocratic urban aristocracy. Bern accepted the Reformation in 1528. When Switzerland was invaded (1798) by the French during the French Revolutionary Wars, Bern was occupied, its treasury pillaged, and its territories dismembered. At the Congress of Vienna (1815), Bern failed to recover Vaud and Aargau, but received the Bernese Jura (the former Bishopric of BASEL). A liberal constitution was adopted in 1831, and in 1848 Bern became the capital of the Swiss Confederation. The city is largely medieval in its architecture. It has a splendid 15th-century town hall, a noted minster (begun 15th cent.), and numerous other historic structures. There are many picturesque patrician houses and old guild halls. An elaborate medieval clock tower and a pit in which bears (Bern's heraldic animal for seven centuries) are kept are well known to tourists. More modern buildings include the 19th-century federal parliament building, many fine museums, and the university (1834).

Bernadette, Saint (bŭrnādēt'), 1844–79, French peasant girl who claimed to see the Virgin Mary in apparitions at a grotto near Lourdes, her home, in 1858. She was born Marie Bernarde Soubirous. The authorities, skeptical of her visions, subjected her to severe examinations and abuse. After years of unpleasantness at the hands of the curious, the skeptical, and the powerful, she was allowed to enter the convent of Notre-Dame de Nevers. There Bernadette, her health steadily worsening, spent her last days. She was canonized in 1933. Feast: April 16. See biographies by L. Cristiani (1965) and A. Stafford (1967).

Bernadotte, Count Folke (fŏl'ka bĕrnādōt', bŭr'nādōt'), 1895–1948, Swedish internationalist, nephew of King Gustavus V. He was active in the Swedish Red Cross and became its president in 1946. Early in 1945 he arranged the evacuation of Danish and Norwegian prisoners from German concentration camps and conveyed a peace offer from Heinrich Himmler to the British and U.S. authorities. Appointed (1948) United Nations mediator in Palestine, he was assassinated by Jewish extremists. Ralph Bunche succeeded him. Bernadotte wrote several autobiographical books. See biography by Ralph Hewins (1950).

Bernadotte, Jean Baptiste Jules: see CHARLES XIV king of Sweden and Norway.

Bernanos, Georges (zhŏrzh bĕrnānŏs'), 1888–1948, French novelist and polemicist. Profoundly Catholic, Bernanos attacked modern materialism and advocated a moral and ethical order based on the teachings of the Church. His novels *The Star of Satan* (1926, tr. 1940) and *The Diary of a Country Priest* (1936, tr. 1937) are powerful accounts of intense spiritual struggle and reflect his mysticism. *Dialogue des Carmélites* (1949) was adapted for the stage in 1952. A believer in monarchy, Bernanos was active in Royalist causes until the Spanish civil war. In 1938, after the Munich pact, which he considered a shameful instance of appeasement, he settled in Brazil and remained there until 1945. His political writings include *Les Grands Cimetières sous la lune* (1938, tr. *A Diary of My Times*, 1938) indicting Franco's policies in the Spanish civil war, and *Lettre aux Anglais* (1942, tr. *Plea for Liberty*, 1944). See studies by T. S. Molnar (1960), G. R. Blumenthal (1965), Peter Hebblewhite (1965), W. S. Bush (1969), and Robert Speaight (1974).

Bernard, Saint: see BERNARD OF CLAIRVAUX. SAINT BERNARD OF MENTHON. SAINT. For the two Alpine passes, see SAINT BERNARD.

Bernard VII, d. 1418, count of Armagnac, constable of France. As father-in-law of Charles d'ORLÉANS he led the Armagnac faction (see ARMAGNACS AND BURGUNDIANS) and from 1415 to 1418 was virtual ruler of France. His oppression of the Parisians, intended to check Burgundian power, caused the betrayal of Paris to John the Fearless of Burgundy, in the ensuing massacre Bernard was killed.

Bernard, Claude (klŏd bĕrnār'), 1813–78, French physiologist. He turned from literature to medicine working in Paris under Magendie and teaching at the College de France and at the Sorbonne. One of the great scientific investigators, he is known as the founder of experimental medicine because of his work on digestive processes, especially the discov-

ery of the glycogenic function of the liver and of the action of pancreatic juice, and on the vasomotor mechanism. He wrote *An Introduction to the Study of Experimental Medicine* (1865, tr. 1927). See J. M. D. Olmsted and E. H. Olmsted, *Claude Bernard and the Experimental Method in Medicine* (1952), Reino Virtanen, *Claude Bernard and His Place in the History of Ideas* (1960).

Bernard, Sir Francis (bŭrn'ārd), 1712–79, British colonial governor. He was educated at Oxford and was called to the bar in 1737. As colonial governor of New Jersey (1758–60), he did much to promote colonial solidarity and to build defense in the French and Indian Wars. Transferred to the governorship of Massachusetts, he lost popularity there because he felt it his duty to enforce the Stamp Act and other laws the colonists found objectionable. In 1769 he was recalled to England. An amateur architect, he was the designer of Harvard Hall at Harvard.

Bernardes, Diogo (dŏg'ō bĕrnār'dīsh), c. 1530–c. 1600, Portuguese poet. A follower of Sa de Miranda, he wrote melodious pastoral verse, and was one of the chief poets of the Portuguese Renaissance. The official poet on the tragic expedition that ended at Alquazarquivir, he was later pensioned.

Bernardin de Saint-Pierre, Jacques Henri (zhāk ānrē' bĕrnārdān' dā sān-pyēr'), 1737–1814, French naturalist and author. He was a friend of Rousseau, by whom he was strongly influenced. His chief work, *Études de la nature* (1784), sought to prove the existence of God from the wonders of nature, it is rich in descriptive passages, and it added specific color terms and plant names to the French language. A section of this was the sentimental prose idyll *Paul et Virginie* (1788), which attained immense vogue and influenced the French romanticists.

Bernardine of Siena, Saint (bŭrnārdīn, sĕēn'ā), 1380–1444, Italian preacher. He was a Franciscan of the Observant congregation and one of the most effective and most widely known preachers of his day. His popular, lively sermons still make good reading. He was vicar general of his congregation, and he repeatedly refused ecclesiastical preferment. St. Bernardine was one of the great promoters of devotion to the Holy Name of Jesus. His principal companion was St. John Capistran. Feast: May 20.

Bernardo del Carpio (bĕrnār'dō dĕl kār pyō), hero of medieval Spanish legend. He was supposedly the nephew of Alfonso II of Asturias, against whom he strove to secure his father's release from prison. Spanish legend has him a counterpart of the French Roland and in some versions the slayer of Roland at Roncevalles.

Bernard of Clairvaux, Saint (klārn'ō'), 1090?–1153, French churchman, mystic, Doctor of the Church. Born of noble family, in 1112 he entered the Cistercian abbey of Cîteaux, taking along 4 brothers and some 25 friends. In 1115 he headed the group sent to found a house at Clairvaux. There he remained abbot all his life, despite many efforts to move him higher. A holy life, a reputation for miraculous cures, and unusual eloquence made Bernard renowned, and he became the most powerful religious influence in France and, in time, in all Western Europe. His example and mystical theology had decisive influence on the Cistercian order, and he is sometimes called its second founder. During his lifetime 68 houses were founded out of Clairvaux alone. It was he who led the long struggle to seat Innocent II, the canonically elected pope, and persuaded Lombardy to accept Holy Roman Emperor Lothar II. He procured the condemnation of Peter Abelard and ARNOLD OF BRESCIA (1140), and he preached the Second Crusade (1146). He was the adviser of popes, especially of his friend EUGENE III. He was tireless in journeys to make peace, and he would undertake any mission or charity, however arduous or apparently trivial, thus he stopped a wave of pogroms in the Rhineland (1146), and he repeatedly saved luckless peasants from the powerful. Through his writings, St. Bernard exerted a profound influence on Roman Catholic spirituality. His deep devotion to the Virgin Mary and to the Infant Jesus is said to have founded a new strain of spirituality known as *devotio moderna*. His works consist of about 330 sermons, some 500 known letters, and 13 treatises. His style, strong and eloquent, full of biblical allusions, and intensely personal and direct, has gained him the name *Mellifluous Doctor*. Among his sermons, the series of 85 on the Canticles have been favorites (*St. Bernard on the Song of Songs*, tr. 1952). The most important treatises are *On the Steps of Humility and Pride* (c.1125; tr. by Geoffrey Webb and Adrian Walker, 1957) and *On the Love of God* (c.1127, tr. by T. L. Connolly, 1951). He

was canonized in 1174. Feast: Aug. 20. See Watkin Williams, *Saint Bernard of Clairvaux* (1952), E. H. Gilson, *The Mystical Theology of Saint Bernard* (tr. 1940), Thomas Merton, *The Last of the Fathers* (1954, repr. 1970), Henry Daniel-Rops, *Bernard of Clairvaux* (tr. 1964), O. J. Egges, *Saint Bernard, His Life and Teaching* (1971).

Bernard of Cluny (klŏn'ōnē) or **Bernard of Morlaix** (mŏrlā'), fl. 1150, French Cluniac monk, of English parentage. He wrote *De contemptu mundi* [on contempt for the world], a poem in 3,000 hexameters. On it Horatio Parker based his oratorio *Hora novissima*, and from it John Mason Neale drew the words of *Jerusalem the Golden*.

Bernard of Menthon, Saint (māntŏn'), d. 1081?, Italian churchman, founder of the Alpine hospices of SAINT BERNARD. His life was spent working among the people of the Val d'Aosta. Also known as Bernard of Montjoux, he is the patron of mountaineers. Feast: May 28.

Bernburg (bĕrn'bŏŏrk), city (1970 pop. 45,322), Halle dist., central East Germany, on the Saale River. Located in a salt-mining region, it has industries that produce food products and farm machinery. There is a 16th-century castle in the city.

Bern Convention: see COPYRIGHT.

Berne, Switzerland: see BERN.

Berners, John Bouchier, 2d Baron (bou'char, bŭrnarz'), 1467–1533, English diplomat and man of letters. A member of Parliament from 1495 to 1529, he later became chancellor of the exchequer (1516) and ambassador to Madrid (1518). He was English governor of Calais from 1520 until his death. Berners's literary work includes such translations as Froissart's *Chronicles* (2 vol., 1523–25), *Huon of Bordeaux* (1534?), and *The Golden Book of Marcus Aurelius* (1535, from a French version of Guevara's work).

Berners, Bernes, or Barnes, Juliana (bŭrn'arz, bārnz'), supposed early 15th-century author of a popular verse treatise on hunting. The treatise is included in *The Book of St. Albans* (1486), a collection treating the arts of heraldry, hawking, and field sports. If Juliana was the author, she is one of the earliest women writers in English, although tradition designates her the prioress of a nunnery in Hertfordshire, nothing is actually known of her life. See facsimile edition with introduction by William Blades (1881).

Bernese mountain dog (barnēz'), breed of sturdy working dog first brought to Switzerland by the invading Roman armies over two millennia ago. It stands from 23 to 27 in (58–69 cm) high at the shoulder and weighs from 50 to 70 lb (23–32 kg). Its long silky, slightly wavy coat is jet black with a white blaze up the face, white on the chest, feet, and tip of tail, and russet-brown or tan markings on all four legs and above the eyes. For hundreds of years in its native canton of Berne, the Bernese mountain dog was used as a draft animal by the local merchants to haul cartloads of goods to market. Today it is raised principally for show competition and as a pet. See DOG.

Bernhardi, Friedrich von (frĕ'drĭkh fan bĕrnhār'dē), 1849–1930, German general and military writer. His book *Germany and the Next War* (1912, tr. 1912) was widely publicized by the Allies as an example of Pan-Germanism and German ambition.

Bernhard of Saxe-Weimar (sāks'-wī'mār, zāks'-wī'mār), 1604–39, Protestant general in the THIRTY YEARS WAR, duke of Weimar. Under Ernst von MANSFELD and the margrave of Baden, Bernhard fought against the imperial forces in defense (1622) of the Palatinate. He served in the Netherlands and later allied himself (1631) with King Gustavus Adolphus of Sweden, after whose death at Lützen (1632) he took command. In 1633, Bernhard became joint commander of the army of the Heilbronn Confederation, created under Swedish auspices. The Swedish government also granted him the newly created duchy of Franconia, formed out of the captured German bishoprics of Würzburg and Bamberg. His capture of Regensburg (1633) made him the hero of the Protestants. In 1634 he suffered a crushing defeat by the imperial army at Nördlingen and soon afterward lost Franconia. Bernhard and his army were taken into French pay in 1635. Victories at Breisgau and Breisach (1638) brought him control over Alsace and the Upper Rhine. He died suddenly of a fever.

Bernhardt, Sarah (bŭrn'hārt, fr. bĕrnār'), 1844–1923, stage name of Rosine Bernard, French actress, b. Paris. She was brought up in a convent until she was 13, when she entered the Paris Conservatory. In 1862 she made an unsuccessful debut at the Comédie

Françoise During her appearances at the Odeon (1866-72) she attracted attention, first in *Coppee's Le Passant* (1869). With the *Comédie* (1872-80) she attained full stature with her superb portrayals of *Phedre* (1874) and of *Doña Sol* in Hugo's *Hernani* (1877). Renowned for her golden voice, she was considered the queen of French romantic and classical tragedy. Oscar Wilde called her "the divine Sarah," a designation by which she became universally known. In 1880 she began her tours of Europe, England, and the United States, in such plays as *Adrienne Lecouvreur*, *La Dame aux camélias*, and *Froufrou*. Long associated with the works of Sardou, she starred in his *Fedora*, *Theodora*, and *La Tosca*. She managed several theaters in Paris before leasing the Théâtre des Nations, renaming it the Théâtre Sarah Bernhardt. Here she revived some of her former successes and appeared in the title role of *Hamlet* (1899) and in Rostand's *L'Aiglon*, which was written for her in 1901. In 1912 she appeared in the silent films *La Dame aux camélias* and *Queen Elizabeth*. Her leg was amputated in 1915, but her career continued and she made numerous "farewell tours." An accomplished painter, poet, and sculptor, she also wrote plays in which she appeared. Among them were *L'Aveu* (1898) and *Un cœur d'homme* (1909). See her memoirs (tr. 1907), biographies by Jules Huret (1899), Maurice Baring (1934), Louis Verneuil (1942), A. W. Row (1957), Cornelia Otis Skinner (1967), and Gerda Taranow (1972).

Berni, Francesco (franchäs'kō bër'nē), 1497?-1535, Italian humorous poet, a priest. He was noted for his burlesque *capitoli*, light, often ribald verses in terza rima. He revised Boiardo's *Orlando Innamorato*, adding humorous touches and what he considered stylistic improvements. For many years Berni's rendering of Boiardo was the standard version, it has been generally discarded. For refusing to help murder Cardinal Salviati, Berni is thought to have been poisoned. One genre of satirical poetry is called *bernesco* after him.

Bernice (bër'nēs, bär'nēs'), form of the name Berenice. Bernice has been commonly used in English-speaking countries in modern times.

Bernicia (bär'nish'ä), Old English kingdom. Established in 547, it later extended from the Tees River to the Forth. In the late 6th cent. it was united with Deira to form NORTHUMBRIA.

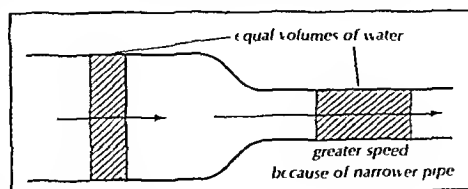
Bernina (bër'nē'na), mountain group, part of the Rhaetian Alps on the Swiss-Italian border, SE Switzerland. Piz Bernina is the highest (13,304 ft/4,055 m) peak. The group has many glaciers, Morteratsch Glacier is the largest. The Bernina Pass, 7,645 ft (2,330 m) high, from the Upper Engadine Valley, Switzerland, to the Valtellina, Italy, is crossed by a road (built 1842-65) and a railroad (built 1907-10).

Bernini, Giovanni Lorenzo or Gianlorenzo (jōvan'nē lōrēn'sō, jän'lōrēn'sō bër'nē'nē), 1598-1680, Italian sculptor and architect, b. Naples. He was the dominant figure of the Italian BAROQUE. After receiving early training from his father, Pietro (1562-1629), an accomplished Florentine sculptor, Bernini worked mainly in Rome. Many of his early statues, such as the *David* (before 1620), *Rape of Proserpine* (1622), and *Apollo and Daphne* (1625), were done for Scipione Cardinal Borghese, one of the most important patrons of the period. These are all in the Borghese Gallery, Rome. In these masterful early works, Bernini broke with the traditions of MANNERISM. Popes Urban VIII, Innocent X, and Alexander VII gave him unparalleled opportunities to design churches, chapels, fountains, monuments, tombs, and statues. In 1629, Bernini was appointed architect of St. Peter's. He designed the ornate baldachin under the dome, the *Cathedra Petri* (the monument enshrining St. Peter's chair), and the exuberant marble decorations of the chapels and nave. From 1656 onward he worked on the great elliptical piazza and the vast, embracing arms of the colonnades in front of the church. During Innocent's papacy Bernini worked frequently for private patrons. In 1655 he was commissioned to do the magnificent fountains in the Piazza Navona. For the Vatican he created the royal staircase and the heroic equestrian statue of Constantine. He was assisted by a host of sculptors in these vast enterprises. Between 1658 and 1670 he designed three churches: San Tomaso di Villanova at Castelgandolfo, Santa Maria dell'Assunzione at Ariccia, and Sant'Andrea al Quirinale in Rome. He established a new mode, dynamically linking sculpture and architecture. In 1665, Louis XIV invited him to Paris to finish the designing of the Louvre, but Bernini's plans failed to win approval. Returning to Italy, he continued to work on St. Peter's. Much of Bernini's sculpture

combines white and colored marbles with bronze and stucco, most effectively used in Santa Maria della Vittoria, Rome, where he represented the *Ecstasy of St. Teresa*. This work exemplifies Bernini's ability to grasp the most dramatic moment from his subject's life. Often inspired by classical forms, Bernini transformed the marble block into a vital, almost breathing figure. A self-portrait drawn c. 1665 (Royal Coll., Windsor) is an example of his superb draftsmanship. As a painter he was also noteworthy, although very few of his paintings survive. Bernini was known as a wit, he wrote comedies and made numerous caricatures. All of his important work is in Rome, with the exception of the *Neptune and Triton* (Victoria and Albert Mus.) and the bust of Louis XIV (Versailles). See biography by F. Baldinucci (1682, tr. 1966), studies by H. Hibbard (1965), R. Wittkower (2d ed. 1966), and I. Lavin (1968).

Bernoulli or Bernouilli (both bër'nōyē'), name of a family distinguished in scientific and mathematical history. The family, after leaving Antwerp, finally settled in Basel, Switzerland, where it grew in fame. **Jacob, Jacques, or James Bernoulli**, 1654-1705, became professor at Basel in 1687. One of the chief developers both of the ordinary CALCULUS and of the CALCULUS OF VARIATIONS, he was the first to use the word *integral* in solving Leibniz's problem of the isochronous curve. He wrote an important treatise on the theory of probability (1713) and discovered the series of numbers that now bear his name, i.e., the coefficients of the exponential series expansion of $x/(1-e^{-x})$. He was succeeded at Basel by his brother, **Johann, Jean, or John Bernoulli**, 1667-1748, who earlier had been professor at Groningen and who was famous for his work in the field of integral and exponential calculus and was also a founder of the calculus of variations. He also contributed to the study of geodesics, of complex numbers, and of trigonometry. His collected works were published under the title *Johannis Bernoulli opera omnia*. His son, **Daniel Bernoulli**, 1700-1782, was a mathematician, physicist, and physician and has often been called the first mathematical physicist. He received his doctorate in medicine but became professor of mathematics at the St. Petersburg Academy in 1725. He was professor of anatomy and botany at Basel from 1733, later becoming professor of natural philosophy (physics). His greatest work was his *Hydrodynamica* (1738), which included the principle now known as BERNOULLI'S PRINCIPLE, and anticipated the law of conservation of energy and the KINETIC-MOLECULAR THEORY OF GASES developed more than 100 years later. He also made important contributions to probability theory, astronomy, and the theory of differential equations (solving a famous equation proposed by Riccati). Among the other noted members of the family are Nicolaus Bernoulli, 1662-1716, brother of Jacob and Johann, who was professor of mathematics at St. Petersburg; Nicolaus Bernoulli, 1695-1726, son of Johann and brother of Daniel, also a mathematician; Johann Bernoulli, 1710-90, another son of Johann (1667-1748) and brother of Daniel, who succeeded his father in the chair of mathematics at Basel and also contributed to physics; his son, Johann Bernoulli, 1746-1807, who was astronomer royal at Berlin and also studied mathematics and geography; and Jacob Bernoulli, 1759-89, another son of Johann (1710-90), who succeeded his uncle Daniel in mathematics and physics at St. Petersburg but met an early death by drowning.

Bernoulli's principle, physical principle formulated by Daniel Bernoulli, that states that as the speed of a moving fluid (liquid or gas) increases, the pressure within the fluid decreases. The phenomenon described by Bernoulli's principle has many practical applications, it is employed in the carburetor and the atomizer, in which air is the moving fluid, and in the aspirator, in which water is the moving fluid. In the first two devices air moving through a tube passes through a constriction, which causes an increase in speed and a corresponding reduction in pressure. As a result, liquid is forced up into the air stream (through a narrow tube that leads from the



Bernoulli's principle

body of the liquid to the constriction) by the greater atmospheric pressure on the surface of the liquid. In the aspirator air is drawn into a stream of water as the water flows through a constriction. Bernoulli's principle can be explained in terms of the law of conservation of energy (see CONSERVATION LAWS, in physics). As a fluid moves from a wider pipe into a narrower pipe or a constriction, a corresponding volume must move a greater distance forward in the narrower pipe and thus have a greater speed. At the same time, the work done by corresponding volumes in the wider and narrower pipes will be expressed by the product of the pressure and the volume. Since the speed is greater in the narrower pipe, the kinetic energy of that volume is greater. Then, by the law of conservation of energy, this increase in kinetic energy must be balanced by a decrease in the pressure-volume product, or, since the volumes are equal, by a decrease in pressure.

Bernstein, Eduard (ä'dōōart bër'n'shtīn'), 1850-1932, German socialist. From 1872 he was actively associated with the Social Democratic party. In 1878 he left Germany because of antisocialist legislation and spent over 20 years in exile, chiefly in England. In 1898 he aroused great discussion among German socialists by his criticisms of Marxist theories, denying the inevitability of intensification of the class struggle and the resultant collapse of the social order ending in world revolution. Returning to Berlin in 1901 he became the leader of revisionism, opposed by Karl Johann KAUTSKY. After World War I, Bernstein was unsuccessful in his attempts to unify the various factions of German socialists. The most important of his several books setting forth criticisms of Marxism is *Evolutionary Socialism* (1898, tr. 1909). See his reminiscences, *My Years of Exile* (1921), Peter Gay, *The Dilemma of Democratic Socialism* (1954), J. W. Hulse, *Revisionists in London* (1970).

Bernstein, Leonard (bër'n'stīn'), 1918-, American composer, conductor, and pianist, b. Lawrence, Mass., grad. Harvard, 1939, and Curtis Institute of Music, 1941. A highly versatile musician, he is the composer of symphonic works (the *Jeremiah Symphony*, 1944, *Age of Anxiety*, 1949, *Kaddish Symphony*, 1963), song cycles, chamber music, ballets (*Fancy Free*, 1944), musicals (*On the Town*, 1944, *Wonderful Town*, 1953, *Candide*, 1956, *West Side Story*, 1957), opera (*Trouble in Tahiti*, 1952), and choral music (*Chichester Psalms*, 1965). His *Mass* (1971), a "theater piece for dancers, singers, and players," was performed at the opening of the John F. Kennedy Cultural Center in Washington, D.C. From 1951 to 1956 he taught at Brandeis Univ. He has been soloist and conductor with many orchestras in the United States and abroad. He first conducted the New York Philharmonic-Symphony Orchestra in 1943, and from 1958 to 1970 was its musical director. Upon his retirement he was named Laureate Conductor, and now frequently appears with the Vienna Philharmonic and the Israel Philharmonic. See his *The Joy of Music* (1959) and *The Infinite Variety of Music* (1966), biographies by John Briggs (1961) and John Gruen (1968).

Bernstorff, Andreas Peter (andrās pā'tar bër'n's-tōrf), 1735-97, Danish politician, nephew of Johann Hartwig Ernst BERNSTORFF. Made (1773) foreign minister after Struensee's fall from power, he obtained from Russia the final ratification of the exchange treaty negotiated by his uncle in 1767. Removed from office in 1780 to pacify Russia, he was recalled in 1784 and was chief minister until 1797. He sought friendly relations with Sweden, kept Denmark neutral in the French Revolutionary Wars, and undertook a liberal program of social, economic, and educational reform.

Bernstorff, Johann Hartwig Ernst (yōhan' hart'-vīkh), 1712-72, Danish politician, of German (Hanoverian) origin. As minister of foreign affairs (1751-70) under FREDERICK V and Christian VII, he successfully kept Denmark at peace. In 1767 he negotiated with Russia a provisional treaty by which the Danish crown was to cede OLDENBURG to Catherine II of Russia in exchange for ducal HOLSTEIN. In 1770, Christian VII, under the influence of STRUENSEE, dismissed Bernstorff.

Bernstorff, Johann Heinrich, Graf von (hīn'rīkh graf fən), 1862-1939, German diplomat. As ambassador to the United States (1908-17), he tried to conciliate American feelings toward Germany and repeatedly warned his government that unrestricted submarine warfare would bring the United States into World War I. A member of the Reichstag from 1921 to 1928 and a delegate to the League of Nations disarmament conference (1926-31), he went into exile at Geneva after Hitler took power in Germany. His memoirs were published in 1936.

Berodach-baladan: see MERODACH BALADAN

Beroea (bērē'a), the same as BEREIA 1

Beroeans: see BEREANS

Berosus (bārō'sas), 3d cent. B.C., Babylonian priest-historian, contemporary of MANETHO. His work, in Greek, preserved Mesopotamian myths regarding creation and history. It survives in fragments quoted by Josephus and Eusebius of Caesarea.

Berothah (bērō'tha), city of Syria. Ezek. 47:16. Berothai may be the same.

Berothai (bērō'thī), city of Syria, perhaps the same as Berothah. 2 Sam. 8:8. Chun. 1 Chron. 18:8.

Berothite (bērō'thīt), inhabitant of the city Beeroth. 1 Chron. 11:39.

Berra, Yogi (Lawrence Peter Berra), 1925–, American baseball player and manager, b. St. Louis, Mo. An outstanding catcher with the New York Yankees (1946–63), he also played briefly with the New York Mets (1965). Berra was elected the American League's most valuable player in 1951, 1954, and 1955, hit 358 home runs and batted .285. In 1964 he managed the Yankees, leading them to the pennant. He managed the Mets (1972–). He was elected to the Baseball Hall of Fame in 1972. See biography by Phil Pepe (1974).

Berrettini, Pietro: see CORTONA PIETRO DA

Berrigan, Daniel, 1921–, American Jesuit priest, poet, and political activist, b. Syracuse, N.Y., brother of Philip Berrigan. Upon his ordination in 1952, he traveled to France, where he developed admiration for militant workers and supported their efforts. Returning to the United States, he taught at Brooklyn Preparatory School and Le Moyne College until, after a second trip to France (1963), he devoted his time to civil rights and antipoverty and antiwar work. Convicted in 1970 and sentenced to three years imprisonment for destroying selective service files in Catonsville, Md., in 1968, Berrigan became a fugitive but eventually was captured and sent to prison; he was granted parole in Jan. 1972. His works include a play, *The Trial of the Catonsville Nine* (1970), *The Dark Night of Resistance* (1971), his prison memoirs, *Lights On in the House of the Dead* (1974), and several volumes of poems. See biography by Richard Curtis (1974), Stephen Halpert and Tom Murray, ed., *Witness of the Berrigans* (1972).

Berrigan, Philip Francis, 1923–, American Roman Catholic priest and political activist, b. Two Harbors, Minn., brother of Daniel Berrigan. In 1950 he graduated from Holy Cross College and was ordained. Throughout the 1960s Berrigan was active in civil rights and antiwar groups, during that time he founded the Catholic Peace Fellowship. He was convicted and imprisoned for destroying selective service files in 1967 in Baltimore and in 1968 in Catonsville, Md. In 1970, while in prison, Berrigan was convicted on charges of smuggling mail out of the federal penitentiary at Lewisburg, Pa. His wife, Sister Elizabeth McAlister, whom he married secretly in 1969, was also convicted on similar charges. In 1972 the convictions were overturned. Berrigan was paroled in December of that year. See his prison writings, *Prison Journals of a Revolutionary Priest* (1970) and *Widen the Prison Gates* (1973).

Berruguete, Alonso (alōn'sō bēr-rōgā'tā), c. 1480–1561, Spanish mannerist sculptor. Probably the first in Spain to break away from the High Renaissance balance of form, he is noted for the expressive torsion of his figures. He studied with his father, Pedro Berruguete, a painter at the Spanish court. In Italy (c. 1504–c. 1517) he was strongly influenced by Michelangelo. On Berruguete's return to Spain he was appointed (1518) court painter and sculptor to Charles V. The carved altar screens for San Benito el Real (1527–32, Valladolid Mus.) and the choir stalls of the cathedral at Toledo (1539–43) are among his masterpieces. Berruguete brought the influence of Michelangelo to Spain, but his vigorous and highly original art is essentially Spanish. His work is best seen in Valladolid.

Berry, Caroline Ferdinande Louise, duchesse de (kārlōn' fērdēnāNd lwēz, dushēs' da bēre'), 1798–1870, wife of the French prince, Charles Ferdinand, duc de Berry, daughter of Francis I of the Two Sicilies. She went into exile from France after the overthrow of King Charles X, her father-in-law. Returning secretly in 1832, she organized a small, unsuccessful uprising in an attempt to win the throne for Berry's posthumous son, Henri, later known as the comte de Chambord. For these activities she was imprisoned. However, when it became obvious that the duchesse was pregnant, she was forced to reveal her secret second marriage to an

Italian count. This marriage alienated her royalist supporters, and the French government released her from prison.

Berry, Charles Ferdinand, duc de (sharl fērdēnāN', duk), 1778–1820, younger son of Charles, comte d'Artois (later Charles X of France). He served in the prince de Condé's army against the French Revolution. His assassination during the reign of King Louis XVIII—an attempt to extinguish the Bourbon line—gave the ultraroyalists the opportunity to turn Louis XVIII against the liberals. Berry's posthumous son was Henri, comte de Chambord.

Berry, Martha McChesney, 1866–1942, American educator and philanthropist, b. near Rome, Ga., Ph.D. Univ. of Georgia, 1920. Determined to provide educational opportunities for underprivileged mountain children, Berry opened (1902) a log-cabin school with five pupils. She developed this at Mt. Berry, Ga., into an institution comprising four units: a boys' school (1902), a girls' school (1909), Berry College (1926, coeducational), and a model practice school. See biography by Tracy Byers (1932, repr. 1971), H. T. Kane and I. W. Henry, *Miracle in the Mountains* (1956).

Berry (bērē'), former province, central France. Bourges, the capital, and Châteauroux are the chief towns. Cattle are raised on the Champagne Berrichonne, a semiarid plateau that covers most of the region. The valleys of the Indre and the Cher rivers are rich farming areas. A part of Roman Aquitaine, Berry was made a county in the 8th cent., and was purchased (1101) by the French crown. In 1360 it was made a duchy. It was held as an appanage by various royal princes until 1601, when it reverted to the crown.

berry: see FRUIT

Berryman, John, 1914–72, American poet and critic, b. McAlester, Okla., grad. Columbia, 1936. From 1955 until his death he was on the faculty of the Univ. of Minnesota. Although he had published several volumes of poetry and a highly regarded biography of Stephen Crane (1950), his literary reputation was not established until the appearance of *Homage to Mistress Bradstreet* (1956), a long dialogue in verse between Berryman and the ghost of Anne Bradstreet. The volumes *77 Dream Songs* (1964, Pulitzer Prize) and *His Toy, His Dream, His Rest* (1968) can be considered a two-part novel in verse in which the only speaker is a middle-aged teacher and lover named Harry, who is the universal voice of an anguished and trivial age. Berryman committed suicide in 1972. *Delusions* (1972), a volume of poems, and *Recovery* (1973), a novel, were published posthumously, in both the poet examines himself and his life—as it slips away—in intimate and harrowing detail. Berryman's other volumes of poetry include *Poems* (1942), *The Dispossessed* (1948), *Berryman's Sonnets* (1967), and *Love and Fame* (1971). See study by J. M. Linebarger (1974).

Bersimis' see BETSIAMITES, river, Canada

Bertha of the Big Foot: see BERTRADA

Berthelot, Pierre Eugène Marcelin (pyēr ūzhēn' mār'salāN' bērtālō'), 1827–1907, French chemist. He was professor at the École Supérieure de Pharmacie (1859) and at the Collège de France from 1865. In 1900 he became a member of the French Academy. A founder of modern organic chemistry, he was the first to produce organic compounds synthetically (including the carbon compounds methyl alcohol, ethyl alcohol, benzene, and acetylene), at the same time dispelling the old theory of a vital force inherent in organic compounds. He also did valuable work in thermochemistry and in explosives. His writings include *Chimie organique fondée sur la synthèse* (1860) and *Leçons sur la thermochimie* (1897).

Berthier, Louis Alexandre (lwē alēksaN'drā bērtiā'), 1753–1815, marshal of France. He served in the American Revolution and in the French Revolutionary Wars, distinguishing himself under Napoleon in Italy, where he served as chief of staff. He was twice minister of war and from 1805 was chief of staff of the Grande Armée. The emperor made him prince of Neuchâtel and Wagram and arranged his marriage with a Bavarian princess. Berthier accommodated himself to the return of the Bourbons in 1814. Torn by divided allegiance when Napoleon returned from Elba, he withdrew to Bavaria, where he killed himself or was killed on June 1, 1815.

Berthollet, Claude Louis, Comte (klōd lwē, kōnt bērtōlā'), 1748–1822, French chemist. His contributions to chemistry include the analysis of ammonia and prussic acid and the discovery of the bleaching properties of chlorine. He collaborated with An-

toine Lavoisier in his researches and in reforming chemical nomenclature and supported him in his theory of combustion. His greatest contribution was in his *Essai de statique chimique* (1803), in which he presented his speculations on chemical affinity and his discovery of the reversibility of reactions.

Bertillon system (bārtīl'yān), first scientific method of criminal identification, developed by the French criminologist Alphonse Bertillon (1853–1914). The system, based on the classification of skeletal and other body measurements and characteristics, was officially adopted in France in 1888 and soon after in other countries. Fingerprinting, added later as a supplementary measure, has largely replaced the system. See biography of Alphonse Bertillon by Henry Rhodes (1956, repr. 1969).

Bertoia, Harry (bērtōi'ya), 1915–, American sculptor and furniture designer, b. Italy. Bertoia emigrated to the United States in 1933 and joined Knoll International (1950). There he designed chairs that brought him wide acclaim. Important examples of his sculptural works are a structural screen for the Manufacturers Hanover Trust Company, New York City, and a bronze panel at Dulles International Airport, Washington, D.C.

Bertoldo di Giovanni (bārtōldō dē jōvān'ne), c. 1420–91, Italian sculptor. A pupil and assistant to Donatello and later the teacher of Michelangelo, Bertoldo was employed by the Medici to supervise instruction in sculpture and care for their collection of antique sculpture. His own works, often small bronzes, include battle scenes and mythological episodes (e.g., *Orpheus*, Bargello, Florence).

Bertrada, d. 783, Frankish queen, wife of Pepin the Short and mother of Charlemagne. She tried without success to reconcile Charlemagne and his brother Carloman. Also called Bertha of the Big Foot or Queen Goosefoot, she figures in Carolingian legend.

Bertrand de Born (būr'trānd də bōrn) or **Bertran de Born** (bēr'traN'), c. 1140–c. 1214. French TROUBADOUR of Limousin. Some of his 40 surviving poems (in Provençal) tell of his part in the struggles between Henry II of England and his sons. For his warlike role in these quarrels, Bertrand is named as a "sower of schism" in Dante's *Inferno*.

Berwald, Franz (frānts bē'rvald), 1796–1868, Swedish composer. Unable to support himself entirely by music, for a time Berwald directed an orthopedic clinic and ran a glassworks. His music, which is highly original in its use of rhythm, harmony, and orchestration, had little popular success. Berwald's orchestral music is reminiscent of work by Berlioz, although his thematic ideas are generally more concise. He wrote six symphonies and several concertos, chamber works, and operas. See Robert Layton, *Berwald* (1959).

Berwick, James FitzJames, duke of (bē'r'ik), 1670–1734, marshal of France, illegitimate son of King James II of England and Arabella Churchill, sister of the duke of Marlborough. Born and educated in France, he fought in Hungary against the Ottoman Turks. In 1687, his father, who had ascended the English throne in 1685, created him duke of Berwick. When his father was dethroned (1688), Berwick took part in the invasion of Ireland (1689) against James's successor William III, the effort was supported by King Louis XIV of France, James's ally. After the defeat in Ireland, Berwick fought for France in the War of the Grand Alliance and became (1703) a naturalized Frenchman. He subsequently helped suppress the Protestant CAMISARDS. In the War of the Spanish Succession (see SPANISH SUCCESSION, WAR OF THE), he won the decisive victory of Almansa (1707) for King Philip V of Spain, Louis XIV's grandson. In 1709 he campaigned against Prince EUGENE OF SAVOY in defense of the southeastern frontier of France, and his capture of Barcelona (1714) was the closing event of the war. During the War of the Polish Succession, he commanded (1733) the French army of the Rhine, he was killed at Philippsburg.

Berwick (bē'r'ik) or **Berwickshire** (bē'r'ikshīr), county (1971 pop. 20,750), 457 sq. mi. (1,194 km), SE Scotland. The county town is Duns. Berwick is separated from England by the Tweed River. The coastline (along the North Sea) is rocky and inhospitable. The county is divided into three geographical regions: the Merse, in the southeast, one of the most productive valleys in Scotland, the Lammermuirs, a pastoral mountainous region in the northwest, and Lauderdale, a cultivated hilly region along Leader Water in the west. The Eye is Berwick's major river. Sheep grazing, the cultivation of grains, sugar beets, and potatoes, and fishing are the chief occupations. Berwick was part of the ancient Saxon kingdom of

Northumbria For many centuries it was the scene of border strife between England and Scotland Dryburgh Abbey, in Berwick, is the burial place of Sir Walter Scott, the writer, and Earl Haig, the general In 1975, Berwick became part of the Borders region

Berwick (bûr'wîk), industrial borough (1970 pop 12,274), Columbia co., E Pa., on the Susquehanna River, in a forest and farm area, inc 1818 Clothing and mobile homes are produced in the city The region abounds in fish and game

Berwick upon Tweed (bêr'îk), municipal borough (1971 pop 11,644), Northumberland, NE England, at the mouth of the Tweed River It is a market town and seaport and is famous for its salmon fishing Grain is the chief export, oil and timber are imported Other industries are shipbuilding, engineering, sawmilling, fertilizer production, and the manufacture of tweed and hosiery The principal border town between Scotland and England, Berwick changed hands more than 13 times between 1147 and 1482, when Edward IV finally claimed it for England It did not become officially English until 1885 Of interest are the Royal Border Bridge, the old barracks, and the walls surrounding the city that were especially designed to utilize artillery guns

Berwyn (bûr'wîn), city (1970 pop 52,502), Cook co., NE Ill., a residential suburb of Chicago, on the Chicago Sanitary and Ship Canal, inc 1891 It has varied light manufactures

beryl (bêr'îl), mineral, a silicate of beryllium and aluminum, $8\text{Be}_3\text{Al}_2\text{Si}_6\text{O}_{18}$, extremely hard, occurring in hexagonal crystals that may be of enormous size and are usually white, yellow, green, blue, or colorless Beryl is commonly used as a gemstone The refractive index is low, and the stones have little or no fire The most valued variety of beryl is EMERALD An AQUAMARINE is a blue to sea-green beryl, morganites are rose-red beryls It is the principal raw material for the element beryllium and its compounds

beryllium (bar'îl'ëəm) [from beryl], rarely **glucium**, metallic chemical element, symbol Be, at no 4, at wt 9.0122, m p about 1285°C, b p 2970°C (estimated), sp gr 1.85 at 20°C, valence +2 Beryllium is a strong, extremely light, high-melting, silver-gray metal with a close-packed hexagonal crystalline structure It is an ALKALINE-EARTH METAL in group IIa of the PERIODIC TABLE Beryllium is resistant to corrosion, weight for weight, it is stronger than steel, and because of its low density (about 1/3 that of aluminum) it has found extensive use in the aerospace industry Beryllium is soluble in hot nitric acid, dilute hydrochloric and sulfuric acids, and sodium hydroxide Like aluminum and magnesium, which it resembles chemically, it readily forms compounds with other elements, it is not found free in nature However, like aluminum, it is resistant to oxidation in air, even at a red heat, it is thought to form a protective oxide film that prevents further oxidation The compounds of beryllium are sweet-tasting and highly toxic, this toxicity has limited the use of beryllium as a rocket fuel, even though it yields more heat on combustion for its weight than any other element Beryllium transmits X rays much better than glass or other metals, this property, together with its high melting point, makes it desirable as a window material for high-intensity X-ray tubes Because beryllium resists attack by liquid sodium metal, it is employed in cooling systems of nuclear reactors that use liquid sodium as the heat-transfer material, because it is a good reflector and absorber of neutrons, it is also used as a shield and as a moderator in nuclear reactors The addition of 2% to 3% of beryllium to copper makes a nonmagnetic alloy six times stronger than pure copper This alloy is used to make nonsparking tools for use in oil refineries and other places where sparks constitute a fire hazard, it is also used for small mechanical parts, such as camera shutters When beryllium is alloyed with other metals such as aluminum or gold it yields substances with a higher melting point, greater hardness and strength, and lower density than the metal with which it is alloyed Beryllium aluminum silicates, especially BERYL (of which emerald and aquamarine are varieties), constitute the chief sources of the metal Although its ores occur widely in North America, Europe, and Africa, the cost of extracting the metal limits its commercial use Beryllium may be prepared by electrolysis of its fused salts, it is prepared commercially by reduction of the fluoride with magnesium metal Beryllium was discovered in 1798 as the oxide beryllia by L N Vauquelin, a French chemist Vauquelin analyzed beryl and emerald at the urging of R J Haüy, a French mineralogist, who had noted that their optical properties were identical Beryllium was first iso-

lated in 1828 independently by F Wohler in Germany and W Bussy in France by fusing beryllium chloride with metallic potassium

Berytus: see BEIRUT, Lebanon

Berzelius, Jöns Jakob, Baron (bærzē'lēās, Swed yons ya'kôp bër-sā'lēās), 1779-1848, Swedish chemist, M D Univ of Uppsala, 1802 He was noted for his work as teacher at the medical school and other institutions in Stockholm and for his discoveries in diverse fields of chemistry He developed the modern system of symbols and formulas in chemistry, prepared a remarkably accurate table of atomic weights, analyzed numerous chemical compounds, and discovered the elements selenium, thorium, and cerium Silicon in the amorphous form was first prepared by Berzelius, and he was the first to isolate zirconium Berzelius coined the words *isomerism*, *allotropy*, and *protein* He also contributed to the science of electrochemistry and wrote numerous books See study by J Eric Jorpes (tr 1971)

Besai (bê'sā), family that returned with Zerubbabel Ezra 2:49, Neh 7:52

Besançon (bazaNsôn'), city (1968 pop 119,471), capital of Doubs dept., E France, in Franche-Comté, on the Doubs An industrial town with metallurgical, textile, and food-processing industries, it is especially famous for its clock and watch manufactures, its watch school is world renowned Of Gallo-Roman origin, Besançon was an archiepiscopal see from the 5th cent Although part of the kingdom of Burgundy, it was made (by Emperor Frederick I) a free city, with special privileges for its archbishops It maintained its independence, with interruptions, until 1648, when it passed under Spanish rule through its incorporation with Franche-Comté After Louis XIV's second conquest of Franche-Comté (1674), Besançon became (1676) the capital of his new province Although bombed during World War II, many old monuments remain Roman ruins, a cathedral (12th-16th cent), and numerous buildings in Spanish Renaissance style, notably the Palais Granvelle (birthplace of Cardinal Granvelle, now housing a museum) and the imposing town hall An intellectual center, Besançon is the seat of a university (founded 1422 in Dôle and moved to Besançon in 1691), a music academy (founded 1726), and an international music festival

Besant, Annie (bêz'ant), 1847-1933, English social reformer and theosophist, b Annie Wood She steadily grew away from Christianity and in 1873 separated from her husband, a Protestant clergyman In 1879 the courts deprived her of her children because of her atheism and alleged unconventionality As a member of the National Secular Society she preached free thought and, as a member of the Fabian society, socialism With Charles BRADLAUGH she edited the *National Reformer* and with him reprinted an old pamphlet on birth control, *The Fruits of Philosophy*, for which they were tried (1877) on a charge of immorality and acquitted In 1889 she embraced THEOSOPHY, becoming a disciple of Mme Blavatsky and, later, her biographer She pursued her mission to India, where she soon became involved in nationalist politics She founded the Central Hindu College at Benares (Varanasi) in 1898 and in 1916 established the Indian Home Rule League and became its president She was president of the Indian National Congress in 1917, but later split with Gandhi She traveled (1926-27) in England and the United States with her protegee Jiddu KRISHNAMURTI, whom she announced as the new Messiah President of the Theosophical Society from 1907, she wrote an enormous number of books and pamphlets on theosophy Her works include her autobiography (1893), *Four Great Religions* (1897), *The Ancient Wisdom* (1897), and a translation of the *Bhagavad Gita* (1905) See Theodore Besterman, *Mrs Annie Besant* (1934), A H Nethercot, *The First Five Lives of Annie Besant* (1960) and *The Last Four Lives of Annie Besant* (1963)

Besant, Sir Walter (bîzant'), 1836-1901, English novelist and humanitarian, grad Christ's College, Cambridge, 1859 He taught at the Royal College of Mauritius from 1861 to 1867 After his return to England he devoted himself to writing and to various causes, among them the improvement of the copyright laws His first novels (in collaboration with James Rice) won immediate popularity Romantic and somewhat florid in style, they include *The Golden Butterfly* (1876) and *Ready-Money Mortiboy* (1872) Many of Besant's novels, written after the collaboration with Rice, dealt with social problems, among them were *All Sorts and Conditions of Men* (1882) and *Children of Gibeon* (1886) Besant was one of the most widely read novelists of the late

19th cent He was knighted in 1895 See his autobiography (1902, repr 1971)

Beskids (bêsk'idz), Czech and Slovak *Beskydy*, Pol *Beskidy* (bêskê'dê), mountain range of the Carpathians, extending c 200 mi (320 km) along the Polish-Czechoslovakian border The highest peak, Babia Gora (Slovak *Babí Hora*) rises to 5,658 ft (1,725 m) The Dunajec River divides the range into eastern and western sections The Vistula River rises in the Western Beskids Several passes, notably Jablunkov, Dunka, and Vlára, cross the range The Beskids are heavily forested Rich in coal and once having large deposits of iron ore, the Beskids became an iron and steel center in the 18th cent, the largest plants are now located at Ostrava, Trinec, and Kladno, in Czechoslovakia There are numerous tourist attractions and winter resorts in the mountains

Besnard, Paul Albert (pôl albêr' bânar'), 1849-1934, French painter, studied with Legros and Cabanel and in Italy He enjoyed many official honors and was the last important academic painter His *Woman Warming Herself* (1866) is in the Louvre He is best known for his many mural decorations in schools and public buildings in Paris

Besodeiah (bêsôdê'ya, bêsôdêf'a), the father of MESULLAM 6

Besor (bê'sôr), stream, S Palestine 1 Sam 30:9, 10:21

Bessarabia (bêsarä'bêa), historic region, c 17,600 sq mi (45,600 sq km), SW European USSR, largely in the Moldavian Soviet Socialist Republic and in the Ukraine It is bounded by the Dneestr River on the north and east, the Prut on the west, and the Danube and the Black Sea on the south Consisting mainly of a hilly plain with flat steppes, it is an extremely fertile agricultural area, especially for wine grapes, fruits, corn, wheat, tobacco, sugar beets, and sunflowers Dairy cattle and sheep raising are also important Agricultural processing is the chief industry There are some stone quarries and lignite deposits Bessarabia's leading cities are KISHINEV and TIRASPOL in Moldavia and IZMAIL and BELGOROD DNESTROVSKY in the Ukraine The population consists of Moldavians (about two thirds), Ukrainians, Russians, Jews, and Bulgarians As the gateway from Russia into the Danube valley, Bessarabia has been an invasion route from Asia to Europe Greek colonies were planted on the Black Sea coast of Bessarabia as early as the 7th cent B C The region was later part of Roman DACIA, but after the 4th cent AD it was subject to incursions by Goths, Huns, Avars, and Magyars Slavs first settled in Bessarabia in the 7th cent in the midst of these incursions From the 9th to the 11th cent, the area was part of Kievan Russia, and in the 12th cent it belonged to the duchy of Galich-Volhynia Cumans and later Mongols overran Bessarabia, after the latter withdrew it was included (1367) in the newly established principality of Moldavia The region probably derives its name from the Walachian princely family of Bassarab, which once ruled S Bessarabia In 1513 the Turks and their vassals, the khans of the Crimean Tatars, conquered Bessarabia After the Russo-Turkish wars, the region was ceded to Russia by the Treaty of Bucharest (1812) The Crimean War resulted (1856) in Russia's cession of S Bessarabia to Moldavia, but the Congress of Berlin (1878) returned the district to Russia After the Bolshevik Revolution (1917) the anti-Soviet national council of Bessarabia proclaimed the region an autonomous republic, however, in 1918, Bessarabia renounced all ties with Soviet Russia and declared itself an independent Moldavian republic, later voting for union with Rumania Although the Treaty of Paris (1920) recognized the union, Russia never accepted it, and in 1940 Rumania was forced to cede Bessarabia to the USSR The larger part of the region was merged with the Moldavian Autonomous Soviet Socialist Republic, thus forming the Moldavian SSR, the southern and northern sections, with a predominantly Ukrainian-speaking population, were incorporated into the Ukraine The Rumanian peace treaty of 1947 confirmed Bessarabia as part of the USSR

Bessarion (bêsar'ëan), 1395?-1472, Byzantine humanist, cardinal of the Roman Catholic Church He was a leading figure at the Council of FERRARA-FLORENCE, which he attended as metropolitan of Nicaea He favored ending the schism between East and West, and when the Orthodox Church refused, he joined the Roman Catholic Church and remained in Italy He was made a cardinal in 1439, and in 1463 the pope named him patriarch of Constantinople A projected translation into Latin of Ptolemy was completed by his protégés, Purbach and REGIOMONTANUS His fine collection of Greek manuscripts was the nucleus of St Mark's library, Venice

Bessel, Friedrich Wilhelm (frēd'rikh vil'hēlm bēs'-al), 1784-1846, German astronomer and mathematician. He became (1810) director of the new observatory at Königsberg and professor of astronomy at the Univ. of Königsberg. Among his many achievements the most noted is his discovery of the parallax of the fixed star 61 Cygni. Announced in 1838, it was officially recognized in 1841 as the first fully authenticated measurement of the distance of a star. His observations had, by 1833, increased the number of accurately determined stars to 50,000. This work was continued and extended by his pupil ARGELANDER. Through observing the variations of the proper motions of Sirius and Procyon, he concluded that they possessed dimmer companions, which was verified a century later by astronomers. Bessel's works on astronomy include *Fundamenta Astronomiae* (1818) and *Astronomische Untersuchungen* (1841-42). Bessel also introduced a class of mathematical functions, named for him, which he established as a result of work on perturbation of the planets and which are widely used in applied mathematics, physics, and engineering.

Bessemer, city (1970 pop. 33,428), Jefferson co., N. central Ala., inc. 1887. Founded as a mining town, it was named after Sir Henry Bessemer, inventor of the Bessemer process. The surrounding area is rich in minerals, and the manufacture of iron and steel is still the city's major industry.

Bessemer process [for Sir Henry Bessemer], industrial process for the manufacture of steel from molten pig iron. The principle involved is that of oxidation of the impurities in the iron by the oxygen of air that is blown through the molten iron, the heat

came in contact with French rationalism and was an ardent follower of Voltaire and the Encyclopedists. Bessenyer's major importance lay in his encouraging the revival of the Hungarian language, rather than in the merits of his own works. His play *The Philosopher* (1777) was among the first modern comic works written in Hungarian. Bessenyer has been called the father of modern Hungarian literature.

Best, Charles Herbert, 1899-, Canadian physiologist, b. West Pembroke, Maine. With F. G. Banting he discovered (1921) the use of insulin in the treatment of diabetes. He was appointed professor of physiology at the Univ. of Toronto in 1929, served as associate director of the Connaught Laboratories from 1932 to 1941, and became director of the Banting and Best department of medical research at the Univ. of Toronto in 1941. With N. B. Taylor he wrote *The Living Body* (rev. ed. 1946), *The Physiological Basis of Medical Practice* (4th ed. 1946), and *The Human Body and Its Functions* (3d ed. 1956).

bestiary (bēs'chēēr'ē), a type of medieval book that was widely popular, particularly from the 12th to 14th cent. The bestiary presumed to describe the animals of the world and to show what human traits they severally exemplify. The bestiaries are the source of a bewildering array of fabulous beasts and of many misconceptions of real ones. They were the artist's guide to animal symbolism in religious building, painting, and sculpture. *Physiologus* (the naturalist), an ancient work of the type, was probably the chief source of the bestiaries. A Middle English version is translated in J. L. Weston, *The Chief Middle English Poets* (1914). Variations of the genre remain popular. Modern authors who have written bestiaries include Lewis Carroll, James Thurber, T. H. White, and Jorge Luis Borges.

Bestuzhev, Aleksandr Aleksandrovich (alyik'sān'-dar alyik'sān'drāvich byistōō'zhaf), pseud. Cossack Marlinsky, 1797-1837, Russian novelist and poet. He wrote popular romantic tales in the Byronic manner. As an officer in the guards he joined the DECEMBRISTS and was exiled to Siberia. He was later transferred to the Caucasus, where he found the material for his best novel, *Ammalat Bek* (tr. 1843).

Bestuzhev-Ryumin, Aleksey Petrovich, Count (alyik'syā' pētrō'vich byistōō'zhēv-rēō'myīn), 1693-1766, Russian statesman. With the accession (1741) of Czarina Elizabeth, he was appointed vice chancellor and (1744) grand chancellor. Directing Russian foreign policy, he attempted to unite Russia, Austria, Great Britain, and Saxony against France and Prussia, which he viewed as Russia's natural enemies. Alliances were sealed with Great Britain (1742, 1747) and Austria (1746). The Anglo-Prussian alliance of Jan. 1, 1756, and the outbreak of the Seven Years War that summer virtually nullified Bestuzhev-Ryumin's efforts. Over his strenuous objections, Russia joined (1757) a counteralliance with France and Austria. Removed (1758) from office and banished to his estate, he was recalled (1762) by Catherine II, who made him a field marshal.

Beta Centauri (bā'tā sēntōr'i) see HADAR

Beta Crucis (krōō'sis) see MIMOSA, in astronomy

Betah (bē'ta), the same as TIBHATH

Betancourt, Rómulo (rō'mōlō bētankōōr'), 1908-, Venezuelan political leader, president of Venezuela (1945-48, 1959-64). Following a stormy career as a leader of radical student groups, he founded (1935) the *Organización Venezolana*, which later became the *Partido Acción Democrática*. In 1945, Betancourt, placed in power by a military coup, declared universal suffrage, instituted social reforms, and secured for Venezuela 50% of the profits reaped by oil companies. Forced into exile in 1948 when Marcos Pérez Jiménez overthrew the constitutionally elected Rómulo Gallegos, he returned (1958) after Pérez Jiménez was ousted, and was elected president. In spite of serious opposition from extremists and disaffected army units, he continued to advance a program of economic and educational reform. He was succeeded by Raul Leoni. In 1973, Betancourt was awarded a lifetime senate seat.

beta particle, one of the three forms of natural radioactivity. Beta radiation (or beta rays) was identified and named by E. Rutherford, who found that it consists of high-speed ELECTRONS. Unlike alpha and gamma particles, whose energy can be explained as the difference of the energies of the radioactive nucleus before and after emission, beta particles emerge with a variable energy. This apparent violation of the law of conservation of energy (see CONSERVATION LAWS) led to the hypothesis that a second undetected particle, the NEUTRINO, is emitted along with the electron and shares the total available energy. In some forms of induced, or artificial, radio-

activity, the electron's ANTIPARTICLE, the positron, is emitted from the excited nucleus, the positron in this case is also called a beta particle and denoted by β^+ (the ordinary beta particle is β^-).

Beta Persei (pūr'sēi') see ALGOL

betatron: see PARTICLE ACCELERATOR

betel (bē'tal), masticatory made from slices of betel palm seeds (called betel nuts) smeared onto a betel pepper leaf together with other aromatic flavorings and lime paste and rolled up. The betel PALM (*Areca catechu*) and the betel pepper (*Piper betle* of the PEPPER family) are native to and widely cultivated in S. Asia, where betel has been chewed since ancient times and is an article of considerable commerce. Betel contains a narcotic stimulant and may have some medicinal value. Habitual chewing stains the teeth.

Betelgeuse (bē'tāljoōz'), bright star in the constellation ORION, Bayer designation α Orionis, 1970 position RA 5^h53^m, Dec. +7°24'. A red supergiant with a luminosity about 13,000 times that of the sun, it is of SPECTRAL CLASS M2 Iab. Betelgeuse is a semi-regular VARIABLE STAR with apparent MAGNITUDE ranging from 0.6 to 0.75, thus, at maximum brightness it is one of the 10 brightest stars in the sky. Betelgeuse marks the right shoulder of Orion, its distance is about 500 light-years.

Beten (bē'tēn), village of N. Palestine. Joshua 19:25

Bethabara (bēthāb'ārā), place, on the Jordan, traditionally located at a ford just above the Dead Sea, where John was baptizing when Jesus came to him. RSV. Bethany, following some ancient texts. John 1:28

Beth-anath (bēth-ā'nāth), town of N. Palestine. Joshua 19:38, Judges 1:33

Beth-anoth (bēth-ā'nōth), town, probably the modern Bayt Anun (Jordan), not far NE of Hebron. Joshua 15:59

Bethany (bēth'anē) 1 Village, at the southeastern foot of the Mount of Olives, the modern Al Ayzariyah (Jordan), 2 mi (3.2 km) E of Jerusalem. Home of Lazarus, Martha, and Mary, it was frequently visited by Jesus. It is closely associated with the final scenes of his life, and the Ascension took place near Bethany. Mat. 21:17, 26:6, Mark 11:11, 14:3, Luke 19:29, 24:50, John 11:2. See BETHABARA.

Bethany, city (1970 pop. 21,785), Oklahoma co., central Okla., inc. 1910. Its manufactures include small airplanes and tires. Bethany was settled in 1906 by members of the Nazarene church. Bethany Nazarene College is in the city.

Bethany College 1 At Lindsborg, Kansas, Lutheran Church in America, coeducational, chartered 1881 as Bethany Academy. Its present name was adopted in 1886. 2 At Bethany, W. Va., Disciples of Christ, coeducational, chartered 1840.

Beth-arabah (bēth-ār'ābā), town, in the Jordan valley near Jericho. Joshua 15:6,61, 18:22

Beth-aram (bēth-ār'ām), the same as BETH HARAN

Beth-arbel (bēth-ār'bēl), unidentified town of Palestine. Hosea 10:14

Beth-aven (bēth-ā'vēn), town of S. central Palestine, between Bethel and Michmash. Joshua 7:2, 1 Sam. 13:5, 14:23. It is probably used as an abusive name for Bethel in Hosea 4:15, 5:8, and 10:5. The prophet seems to use Aven (for Beth-aven) also in the same way. Hosea 10:8

Beth-azmaveth: see AZMAVETH

Beth-baal-meon (bēth-bā'al-mē'an), town of Moab, E of the Jordan, now called Main (Jordan), 12 mi (19 km) SW of Hisban. Joshua 13:17. Baal-meon Num. 32:38, Ezek. 25:9, 1 Chron. 5:8. Beth-meon Jer. 48:23. Beon in Num. 32:3, an otherwise unidentified place, is probably the same. Beth-baal-meon is mentioned on the Moabite stone.

Beth-barah (bēth-bā'rā), unidentified town, near Beth-shan. Judges 7:24

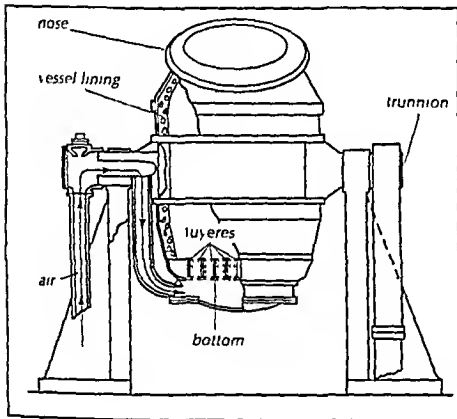
Beth-birei (bēth-bī'rēi), unidentified town. 1 Chron. 4:31. See BETH-LEBAOTH.

Beth-car, town, generally west of Jerusalem. 1 Sam. 7:11

Beth-dagon (bēth-dā'gōn) 1 Unidentified town of SW Palestine. Joshua 15:41. 2 Unidentified town of N. Palestine. Joshua 19:27

Beth-diblathaim see ALMON-DIBLATHAIM

Bethe, Hans Albrecht (bā'ta), 1906-, American physicist, b. Strassburg, Germany (now Strasbourg, France), educated at Frankfurt and Munich universities. In 1935 he came to the United States to teach at Cornell Univ., where he became professor in 1937. He was director (1943-46) of the theoretical physics division of the Los Alamos Atomic Scientific Labora-



Bessemer converter

of oxidation raises the temperature of the mass and keeps it molten during operation. The process is carried on in a large container called the Bessemer converter, which is made of steel and has a lining of silica and clay or of dolomite. The capacity is from 8 to 30 tons of molten iron, the usual charge is 15 or 18 tons. The converter is egg-shaped. At its narrow upper end it has an opening through which the iron to be treated is introduced and the finished product is poured out. The wide end, or bottom, has a number of perforations (tuyeres) through which the air is forced upward into the converter during operation. The container is set on pivots (trunnions) so that it can be tilted at an angle to receive the charge, turned upright during the "blow," and inclined for pouring the molten steel after the operation is complete. As the air passes upward through the molten pig iron, impurities such as silicon, manganese, and carbon unite with the oxygen in the air to form oxides, the carbon monoxide burns off with a blue flame and the other impurities form slag. Dolomite is used as the converter lining when the phosphorus content is high, the process is then called basic Bessemer. The silica and clay lining is used in the acid Bessemer, in which phosphorus is not removed. In order to provide the elements necessary to give the steel the desired properties another substance (often spiegeleisen, an iron-carbon-manganese alloy) is usually added to the molten metal after the oxidation is completed. The converter is then emptied into ladles from which the steel is poured into molds, the slag is left behind. The whole process is completed in 15 to 20 min. Bessemer steel is used for making machinery, tools, wire, and nails and is the essential modern structural steel used in steel-framework buildings. See METALLURGY.

Bessenyer, Gyorgy (dyōr'dyā bēs'shēnyā), 1747-1811, Hungarian dramatist and writer. In Vienna he

tory and in 1958 was scientific adviser to the United States at the nuclear test ban talks in Geneva. He is noted for his brilliant theories on atomic properties and in 1967 was awarded the Nobel Prize in Physics for his work on the origin of solar and stellar energy (see NUCLEOSYNTHESIS).

Bethel (bēth'āl) 1 Ancient city, central Palestine, the modern Baytān (Jordan), N of Jerusalem. According to the Bible, where it is frequently mentioned, it was originally called Luz (see LUZ 1). Abraham built his first Palestinian altar here. The name Bethel was given to Jacob's sacred stone and was then transferred to the town itself. At the time of the Judges it was a national shrine, it temporarily harbored the Ark of the Covenant. Bethel lost its preeminence as a Jewish shrine to Jerusalem, Jeroboam's attempt to establish Bethel as a rival religious capital failed. Bethel thereafter became increasingly associated with heathen worship—hence the denunciations by Amos and by Hosea, who called it BETH-AVEN by way of insult. Modern excavations have disclosed a temple wall, water gate, and palace complex, indicating the site was once a flourishing Canaanite cultic center. See Gen 12:8, 35:1-15, Judges 20:26, 27, 1 Kings 12:26-33, Amos 3:14. 2 Unidentified place, S Palestine. Joshua 12:16, 1 Sam 30:27. Chesil. Joshua 15:30. Bethul. Joshua 19:4. Bethuel. 1 Chron 4:30.

Bethel, town (1970 pop 10,945), Fairfield co., SW Conn., inc. 1855. Bethel is noted for its hat industry, which was founded c 1800. Other manufactures include garment leather, clothing, chemicals, rubber goods, metal products, power saws, and game equipment. P. T. Barnum, the showman, was born there.

Beth-emek (bēth-ē'mēk), unidentified town of NE Palestine. Joshua 19:27.

Bether (bē'thar), in the Bible, word or name of unknown significance. It has been suggested that it may mean the spice malobathron. Song 2:17.

Bethesda (bēthēz'da, -thēs'-), pool in Jerusalem, perhaps the one discovered under the Crusaders' Church of St. Anne near St. Stephen's Gate in the northeast corner of the city. Its healing properties, which made it the resort of the sick, were said to have been the result of an angel's visits. John 5:2-9.

Bethesda, uninc. city (1970 pop 71,621), Montgomery co., W central Md., a residential suburb of Washington, D.C. The area was settled in the late 17th cent. by the Scottish, English, and Irish. In 1820 they built Bethesda Presbyterian Church, from which the district takes its name. The biblical pool of Bethesda, mentioned in St. John, was a healing place. The National Institutes of Health, the National Cancer Institute, and the Naval Medical Center are in Bethesda.

Beth-ezel (bēth-ē'zēl), unidentified town. Micah 1:11.

Beth-gader (bēth-gā'dar), unidentified town. 1 Chron 2:51. The Geder of Joshua 12:13, otherwise unidentified, is perhaps the same. See CEDOR 3.

Beth-gamul (bēth-gā'mal), unidentified town of Moab. Jer 48:23.

Beth-hacerem (bēth-hāk'arēm), town, probably the modern En Kerem (Israel), SW of Jerusalem. Neh 3:14, Jer 6:1.

Beth-haran (bēth-hā'rān), town, E of the Jordan, not far northeast of its mouth into the Dead Sea. Num 32:36. Beth-aram. Joshua 13:27.

Beth-hogla or **Beth-hoglah** (both bēth-hōg'la), town, the modern Ayn Hajalah (Jordan), W of the Jordan, SE of Jericho. Joshua 15:6, 18:21.

Beth-horon (bēth-hō'rān), name of two neighboring towns on the northerly road from Lod to Jerusalem. They are the modern Beit Ur at Tahta and Beit Ur al Fawga, Jordan. In this strategic locality two historic Jewish victories were gained, by Joshua and by Judas Maccabaeus (Joshua 10, 1 Mac 3). See also Joshua 16:3, 5, 18:13, 14, 21:22, 1 Kings 9:17, 1 Chron 6:68, 7:24, 2 Chron 8:5.

Beth-jeshimoth (bēth-jēsh'īmōth), town, NE of the Dead Sea. Joshua 12:3, 13:20, Ezek 25:9. Beth-jeshimoth. Num 33:49.

Beth-lebaoth (bēth-lēb'āōth), town of S Palestine. Joshua 19:6. Lebaoth. Joshua 15:32. BETH BIREI corresponds with Beth-lebaoth in a parallel passage.

Bethlehem (bēth'lī'hēm, -lēām) [Heb., =house of bread or house of Lahm, a goddess], Arab. *Bayt Lahm*, town (1967 est. pop. 16,000), W Jordan. It is traditionally considered the birthplace of Jesus and is one of the world's great shrines. Situated on a hill in green, fertile country, Bethlehem looks across to the Dead Sea and beyond. Its inhabitants, who are mostly Christians, depend largely on pilgrims and

tourists for their livelihood. Handicrafts, fashioned from olive wood and mother-of-pearl, and embroidered goods are made in the town. Bethlehem is also the trade center for surrounding farming villages and for the pastoral nomads who inhabit the area. In the Old Testament Bethlehem was the scene of the book of RUTH and the home of David. The tomb of RACHEL is nearby. Benjamin was born near Ephrath (or Ephrath), which was either an earlier name for Bethlehem or a nearby town (Gen 35:16-20, 48:7, 1 Sam 16:17, 2 Sam 23:13-17, 1 Chron 15:19). David and his family neglected their city, which became obscure, forgotten by all except those who looked to Bethlehem for the MESSIAH, the second David (Micah 5:2). The city later became important as the birthplace of Jesus. HADRIAN desecrated (A.D. 135) the traditional place of the nativity with a grove sacred to ADONIS. In 315, Constantine destroyed the heathen grove and constructed instead the Church of the Nativity (completed 333). The church, rebuilt and enlarged by Justinian I in the 6th cent., is now shared by monks of Greek, Latin, and Armenian orders. The manger where Jesus was born is said to have been in the grotto under the church. Saint Jerome lived (386-420?) in the court of the church and produced there the Vulgate text of the Bible. From 1099 to 1187, Crusaders controlled Bethlehem, and in 1571 the city was annexed by the Ottoman Empire. It was part of the British-administered Palestine mandate from 1922 until 1948, when it joined Jordan. In the Arab-Israeli War of 1967, Bethlehem surrendered to Israeli troops without a battle.

Bethlehem, town (1970 pop. 29,460), Orange Free State, E central South Africa. It is situated in a farming and livestock area and has industries producing furniture and food products. Bethlehem was founded in 1860, and its main growth began after the railroad from Natal reached there in 1905.

Bethlehem, city (1970 pop. 72,686), Northampton and Lehigh counties, E Pa., on the Lehigh River, inc. as a city 1917. It is one of the most important centers of steel production in the United States and is the site of the Bethlehem Steel Corp. Much cement is also produced there. Bethlehem was settled in 1740-41 by Moravians and was incorporated as a borough in 1845. Threatened with destruction in 1757 by hostile Delaware and Shawnee Indians, it was saved by Paxinos, a Shawnee chief. During the Revolutionary War one of the community buildings was used as a hospital for Continental soldiers. Points of interest in Bethlehem are the Central Moravian Church (c 1803), the Schnitz House (1749), and other early Moravian buildings. An internationally famous music festival performed by the Bach Choir is held in the city. Bethlehem is the seat of Lehigh Univ. and Moravian College.

Bethlem Royal Hospital, popularly known as Bedlam, oldest institution for the care and confinement of the mentally ill in England and one of the oldest in Europe. A priory in 1247, the building was converted to its later usage c 1400. Its administration, staff, and patients were moved in 1675, in 1815, and to its present location near Croydon in 1930. The word *bedlam* has long been applied to any place or scene of wild turmoil and confusion.

Bethlen, Gabriel (bēth'lan), 1580-1629, prince of Transylvania (1613-29). He was chief adviser of Stephen BOCSKAY and was elected prince after the assassination of Gabriel BATHORY. A Protestant, though tolerant toward all religions, he allied himself (1619) with the Protestant FREDERICK THE WINTER KING and overran Hungary, of which he was elected king (1620). After Frederick's defeat at the White Mt. (1620), Bethlen signed with Holy Roman Emperor FERDINAND II the Treaty of Nikolsburg (1621), by which he renounced the royal title but retained control of seven Hungarian counties and received the rank of prince of the empire. He continued his relations with the Protestant powers opposing the emperor in the Thirty Years War and married the sister of the elector of Brandenburg, however, he kept the interests of Transylvania paramount. He was a wise administrator and encouraged the development of law and learning.

Bethlen, Count Stephen, 1874-1947?, Hungarian premier (1921-31). A Transylvanian, he entered the Hungarian parliament in 1901, and in 1919 he was a delegate to the Paris Peace Conference. Called to the premiership by Admiral Horthy, he prevented (1921), despite his monarchist leanings, the return of King Charles (Austrian Emperor Charles I) to avoid military intervention by the LITTLE ENTENTE. The chief aim of his foreign policy was the revision of the post-World-War-I Treaty of Trianon (see TRIANON,

TREATY OF), a treaty of friendship (1927) with Italy advanced this cause. Bethlen survived a scandal over the forgery of francs in 1926, but his revisionism aroused the increasing suspicion of the Little Entente powers. In 1931, French bankers offered a loan to the hard-pressed government on condition that there be an end to revisionism, and Count Bethlen resigned. He was succeeded as premier by Count Julius Karolyi. Drawn at first toward collaboration with Nazi Germany, Bethlen grew increasingly opposed to Adolf Hitler and in 1940 opposed Hungary's alliance with Germany. In 1945 he was taken by the Russians to the USSR, apparently because of his efforts at concluding a separate peace with the Western powers. He was unofficially reported to have died there in prison.

Beth-maachah: see ABEL-BETH MAACHAH.

Bethmann-Hollweg, Theobald von (tā'ōbalt fan bāt'man-hōl'vāk), 1856-1921, German chancellor. A career civil servant, he became minister of the interior (1905) and secretary of state (1907), and in 1909 succeeded Bernhard von BULOOW as chancellor. He favored some reform and worked for a comprehensive insurance law, extension of the franchise, and greater autonomy for Alsace-Lorraine; his legislative efforts were supported in the Reichstag by a coalition of conservatives and centrists. Even though he greatly increased the German peacetime army, he did not desire World War I. When it began, however, he tried to justify the German stand. He denigrated the treaty guaranteeing Belgian neutrality as "a scrap of paper." Bethmann-Hollweg tried to restrict submarine warfare and to end the war (1916) by conciliation—an attempt that led to his overthrow (1917) by Ludendorff and Hindenburg. See biography by K. H. Jarausch (1973).

Beth-marcaboth (bēth-mar'kabōth), town in Palestine, perhaps the same as MADMANNAH. Joshua 19:5, 1 Chron 4:31.

Beth-meon (bēth-mē'ōn) see BETH BAAL-MEON.

Beth-millo see MILLO.

Bethnal Green: see TOWER HAMLETS.

Beth-nimrah (bēth-nīm'rā), town of Palestine. Num 32:36, Joshua 13:27. Nimrah. Num 32:3.

Bethpage, uninc. village (1970 pop. 18,555), including Old Bethpage), Nassau co., SE N.Y., on W Long Island. Grumman Aircraft Engineering Corp. has a large plant there. A village restoration in Old Bethpage features 20 pre-Civil War buildings. A state park is to the east.

Beth-palet (bēth-pā'lat), unidentified town of S Palestine. Joshua 15:27. Beth-phelet. Neh 11:26. Its adjective is Palite. 2 Sam 23:26. See PELONITE.

Beth-pazzez (bēth-pāz'ēz), unidentified town. Joshua 19:21.

Beth-peor (bēth-pē'ōr), town of Palestine where Baal-peor was worshipped. Num 25:3, Deut 32:9, 44:36, 34:6, Joshua 13:20.

Bethphage (bēthfā'jē, -fāj), unidentified place, near Jerusalem, traditionally between Bethany and the Mount of Olives. Mat 21:1, Mark 11:1, Luke 19:29.

Beth-phelet: see BETH PALET.

Beth-rapha (bēth-rā'fā), unidentified person or place. 1 Chron 4:12.

Beth-rehob (bēth-rē'hōb), Aramaean principality or town of N Palestine. Judges 18:28, 2 Sam 10:6. Rehob. Num 13:21, 2 Sam 10:8.

Bethsaida (bēth-sā'īdā), birthplace of saints Peter, Andrew, and Philip. It was renamed Julias later. John 1:44, 12:21, Mark 6:45, 8:22, Mat 11:21, Luke 10:13. Some identify Bethsaida with the Julias just E of the Jordan and N of the Sea of Galilee, others would place it on the eastern shore of the lake, still others suppose two Bethsaiidas, one on the eastern and another on the northwestern shore.

Beth-shan (bēth-shān') or **Beth-shean** (bēth-shē'ān), ancient town, at the meeting of the Vale of Jezreel with the Jordan valley. It was the most strategic point of E Palestine, with the crossing of four roads. Judges 12:7, 1 Sam 31:10, 12, 2 Sam 21:12, 1 Kings 4:12, 1 Chron 7:29. Bethsan. 1 Mac 5:52, 12:40, 41. Excavations (1921-33) revealed settlements of the 4th millennium B.C. From the 15th cent. B.C. to the 12th cent. B.C. it was a fortified Egyptian outpost, and later it was a Philistine town until it fell to the Israelites at the time of David. In Hellenistic times it was called Scythopolis, apparently because it fell to the Scythians in the 7th cent. B.C. It was a principal city of the Decapolis and a major trade center. The Arabs who took it (638 B.C.) named it Beisan. The present-day Israeli settlement called Bet Shean is nearby. See Alan Rowe, *A Topography and History of Beth-shan* (1930), G. M. FitzGerald, *Beth shan* (1931).

Beth-shemesh (bēth-shē'mēsh) 1 The Egyptian Heliopolis Jer 43 13 2 Town of Palestine, the modern Tel Bet Shemesh (Israel), W of Jerusalem Excavations there have revealed traces of the Egyptian occupation in the 2d millennium 8 C Joshua 15 10, 21 16, 1 Sam 6 9, 1 Kings 4 9, 2 Kings 14 11, 13, 1 Chron 6 59, 2 Chron 28 18 Ir-shemesh Joshua 19 41 3 Town of Issachar Joshua 19 23 4 Unidentified town of Naphtali Joshua 19 38

Beth-shittah (bēth-shī'tā), town of Palestine, mentioned in connection with Gideon's battle against the Midianites Judges 7 22

Bethsura (bēthshyōō'ra), the same as BETH-ZUR

Beth-tappuah (bēth-tāpyōō'ā), town, c 4 mi W of Hebron, of which it was perhaps a colony, now called Taffuh (Jordan) Joshua 15 53

Bethuel (bēthyōō'āl) 1 Father of Laban and Rebecca Gen 22 23, 28 5 2 The same as BETHEL 2.

Bethul (bēth'āl), the same as BETHEL 2.

Bethulia (bēthyōō'lēā), city, Palestine, apparently located somewhere NE of Samaria, c 10 mi (16.1 km) from that city It was the scene of the principal events of the book of Judith It has been variously identified, by some even with Jerusalem

Bethune, David see BEATON, DAVID

Bethune, Mary McLeod (bathyōōn'), 1875-1955, American Negro educator, b Mayesville, S C, grad Moody Bible Institute, Chicago, 1895 The 17th child of former slaves, she taught (1895-1903) in a series of southern mission schools before settling in Florida to found (1904) the Daytona Normal and Industrial Institute for Negro Girls From 1904 to 1942 and again from 1946 to 1947, she served as president of the institute, which, after merging with Cookman Institute (1923), became Bethune-Cookman College A leader in the American Negro community, she founded the National Council of Negro Women (1935) and was director (1936-44) of Negro Affairs of the National Youth Administration In addition, she served as special adviser on minority affairs to President Franklin Delano Roosevelt At the 1945 conference that organized the United Nations, she was a consultant on interracial understanding See biography by Rackham Holt (1964)

Bethune-Cookman College, at Daytona Beach, Fla, United Methodist, coeducational The school was formed as a result of a merger (1923) of the Daytona Normal and Industrial Institute for Girls (founded 1904) and the Cookman Institute (founded 1872) It became a four-year college in 1941 Founded primarily for blacks, it is open to all qualified students

Beth-zur (bēth-zūr'), town, Palestine, N of Hebron, on the Jerusalem road It is the modern Khirbat Tubbaynah (Jordan) Excavations (1924, 1931, 1957) have revealed settlements from the 19th cent 8 C During the Hellenistic period it was important in the Maccabean campaigns Joshua 15 58, 1 Chron 2 45, Neh 3 16 Bethsura 1 Mac 4 29, 6 31, 11 65

Betjeman, John (bē'tjəman), 1906-, English poet, b London His verse combines a witty appraisal of the present with nostalgia for the past, especially the Victorian past His published collections include *Mt Zion* (1933), *Continental Dew* (1937), *Old Lights for New Chancels* (1940), *A Few Late Chrysanthemums* (1954), *High and Low* (1966), and *Collected Poems* (1971) He has also published several delightful architectural studies including *Ghastly Good Taste or a Depressing Story of the Rise and Fall of English Architecture* (1933, rev ed 1971) and *A Pictorial History of English Architecture* (1972) In 1972 he was named poet laureate of England See *Summoned by Bells* (1960), his autobiography, which is written in verse

Betonim (bē'tōnīm), unidentified town, E of the Jordan Joshua 13 26

Bet Shean (bāt shīān'), town (1972 pop 11,300), NE Israel, in the Jordan River valley, c 300 ft (90 m) below sea level Situated in a fertile farming region, it is a center for agricultural experiments Textiles are manufactured Archaeological excavations have traced settlements on the site back to the Bronze Age Bet Shean was the site of an Egyptian administrative center during the XVIII and XIX dynasties (see EGYPT), a Scythian city from c 625 to 300 B C, and the biblical city Beth-shan In 64 B C it was taken by the Romans, rebuilt, and made the center of the DECAPOLIS The modern Bet Shean was established in 1949 by Israeli settlers Archaeological finds include temples of the Canaanite Bronze Age, a Hellenistic-Roman temple, and a Byzantine monastery The town is also known as Beisan

Betsiamites or **Bersimis**, river, c 240 mi (390 km) long, rising in the highlands of E Que, Canada, and

flowing SE into the St Lawrence River at Betsiamites Two hydroelectric plants provide power, Bersimis Dam (1,050,000-kw capacity, completed 1956) impounds Lake Pimpuacan

betta (bē'tā) or **fighting fish**, small, freshwater fish of the genus *Betta*, found in Thailand and the Malay Peninsula Best known is the Siamese fighting fish, *Betta splendens* Mature males of this species are about 2 in (5 cm) long In its native waters *B. splendens* is drab with small fins, but several centuries of breeding have produced multicolored varieties with extremely enlarged decorative fins, highly prized as aquarium fishes Males of this species are extremely aggressive, and in Thailand they are used in fighting contests lasting as long as six hours, with spectators betting on the outcome Bettas thrive in shallow, sunlit areas with soft or sandy bottoms Males secrete a mucous, with which they build bubble nests After the female of a pair lays her eggs, both members transfer them to the nest, which is then guarded by the male Several hundred young hatch out in 24 to 30 days Like its relatives the GOURAMI, the CLIMBING PERCH, the betta is equipped to breathe air as well as water and must surface from time to time It is classified in the phylum CHORDATA, subphylum Vertebrata, class Osteichthyes, order Perciformes, family Anabantidae

Bettendorf, city (1970 pop 22,126), Scott co., E Iowa, on the Mississippi River, settled c 1840, inc 1903 Its manufactures include aluminum products and farm equipment

Betterton, Thomas, 1635?-1710, English actor and manager He joined Sir William D'Avenant's company at Lincoln's Inn Fields theater in 1661 and became the leading actor of the Restoration stage, the theatrical leader of his time In the role of Hamlet he was acknowledged as the greatest since Burbage After D'Avenant's death (1668), he became the head of the company and moved to the Dorset Garden theater (1671), which he partially managed, and where he was especially successful in adaptations of Shakespeare by Dryden, Shadwell, Tate, and himself Betterton managed the Drury Lane theater from 1682 until 1695, at which time he reopened a theater in Lincoln's Inn Fields, with Congreve's *Love for Love* as his first production In 1705 he moved his company to the new Haymarket theater, built for them by Sir John Vanbrugh, where he made his last appearance in 1710 Sent to Paris by James II to study French technique, Betterton adopted new ideas in his theaters, especially in regard to scene design See R W Lowe, *Thomas Betterton* (1891, repr 1972) His wife, Mary Saunderson Betterton, d 1711, was the first woman to act Shakespeare's great female characters, most notably Lady Macbeth Both are buried in Westminster Abbey See Rosamond Gilder, *Enter the Actress* (1931), Barbara Marinacci, *Leading Ladies* (1961)

Betti, Ugo (ōō'gō bāt'tē), 1892-1953, Italian dramatist and poet A judge of the Roman high court by profession, he wrote poetry and plays in his spare time and became recognized as a major literary figure only late in life Although his earliest published works were two volumes of poetry (1922 and 1932), he is remembered for his dramas He wrote 27 plays and saw 24 of them produced Among the most notable were *La padrona* [the mistress] (1927), *Frano allo scalo nord* [landslide at the north station] (1936), *Il cacciatore di anitre* [the duck hunter] (1940), *Il diluvio* [the flood] (1943), and *Delitto all'isola delle capre* [crime on goat island] (1950) Betti's outlook was predominantly pessimistic, concerned with man's moral responsibility, guilt, and forgiveness Despite his frequently moralizing tone, he is ranked second only to Pirandello among 20th-century Italian dramatists See translations of his most important plays by Henry Reed (1958), G H McWilliam (1964), and Gino Rizzo (1966)

Betto, Bernardino di see PINTURICCHIO

Beuckelszoon, Beuckelzoon, or Beukels, Jan: see JOHN OF LEIDEN

Beulah [Heb., =married, used of a woman], allegorical name for Israel Isa 62 4,5

Beust, Friedrich Ferdinand (frē'drīkh fēr'dīnānt boist), 1809-86, Saxon and Austrian politician He held various portfolios in the Saxon ministry and served as premier (1853-66), but his opposition to Bismarck forced his resignation after Saxony's defeat in the Austro-Prussian War He entered the service of Austria, becoming foreign minister (1866), prime minister (Feb., 1867), and chancellor (June, 1867) With the Hungarians Julius Andrássy and Francis Deak he negotiated the *Ausgleich* [compromise] of 1867, which resulted in the establishment of the

AUSTRO HUNGARIAN MONARCHY Created a count in 1868, Beust was dismissed in 1871, but later served as ambassador to London (1871-78) and Paris (1878-82) See his memoirs (tr 1887)

Beuthen: see BYTOM, Poland

Bevan, Aneurin (ānī'rīn bē'vān), 1897-1960, British political leader A coal miner and trade unionist, he served (1929-60) in Parliament as a member of the Labour party As minister of health (1945-51) he administered and developed the National Health Service instituted by the Labour government A leader of the party's left wing, he resigned from the government in protest against the decisions to rearm Germany and cut social services Briefly expelled from the party for insubordination in 1955, and unsuccessful in his contest with Hugh GAITSKELL for the party leadership, he was reconciled to the party and became its spokesman for colonial and foreign affairs In ensuing years he favored British diplomatic neutralism and nuclear disarmament See his autobiography (1952), biographies by M M Krug (1961) and Michael Foot (2 vol., 1962 and 1974)

bevatron: see PARTICLE ACCELERATOR

Beveland, North, and South Beveland (bā'vālānt), two former islands, Zeeland prov., SW Netherlands, in the Scheldt estuary As a result of Dutch plans for a delta to shut off most of Zeeland from the North Sea, South Beveland became a peninsula of the mainland, North Beveland was linked to the peninsula by way of Walcheren island A shipping canal connecting the Belgian port of Antwerp with the Rhine River traverses South Beveland Agriculture and livestock breeding are the mainstays of the islands' economy Dairying and the cultivation of sugar beets are the principal activities on North Beveland, which also has factories for sugar extraction South Beveland specializes in the growing of wheat, potatoes, sugar beets and fruits and is also known for its fisheries and oyster culture Wissenkerke, whose name derives from a beautiful 17th-century church, is the chief town of North Beveland, Goes, which has a 15th-century Gothic church, is South Beveland's main urban center Heavy fighting occurred on both islands during World War II

Beveridge, Albert Jeremiah, 1862-1927, U S Senator from Indiana (1899-1911) and historian, b Highland co., Ohio He was admitted to the bar (1887) and practiced law (1887-99) in Indianapolis As a Republican Senator, he supported the policies of Theodore Roosevelt With other INSURGENTS he opposed the PAYNE-ALDRICH TARIFF ACT (1909) and was defeated for reelection (1910) He became (1912) an organizer of the PROGRESSIVE PARTY, ran (1912) for governor of Indiana on the party's ticket, and lost Thereafter he devoted himself principally to writing history His thorough, sober lives of John Marshall (4 vol., 1916-19) and Abraham Lincoln (unfinished, 2 vol., 1928) are outstanding See his *Russian Advance* (1903, repr 1970), biography by John Braeman (1971), Claude Bowers, *Beveridge and the Progressive Era* (1932)

Beveridge, William Henry, 1879-1963, British economist, b India, grad Oxford, 1902 His fame as an authority on social problems was gained through investigations and writings in government service (1908-19), especially as director of labor exchanges, set up largely through his efforts, and in the food ministry, where he devised rationing during World War I Knighted in 1919, he was director of the London School of Economics from that year until 1937, when he became master of University College, Oxford *Social Insurance and Allied Services* (1942), a report prepared for the British government, proposed a social security system "from the cradle to the grave" for all British citizens In 1944 his *Full Employment in a Free Society* advocated planned public spending, control of private investment, and other measures to assure full employment He served (1944-45) as a Liberal member of Parliament and was in 1946 made 1st Baron Beveridge of Tuggal Beveridge advocated state management to complement, not replace, individual initiative This was a theme of such later writings as *Voluntary Action* (1948) and *A Defence of Free Learning* (1959)

Beverley, Robert, 1673-1722, Virginia colonial historian, author of *The History and Present State of Virginia* (1705) A substantial planter and colonial official, he wrote his book after finding numerous errors in the manuscript of a book on Virginia written by an Englishman Vigorous, honest, and not without humor, his history was an immediate success, reprinted a number of times, it served to attract immigrants to Virginia See edition by Louis B Wright (1947, repr 1968)

Beverley, municipal borough (1971 pop 17,124), administrative center of the former county of East Rid-

ing of Yorkshire, NE England, since 1974 a part of the new nonmetropolitan county of Humberside. It is primarily a market town with some shipbuilding and such light industries as the manufacture of railroad and automobile accessories and leather. The famous large minster, or monastery church (13th cent.), was attached to a monastery founded by St John of Beverley (d 721) and transformed by ÆTHELSTAN into a college of canons. It contains the tomb of the Percy family and the ancient "chair of peace," which gave sanctuary from the laws of man (The sanctuary, a privilege granted by Æthelstan, applied in a 1-mi (1.6-km) radius around the minster, it was ended at the time of the Reformation.) The town gate is of the early 15th cent., and St Mary's Church dates from the 14th cent.

Beverloo, Cornelis van: see CORNEILLE

Beverly, city (1970 pop 38,348), Essex co., NE Mass., on Massachusetts Bay, inc. as a city 1894. Its chief manufactures are shoe machinery and electronic equipment. Beverly was settled in 1626 by Roger Conant, one of the founders of Massachusetts. In 1775 the schooner *Hannah*, the first ship of the U.S. navy, was outfitted and commissioned by Gen. George Washington at Glover's Wharf in Beverly. In 1787, Beverly became the site of the first cotton mill in the United States. Points of interest include Balch house (1636), believed to be the oldest house in the United States, the John Cabot house (1781), which is preserved as a museum, and several other Colonial buildings. Beverly Farms, a residential and resort section of the city, was the summer home of Oliver Wendell Holmes. Endicott Junior College and North Shore Community College are in Beverly.

Beverly Hills, 1 City (1970 pop 33,416), Los Angeles co., S Calif., completely surrounded by the city of Los Angeles, inc. 1914. Mainly residential, it is the home of many film and television personalities. 2 Village (1970 pop 13,598), Oakland co., SE Mich., a residential suburb of Detroit, on the Rouge River, inc. 1958.

Bevin, Ernest (bēv'ən), 1881-1951, British labor leader and statesman. An orphan who earned his own living from childhood, he began a long career as a trade union official when he became secretary of the dock workers' union in 1911. In 1921, Bevin merged his own union with many others to form the powerful Transport and General Workers' Union, of which he became general secretary. From 1925 to 1940 he sat on the general council of the Trade Union Congress, serving as chairman in 1937. Bevin played a leading organizing role in the general strike of 1926, but after the failure of that strike he worked to achieve greater cooperation between labor and the employers. He was enormously influential in labor party politics in the 1930s but did not enter Parliament until invited to join Winston Churchill's coalition government in 1940. In that government he was minister of labor and national service and thus was responsible for mobilizing manpower for war uses. As foreign minister in the Labour government of 1945 to 1951, Bevin devoted himself to building up the strength of Western Europe in close cooperation with the United States and helped lay the groundwork for the North Atlantic Treaty Organization. He favored the establishment of a federated Arab-Israeli state in Palestine, but that proved impossible to achieve. See biographies by Trevor Evans (1946), Francis Williams (1952), and Alan Bullock (2 vol., 1960-1967).

Bevis of Hampton (bē'vīs), English metrical romance of the early 14th cent. that also appears in Anglo-Norman, French, Italian, Scandinavian, Celtic, and Slavonic versions. Although its adventures are made up of such stock motifs as murder, mistaken identity, and revenge, the tale is nevertheless notable for its broad humor.

Bewick, Thomas (byōō'ik), 1753-1828, English wood engraver. Bewick pioneered in the revival of original wood engraving. Among his famous early works are his illustrations for Gay's *Fables* (1779) and *Select Fables* (1784) and for Ralph Beilby's *General History of Quadrupeds* (1790). In 1789 he engraved the Chillingham Bull, considered one of his finest blocks. He is best known for his classic illustrations of Beilby's *History of British Birds* (2 vol., 1797-1804). See his memoirs (1862), studies by Austin Dobson (1884, repr 1969), Rudolph Ruzicka (1943), and Graham Reynolds (1949).

Bexhill (bēks'hīl'), municipal borough (1971 pop 32,849), East Sussex, SE England. It is a summer resort and has a 14th-century manor house and an 11th-century church.

Bexley, borough (1971 pop 216,172) of Greater London, SE England. It was created in 1965 by the

merger of the municipal boroughs of Bexley and Erith, the urban district of Crayford, and part of the urban district of Chislehurst and Sidcup. The borough has many parks and open areas. Erith and Crayford are industrial centers. There are engineering and chemical works, oil and resin refineries, flour and seed-crushing mills, cloth printshops, and factories that produce electrical equipment, building materials, cable, paper products, plywood, and plastics. Erith is also a yachting resort. Parts of the borough have histories of more than 1,000 years, and there are several old churches. Viscount Castle-reagh (1769-1822) lived at Crayford.

Bexley, city (1970 pop 14,888), Franklin co., central Ohio, inc. 1908. It is a residential community completely within the confines of Columbus.

bey (bā), general title of respect used by Turkish peoples since ancient times. Originally given to tribal leaders, it was later used by the Ottomans to denote a provincial ruler. At first the Ottoman beys were appointed, but by the 18th cent. the title had become hereditary. In Ottoman Egypt, the beys were descendants of the former Mameluke rulers.

Beyazid I (bāyazīd'), 1347-1403, Ottoman sultan (1389-1402), son and successor of Murad I. He besieged Byzantine Emperor MANUEL II at Constantinople, then overcame the Turkish rulers in E Anatolia and defeated the army of Sigismund of Hungary (see SIGISMUND, Holy Roman emperor) at NIKOPOL. Ottoman expansion led to conflict with the conqueror TAMERLANE, and the two armies met at Ankara in 1402. Beyazid's troops consisted only of Serbs and the Janissaries, since the Tatars and most of his Turkish vassals had deserted him. His army was routed, and he died as Tamerlane's prisoner. His sons fought (1402-13) each other for the succession, and MUHAMMAD I emerged victorious. The name appears in other forms, e.g., Bajazet, Bayazid, and Bayazit.

Beyazid II, 1447-1513, Ottoman sultan (1481-1512), son and successor of Muhammad II to the throne of the Ottoman Empire (Turkey). With the help of the corps of Janissaries he put down the revolt of his brother Jem, who fled to Rhodes and then was held captive, as a threat to Bayazid, first by Pierre d'AUBUSSON, then by popes INNOCENT VIII and ALEXANDER VI. Transferred to the custody of Charles VIII of France, Jem died (1495) near Naples. A peace-loving monarch, Bayazid did little to advance Ottoman power but much to further Ottoman culture. He warred (1485-91) with the Mamelukes of Egypt, to whom he lost Cilicia, and allowed Cyprus to be seized (1489) by Venice. A war (1499-1503) with Venice ended to the sultan's disadvantage, and he then renovated his army and navy. Beyazid speedily rebuilt Constantinople after it was devastated (1509) by an earthquake. In 1510 civil war broke out between Bayazid's sons SELIM I and AHMED. In 1512, Bayazid was forced to abdicate by Selim's supporters, who included the Janissaries, and Selim became sultan.

Beyazid, 1612-1638?, Ottoman prince, brother of Sultan Murad IV. Considering Bayazid a dangerous rival, Murad ordered his execution. Bayazid's death is treated in Racine's tragedy, *Bajazet* (1672).

Beyle, Marie Henri: see STENDHAL

Beyrouth: see BEIRUT, Lebanon

Beza, Theodore (bē'zə) (Theodore de Beze), 1519-1605, French Calvinist theologian. In 1548 he joined John Calvin at Geneva and soon became his intimate friend and chief aid. From 1549 to 1558, Beza was professor of Greek at Lausanne, where he wrote *De haereticis a civili magistratu puniendis* (1554), a defense of the conduct of Calvin and the Geneva magistrates in the notorious trial and burning of Servetus. In 1558 he became professor of Greek at Geneva, and in 1564 he succeeded Calvin in the chair of theology at Geneva. Beza came to be regarded as the chief advocate of all reformed congregations in France, serving with distinction at the Colloquy of Poissy (see POISSY, COLLOQUY OF). He was of great importance in aiding the edition of the Greek and Latin versions of the New Testament, and he gave Codex D, or Codex Bezae, one of the most important manuscripts of the Bible, to Cambridge Univ. He wrote various theological tracts and a biography of Calvin.

Bezai (bē'zā), family in the return from captivity. Ezra 2:17, Neh 7:23, 10:18.

Bezaleel (bēzāl'ēel, bēz'ālēl) 1 The artist of the Tabernacle in the wilderness. Ex 31:2-11, 35:30, 38:22, 1 Chron 2:20, 2 Chron 1:5. 2 Jew who had married a foreign wife. Ezra 10:30.

Bezborodko, Aleksandr Andreevich, Prince (alyk'sān'dar andrā'evich bēzbōrōd'kō), 1747-99,

Russian statesman. He became secretary of petitions under Catherine II in 1775 and from 1780 served as head of the department of foreign affairs. During Catherine's reign foreign policy was determined largely by the empress, and Bezborodko generally went along with her schemes. He devised an imaginative plan for the partition of Turkey between Russia and Austria that fitted well with Catherine's unfulfilled dream of a new Byzantine Empire. He encouraged Catherine to participate with Austria and Prussia in the last two partitions of Poland (1793, 1795), by which Russia obtained Lithuania, Courland, and the W. Ukraine. After Catherine's death (1796) her son, Paul I, made him grand chancellor, with virtual control of Russian foreign affairs. He held this post until his death.

Bezek (bē'zēk) 1 Country or city of Adoni-bezek. Judges 1:5. 2 Iviouac of Israel. 1 Sam 11:8.

Bezer (bē'zər) 1 Asherite. 1 Chron 7:37. 2 Reubenite town, E of the Jordan. Deut 4:43, Joshua 20:8, 21:36, 1 Chron 6:78. Bezer is mentioned in the Moabite stone and may be identical with BOZRAH 2.

Bezhtsa: see BRYANSK, USSR

Béziers (bāzyā'), city (1968 pop 82,271), Hérault dept., S France, in Languedoc. A communications and industrial center with an important trade in wines and liqueurs, it has ironworks, breweries, and factories making a great variety of products. An episcopal see from the 4th cent. to 1802, Béziers was involved in numerous religious wars. During the ALBIGENSIAN CRUSADE it was taken (1209) by Simon de Montfort, a horrible massacre followed. Béziers has a noted cathedral (13th-14th cent.) and some old churches.

bezique (bāzēk'), card game usually played with 128 cards by two players. Bezique developed in France and England in the 1860s and originally required only 64 cards, later there were variations for three players with a 96-card pack and for four players with 128 cards. PINOCHLE is similar and is probably derived from bezique. In the United States the most popular form is the two-handed game, known as rubicon bezique, in which four 32-card packs are shuffled together. The cards in each suit rank ace, ten, king, queen, jack, nine, eight, seven. Each player receives nine cards, and the remaining cards, face down, become the stock. Trump suit is determined by the first marriage (king and queen of the same suit) declared. The nondealer leads, and his opponent follows, playing any card he desires. Highest card of the suit led or highest trump wins the trick. The winner of a trick leads to the next trick after first drawing the top card of the stock, with his opponent then drawing the next card from the stock. Play continues with nine cards to a hand until the stock is exhausted. Certain combinations of cards score various points. The player with the most points wins and receives a bonus of 500. If the loser is rubiconed (has a total of less than 1,000 points), the winner's score includes the sum of his and the loser's final totals and a bonus of 1,000.

Bezruč, Petr (pē'r'ar bēz'rōoch), pseud of Vladimír Vašek, 1867-1958, Czech poet, called the bard of Silesia. Bezruč's fame rests solely on the *Silesian Songs* (1903, enlarged ed 1909). In these 88 stark, moving verses the poet protests the suppression by the Austrians of the Slavic peoples living between Silesia and Moravia. Bezruč was an admirer of Whitman, but his work belongs to no school. After World War II the Czech government granted him a pension.

Bezawada, India. See VIJAYAWADA

Bhabha, Homi Jehangir (pəhan'gēr bā'bā), 1909-66, Indian physicist, b. Bombay. He was educated at the Royal Institute of Science, Bombay, and at Cambridge, England, where he studied cosmic rays and atomic physics. He was the leading Indian atomic physicist of his time. In 1945 he became professor of theoretical physics and director of the Tata Institute of Fundamental Research, Bombay. He was named the first chairman (1948) of India's Atomic Energy Commission and became secretary (1954) of its atomic energy department. He was president of the UN Atoms for Peace conference in 1955.

Bhadravati (bādrā'vātē), city (1971 metropolitan area pop 101,315), Karnataka state, S India, on the Bhadra River. The city contains iron and steel plants and paper mills.

Bhagalpur (bā'gālpōor'), city (1971 pop 172,700), Bihar state, NE India, on the Ganges River. It is a district administrative center and the market for an agricultural region. Bhagalpur Univ. and the remains of Buddhist monasteries are in the city.

Bhagavad-Gīta (būg'avad-gē'tā) [skt., = song of the Lord], Sanskrit poem incorporated into the MAHABHARATA.

HARATA, one of the greatest religious classics of Hinduism. The Gita (as it is often called) consists of a dialogue between Lord KRISHNA and Prince Arjuna on the eve of the great battle of Kurukshetra. Arjuna is overcome with anguish when he sees in the opposing army many of his kinsmen, teachers, and friends. Krishna persuades him to fight by instructing him in spiritual wisdom and the means of attaining union with God (see YOGA). The main doctrines of the Gita are karma-yoga, the yoga of selfless action performed with inner detachment from its results, jñāna-yoga, the yoga of knowledge and discrimination between the lower nature of man and his soul, which is identical with the supreme self, and bhakti yoga, the yoga of devotion to a particular god—in this case, Krishna, who reveals himself to Arjuna as the avatara (incarnation) of Vishnu through his teaching and the manifestation of his cosmic form. The Bhagavad-Gita is essentially Upanishadic in content, but it differs significantly from the brahman-atman doctrine of the UPANISHADS in teaching that the highest God is personal and that love and surrender to God's grace is a better and easier spiritual path than that of pure knowledge. The Gita has been the subject of many commentaries and has been much translated. Its translators include Annie Besant, Sir Edwin Arnold, Sarvepalli Radhakrishnan, and Mohandas Gandhi. See Franklin Edgerton, *The Bhagavad Gita* (1944), Svāmī Nikhīlānanda, *The Bhagavad Gita* (1944), Vinoba Bhave, *Talks on the Gita* (1960), Eliot Deutsch, ed., *Bhagavad Gita* (1968).

Bhaktapur: see BHATGAON, Nepal

bhakti (būktī) [Skt., =devotion], theistic devotion in Hinduism. Bhakti cults seem to have existed from the earliest times, but they gained strength in the first millennium A.D. The first full statement of liberation and spiritual fulfillment through devotion to a personal god is found in the BHAGAVAD GITA. The Puranas (from the 1st cent. A.D.) further elaborated theistic ideas. Devotion to SHIVA and VISHNU and to the latter's avatara (incarnations), Rama and KRISHNA, continues to be practiced throughout India. Intense love for God and surrender to Him, reliance on His grace rather than on rituals, learning, or austerities, and the continuous repetition of His name are the means to the goal of His constant presence. The devotee may worship the chosen deity as child, parent, friend, master, or beloved. The bhakti tradition has tended to stress authentic inner feelings as opposed to institutional forms of religion and to disregard caste distinctions. Great devotees and saints such as the Alvars of S. India (a Vaishnavite group of wandering singers), Mirabai, Tukaram, Tulsi-dasa, KABIR, and CHAITANYA have continuously inspired the cults, founded their own sects, and produced a great literature of songs and poems in their vernaculars.

Bhamo (ba'mō, bamō'), town (1960 est. pop. 16,000), NE Burma, on the upper Irrawaddy River. Located c. 900 mi (1,450 km) from the sea, it is the head of navigation on the Irrawaddy. Bhamo is the market town for the surrounding hill region and is also important for its ruby mines. Formerly significant as a center of overland trade with China, it was linked in World War II by the building of the Stilwell Road to Ledo in Assam, India. Although most of the population is now Kachin, in 1884 the Burmese authorities used Chinese freebooters to repel a Kachin attack on the town.

Bharat (bārūt'), a name for the Republic of India. It is derived from Bharata, a tribe famous in Vedic tradition. Some Hindus prefer this name to that of India, a name they believe to be of foreign origin.

Bharatpur (bārūt'pūr), city (1971 pop. 69,442), Rajasthan state, N central India. It is a district administrative center and has railroad-car and glass factories. Fans and fly whisks are fashioned from ivory and sandalwood. The city is thought to have been founded in 1733 and named after Bharat, a figure in Hindu mythology. The British captured Bharatpur in 1826. The city is well known for its bird sanctuary.

Bhaskara (būs'karā), called **Acarya** (achar'yā) [Skt., =learned], b. 1114, Hindu mathematician and astronomer. According to the custom, he put his learned treatises into verse, adding, however, explanations in prose. His work *Siddhantasīromani* includes chapters on arithmetic, algebra, and astronomy that have been translated into English. He gives the first systematic exposition of the decimal system. By mentioning such items as rates of interest and the prices of slaves, he gives some indication of economic conditions in his day. He was at the head of the observatory at Ujjain.

Bhatgaon (bāt'goun) or **Bhadgaon** (bād'-), city (1971 pop. 104,703), E Nepal, in a valley c. 4,000 ft

(1,220 m) above sea level, surrounded by high Himalayan peaks. It is a processing center for the grains, vegetables, and other crops of the surrounding area. Grazing is also important. A religious center, Bhatgaon was founded in 865 by Raja Ananda Malla. When the Gurkhas conquered the Nepal valley in 1768, Bhatgaon surrendered peacefully, thereby escaping the plunder that befell Katmandu and Patan. Landmarks include many ornate temples and the well-preserved palace (c. 1700) built by King Bhupatindra Malla. The city is also called Bhaktapur. **Bhatpara** (batpa'ra), city (1970 est. pop. 160,000), West Bengal state, NE India, on the Hooghly River. Once a center of Sanskrit learning, it is now part of the vast Hooghlyside industrial complex. Jute products are the chief manufactures.

Bhattacharya, Bhabhani (bābā'nē batāchār'yā), 1906-, Indian novelist, journalist, and translator. Bhattacharya was educated in India and England and has taught and traveled in many parts of the world. The themes of his novels, written in English, are drawn from the history and modern social problems of India. Sharp with social criticism, they deal with poverty and famine, caste and intolerance, and political inequality and injustice. His first work, *So Many Hungers!* (1948), describes in shocking terms a Bengal famine and the black-market corruption it produces. In *Music for Mohini* (1952) a modern city girl is forced by means of an arranged marriage into a repressive, traditional way of life. Bhattacharya attacks the caste system in *He Who Rides a Tiger* (1954), in which an untouchable masquerades successfully as a Brahmin priest. His other major works include the novels *A Goddess Named Gold* (1960) and *Shadow from Ladakh* (1966) and translations from the Bengali of some of Rabindranath Tagore's work. Bhattacharya's novels are internationally acclaimed for their irony and perceptive social commentary.

Bhave, Vinoba (vīnōbā ba'vā), 1895-, Indian religious figure, founder of the Bhoodan Movement. Born to a Brahmin family in Maharashtra, Bhave left home while quite young to study Sanskrit in Benares (Varanasi). There he became inspired by the teachings of Mohandas K. Gandhi and soon joined him as a disciple. Far more austere and disciplined than Gandhi, Bhave was acknowledged by Gandhi as a spiritual superior. At Gandhi's request Bhave resisted British wartime regulations in 1940 and spent nearly five years in prison. After Gandhi died (1948), Bhave was widely accepted as his successor. More interested in land reform, accomplished voluntarily, than in politics, he founded in 1951 the Bhoodan Movement, or land-gift movement, and subsequently traveled thousands of miles by foot, accepting donations of land for redistribution to the landless. By 1969 the Bhoodan had collected over 4 million acres (1.6 million hectares) of land for redistribution. His writings include *The Principles and Philosophy of Bhoodan Yajna* (1955), *Talks on the Gita* (1960, 3d ed. 1964), and *The Steadfast Wisdom* (1966). See biography by Shriram Narayan (1970), T. K. Oommen, *Charisma, Stability and Change* (1972).

Bhavnagar (boun'gar), city (1971 pop. 226,072), Gujarat state, W India, on the Gulf of Cambay, the chief port on the Kathiawar peninsula. Cotton is exported. The city manufactures bricks, tiles, and metal products.

Bhilainagar (bē'līnagar) or **Bhilai** (bē'lī), city, (1971 pop. 174,557), Madhya Pradesh state, central India. It is the site of a large state-owned steel industry, built with Soviet assistance.

Bhils (bēlz), people, numbering more than 2 million, who inhabit portions of Pakistan and of W central India, especially S Rajasthan and Gujarat states. They speak an Indo-European language, Bhili, and retain a distinctive culture, much affected by, but not absorbed into, Hinduism. They were traditional enemies of the Rajputs and allies of the Moguls. See S. M. Doshi, *Bhils* (1971).

Bhilwara (bēlvārā), town (1971 pop. 82,101), Rajasthan state, NW India. The town is a district administrative center and a market for mica, wheat, maize, cotton, and wool. Stone dressing is an important occupation. Coins called *Bhilari* were formerly minted in the town.

Bholan Pass, Pakistan. See BOLAN PASS.

Bhopal (bō'pāl), former principality, Madhya Pradesh state, central India. A region of rolling downs and thickly forested hills, it is predominantly agricultural. Its Buddhist monuments include the famous stupa (3d cent. B.C.) at Sanchi. Bhopal was

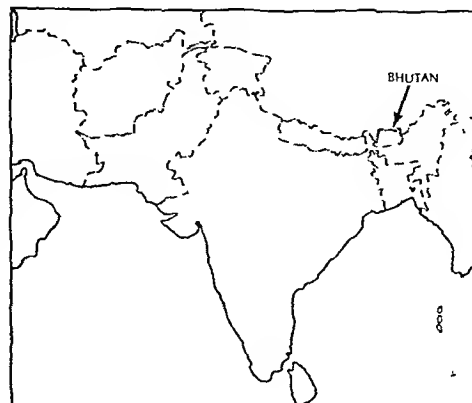
founded in the early 18th cent. and was ruled from 1844 to 1926 by the begums of Bhopal, famous women leaders. Although the population was mainly Hindu, the princely family was Muslim. Bhopal became part of the state of Madhya Pradesh in 1956. The city of Bhopal (1971 pop. 309,285), the former capital of the principality and now the capital of Madhya Pradesh, was founded in 1728. It is a trade center with manufactures of cotton cloth, jewelry, and electrical goods.

Bhubaneswar (bōōbānē'swār), city (1971 pop. 105,514), capital of Orissa state, E central India, on a tributary of the Mahanadi River. A small village before it became the capital in 1947, it is now a model administrative center and the seat of Orissa Univ. of Agriculture and Technology. There are rolling mills and wire-cable works. Settlements on this site date back to the reign of ASOKA (3d cent. B.C.). The capital of the Kesharis dynasty of Orissa (5th-10th cent.) was here. Bhubaneswar, a religious center, once had c. 7,000 shrines around its sacred lake, the remains of c. 500 still stand, displaying many styles of Hindu and Buddhist art and architecture. The Lingaraja temple, with an elaborately carved tower, is the most famous.

Bhumibol Adulyadej (pōō'mēpōl' ādōōl'yādēt'), 1927-, king of Thailand (1946-), b. Cambridge, Mass. A member of the Chakri dynasty, he was at school in Switzerland when his brother, King Ananda, was killed (1946) under mysterious circumstances. Bhumibol ruled with a regent until 1950, when he was crowned and took power in his own right as Rama IX. His power is largely ceremonial. His name also appears as Phumiphon.

Bhusawal (bōōsā'val), town (1971 pop. 96,236), Maharashtra state, W central India. The town is on the Bombay-Delhi railroad. It has large railroad workshops and several cotton factories.

Bhutan (bōōtiān'), kingdom (1974 est. pop. 1,300,000), 18,147 sq mi (47,000 sq km), in the E Himalayas, bordered on the S and E by India, on the N by the Tibet region of China, and on the W by Sikkim. PUNAKA is the traditional capital, Thimbu is the official capital. Great mountain ranges, rising in the N to Kula Kangri (24,784 ft/7,554 m), Bhutan's tallest peak, run north and south, dividing the country into forested valleys with some pastureland. The perpetually snow-covered Great Himalayas are uninhabited, except for some Buddhists in scattered monasteries. Bhutan is drained by several rivers rising in the Himalayas and flowing into India. Thunderstorms and torrential rains are common; rainfall averages from 200 to 250 in (508-635 cm) on the southern plains. The valleys, especially the Paro, are intensively cultivated. The chief occupations are small-scale subsistence farming (with rice the chief crop) and the raising of yaks, cattle, sheep, pigs, and tanguns, a sturdy breed of pony valued in mountain transportation. Metal, wood, and leather working, papermaking, and the weaving of cloth, baskets, and mats are also important activities. Bhutan's people are mostly Bhotias, who call themselves Drukpas (dragon people). They are ethnically related to the Tibetans and practice a form of Buddhism closely related to the Lamaism (see TIBETAN BUDDHISM) of Tibet, many Bhutanese live in monasteries. Dzongka, the official language, is also basically Tibetan. In W Bhutan there is a sizable minority of Nepalese. Although its early history is vague, Bhutan seems to have existed as a political entity for many centuries. In the 16th cent. the Tibetans conquered and assimilated Bhutan's native tribes, and around 1630 a refugee lama from Tibet made himself the first Dharma Raja, or spiritual ruler, of Bhutan. He named a Deb



Raja, or temporal ruler, but real administrative power was soon wielded by provincial governors (*ponlops*), who reduced the Deb Raja to a figurehead. In 1720 the Chinese invaded Tibet and established suzerainty over Bhutan. Friction between Bhutan and Indian Bengal culminated in a Bhutanese invasion of Cooch-Behar in 1772, followed by a British incursion into Bhutan, but the Tibetan lama's intercession with the governor-general of British India improved relations. In 1774 a British mission arrived in Bhutan to promote trade with India. British occupation of Assam in 1826, however, led to renewed border raids from Bhutan. In 1864 the British occupied part of S Bhutan, which was formally annexed after a war in 1865, the Treaty of Sinchula provided for an annual subsidy to Bhutan as compensation. In 1907 the most powerful of Bhutan's provincial governors, Sir Ugyen Wangchuk, supported by the British, became the monarch of Bhutan, the first of a hereditary line. A treaty signed in 1910 doubled the annual British subsidy to Bhutan in return for an agreement to let Britain direct the country's foreign affairs. After India won independence, a treaty (1949) returned the part of Bhutan annexed by the British and allowed India to assume the former British role of subsidizing Bhutan and directing its defense and foreign relations, the Indians, like the British before them, promised not to interfere in Bhutan's internal affairs. After Chinese Communist forces occupied Tibet in 1950, Bhutan, because of its strategic location, became a point of contest between China and India. The Chinese claim to Bhutan (as part of a greater Tibet) and the persecution of Tibetan Buddhists led India to close the Bhutanese-Tibetan border and to build roads in Bhutan capable of carrying Indian military vehicles. In the 1960s, Bhutan also formed a small army, trained and equipped by India. The kingdom's admission to the United Nations in 1971 was seen as strengthening its sovereignty. Bhutan's monarch, the Druk Gyalpo (Dragon King), is assisted by a small advisory council. In 1954 a 130-member national assembly was created, about one fourth of its members are appointed by the king, and the rest are village headmen elected to the assembly for five-year terms. Political parties are banned, the Bhutan state congress, led by Nepalese, must operate from India. Bhutan's third hereditary ruler, King Jigme Dorji Wangchuk (reigned 1953-72), modernized Bhutanese society by abolishing slavery and the caste system, emancipating women, dividing large estates into small individual plots, and starting a secular educational system. Although Bhutan no longer has a Dharma Raja, Buddhist priests retain political influence. In 1969 the absolute monarchy gave way to a "democratic monarchy," in which the national assembly was empowered to select and remove the king and to veto his legislation. The assembly must also give the king a periodic vote of confidence. In 1972 the crown prince Jigme Singhi Wangchuk became the fourth hereditary king of Bhutan upon his father's death. He was crowned in June, 1974. See studies by Ram Rahul (1872) and Nagendra Singh (1972).

Bhutto, Zulfikar Ali (zōl'fīkar alē' bōōt'tō), 1928-, Pakistani political leader. A member of a rich and powerful family, he took a law degree in England and then returned (1953) to Pakistan, where he soon entered politics as the protégé of General Ayub Khan. Bhutto became minister of commerce in 1958 and held several other cabinet posts before becoming foreign minister in 1963. After criticizing Pakistan's agreement with India ending the 1965 war between the two countries, he left the government and formed (1967) an opposition party, the Pakistan People's party, which quickly gained great popular support. In the 1970 elections his party won a majority in West Pakistan, but candidates of East Pakistan's AWAMI LEAGUE, led by MUJIBUR RAHMAN, won an overall majority. Bhutto's refusal to meet Mujibur's demands for East Pakistan's autonomy or for participation in the government helped provoke (1971) war between East and West Pakistan (see INDIA-PAKISTAN WARS). During the war Bhutto was made foreign minister and deputy prime minister, and when Pakistan was forced to accept a cease-fire in Dec., 1971, he took over the presidency. In 1973, under a new constitution, he resigned the presidency and became prime minister, still retaining control of the country. In Feb., 1974, in an effort to normalize relations with Bangladesh (formerly East Pakistan), he recognized that country.

Bi, chemical symbol of the element BISMUTH.

Biafra, Bight of (bēā'frā), eastern bay of the Gulf of Guinea, W Africa. It extends approximately from the Niger River delta, in S Nigeria, to N Gabon. The

bight gave its name to the secessionist Eastern Region of Nigeria (1967-70).

Biafra, Republic of, secessionist state of W Africa, in existence from May 30, 1967, to Jan. 15, 1970. At the outset Biafra comprised, roughly, the East-Central, South-Eastern, and Rivers states of the Federation of Nigeria, states inhabited mainly by the IBO people. The country, which took its name from the Bight of Biafra (an arm of the Atlantic Ocean), was established by Ibos who felt they could not develop—or even survive—within Nigeria. In Sept., 1966, numerous Ibos had been massacred in N Nigeria, where they had migrated in order to engage in commerce. The secessionist state was led by Lt. Col. Chukwuka Odumegwu Ojukwu and included some non-Ibo persons. Biafra's original capital was Enugu, Aba, Umuahia, and Owerri served successively as provisional capitals after Enugu was captured (Oct., 1967) by Nigerian forces. Seeking to maintain national unity, Nigeria imposed economic sanctions on Biafra from the start of the secession, and fighting between Nigeria and Biafra broke out in July, 1967. After initial Biafran advances, Nigeria attacked Biafra by air, land, and sea and gradually reduced the territory under its control. The break-away state had insufficient resources at the start of the war—it was a net importer of food and had little industry—and depended heavily on its control of petroleum fields for funds to make purchases abroad. It lost the oil fields in the war, and more than one million of its civilian population are thought to have died as a result of severe malnutrition. At the time of its surrender on Jan. 15, 1970, Biafra was greatly reduced in size, its inhabitants were starving, and its leader, Ojukwu, had fled the country. During its existence Biafra was recognized by only five nations, although other countries gave moral or material support. Civilian groups were organized in a number of countries to publicize the case for Biafra and to raise funds for the secessionist state. See A. H. Kirk-Greene, ed., *Crisis and Conflict in Nigeria: A Documentary Sourcebook* (2 vol., 1971), Joseph Okpaku, ed., *Nigeria, Dilemma of Nationhood: An African Analysis of the Biafran Conflict* (1972).

Bialik, Hayyim Nahman (hī'yām na'mān byā'lēk), 1873-1934, Hebrew poet, publisher in Odessa, Berlin, and Tel-Aviv, b. Volhynia, Russia. As an editor and publisher Bialik spread the ideas of the enlightenment (Haskalah). His fame began with the publication (1903) of his poem "In the City of Slaughter," inspired by a pogrom in Kishinev. Bialik's style is sometimes biblical, prophetic, and majestic, sometimes simple and lyrical, he had a great effect upon modern Hebrew literature. He wrote novels, humorous songs, and sketches, some of his work is in Yiddish, but his most important writings are in Hebrew. They have been widely translated (English translations of his poems were published in 1924, 1926, and 1948). Bialik translated into Hebrew Shakespeare's *Julius Caesar*, Cervantes's *Don Quixote*, Schiller's *Wilhelm Tell* and Heine's poems.

Białowieża (byalōv'yē'zha), Rus. *Byelovezhskaya Pushcha*, large forest, c 450 sq mi (1,170 sq km), E Poland and W USSR. Its varied trees (predominantly pines) shelter many animals, including bear, deer, European bison, and tarpan horse, and it was a favorite hunting ground of Polish kings. It passed to Prussia in 1795, was annexed by Russia in 1807, but was restored to Poland in 1921. In 1939, however, the forest was incorporated into the USSR. After World War II nearly half of the region was returned to Poland. Today both sections of the forest have animal preserves. The first Polish national park was established in the center of the forest in 1921.

Białystok (byalīs'tók), city (1970 pop. 166,619), capital of Białystok prov., NE Poland. It is a leading regional manufacturing center and a railway transportation point. Noted especially for its textile industry, the city also has factories producing machinery, metal goods, ceramics, food products, and precision instruments. Founded in 1310, Białystok was taken by Prussia in 1795 and by Russia in 1807, it was returned to Poland in 1921. About half of the city's population were killed by German occupation forces during World War II. Białystok has an academy of medicine and a technical college. Historical landmarks include a 16th-century church and an 18th-century palace.

Biard, Pierre (pyēr byār), c 1567-1622, French Jesuit missionary in North America. He left a professorship of theology in Lyons to head the first Jesuit mission to Canada, coming to Port Royal (later Annapolis Royal) in Acadia in 1611. He was one of the founders (1613) of the French settlement at Bar Harbor on

MOUNT DESERT ISLAND, in what is now Maine. He and all the colonists were soon taken prisoners by Samuel ARGALL. After a long captivity and a stormy return voyage Biard finally reached France, where he was accused of being in league with his English captors. His *Relation de la Nouvelle France* (1616), which has been of much value to later historians, embodied his reply to these charges.

Biarritz (byarēt's'), town (1968 pop. 26,985), Pyrénées-Atlantiques dept., SW France, on the Bay of Biscay near the Spanish border. An ancient fishing village, it was a favorite vacation spot of Napoleon III and Empress Eugénie, whose visits sparked the growth of Biarritz into one of the world's most fashionable sea resorts.

Bias (bī'ās), fl. 6th cent. B.C., Greek sage, b. Priene. He is at best semi-legendary but was called one of the SEVEN WISE MEN OF GREECE. Many epigrams were attributed to him by ancient writers.

bias, a voltage, current, or other input applied to a device or system as a reference or to set its conditions of operation. A bias is usually steady but may vary with time, usually within a fixed and known range and with a fixed and known frequency. In electronics, the most common forms of bias are the voltage applied to the grid of an ELECTRON TUBE to set its operating conditions and the current applied to the base of a TRANSISTOR to perform the same function. In tape recording, a bias current, usually alternating with a frequency in the ultrasonic range, is mixed with the signal to be recorded to minimize distortion produced by the tape itself.

biathlon (bīāth'lōn), athletic competition in which cross-country skiers race across hilly terrain, occasionally stopping to shoot with rifles at fixed targets. The regulation course is about 12½ mi (20 km) long, and the four targets are placed at a range of 164 yd (150 m) from the athlete. Competitors are penalized for missing targets by having a standard length added to the course distance that they must complete. Originally a Swedish hunting competition, the biathlon first became an event of the Winter Olympics in 1960.

Bibai (bī'bī), city (1970 pop. 47,369), Hokkaido prefecture, central Hokkaido, Japan. It is a mining city located on the Ishikari coal field.

Bibb, William Wyatt, 1781-1820, first governor of Alabama (1817-20), b. Amelia co., Va. Graduated in medicine from the Univ. of Pennsylvania (1801), he began practice in Petersburg, Ga. He was a state legislator, U.S. Representative (1807-13), and U.S. Senator (1813-16). In April, 1817, President Monroe appointed him governor of the newly created territory of Alabama, and Bibb continued in office when the new state government was organized (1819). On his death, Thomas Bibb, a brother, succeeded him in office.

Bibbiena, Galli da: see BIBBIENA, GALLI DA.

Biber, Heinrich Ignaz Franz von (hīn'rīkh īg'nats frants fən bē'bər), 1644-1704, Austrian musician. Biber was one of the first notable Central European violinists and may have been the first to employ *scordatura*, an unusual tuning of the violin to obtain special effects. He composed much violin music, some of it programmatic, that requires great virtuosity, and also various dramatic works.

Bibescu (bībēs'kōō) or **Bibesco** (-kō), Rumanian noble family. A prominent member was George Bibescu, 1804-73, prince of Walachia (1842-48). The first to be elected to his post, he effected important financial reforms but was driven from the county in the Revolution of 1848. His brother Barbu Bibescu, 1799-1869, was adopted by Prince Stirbei, a Rumanian magnate, whose name he later assumed. He served as minister of the interior and subsequently was appointed hospodar [governor] of Walachia for a seven-year term (1849-56). In Feb., 1856, he decreed the abolition of slavery in Walachia.

Bibiena or Bibbiena, Galli da (ga'lī'da bēbyā'nā), family of Italian artists of the 17th and 18th cent. Giovanni Maria Galli da Bibiena, 1625-65, studied with Francesco Albani and painted chiefly altarpieces, examples of which are to be seen in the churches of Bologna. His son, Ferdinando Galli Bibiena, 1657-1743, the most renowned of the group, became celebrated throughout Europe for his architectural views and theatrical designs and for his magnificent decorations for public and court festivities. He wrote several treatises on architecture. A master of baroque illusionism, he created an effect of depth by extending the set pieces of his scene designs beyond the proscenium arch. Francesco Galli Bibiena, 1659-1739, brother of Ferdinando, is celebrated chiefly as the designer of great European theaters. Other members of the family include Ales-

sandro Galli Bibiena, 1687–c 1769, son of Ferdinando, a fresco painter and architect, Giuseppe Galli Bibiena, 1696–1756, second son and pupil of Ferdinando and, like him, renowned for his sumptuous decorations, designed principally for the courts and theaters of Vienna, Munich, Dresden, Bayreuth, and Prague, Antonio Galli Bibiena, 1700–1774, third son of Ferdinando, an architect and designer, and Carlo Galli Bibiena, 1728–1787, the son of Giuseppe, a painter and architect employed at many of the European courts. See A. H. Mayor, *The Bibiena Family* (1940).

Bible [Gr., =the books], name used by Christians for their Scriptures. For the composition and the canon of the Bible, see OLD TESTAMENT, NEW TESTAMENT, APOCRYPHA, PSEUDEPIGRAPHIA, articles on the several books. The traditional Christian view of the Bible is that it was all written under the guidance of God and that it is, therefore, all true, literally or under the veil of allegory. In recent times, however, the view of many Protestants has been influenced by the pronouncements of critics (see HIGHER CRITICISM), this has produced a counterreaction in the form of FUNDAMENTALISM, whose chief emphasis has been on the inerrancy of the Bible. The interpretation of the Bible is one of the principal points of difference between Protestants, who believe that individuals have the right to interpret the Bible as they read it, and the Roman Catholic Church, which teaches that it alone may interpret Scripture and that the individual may read the Bible only according to the interpretation of the church, such an interpretation is provided in the notes to the text that appear in Roman Catholic Bibles. These notes vary from edition to edition. Celebrated extant manuscripts of the Bible include Codex Vaticanus (Greek, 4th cent.), at the Vatican, Codex Sinaiticus (Greek, 4th cent.), in the British Museum, discovered by Lobegott Friedrich Konstantin von Tischendorf on Mt. Sinai, Codex Alexandrinus (Greek, 5th cent.), in the British Museum, given to King Charles I by Cyril Lucaris, and Codex Bezae (Greek and Latin, 6th cent.), at Cambridge, England, given by Theodore Beza. The most ancient fragments of the Hebrew text are the 2d cent. B.C. papyrus of Nash, discovered in 1902 in Al Fayyum, Egypt, and the DEAD SEA SCROLLS, containing several books and fragments of the Old Testament. The first great translation of the whole Bible was the VULGATE of St. Jerome, the Latin version still used by the Roman Catholic Church. The Greek text generally received in the East is, for the Old Testament, that of the SEPTUAGINT, the first translation of the Old Testament was the Aramaic TARGUM. The New Testament has come down to us in Greek. In England there were current from early times vernacular versions of parts of the Bible, especially of the Gospels, since the Gospel was often read at Mass in the vernacular after its recitation in Latin. John Wyclif was one of the first to project the publication and distribution of the Bible in the vernacular among the English people, and two translated versions go by his name. In the 15th cent. the Lollards did much to extend the use of the Wyclifite translation. The next name in the history of the English Bible is that of William Tyndale, whose translation was not from Latin, like Wyclif's, but from Hebrew and Greek. Its excellence is made evident in its use as a basis of the Authorized Version. Tyndale's New Testament (1525–26) was the first English translation to be printed. Contemporary with Tyndale was Miles COVERDALE. The second version of Coverdale and the translation of Thomas Matthew closely followed Tyndale. In 1539 the crown issued its first Bible, in the name of Henry VIII. This, the Great Bible, was done principally by Coverdale. The Geneva Bible, or Breeches Bible ("made themselves breeches," Gen. 37), was a revision of the Great Bible, financed and annotated by the Calvinists of Geneva. The Bishops' Bible (1568) was a recasting of Tyndale. The greatest of all English translations was the Authorized Version (AV), or King James Version (KJV), of 1611, made by a great committee of churchmen led by Lancelot ANDREWES and composed of many of the finest scholars in England. The beautiful English of this version has had great influence and is generally ranked in English literature with the work of Shakespeare. The phraseology of much of it is that of Tyndale. The Douay, or Rheims-Douay, Version was published by Roman Catholic scholars at Rheims (New Testament, 1582) and Douai, France (Old Testament, 1610), it was extensively revised by Richard CHALLONER. In the 19th cent. the project of revising the Authorized Version from the original tongues was undertaken by the Church of England with the cooperation of nonconformist churches. The results of this revision were

the English Revised Version and the American Revised Version (pub. 1880–90). Many scholars, either cooperatively or independently, have translated the Bible into English. In other literatures also the translation of the Bible has had formative effect on the literary language, notably the case with Martin Luther's standard German translation. Occasionally translation of the Bible has been the first or the only notable work in a language—as for instance, the translation by Ulfilas into Gothic. In the 20th cent. American biblical scholars combined to produce the notable Revised Standard Version (RSV), published in 1952 and immediately adopted by many churches. A completely new translation, the work of a joint committee of representatives of all Protestant denominations in Great Britain, aided by Roman Catholic consultants, was begun in 1946. The New Testament was first published in 1961, and the entire Bible, called The New English Bible, appeared in 1970. New Roman Catholic translations were also undertaken, the Westminster Version in England, and a complete revision of the Rheims-Douay edition sponsored by the Confraternity of Christian Doctrine in the United States. The latter, after undergoing several major revisions and retranslations, was finally published as the New American Bible (1970). In addition, an English translation of the French Catholic Bible de Jerusalem (1961) appeared as the Jerusalem Bible (1966). See F. G. Bratton, *A History of the Bible* (1959), *The Cambridge History of the Bible* (3 vol., 1963–70), J. H. P. Reumann, *The Romance of Bible Scripts and Scholars* (1965), H. J. Frank, *The Bible through the Ages* (1967).

Bible Christians, denomination of Methodists in England founded by William O'Bryan. They seceded from the Wesleyan Methodist Church (1815–19) and in 1907 were merged with two other branches in the UNITED METHODIST CHURCH.

Bible societies, an essentially Protestant movement, formed for the translation, printing, and dissemination of the Holy Scriptures. An early important organization of this kind was the Canstein Bible Society established in 1710 by Baron von Canstein at Halle, Germany. In 1780 the Bible Society was formed in England to distribute Bibles among soldiers and sailors, the name was later changed to the Naval and Military Bible Society. A pioneer and leader is the British and Foreign Bible Society founded (1804) in London, which began its work with Welsh Bibles for Thomas CHARLES. With branches throughout the world, it has distributed Bibles in hundreds of languages. In the United States the formation of Bible societies began early in the 19th cent. Delegates from these associations founded (1816) the American Bible Society, which has many affiliates. Through its work, the Bible has been translated into many languages and has been widely distributed. In 1898 in Boscobel, Wis., a meeting occurred that led to the founding of the Christian Commercial Men's Association of America, more usually known as the Gideons, International. Its program of placing Bibles in hotel rooms for use by commercial travelers and others has been widely realized and has made the organization internationally known. In 1946 more than 20 national Bible societies formed an international association known as the United Bible Societies, with headquarters in London and in Geneva, Switzerland.

Biblical Antiquities, book of. see PSEUDEPIGRAPHIA. **biblical archaeology**, term applied to the ARCHAEOLOGY of the biblical lands, especially those of the ancient Middle East. While the thousands of written texts found in the languages of the ancient Middle East illuminate the Bible itself, the artifacts uncovered by archaeologists help recreate the cultural setting of its time. Biblical archaeology developed in earnest in the early part of the 19th cent. when the British biblical scholar Edward Robinson traveled across Palestine and opened the way for study of the area. The founding (1865) of the Palestine Exploration Fund in Great Britain further encouraged research, by 1900 biblical archaeological societies had been formed in Germany, France, and the United States. The system developed by Flinders PETRIE at Tel-el-Hesi (see EGTON 2) to date pottery is of the greatest importance for the archaeology of Palestine, where spectacular monuments and written material are rarely found. Other important excavations in Palestine were undertaken at JERICHO by John GARSTANG and others, MEGIDDO, SAMARIA, GIBEON, BETH-SHAN, LACHISH, EZION-GEGER, and HAZOR. Outside of Palestine the important archaeological discoveries in the old lands of EGYPT, SUMER (see also UR), BABYLONIA (see also GILGAMESH and HAMMURABI), ASSYRIA, BYBLOS, NUZI, UGARIT, and JORDAN (see also MOABITE STONE) have done much to increase knowledge of

the Bible. The Palestine Dept. of Antiquities, founded 1918, encouraged research until the turbulent years preceding the establishment of the State of Israel in 1948, since that time some of the most important archaeological work has been conducted by Israeli archaeologists, e.g., the excavation of the ancient tel (an artificial mound formed by the debris of settlements of ancient cities) of Joppa in 1948 and 1955, and the work at Arad from 1962 to 1967. After more than 100 years of biblical archaeology, it is possible to read the Bible in a new light. It has become clear that ancient Palestine was an integral part of the whole cultural area of the ancient Middle East. Many obscurities have been cleared up, and the historical data of the Old Testament have been proved more accurate than suspected. Archaeology is less important for the New Testament because of the brevity of the period and the relative abundance of material available on it. However, the discovery of several manuscripts of the Greek New Testament of the 2d and 3d cent. and especially the DEAD SEA SCROLLS have added new evidence that the Gospels are of greater antiquity than had been thought. See Michael Du Buit, *Biblical Archaeology* (1960), G. E. Wright, *Biblical Archaeology* (1962), W. G. Williams, *Archaeology in Biblical Research* (1965), Paul Lapp, *Biblical Archaeology and History* (1969), Avraham Negev, ed., *Archaeological Encyclopedia of the Holy Land* (1972), E. M. Yamauchi, *The Stones and the Scriptures* (1972).

bibliography. The listing of books is of ancient origin. Lists of clay tablets have been found at Nineveh and elsewhere, the library at Alexandria had subject lists of its books. Modern bibliography began with the invention of printing and at first consisted of "trade" bibliographies, i.e., lists of the publications of important publishing houses, comparable to those in the present-day *Trade List Annual*, *Reference Catalogue of Current Literature* (British), and *Books in Print*. There have been efforts at universal bibliography, in 1545 at Zürich, Konrad von Gesner published his *Bibliotheca universalis*, in 1895 the International Institute of Bibliography was established at Brussels. There are also national bibliographies, such as the *Library of Congress Catalog* and the *British Museum Catalogue*, subject bibliographies, such as Sabin's *Dictionary of Books Relating to America*, and lists of the works of individual authors. Bibliographies of rare and old books include that of J. C. Brunet and *Book Prices Current*. The *Cumulative Book Index* is a monthly bibliography of books in the English language that cumulates annually. The *Cambridge Bibliography of English Literature* is useful for English publications, and the *Bibliographic Guide to the Study of the Literature of the U.S.A.*, by C. L. Gohdes, for American works. The *Bibliographical Index*, which is cumulative, and *World Bibliography of Bibliographies* are useful compilations. The term *bibliography* is also used to describe books as physical objects and their production history, and has been expanded to include nonprint media such as microfilm. Computers are currently used in the compilation of some bibliographies. See A. J. K. Esdaile, *Manual of Bibliography* (4th ed. 1967), Robert Downs, *Bibliography* (1967), E. W. Padwick, *Bibliographical Method* (1969), A. M. Robinson, *Systematic Bibliography* (3d ed. 1971), Philip Gaskell, *A New Introduction to Bibliography* (1972), Pearce Grove and Evelyn Clement, *Bibliographic Control of Nonprint Media* (1972).

Bibliothèque nationale (bèblèötèk' nāsýōnāl'), the great national library of France, in Paris, and one of the foremost libraries in Europe. It originated with the collections of writings made by early French kings, including Charlemagne. The collection of Charles V, placed in the tower of the old Louvre in the 14th cent., and a library belonging to the house of Orleans at Blois were brought together at Fontainebleau in the 16th cent. under Francis I. The collection was later transferred to Paris by Charles IX, and was expanded greatly under the supervision of Jean-Baptiste Colbert (17th cent.). Since 1537 the library has been the legal depository for all books published in France. It now has more than 7 million books and manuscripts, and an extensive accumulation of medals and coins, and maps and prints. The library is housed in a building erected from 1854 to 1875 in the Rue de Richelieu under the direction of Henri Labrousse, it was remodeled in 1932–39. There is also a branch at Versailles. The Bibliothèque nationale is a governmental archive, not a public library.

Bibracte (bibrāk'tè), former capital of the AEDUI, site atop Mont Beuvray, central France. There Caesar defeated (58 B.C.) the Helvetii (see GALIC WARS). Excavations on the site have revealed a Gallic town

Bibulus (Marcus Calpurnius Bibulus) (bīb'yōōlās), d 48 B C, Roman statesman. The colleague in the consulship with Julius CAESAR in 59 B C, he did everything in his power to block each move made by Caesar. A conservative republican, he was a strong partisan of Pompey. In 51 B C he was governor of Syria, and in 48 B C he died trying to halt Caesar in the Adriatic. His wife was Portia, daughter of Cato the Younger, she later married Brutus.

bicameral system, governmental system dividing the legislative function between two chambers, an "upper," such as the US Senate and the British House of Lords, and a "lower," such as the US House of Representatives and the British House of Commons. Although the term *bicameral* was coined by Jeremy Bentham as recently as 1832, division of the legislative branch of government according to function and composition is of long standing. The division of the English PARLIAMENT into separate houses of Lords and Commons in the 14th cent. may have arisen simply for the sake of convenience in transacting business, however, this division came to represent the historic cleavage of interest between nobles and commoners, with the balance of power, especially after the Glorious Revolution of 1688 and the gradual development of cabinet government in the 18th cent., shifting more and more to the commoners. The powers of the House of Lords were drastically reduced by the Parliament acts of 1911 and 1949, and though the house continues to debate and vote on bills, its function has become essentially advisory. The British colonies in North America gradually adopted the bicameral system, the upper chamber, whether elective or appointive, came to represent the colony as a whole, while delegates to the lower house were attached to particular constituencies. According to modern scholars, the adoption of the same system for the CONGRESS OF THE UNITED STATES reflected colonial practice, British example, and the widespread differences in property qualification for suffrage and office-holding purposes current at the time rather than the French philosophical influences once considered primary. In France some 18th-century theorists, such as Montesquieu, favored a bicameral legislature based on the British example, but the "natural rights" philosophers, such as Rousseau, opposed such a system. France experimented with various forms of legislature during the Revolutionary and Napoleonic periods but thereafter, despite numerous constitutional changes, retained a bicameral system. Where bicameral legislatures exist, the two chambers are based on different principles of representation in addition to possessing separate functions. After World War I the unicameral legislative system made headway in Eastern Europe, Latin America, and parts of the British dominions. See D. Schaffter, *The Bicameral System in Practice* (1929), J. A. Corry, *Elements of Democratic Government* (4th ed. rev. 1964), S. H. Beer, *Patterns of Government* (3d ed. 1973).

bicarbonate or hydrogen carbonate, chemical compound containing the bicarbonate radical, HCO_3^- . The most familiar of such compounds is SODIUM BICARBONATE (baking soda). See CARBONATE.

bicarbonate of soda. See SODIUM BICARBONATE.

biceps, any muscle having two heads, or fixed ends of attachment, notably the biceps brachii at the front of the upper arm. Originating in the shoulder

area, the heads of the biceps merge partway down the arm to form a rounded mass of tissue linked by a tendon to the radius, the smaller of the two forearm bones. When the biceps contracts, the tendon is pulled toward the heads, thus bending the arm at the elbow. For this reason the biceps is called a flexor. It works in coordination with the TRICEPS brachii, an extensor. The biceps also controls rotation of the forearm to a palm-up position, as in turning a doorknob. The size and solidity of the contracted biceps are a traditional measure of physical strength.

Bichat, Marie François Xavier (marē' fraNswa' zavvā' bēsha'), 1771-1802, French anatomist and physiologist. He studied the tissues, giving them that name and classifying them into 21 types, this work was the basis of modern histology. He wrote *Traité des membranes* (1800), *Recherches physiologiques sur la vie et sur la mort* (1800), *Traité d'anatomie descriptive* (1801-3, in 5 vol.), and *Anatomie générale* (1801).

bichir (bīch'ər), common name for African freshwater fishes as of the family Polypteridae, and particularly for those of the genus *Polypterus*. Bichirs are among the most primitive of the ray-finned fishes, or Actinopterygii, the dominant group of modern fishes. The long, narrow body of *Polypterus* is 2 to 3 ft (60-90 cm) long and is covered by thick, rhombic scales made of an enamellike substance called ganoin. Such scales were also present in the earliest ray-finned fishes, now extinct, and are quite different from those of other living fishes. The dorsal fin of the bichir is split into a row of small, saillike finlets that are erected when the animal is agitated. Like the sharks and the rays, it has a pair of spiracles. The bichir seems especially adapted to life in dry environments. Instead of the SWIM BLADDER of most ray-finned fishes, it has a pair of lungs, somewhat like those of the LUNGFISHES, which enables it to survive out of water for several hours. It also resembles the lungfishes in having a pair of external gills when newly hatched. The bichir is a bottom-dwelling fish, found in the Nile and in the rivers of W Africa. When these rivers overflow in late summer, it moves out to spawn in the flood marshes. It is sometimes caught as a food fish. In addition to the ten species of *Polypterus*, the bichir family includes the reed-fish, *Erpetochthys calabaricus*, similar in character and distribution, but with a longer, more eellike form. Bichirs are classified in the phylum CHORDATA, subphylum Vertebrata, class Osteichthyes, order Polypteriformes, family Polypteridae.

Bichon Frise (bēshōn' frēs), breed of small dog developed in France after World War I. It stands from 8 to 12 in. (20-30 cm) high at the shoulder and has a profuse, silky coat that is loosely curled. It is solid white or white with apricot, cream, or gray markings. A relative of the Maltese, the Bichon was first bred in the United States in the 1950s. It is exhibited in the miscellaneous class at dog shows sanctioned by the American Kennel Club. See DOG.

Bichiri (bīk'ri), father of SHEBA 3, but "son of Bichri" may stand for "descendants of BECHER 1." The "Berites," supporters of Sheba, are apparently to be understood as "Bichrites." 2 Sam. 20.

Bickerdyke, Mary Ann, 1817-1901, Union nurse in the American Civil War, b. Mary Ann Ball in Knox co., Ohio. Generally called Mother Bickerdyke, she served throughout the war in the West and was beloved by the enlisted men, whose rights she championed; she was also a favorite with generals Grant and Sherman. After the war she lobbied in Washington to secure pensions for Civil War nurses and veterans. See biographies by N. B. Baker (1952) and A. L. DeLeeuw (1973).

Bickerstaff, Isaac, pseudonym used by Jonathan Swift and later by Richard Steele in the *Tatler*.

Bickerstaffe, Isaac, c. 1735-c. 1812, English dramatist, b. Ireland. Included among his comedies and ballad operas are *The Maid of the Mill* (produced in 1765) and *The Padlock* (produced in 1768).

Bicocca, La (la bēkōk'ka), former village, Lombardy, N Italy, now part of Milan. There, in 1522, the vicomte de Lautrec, commanding a French army and Swiss mercenaries, was defeated by a combined Milanese, Spanish, and German force in the ITALIAN WARS.

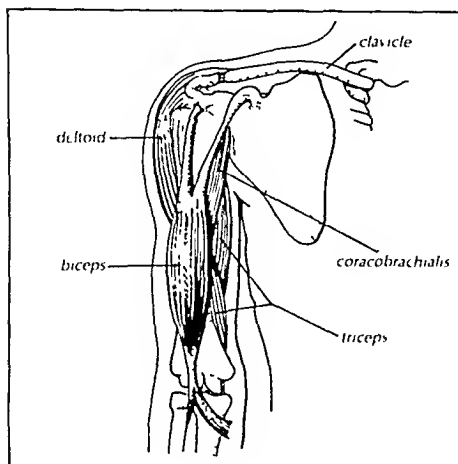
bicycle, light, two-wheeled vehicle driven by pedals. The name *velocipede* is often given to early forms of the bicycle and to its predecessor, the dandy horse, a two-wheeled vehicle moved by the thrust of the rider's feet upon the ground. Probably the first practical dandy horse was the draisine, originated c. 1816 by Baron Karl Drais von Sauerbronn,

chief forester of the duchy of Baden, to facilitate his inspection tours. Introduced into England in 1818, it was slowly improved, and c. 1839 Kirkpatrick Mac-Millan, a Scottish blacksmith, developed a machine mechanically propelled by foot treadles and incorporating cranks, driving rods, and handle bars. The French inventor Ernest Michaux introduced in 1855 a heavy crank-driven bicycle. This was perfected c. 1865 by Pierre Lallement, whose velocipede, known as a "boneshaker," ran on iron-tired wooden rims, the front wheel larger than the rear. Major improvements followed rapidly and included a light, hollow steel frame, ball bearings, tangential metal spokes, and solid rubber tires. By the 1880s the front wheel attained a diameter up to 64 in. (163 cm). Although the larger the wheel, the greater the potential speed, the size was limited by the length of the rider's legs, and the speed by their strength. The safer tricycle, a three-wheeled vehicle similar in design to the bicycle, also attained a vogue in the 1880s, especially among women and short men. The safety bicycle, with wheels of approximately equal diameter and a sprocket-chain drive connecting the pedals with the rear wheels, was first manufactured at Coventry, England, c. 1885 by the English machinist James Starley, following the invention of the pneumatic tire in 1888 by the Scotsman John Dunlop, the safety bicycle superseded the high-wheel form. Additions to safety or comfort include the freewheel (rear wheel that turns freely when the pedals are stopped or rotated backward), the coaster brake, the hand brake, variable drive gear, and adjustable handle bars. In the 1880s and 90s cycling became a fad of major proportions in the United States and Europe. Bicycle clubs were formed, both sexes participated in rides into the country, often on tandem bicycles. The League of American Wheelmen, organized in 1880, was a leader in the agitation for good roads. Although cycling declined in the United States with the introduction of automobiles, it has recently become very popular again. In most of the world the bicycle is still a more important means of transportation than the automobile. The worldwide production of bicycles is between 35 million and 40 million yearly. See MOTORCYCLE. See Frederick Alderson, *Bicycling* (1972), E. A. Sloane, *The Complete Book of Bicycling* (1972), R. A. Smith, *A Social History of the Bicycle* (1972). The sport of bicycle racing is widely popular, and several international competitions are held annually. In Olympic competition, medals are awarded in seven cycling events. Internationally famed is the annual Tour de France (originated in 1903) with the world's best cyclists competing over a road course more than 2,500 mi. (4,000 km) long. Before World War II the six-day race, a professional event, was popular in the United States. Since World War II amateur events have become more common.

Bida (bēda'), town (1969 est. pop. 64,000), W central Nigeria. It is the trade center for a rice-growing region and is noted for its fiber, glass, and metal handicrafts. In the 19th cent. Bida was the capital of an emirate of the Muslim FULANI empire centered in SOKOTO. The town was captured in 1897 by forces under Sir George GOLDIE, head of the British-chartered Royal Niger Company.

Bidault, Georges (zhōrhz bēdō'), 1899-, French political leader. An influential columnist (1932-39), he was imprisoned (1940-41) in World War II and then joined the French underground, becoming its leader. A founder of the Mouvement Republicain Populaire (MRP), one of France's leading postwar parties, he was president of the provisional government (1946), premier (1949-50), and several times foreign minister. Although a strong supporter of Charles De Gaulle in 1958, Bidault opposed the Gaullist policy of Algerian independence and broke with the MRP. In 1962, announcing that he was going underground, he formed the National Council of Resistance within the terrorist Secret Army Organization (OAS), the French government accused Bidault of having become head of the OAS. In exile from 1962, Bidault lived in Brazil and then in Belgium before returning (1968) to France. See his autobiography (tr. 1967).

Biddeford (bīd'fərd), city (1970 pop. 19,983), York co., SW Maine, on the Saco River, inc. as a town 1718, as a city 1855. Samuel de Champlain, a French explorer, visited the area in 1605. The first permanent settlement was established in 1630. During the 17th cent. the town exported lumber and fish, and in 1840 the first cotton mill was built. Biddeford, which has an industrial park, manufactures blankets, linens, shoes, boys' clothing, and electrical appliances. Biddeford Pool is a resort at the mouth of the Saco River. St. Francis College is in the city.



Biceps of arm

Biddle, Clement, 1740-1814, American Revolutionary soldier, b. Philadelphia. Early in the war, he helped organize the "Quaker Blues," a company of volunteers. He later served as deputy quartermaster general of the Pennsylvania and New Jersey militia, commissary general of forage under Nathaniel Greene in the Carolina campaign, and quartermaster general of the Pennsylvania militia. After the war he was (1787-93) U.S. marshal in Pennsylvania, but he gained more note as an importing merchant of Philadelphia.

Biddle, Francis Beverley, 1886-1968, U.S. Attorney General (1941-45), b. Paris, France, of American parents. Secretary to Associate Justice O. W. Holmes (1912), he became a successful corporation lawyer. He served as National Labor Relations Board chairman (1934-35) and as appellate judge (1939-40) before succeeding Robert H. Jackson as Solicitor General (1940) and as Attorney General. Biddle was (1945-46) a U.S. judge for the trial of war criminals at Nuremberg. See his autobiographical *A Casual Past* (1961) and *In Brief Authority* (1962).

Biddle, George, 1885-1973, American painter and writer on art, b. Philadelphia. After studying abroad Biddle settled in the 1930s in Croton-on-Hudson, N.Y., where he devoted himself to paintings of social import. During World War II he served as chairman of the War Dept. Art Commission and later held important offices in several national artists' organizations. Biddle painted the frescoes for the Dept. of Justice Building, Washington, D.C., his major works include *Mother and Child* (Denver Art Mus.) and *Winter in Tortilla Flat* (Whitney Mus., New York City). He is the author of the autobiographical *An American Artist's Story* (1939), *Artist at War* (1944), *Yes and No of Contemporary Art* (1957), and *Tahitian Journals* (1968). See Massey Trotter, *Catalogue of the Lithographs of George Biddle* (1950).

Biddle, James, 1783-1848, U.S. naval officer and diplomat, b. Philadelphia. He became a midshipman in 1800. At the beginning of the War of 1812 he was first lieutenant on the *Wasp*, he later commanded the sloop *Hornet*. Sent out in the *Ontario* in 1817, he took formal possession of the Oregon country for the United States in 1818, helping to establish a claim that later was extremely important. Afterward he spent much time protecting U.S. shipping in South American waters when the difficult times of the new Latin American republics made the rights of neutrals hard to maintain. In 1846, James Biddle negotiated the first treaty between the United States and China.

Biddle, John, 1615-62, founder of English Unitarianism. From his examination of the Scriptures he lost belief in the doctrine of the Trinity and stated his conclusions in *Twelve Arguments Drawn Out of Scripture*. When the existence of this paper was made known to the magistrates in 1645, Biddle was imprisoned, as he was frequently thereafter. His *Twelve Arguments* was suppressed and burned publicly in 1647. Upon the publication of his *Two-fold Catechism* in 1654, he was tried for his life but received from Oliver Cromwell a sentence of banishment to the Scilly Islands. Returning in 1658, Biddle taught and preached until in 1662 he was again thrown into prison, where he died. His followers were called Biddelians, Socinians, or Unitarians. See biography by Joshua Toulmin (1789).

Biddle, Nicholas, 1750-78, American naval officer, b. Philadelphia. Biddle left the British navy in 1773. In the American Revolution he became captain in the patriot navy and daringly raided British shipping off the American coast. After receiving command (1777) of the ship *Randolph*, Biddle was killed and his ship destroyed in an encounter (1778) with the British warship *Yarmouth* off the coast of Barbados. See W. B. Clark, *Captain Dauntless* (1949).

Biddle, Nicholas, 1786-1844, American financier, b. Philadelphia. After holding important posts in the American legations in France and England, he returned to the United States in 1807 and became one of the leading lights of *Port-Folio*, a literary magazine, which he edited after 1812. He was also commissioned to write the history of the Lewis and Clark expedition, but turned over the job to Paul Allen, a Philadelphia journalist, when he was elected (1810) to the state house of representatives, where he served a single term. In 1819, President Monroe appointed him one of the government directors of the BANK OF THE UNITED STATES. He became its president in 1823, and his administration illustrated his belief in the necessity of a central banking institution to stabilize the currency and curb the in-

flationary tendencies of the era. He became the leading target of the Jacksonians in their war against the bank. After the bank failed of recharter, Biddle operated it as a private bank until it collapsed (1841) as an aftermath of the Panic of 1837. He was charged with fraud but was subsequently acquitted. Biddle's public correspondence dealing with national affairs (1817-44) was edited by Reginald McGrane (1919). See biography by T. P. Gowan (1959), study by G. R. Taylor (1949), Gray Hammond, *Banks and Politics in America* (1957, repr. 1967), R. V. Remini, *Andrew Jackson and the Bank War* (1967).

Bideford (bīd'afard), municipal borough (1971 pop. 11,766), Devonshire, SW England, on the Torridge estuary. Formerly a major seaport, it still maintains some foreign trade (timber is imported) and has a boatbuilding industry. Tourism and the manufacture of gloves and concrete products are other important industries. Bideford supplied ships used in the defeat of the Spanish Armada (1588) and was a port of embarkation for colonists going to America. It also participated in the colonial tobacco and salt-fish trade. A 24-arch stone bridge dating from the 15th cent. spans the Torridge estuary. Sir Richard Grenville, the naval commander, was born in Bideford.

Bidermann, Jakob (ya'kōp bē'darmān), 1578-1639, German Jesuit dramatist and poet. Based on saint and martyr legends, Bidermann's plays were among the finest artistic expressions of the Catholic Reformation in Germany. His chief work, *Cenodoxus* (1602), was a Faustian drama about mortality. Professor of rhetoric in Munich, later assistant to the Jesuit general in Rome, he also wrote *Belisar* (1607), *Marcarius* (1613), and *Himmelsglocklein* [heavenly bells] (1620), a collection of songs.

Bidkar, captain under Ahab and Jehu. 2 Kings 9:25.

Bidpai or **Bidpay** (both bīd'pī), supposed name of the author of the fables of the PANCHATANTRA. The name first appears in an Arabic version of these fables—hence they are called the fables of Bidpai. The word is probably Sanskrit, meaning "wise man" or "court scholar."

Biedermeier (bē'darmīar), name applied, at first in a joking spirit, to a period of culture and a style of furniture and decoration originating in Germany early in the 19th cent. It is believed to have been named for the worthy, bourgeois-minded "Papa Biedermeier," a humorous character featured in a series of verses by Ludwig Eichrodt, published in *Fliegende Blätter*. The Biedermeier period found expression in comfortable, homelike furnishings, simple in design and inexpensive in material, fitting the requirements of the German people in a time of little wealth following the Napoleonic Wars. Although the best Biedermeier furniture was produced between 1820 and 1830, the period is regarded as extending from 1816 to 1848. Later pieces were usually clumsy and tasteless. The designs were simplified forms of the French Empire and Directoire styles and of some 18th-century styles of England. Cabinets and other large pieces were severe in line and surface. Chairs and sofas show curved lines, frequently graceful, but sometimes exaggerated into swellings and contortions. Black lacquer was effectively substituted for the costly ebony of Empire pieces. Painted decorations reminiscent of peasant types were common.

Biel (bēl) or **Bienne** (byēn), city (1970 pop. 64,333), Bern canton, NW Switzerland, at the northeast end of the Lake of Biel. A watchmaking center, Biel also has manufactures of machinery, automobiles, and pianos. There is a 16th-century Gothic town hall and a late Gothic church. Both French and German are spoken. The Schwab museum has archaeological relics of lake dwellings found in the Lake of Biel, or Lake of Bienne (15 sq mi/39 sq km), at the foot of the Jura mts. The lake is connected with the Lake of Neuchâtel by the Zihl Canal. It contains the Isle of Saint-Pierre (now a peninsula), made famous by J. J. Rousseau.

Biel-. For some Russian names beginning thus, see BEL.

Bielefeld (bē'lafēlt), city (1970 pop. 168,937), North Rhine-Westphalia, N central West Germany. It has been noted since the 13th cent. for its handmade linens. Other manufactures include silks, sewing machines, bicycles, machinery, starch, clothing, and pharmaceuticals. Chartered in 1214, Bielefeld became a member of the Hanseatic League in 1270. In 1647 it passed to Brandenburg. It is the seat of a university founded in 1966.

Bieler, Manfred (man'frēt bē'lār), 1934-, East German dramatist and novelist. Among Bieler's plays,

written for radio, are *Die achte Trubsal* [the eighth misery] (1960), attacking anti-Semitism, *Die linke Wand* [the left wall] (1962), concerning the Mexican painter David Siqueiros, and *Nachtwache* [night watch] (1963), a portrait of contemporary times. The picaresque novel *Bonifaz oder der Matrose in der Flasche* (1963, tr. *The Sailor in the Bottle*, 1965) brought him international fame. His collection of stories, *Marchen und Zertungen* [fairy tales and newspapers], appeared in 1966.

Bielitz. see BIELSKO BIALA, Poland

Biella (byēl'la), city (1971 pop. 54,065), Piedmont, NW Italy. It is a major cotton and wool textile manufacturing center. Biella came under the Visconti of Milan in 1353 and under the house of Savoy in 1379. Of note are several palaces (15th-16th cent.), an early Romanesque baptistery (10th cent.), and a Renaissance cathedral.

Bielski, Martin, Pol. Marcin Bielski (mār'stēn byēl'skē), c. 1495-1575, Polish historian and poet. His history of Poland, the first historical work written in Polish, was completed by his son, Joachim Bielski.

Bielsko-Biała (byēl'skō bya'la), Ger. *Bielitz*, city (1970 pop. 105,601), S Poland, on the Biała River, a tributary of the Vistula. The city is a railway junction and has a noted woolen textile industry. Other manufactures include textile machinery, electrical equipment, and machine tools. It is also a tourist and winter sports center. Founded in the 13th cent., the city passed to Austria in 1772 and was returned to Poland in 1919. It was called Bielsko until 1950, when it joined the town of Biała, across the river, to form a single city.

Bienewitz, Peter: see APIANUS, PETRUS

Bien Hoa (bēēn' wā), city (1968 est. pop. 83,000), S South Vietnam, c. 20 mi (30 km) NE of Saigon. It is famous for its handmade pottery. In the city are saw mills and a rice-bag factory. There is a commercial airport. A large U.S. air base was established there during the Vietnam War.

Bienne, Switzerland. see BIEL

biennial, plant requiring two years to complete its life cycle, as distinguished from an annual or a perennial. In the first year a biennial usually produces a rosette of leaves (e.g., the cabbage) and a fleshy root, which acts as a food reserve over the winter. During the second year the plant produces flowers and seeds and, having exhausted its food reserve, then dies. Short-lived perennials (e.g., the hollyhock) are often treated as biennials. Some biennials will, like annuals, bloom in the same season if sown early, others reseed themselves or produce offsets, thus perpetuating the plant indefinitely so that it becomes essentially a perennial. There are very few true biennials. Most are crop plants, such as carrots and parsnips, which are harvested for their succulent roots at the end of their first growing season.

Bienville, Jean Baptiste le Moyne, sieur de (zhaN bātēs'tē la mwan syor də byāNvēl'), 1680-1768, colonizer and governor of Louisiana, b. Ville Marie (on the site of Montreal), Canada, son of Charles le Moyne, sieur de LONGUEUIL, and brother of Pierre le Moyne, sieur d'IBERVILLE. A midshipman in the royal navy, he served gallantly in Iberville's last expedition into the Hudson Bay region in 1697 and the next year accompanied Iberville's colonizing expedition to the mouth of the Mississippi. He was prominent in the preliminary explorations Iberville, upon his departure, left Bienville at the Biloxi settlement as second in command to the sieur de Sauvole, and in 1701, when Sauvole died, Bienville became the leader of the settlement. He transferred the colony to Mobile Bay in 1702 and founded Mobile in 1710. After Iberville's death in 1706, only Bienville's heroic efforts kept the settlement alive in the face of famine, Indian hostility, the jealousy of Spain and Canada, and the neglect of France. In 1712, when Louisiana became a monopoly of the French merchant Antoine Crozat, Bienville was superseded as governor by Cadillac, but he regained his position in 1717. The colony grew rapidly in the next few years. New Orleans, which Bienville founded in 1718, succeeded Biloxi as Louisiana's capital in 1722. In 1719 he twice captured Pensacola from the Spanish. Fearing insurrections of Negro slaves, first brought to the colony under his direction, Bienville promulgated (1724) the Code Noir. Its provisions, completely regulating slave life, were humane for the times, and the code remained in force until Louisiana became part of the United States. An unsuccessful campaign in 1723 against the Natchez, whom he had previously defeated (1716), led to his recall (1725). Unsuccessful in defending his administration, he was relieved of the governorship. Upon Louisiana's sub-

sequent decline, he was begged to return and was warmly received on his arrival in 1733. He led strenuous but indecisive expeditions (1736, 1739–40) against the Natchez and the Chickasaw. Worn out by his exertions, Bienville retired in 1743 and spent his remaining days in Paris. See biography by Grace King (1892).

Bié Plateau or **Bihé Plateau** (both *byě*), highland region, western section of the central plateau of Angola, SW Africa, alt. 5,000 to 6,000 ft (1,520–1,830 m). Its cool climate and ample rainfall made it a favored area for European settlement. Corn, sisal, peanuts, and coffee are raised there. It is linked to the sea by the Benguela Railway. Nova Lisboa and Silva Porto are the chief towns.

Bierce, Ambrose Gwinett, 1842–1914?, American satirist, journalist, and short-story writer, b. Meigs co., Ohio. After distinguished Civil War service, he turned to journalism. In San Francisco he wrote for the *News-Letter*, of which he became editor in 1868. He soon established a reputation as a satirical wit, and his squibs and epigrams were much quoted. In London, from 1872 to 1875, he wrote for the magazine *Fun* and finished three books, including *Cobwebs from an Empty Skull* (1874). After his return to San Francisco, he wrote for the *Argonaut*, edited the *Wasp* (1881–86), and was a columnist for Hearst's *Sunday Examiner* (1887–96), his writings in the *Examiner* made him the literary arbiter of the West Coast. Later he was Washington correspondent for the *American* and a contributor to *Cosmopolitan*. His collection of sardonic definitions, *The Cynic's Word Book* (1906), was retitled *The Devil's Dictionary* in 1911. The short stories of Bierce were collected in such volumes as *Tales of Soldiers and Civilians* (1891) and *Can Such Things Be?* (1893). He was highly praised for *The Monk and the Hangman's Daughter* (1892), which he adapted from a translation of a German story. Bierce's distinction lies in his distilled satire, in the crisp precision of his language, and in his realistically developed horror stories. Disillusionment and sadness pervaded the latter part of his life. In 1913 he went to Mexico, where all trace of him was lost. See his *Collected Works* (12 vol., 1909–12, repr. 1966), *Collected Writings* (selected by Clifton Fadiman, 1946), biography by R. O'Connor (1967), study by M. E. Grenander (1971).

Bierstadt, Albert (bēr'stat), 1830–1902, American painter of Western scenery, b. Germany. After traveling and sketching throughout the mountains of Europe, he returned to the United States. He then journeyed (1859) to the West with a trail-making expedition. His immense canvases of the Rocky Mts. and the Yosemite emphasized grandeur and drama, sometimes at the expense of clarity. His works were popular and commanded great prices during his lifetime. They include *The Rocky Mountains* (Metropolitan Mus.), *Indian Encampment*, *Shoshone Village* (N.Y. Public Lib.), *The Last of the Buffalo* (Corcoran Gall.), and *Discovery of the Hudson River and the Settlement of California* (Capitol, Washington, D.C.).

Bifrost: see ASGARD

bigamy (bī'gamē), crime of marrying during the continuance of a lawful marriage. Bigamy is not committed if a prior marriage has been terminated by a DIVORCE or a decree of NULLITY OF MARRIAGE. In the United States if a husband or wife is absent and unheard of for seven (or in some states five) years and not known to be alive, he is presumed dead, and remarriage by the other spouse is not bigamous. It is not necessarily a defense to a charge of bigamy that the offending party believed in good faith that he was divorced or that his previous marriage was not lawful. The U.S. Supreme Court ruled in 1878 that plurality of wives (polygamy), as originally permitted by the Mormon religion, violated criminal law and was not defensible as an exercise of religious liberty.

big bang theory. see COSMOLOGY

Big Ben, the bell in the Parliament tower (Westminster Palace), London, England. It was named for Sir Benjamin Hall, commissioner of works when the bell was installed in 1856. The name is often used to refer to the huge clock in the tower.

Big Bend National Park, 708,221 acres (286,627 hectares), W Texas, est. 1944. It is a triangle formed by the Rio Grande, which runs south, then north in a big bend and flows through deep canyons, notably the Santa Elena Canyon. The river, the desert plain, and the Chisos Mts. offer sharp contrasts in wilderness scenery, and the park has archaeological treasures, some petrified trees, vestiges of prehistoric Indian cultures, and rare forms of animal and plant life.

Big Black Mountain, peak, 4,145 ft (1,263 m) high, E Ky., in the Cumberland Mts., highest point in Kentucky.

Big Dipper, familiar configuration of stars visible in the constellation Ursa Major (see URSA MAJOR AND URSA MINOR).

Bigelow, John, 1817–1911, American editor, author, and diplomat, b. Malden, N.Y. In 1838 he was admitted to the New York bar. From 1848 to 1861 he shared with William Cullen BRYANT the ownership and editing of the New York *Evening Post*. His anti-slavery and free trade editorials were especially vigorous. In 1861 he was appointed consul general at Paris, and later (1865–66) he served as U.S. minister to France. He is given much credit for preventing French recognition of the Confederacy; he also treated with great skill the problems arising from Napoleon III's attempts to establish an independent state in Mexico. His *France and the Confederate Navy* (1888) is a valuable historical work. Bigelow found in Paris the original manuscript of Benjamin Franklin's *Autobiography*, which he edited and published in 1868. His other works include a life of Franklin (1874) and an edition of Franklin's complete works (10 vol., 1887–88). See his *Retrospections of an Active Life* (5 vol., 1909–13).

Biggs, E. Power (Edward George Power Biggs), 1906–, Anglo-American organist. Biggs studied at the Royal Academy of Music, London. He emigrated to the United States in 1930. Through many recitals, radio broadcasts, and recordings, he helped to make the best organ music, particularly that of the baroque period and of the 20th cent., familiar to the American public.

Big Hole National Battlefield. see NATIONAL PARKS AND MONUMENTS (table)

Bighorn, river, 461 mi (741 km) long, formed in W central Wyo. by the confluence of the Wind and Pop Agie rivers and flowing north to join the Yellowstone River in S Mont. The Bighorn basin, part of the Missouri River basin project, has several dams that provide for flood control, irrigation, hydroelectricity, and recreation. Boysen and Yellowstone are the principal dams, the lake behind Yellowstone dam is the nucleus of Bighorn Canyon National Recreation Area (see NATIONAL PARKS AND MONUMENTS, table). In 1807 a U.S. trading post was established at the mouth of the Bighorn. The battle between the forces of Col. George Custer and the Sioux Indians took place (1876) near the junction of the Bighorn and the Little Bighorn rivers.

bighorn or Rocky Mountain sheep, wild sheep of W North America, formerly plentiful in mountains from Canada to Mexico. Indiscriminate hunting, disease, and scarcity of food have reduced its numbers, and in some areas it has been exterminated. It is a heavy, grayish brown animal, with a conspicuous whitish patch on its hindquarters, the male has heavy, curling horns, while the female has short, straight spikes. One type of bighorn lives at high altitudes in the W United States and another in desert regions. Alaskan types are the Dall's, or white, sheep and the Stone's, or black, sheep. Bighorn sheep are classified in the phylum CHORDATA, subphylum Vertebrata, class Mammalia, order Artiodactyla, family Bovidae.

Bighorn Mountains, range of the Rocky Mts., N central Wyo., extending c 120 mi (190 km) N into S Montana, E of the Bighorn River. Cloud Peak, 13,165 ft (4,013 m), is the highest point. The glaciated mountain range contains Bighorn National Forest.

bight, broad bend or curve in a coastline, forming a large open bay. The New York bight, for example, is the curve in the coast described by the southern shore of Long Island and the eastern shore of New Jersey. The term *bight* may also refer to the bay so formed.

Bignon, Louis Pierre Édouard (lŭē pyēr ēdwar' bēnyōn'), 1771–1841, French diplomat and historian. He held diplomatic posts under Napoleon, was acting minister of foreign affairs during the Hundred Days, and signed the surrender of Paris after Waterloo. A member of the chamber of deputies in the Restoration, he was (1830) foreign minister under Louis Philippe, who raised him to the peerage. His major historical work, *Histoire de France sous Napoleon* (14 vol., 1829–50, completed posthumously by A. A. Ernouff), was commissioned by Napoleon.

bigonia (bīgnō'nēā), common name for the family Bignoniaceae, a family of chiefly woody vines of the American tropics and also a few shrubs and trees. The trumpet creeper (of the genus *Bignonia*) and the trumpet flower, or trumpet vine (of the genus

Campsis), both found wild in the SE United States, are sometimes cultivated for their orange-red trumpet-shaped flowers. The calabash tree of the tropics bears large fruits from which carrying gourds (called calabashes) are made and used locally, its wood is used for making pipes. The *Catalpa* genus of trees with showy flowers is valued in the United States for ornament and shade. The highly durable wood is used for lumber, as is that of the South American genus *Jacaranda* and of the West Indian boxwood (of the genus *Tabebuia*). The bignonias are classified in the division MAGNOLIOPHYTES, class Magnoliopsida, order Scrophulariales.

Bigod, Hugh, 1st earl of Norfolk (bī'gōd, nōr'fak), d. 1177, English nobleman. He was instrumental in securing the throne for STEPHEN in 1135, but he subsequently switched his allegiance back and forth between Stephen and MATILDA, and it is not known for sure which one of them created him earl of Norfolk. He finally cast his lot with the future Henry II in 1153. In 1173 he joined the revolt of Henry's sons against their father. His lands were seized, his castle was burned, and a heavy fine was exacted.

Bigordi, Domenico: see GHIRLANDAIO, DOMENICO

Bigot, François (fra'nsŭa' bēgō'), 1703–77?, intendant of New France (1748–59), b. Bordeaux, France. At Louisbourg, where he served (1739–45) as commissary, it has been said that he indulged in fraudulent practices that contributed to the downfall of that fort. Powerful friends in France secured for him the office of intendant of New France. Bigot arrived at Quebec in 1748 and immediately instituted a system of official theft by which every branch of the public service was laid under tribute to enrich himself and his friends. His corrupt administration reduced the colony to bankruptcy and helped bring on the fall of New France to the British. After the capture of Quebec in 1759 he returned to France, where he was arrested, imprisoned for nearly a year, compelled to make restitution, and then banished. The date of his death in Switzerland is uncertain.

Big Rapids, city (1970 pop. 11,995), seat of Mecosta co., W central Mich., at the falls of the Muskegon River, inc. 1869. The region has extensive natural gas wells. The city's major manufactures include shoes, machine tools, and wood products. Ferris State College, part of the Univ. of Michigan system, is in Big Rapids.

Big River. see FORT GEORGE, river

Big Sioux (sōō), river, 420 mi (676 km) long, rising in NE S. Dak. and flowing S into the Missouri River. It passes through an agricultural region that produces corn, oats, hogs, and beef cattle. The Big Sioux forms part of the border between Iowa and South Dakota.

Big Spring, city (1970 pop. 28,735), seat of Howard co., W central Texas, inc. 1907. The spring for which it was named once fed a branch of the Colorado River but is now dry. The city is the trade center for a farm and livestock region. A variety of oil-related industries have been developed since the discovery of oil in 1928. Points of interest in Big Springs include a historical museum and the Comanche Trail Park. A junior college is in the city. Webb Air Force Base is nearby.

Big Stone Lake, narrow lake, c 25 mi (40 km) long, on the Minn.-S. Dak. line. Located in the outlet channel of glacial Lake AGASSIZ, it is the source of the Minnesota River.

Bigtha, chamberlain of Ahasuerus. Esther 1:10.

Bigthan (big'thān), chamberlain who conspired with Teresh against King Ahasuerus. Esther 2:21. He is called *Bigthana* in Esther 6:2.

big tree. see SEQUOIA

Bigvai (bīg'vāi, bīg'vā't) 1. Signer of the covenant. Ezra 2:2, Neh. 7:7, 10:16. 2. Name of a family in the return. Ezra 2:14, Neh. 7:19.

Bihar or Behar (bēhar'), state (1971 pop. 56,387,296), 67,198 sq mi (174,042 sq km), E central India. PATNA is the capital. RANCHI is an important administrative center. Bihar is bounded on the N by Nepal, on the E by West Bengal state, on the S by Orissa state, and on the W by Uttar Pradesh and Madhya Pradesh states. The predominantly agricultural northern area, crossed by the Ganges River, supports the bulk of the population. Rainfall, frequently inadequate, is supplemented by extensive irrigation. Rice is grown where possible, maize, wheat, barley, sugarcane, tobacco, and oilseed are also important crops. Jute is the main cash crop of the extreme northeast. The central and southern areas are hilly. The southeastern section is one of the greatest sources of India's mineral wealth, mica and copper are abundant, and iron ore, found in association with coal, is pro-

cessed at the great Jamshedpur steelworks. The chief transportation lines run east and west, thus linking central India with the Bengal ports. Bihar's population, almost entirely Hindu, is unusually homogeneous for India. The people speak Bihari, an Indo-European language. Bihar was the scene of Buddha's early life, and BODH GAYA is an ancient Buddhist center. Bihar was part of the ancient kingdom of Magadha. Muslims occupied it in 1193 and the Delhi sultans in 1497. In 1765 the British took over Bihar and merged it with Bengal. The province of Bihar and Orissa was formed in 1912, and Bihar became a separate province in 1936. About 3,150 sq mi (8,160 sq km) situated along Bihar's eastern boundary were transferred to West Bengal state in 1956. Bihar is governed by a chief minister and a cabinet responsible to a bicameral legislature with one elected house and by a governor appointed by the president of India. Bihar city (1971 pop. 100,052), on a tributary of the Ganges River, is an agricultural market.

Bisk, see **BYSK**, USSR

Biṣapur (biṣā'pūr), town (1971 pop. 103,308), Karnataka state, SE India. It is a trade and district administrative center. Cotton ginning is an important activity. Biṣapur is famous as the capital (15th-17th cent.) of the Deccan kingdom of Biṣapur, under the Adil Shahi sultans. Among the town's many notable remains is the Gol Gumbaz, the tomb of Mahmud Shah.

Bijs, Anna (a'nā bīns), c.1494-1575?, Flemish poet of Antwerp. Her three volumes (1528, 1548, 1567) of lyric verse place her among the foremost Dutch poets of her age. She excelled in robust satires passionately inveighing against the social evils of the day and deploring the Reformation. Bijs's religious poetry is sincere and moving.

Bika, El, see **BIQA**, AL

Bikaner (bīkānēr'), former native state, NW India. The state is now part of Rajasthan state. The region, almost entirely in the Thar desert, chiefly supports the raising of sheep and camels. Wool is spun and woven, and coal is mined. The city of Bikaner (1971 pop. 188,598), the capital of the former state, was founded in 1488. There are several beautiful 16th-century Rajput palaces. The city has five colleges that are affiliated with the Univ. of Rajasthan.

Bikini (bēkē'nē), atoll, c.2 sq mi (5.2 sq km), W central Pacific, one of the Ralik Chain, MARSHALL ISLANDS. It comprises 36 islets on a reef 25 mi (40 km) long. After its inhabitants were removed (1946) to Rongerik, Bikini was the scene of 23 U.S. atomic and hydrogen bomb tests between 1946 and 1958. The Bikini natives were transferred from Rongerik to Ujelang in 1947 and in 1949 were resettled on Kili. The atoll was declared safe for habitation in 1969. Bikini was formerly called Escholtz Island.

Bilac, Olavo (ōlā'vōō bēlak'), 1865-1918, Brazilian poet, journalist, and critic. He was the chief poet of the Brazilian group related to the French PARNASSIANS. His writings have an enameled elegance as well as sensual richness that gained them enduring acclaim. Some of them are gathered in *Poesias* (1888) and *Tarde* [afternoon] (1919).

Bilaspur (bēlas'pūr'), 1. Former principality, Himachal Pradesh state, NW India, in the W Himalayas. It is the site of the Bhakra dam, a massive project on the Sutlej River. The town of Bilaspur (1971 pop. 7,024), formerly the capital, trades in agricultural products. 2. Town (1971 pop. 130,804), Madhya Pradesh state, central India. Founded in the 17th cent., the city is a district administrative center and an agricultural market.

Bila Tserkva: see **BELAYA TSEKOV**, USSR

Bilauktung (bēlouk'toun), mountain range, extending c.250 mi (400 km) along the Thailand-Burma border from the Dawna Range SE to the Isthmus of Kra. The western slopes of the range, which receive the heavy rains of the monsoon, have a dense covering of tropical rain forest.

Bilbao (bēlbā'ō), city (1971 pop. 410,490), capital of Vizcaya prov., N Spain, in the Basque Provinces, on both banks of the Nervion River, near the Bay of Biscay. A leading Spanish port and commercial center since the 19th cent., it is the center of an important industrial area, with rich iron mines nearby. The production of steel and chemicals and shipbuilding are the chief industries. Founded c.1300 on the site of an ancient settlement, Bilbao flourished from a wool export trade in the 15th and 16th cent. In the 19th cent. it was three times unsuccessfully besieged by the Carlists. In the Spanish civil war, Bilbao was the seat of the short-lived Basque autonomous government from 1936 until its capture (1937) by the Insurgents.

Bilbilis: see **CALATAYUD**, Spain

Bilbo, Theodore Gilmore, 1877-1947, U.S. Senator (1935-47), b. near Poplarville, Pearl River co., Miss. After study at the Univ. of Nashville (1897-1900) and Vanderbilt Univ. law school (1905-7), he was admitted (1908) to the Tennessee bar. An ultraconservative Southern Democrat, he won political success by demagogic insistence on white supremacy. He was twice governor of Mississippi (1916-20, 1928-32) before his election to the U.S. Senate. He died while Congress was investigating charges that he had disqualified himself for the Senate by using intimidation to keep Negroes from voting and by accepting bribes. See biography by A. W. Green (1963).

Bildad, the second, and perhaps the least consoling, of Job's comforters. Job 8, 18, 25, 42 9.

Bilderdijk, Willem (wīl'əm bīl'dārdīk), 1756-1831, Dutch poet. His work influenced Dutch literature throughout the 19th cent. He tutored Louis Bonaparte in Dutch and later conducted a small private college at Leiden, where he greatly influenced his pupils, notably Isaac da Costa and Jacob van Lennep. Bilderdijk's work is of prodigious quantity and includes passionate love poetry as well as the religious verse for which he is best known. At its best, the poetry is so splendid that Bilderdijk is ranked among the great Dutch poets. His most ambitious effort is an unfinished epic, *De Ondergang der eerste Wereld* [the destruction of the first creation] (1820). His Dutch translation of the romanticists catalyzed that movement in Dutch literature, and a number of his own works were modeled after those of the British romanticists.

bile, bitter alkaline fluid of a yellow, brown, or green color, secreted, in man, by the liver. Bile, or gall, is composed of water, bile acids and their salts, bile pigments, cholesterol, fatty acids, and inorganic salts. In man it is stored in the GALL BLADDER and, in response to the action of the hormone cholecystokinin (whose secretion by the intestine is stimulated by the presence of food), is secreted via the cystic and common ducts into the duodenum. The bile salts aid in digestion by emulsifying fats, enabling the absorption of fats and of the fat-soluble vitamins (A, D, E, and K) through the intestinal wall. Since unabsorbed fats tend to coat other foods and prevent the action of digestive enzymes, adequate fat absorption mediated by bile salts is necessary for the complete digestion of food and the prevention of decomposition of partially digested foods by intestinal bacteria. The alkaline bile acts to neutralize the stomach acid in the small intestine, providing a more optimum environment for the pancreatic enzymes. The bile is a route of excretion for many drugs and metabolites, cholesterol is excreted almost entirely in the bile, as are breakdown products of heme, such as bilirubin, that color the bile and are known as the bile pigments. If the flow of bile is impeded by inflammation, gall stones, or other abnormality, digestive disturbances and frequently JAUNDICE result.

Bileam (bīl'ēām), the same as **IBELAM**

Bilgah (bīl'gā), 1. Priest 1 Chron 24:14. 2. Priest in the return. Neh 12:5, 18. He is called Bilgāi at Neh 10:8.

Bilhah (bīl'hā), 1. Rachel's maid and Jacob's concubine. Gen 29:29, 30:1-8, 35:22, 25, 46:25, 1 Chron 7:13. 2. City of Simeon, of unknown location. 1 Chron 4:29. Baalah. Joshua 15:29. Balah. Joshua 19:3.

Bilhan (bīl'hān), 1. Horite. Gen 36:27, 1 Chron 1:42. 2. Benjamite. 1 Chron 7:40.

Billaud-Varenne, Jacques Nicolas (zhak nēkōlā' bēyō'-vārēn'), 1756-1819, French revolutionary. A violent antimanagerialist in the Convention, the revolutionary national assembly, he became a member of the Committee of Public Safety. He proposed a centralization of power from which no one would be exempt; this proposal, passed as law, became the basis for the dictatorship of the REIGN OF TERROR. He plotted first against Georges DANTON and then against Maximilien ROBESPIERRE. After Robespierre's fall, however, he was deported to French Guiana for his role in the Terror. He refused an amnesty offered by Napoleon Bonaparte (later Emperor Napoleon I). Ultimately he went to Haiti, where he died.

Billerica (bīl'rīkā), town (1970 pop. 31,648), Middlesex co., NE Mass., on the Concord River, settled 1637, inc. 1655. It is mainly residential. Billerica was one of the "praying Indian" towns of John Eliot. The town's historical attractions include several 17th-, 18th-, and 19th-century homes and an Indian site and burial ground dating back to 1,000 B.C.

billiards, any one of a number of games played with a tapered, leather-tipped stick called a cue and various numbers of balls on a rectangular, cloth-cov-

ered slate table with raised and cushioned edges. Games similar to billiards were popular in England and France in the 16th cent., and there is even evidence that a billiardlike game was played in the 14th cent. The country of origin is a matter of dispute—England, France, Italy, Spain, and China have been credited by various historians with its invention. The game in its present form was probably fully developed by 1800. There are three main types of billiards: carom billiards, pocket billiards (also known as pool), and snooker. Carom billiards is played with three balls, a cue ball and two object balls, on a pocketless table, scoring is by caroms only, i.e., by causing the cue ball to strike the object balls in specified ways. Pocket billiards is played with 15 object balls and a cue ball on a table with six pockets, the essential object of the game is to cause the object balls to enter the pockets. Snooker is similar to pocket billiards, except that it uses 21 object balls and smaller pockets. There are many additional variations of the basic games, depending on the number of balls used, the positioning of the balls, the boundaries on the table, and the scoring. Among the variations are Chicago, golf, rotation, balk-line, and bumpers. William Frederick HOPPE is generally considered the foremost billiards player of all time. See Clive Cottingham, *The Game of Billiards* (1964).

Billings, John Shaw, 1838-1913, American surgeon and librarian, b. Indiana. In the Civil War he was medical inspector of the Army of the Potomac. After the war he was given charge of the Surgeon General's Library in Washington. The catalog entries greatly increased under his supervision by 1873, and soon after he began work on the great *Index Catalogue*. Sixteen volumes appeared before his military retirement. In 1879 he initiated the *Index Medicus*, a monthly guide to current medical literature. Billings designed plans for the construction of Johns Hopkins Hospital. His essays on hospital administration and training remain classics. Under his librarianship (1864-95) the National Library of Medicine became one of the greatest medical library systems in the world. In 1889 he compiled the *National Medical Dictionary*. As director of the combined Astor, Lenox, and Tilden foundations in New York City, which were to become the NEW YORK PUBLIC LIBRARY, he consolidated the collections, planned and supervised the erection of the central library building, united the various free circulating libraries of the city, secured \$5 million from Andrew Carnegie for branch buildings, and in general created the New York Public Library as it now stands. It was at Billings' suggestion that punched card machinery was developed, forming the beginnings of computer technology. He also supervised compilation of U.S. census information in 1880 and 1890. See his *Selected Papers* (comp. with a biography by F. B. Rogers, 1965), biographies by F. H. Garrison (1915) and H. M. Lydenberg (1924).

Billings, Josh, pseud. of **Henry Wheeler Shaw**, 1818-85, American humorist and lecturer, b. Lanesboro, Mass. After a roving life as farmer, explorer, and coal miner, he settled in Poughkeepsie, N.Y., as an auctioneer and real estate dealer. In 1860 he began to write humorous sketches and homespun philosophies in rural dialect and soon became a popular lecturer. His first collection was *Josh Billings' His Sayings* (1869), but his best humor was published in his annual *Farmer's Almanac* (1869-80). See study by D. B. Kesterson (1974).

Billings, William, 1746-1800, American hymn composer, b. Boston. A tanner by trade, he was one of the earliest American-born composers. He wrote popular hymns and sacred choruses of great vitality, using simple imitative counterpoint—hence their designation as "fuguing tunes." He often wrote his own texts, breaking with the colonial New England tradition of using psalm verses as texts for hymns. His self-reliance and lack of musical training made him relatively independent of European musical fashions. As a singing master, he introduced the use of both pitch pipe and violoncello to improve the intonation of church choirs. A singing class he organized in 1774 became in 1786 the Stoughton Musical Society. During the American Revolution he wrote patriotic words to his best-known hymn, "Chester," beginning "Let tyrants shake their iron rods, / And Slav'ry clank her galling chains." His songbooks include *The New England Psalm Singer* (1770), *The Singing Master's Assistant* (1778), and *The Continental Harmony* (1794). See biography by David McKay and Richard Crawford (1974). Murray Barbour, *The Church Music of William Billings* (1960, repr. 1972).

Billings, city (1970 pop. 61,581), seat of Yellowstone co., 5 mi. N. on the Yellowstone River, in a valley

surrounded by seven mountain ranges, inc as a city 1885 Founded in 1882 by the Northern Pacific RR, Billings quickly became an important shipping point and fur-trading center It is now a trade and manufacturing center for the S Montana and N Wyoming region Oil refining, sugar refining, meat packing, and flour milling are the city's major industries Wheat, sugar, beets, livestock, and wool are traded Billings, the center of a recreational area, is near Custer National Forest and Yellowstone National Park Rocky Mountain College and Eastern Montana College are in Billings

Billingsgate (bīl'ingzgīt, -gāt), wharf and fish market in the City of London, Greater London, England, on the north bank of the Thames River The market is named after a river gate in the old city wall The word *Billingsgate*, a synonym for coarse language, arose from references to the speech of the district's fish porters

Billiton: see BELITUNG

bill of exchange. see DRAFT

Bill of Rights, 1689, in British history, one of the fundamental instruments of constitutional law It registered in statutory form the outcome of the long 17th-century struggle between the Stuart kings and the English Parliament Its principles were accepted by William III and Mary II in the Declaration of Rights as a condition for ascending the throne after the revolution in which James II was dethroned (1688) The Bill of Rights stated that certain acts of James II were illegal and henceforth prohibited, that Englishmen possessed certain inviolable civil and political rights, that James had forfeited the throne by abdication and that William and Mary were lawful sovereigns, that the succession should pass to the heirs of Mary, then to Princess Anne (later queen) and her heirs, and that no Roman Catholic could ever be sovereign of England By its provisions and implications it gave political supremacy to Parliament and was supplemented (1701) by the Act of Settlement

Bill of Rights, in U.S. history see CONSTITUTION OF THE UNITED STATES

Billy the Kid, 1859-81, American outlaw, b New York City His real name was William H Bonney His family moved to Kansas and then to New Mexico when he was a child He frequented saloons and gambling halls, and before he was 16 years old he had killed several men In 1878 he led a gang in the Lincoln co cattle war, killed a sheriff, and engaged in large-scale cattle rustling John S Chisum and other cattlemen secured (1880) the election of a new sheriff sworn to rid the country of the cattle thieves Billy the Kid was captured, tried, and sentenced to death He escaped but was again trapped and was shot by Sheriff Pat F Garrett See biographies by Pat F Garrett (1882, repr 1967), R N Mullin (1967), C A Siringo (1967), and C W Breihan (1970)

Biloxi (bīl'ūk'sē), city (1970 pop 48,486), Harrison co, SE Miss, on a small peninsula between Biloxi Bay and Mississippi Sound, on the Gulf of Mexico, inc as a town 1838, as a city 1896 The warm, almost tropical climate has made Biloxi a popular resort In addition to tourism, major industries include fishing and boatbuilding, the packing and shipping of shrimps and oysters, and the manufacture of small appliances and fishing nets The first white settlement in the lower Mississippi valley was established in 1699 across the bay at Old Biloxi (now Ocean Springs) by the French under Pierre Iberville New Biloxi was founded in 1719 and was the capital of the French colony of Louisiana until 1722, when New Orleans replaced it In the city are Keesler Air Force Base, a U.S. coast guard air station, and a U.S. veterans hospital Nearby are "Beauvoir" (built 1852-54), the last home of Jefferson Davis, the Biloxi Light House (built 1848), and, off the coast, Ship Island, a Union fort in the Civil War The city has a junior college, a symphony, and a theater group

Bishan, one who returned with Zerubbabel Ezra 22, Neh 77

Bimeler, Joseph Michael (bī'mələr), 1778-1853, German religious leader, originally called Baumler A teacher of the separatists in Württemberg, in 1817 he led a group of them to America In Ohio they founded the community of ZOAR

bimetallism, in economic history, monetary system in which two commodities, usually gold and silver, were used as a standard and coined without limit at a ratio fixed by legislation that also designated both of them as legally acceptable for all payments The term was first used in 1869 by Enrico Cernuschi (1821-96), an Italian-French economist and a vigorous advocate of the system In a bimetallic system,

the ratio is expressed in terms of weight, e.g., 16 oz of silver equal 1 oz of gold, which is described as a ratio of 16 to 1 As the ratio is determined by law, it has no relation to the commercial value of the metals, which fluctuates constantly Gresham's law, therefore, applies, i.e., the metal that is commercially valued at less than its face value tends to be used as money, and the metal commercially valued at more than its face value tends to be used as metal, valued by weight, and hence is withdrawn from circulation as money Working against that is the fact that the debtor tends to pay in the commercially cheaper metal, thus creating a market demand likely to bring its commercial value up to its face value In practice, the instability predicted by Gresham's law overpowered the cushioning effect of debtors' payments, thereby making bimetalism far too unstable a monetary system for most modern nations Aside from England, which in acts of 1798 and 1816 made gold the standard currency, all countries practiced bimetalism during the late 18th cent and most of the 19th cent See J L Laughlin, *The History of Bimetallism in the United States* (1897, repr 1968)

Bimhal (bīm'hāl), Asherite 1 Chron 733

Biminis (bī'mīnēz, bāmē'nēz), island group in the Straits of Florida, forming the northwest section of the Bahamas The group includes North Bimini, South Bimini, and surrounding cays Exceptionally good fishing attracts many tourists According to legend, the Bimins are the location of the fountain of youth for which Juan Ponce de Leon searched

binary star or binary system, pair of stars that are held together by their mutual gravitational attraction and revolve about their common center of mass True binary stars are distinct from optical doubles—pairs of stars that lie nearly along the same line of sight from the earth but are not physically associated Binary stars are grouped into three classes A visual binary is a pair of stars that can be seen by direct telescopic observation to be a distinct pair with shared motion A spectroscopic binary cannot be seen as two separate stars, even with the most powerful telescopes, but spectral lines from the pair show a periodic Doppler effect that indicates mutual revolution Some lines indicate motion toward the earth while others indicate motion away, later, as the stars revolve around in their orbit, this pattern reverses An eclipsing binary has the plane of its orbit lying in the line of sight, and shows a periodic fluctuation in brightness as one star passes in front of the other The brighter star (A) of a binary is called the primary, and the less bright (B) is called the secondary, e.g., Sirius A and Sirius B are the primary and secondary components of the Sirius system It seems likely that about half the stars in our galaxy are binary or multiple (a system of more than two stars moving around their mutual center of

mass), since half the known stars within 30 light-years of the sun are binary or multiple The masses of the components of a visual binary can be deduced from the observed motions and Newton's law of gravitation, these are the only stars, other than the sun, for which masses have been directly determined Measurements of the masses of some of the visual binary stars have been used to verify the MASS-LUMINOSITY RELATION

binary system, NUMERATION system based on powers of 2, in contrast to the familiar DECIMAL SYSTEM, which is based on powers of 10 In the binary system, only the digits 0 and 1 are used Thus, the first ten numbers in binary notation, corresponding to the numbers 0, 1, 2, 3, 4, 5, 6, 7, 8, and 9 in decimal notation, are 0, 1, 10, 11, 100, 101, 110, 111, 1000, and 1001 Since each position indicates a specific power of 2, just as the number 342 means $(3 \times 10^2) + (4 \times 10^1) + (2 \times 10^0)$, the decimal equivalent of a binary number can be calculated by adding together each digit multiplied by its power of 2, for example, the binary number 1011010 corresponds to $(1 \times 2^6) + (0 \times 2^5) + (1 \times 2^4) + (1 \times 2^3) + (0 \times 2^2) + (1 \times 2^1) + (0 \times 2^0) = 64 + 0 + 16 + 8 + 0 + 2 + 0 = 90$ in the decimal system Binary numbers are sometimes written with a subscript "b" to distinguish them from decimal numbers having the same digits As with the decimal system, fractions can be represented by digits to the right of the binary point (analogous to the decimal point) A binary number is generally much longer than the decimal equivalent, e.g., the number above, 1011010, contains seven digits while its decimal counterpart, 90, contains only two This is a disadvantage for most ordinary applications but is offset by the greater simplicity of the binary system in COMPUTER applications Since only two digits are used, any binary digit, or bit, can be transmitted and recorded electronically simply by the presence or absence of an electrical pulse or current The great speed of such devices more than compensates for the fact that a given number may contain a large number of digits

Binchois, Gilles (zhēl bān'shwa'), c 1400-1460, Flemish composer From about 1430 until his death Binchois served Philip the Good of Burgundy His secular chansons are considered his best work The 15th-century theorist Tinctoris ranked him with Du Fay and Dunstable

binder: see COMBINE

bindweed see MORNING GLORY

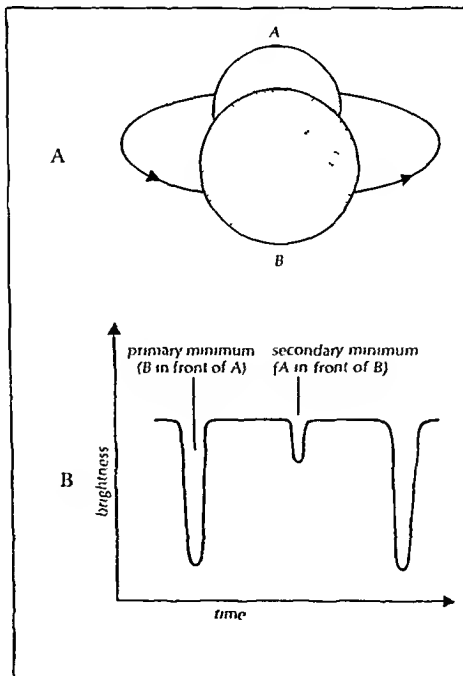
Binea (bīn'ēa), descendant of Saul 1 Chron 837, 943

Binet, Alfred (alfred' bēnā'), 1857-1911, French psychologist From 1894 he was director of the psychology laboratory at the Sorbonne He is known for his research and innovation in testing human intelligence With Theodore Simon he devised (1905-11) a series of tests that, with revisions, came into wide use in schools, industries, and the army The Stanford, the Herring, and the Kuhlmann are important revisions Binet and Simon wrote *Les Enfants anormaux* (1907, tr *Mentally Defective Children*, 1914) Most of his writings were published in *Année psychologique*, a journal that he founded in 1895 See study by T H Wolf (1973)

Bing, Rudolf (rōō'dōlf bīng), 1902-, Austrian operatic manager Naturalized a British subject in 1946, he was general manager of the Glyndebourne operatic festivals (1934-49) and artistic manager of the Edinburgh International Festival (1947-49) He became general manager of the Metropolitan Opera in New York in 1950 Bing was knighted in 1971 and retired the following year See his *5000 Nights at the Opera* (1972)

Bingen (bīng'an), city (1970 pop 23,724), Rhineland-Palatinate, W West Germany, where the Nahe River enters the Rhine A busy river port, railroad junction, and tourist center, Bingen is also noted for its wine and tobacco manufactures Dating from pre-Roman times, Bingen was fortified (1st cent BC) by Drusus In 983 it came under the rule of the archbishops of Mainz Near Bingen, on a rock in the Rhine, is the famous Mauseturm [Ger, = mice tower], where, according to legend, Archbishop Hatto I of Mainz was devoured (913) by mice for wronging his subjects

Bingham, Caleb, 1757-1817, American textbook writer, b Salisbury, Conn He taught until 1796, then became a bookseller and publisher in Boston He wrote and published some of the earliest grammars, spelling books, and geographies He was best known for his readers *The American Preceptor* (1794) and *The Columbian Orator* (1797), both widely used in New England schools for the next quarter century



A Eclipsing binary Primary component passing behind secondary (dimmer) component

B Light curve for eclipsing binary

Bingham, George Caleb, 1811–79, American genre painter and politician, b Augusta co, Va. His family moved (1819) to Missouri which was the site of most of Bingham's activities. In 1837 he studied for a short time at the Pennsylvania Academy of the Fine Arts. From 1856 to 1859 he traveled in Europe, studying at Düsseldorf for a time. Journeys on the Mississippi and through the South resulted in such paintings as *Fur Traders Descending the Missouri* (Metropolitan Mus.), *Daniel Boone Coming Through the Cumberland Gap* (1851, Washington Univ, St. Louis), and *Raftsmen Playing Cards* (City Art Mus, St. Louis). Bingham entered Missouri politics with his election to the legislature in 1848 (he had been defeated in 1846), he served as state treasurer (1862–65), after a year in the Union army, and became state adjutant general in 1875. Such pictures as *The Verdict of the People* and *Stump Speaking* (Mercantile Library Association, St. Louis) reflect his interest in politics. His scenes—vigorous, interesting in composition, humorous, and faithfully representing their time and locale—were very popular in his day, and engravings from them sold widely. See catalog and study by E. M. Bloch (2 vol., 1967), studies by A. W. Christ-Janer (1940) and J. F. McDermott (1959).

Bingham, Hiram, 1789–1869, American Congregationalist missionary, b Bennington, Vt. In 1819 the American Board of Missions sent him, with others, to found the first Protestant mission in the Hawaiian Islands. Bingham adapted the Hawaiian language to writing, published *Elementary Lessons in Hawaiian* (1822), and, with his associates, translated the Bible into Hawaiian. See his *A Residence of Twenty-one Years in the Sandwich Islands* (1847, 3d ed rev 1969).

Bingham, Hiram, 1831–1908, American Congregationalist missionary, b Honolulu, son of Hiram Bingham (1789–1869). In 1857 he founded a mission on Abaia in the Gilbert Islands. Bingham adapted the language of the Gilbert Islands to writing. He translated the Bible and also prepared in Gilbertese a Bible dictionary, a hymnbook, and a commentary on the Gospels.

Bingham, Hiram, 1875–1956, American archaeologist, historian, and statesman, b Honolulu, son of Hiram Bingham (1831–1908). He was educated at Yale (B.A., 1898), the Univ of California (M.A., 1900), and Harvard (M.A., 1901, Ph.D., 1905) and later taught (1907–23) at Yale. Bingham headed expeditions sent from Yale in 1911, 1912, and 1914–15 to South America to study Inca ruins and was the discoverer of the Inca cities of Vitcos and Machu Picchu in 1911 and 1912, the road opened to Machu Picchu in 1948 was named the Hiram Bingham Highway. His well-known books deal with these expeditions and with Machu Picchu—*Journal of an Expedition across Venezuela and Colombia* (1909), *Across South America* (1911), *Inca Land* (1922), *Machu Picchu, a Citadel of the Incas* (1930), and *Lost City of the Incas* (1948). In World War I he was notable as an aviator, heading an Allied flying school in France. After leaving Yale, he served as lieutenant governor (1923–24) and governor (1925) of Connecticut and as U.S. Senator (1925–33). He also wrote on the Monroe Doctrine and other policies of state.

Bingham, Joseph, 1668–1723, English theologian. He is known for his learned work on Christian antiquities (10 vol., 1708–22).

Bingham Canyon or Bingham, town (1970 pop 31), N central Utah, near Tooele, in a canyon of the Oquirrh Mts. SW of Salt Lake City. At first (1848) a farm of the Mormons Thomas and Sanford Bingham, it became in the 1860s a roaring mining town, dealing in gold, then silver and lead, and in the 20th cent copper. One of the world's largest open-pit mines is located nearby. The town's single street, squeezed into a mountain gulch, is 6 mi (9.7 km) long.

Binghamton (bing'amtən), industrial city (1970 pop 64,123), seat of Broome co, S central N.Y., at the confluence of the Chenango and the Susquehanna rivers, settled 1787, inc. as a city 1867. It is the largest of the Triple Cities (Binghamton, Endicott, and Johnson City), which are famous for shoes. Many electronic products are also manufactured in the city. Binghamton grew mainly after the Chenango Canal connected it with Utica in 1837. The first railroad service began in 1869. The State Univ. of New York at Binghamton includes Harpur College. The city also has a junior college and a symphony orchestra. A state mental hospital is there. A state park is to the north.

Binh, Nguyen Thi (nawin tē bēn), 1927–, Vietnamese political leader, b Saigon. She was a militant student leader in Saigon and was imprisoned (1951–54) by the French. She later joined the National Liberation Front (NLF), the Communist-supported anti-government guerrilla organization in South Vietnam, and became a member of its central committee. She represented the NLF at the Vietnam peace talks in Paris, which began in 1968, and in 1969 she was named the foreign minister of the NLF-sponsored Provisional Revolutionary Government of South Vietnam. In 1973 she was a signer of the Vietnam peace accords.

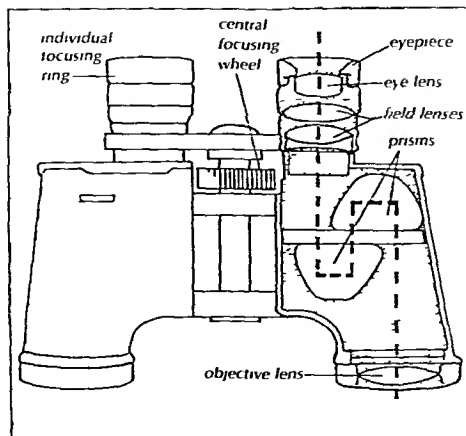
Binh Dinh: see QUI NHON, South Vietnam.

Binney, Horace, 1780–1875, American lawyer, b Philadelphia. A leading lawyer in Pennsylvania, Binney was appointed in 1808 a director of the First Bank of the United States. He served in Congress from 1833 to 1835 as an anti-Jacksonian. In 1844, opposing Daniel Webster, Binney argued successfully before the U.S. Supreme Court that a bequest of Stephen Girard to Philadelphia for philanthropic purposes was lawful. His argument had an important influence on the American law relating to charitable bequests. He wrote several biographies, as well as *Leaders of the Old Bar of Philadelphia* (1859). See biographies by C. C. Binney (1903, repr 1972) and H. L. Carson (1907).

Binns, John Alexander, c 1761–1813, American agriculturist, b Loudoun co, Va. He was one of the first to experiment with gypsum as a fertilizer and to convince others of its efficacy. Partly through example and partly through his pamphlet, *Treatise on Practical Farming* (1903), what came to be known as the Loudoun system of soil treatment spread rapidly throughout Virginia and Maryland and ultimately into other states.

Binnui (bin'yoōi), Levitical name common in Ezra and Nehemiah. The following can probably be distinguished: 1 Levite with Zerubbabel (Ezra 8:33, Neh 3:24, 10:9, 12:8); 2 Bani (Neh 8:7); 3 Banni (Neh 9:4, 2:3); 4 Men married to foreign wives (Ezra 10:30, 38). See also BANI 4.

binocular, small optical instrument consisting of two similar TELESCOPES mounted on a single frame so that separate images enter each of the viewer's eyes. As with a single telescope, distant objects appear magnified, but the binocular has the additional advantage that it substantially increases the range of depth perception of the viewer because the magnified images are seen with both eyes. The frame of a binocular is usually hinged to permit adjustment of the distance between the telescopes. Focusing can be done by means of a wheel on the central axis between the telescopes, turning the wheel changes the distance from the objective lenses of the telescopes to the eyepieces. Separate focusing of each telescope from the eyepiece may be provided in some types of binocular. The term *binocular* now usually refers to the prism binocular, in which light entering each telescope through its objective lens is bent first one way and then the other by a pair of prisms before passing through one or more additional lenses in the eyepiece. The prisms aid in reducing the length of the instrument and in enhancing the viewer's depth perception by increasing the distance between the objective lenses. Other types of binocular include the opera glass and the field glass, both use Galilean telescopes, which do not



Binocular

employ prisms and which usually have less magnifying power than the telescopes in prism binoculars. A binocular is often specified by an expression such as "7×35" or "8×50"—the first number indicates how many times the binocular magnifies an object and the second number is the diameter of either objective lens in millimeters. The size of an objective lens is a measure of how much light it can gather for effective viewing.

binomial (bī'nō'mēəl), mathematical expression (see POLYNOMIAL) containing two terms, for example, $(x+y)$. Binomials occur widely in mathematics and physics and are often raised to a power. The binomial theorem, or binomial formula, gives the expansion of the n th power of a binomial $(x+y)$ for $n=1, 2, 3, \dots$, as follows:

$$(x+y)^n = x^n + \frac{n}{1} x^{n-1}y + \frac{n(n-1)}{1 \cdot 2} x^{n-2}y^2 + \frac{n(n-1)(n-2)}{1 \cdot 2 \cdot 3} x^{n-3}y^3 + \dots + nxy^{n-1} + y^n,$$

where the ellipsis () indicates a continuation of terms following the same pattern. For example, using the formula and reducing fractions, one obtains $(x+y)^5 = x^5 + 5x^4y + 10x^3y^2 + 10x^2y^3 + 5xy^4 + y^5$. The coefficients 1, n , $n(n-1)/2$, etc., of x and y may also be found from an array known as Pascal's triangle (for Blaise Pascal), formed by adding adjacent numbers to find the number below them as follows:

		1			
	1	1			
	1	2	1		
	1	3	3	1	
1	4	6	4	1	
1	5	10	10	5	1

Bío-Bío (bē'ō-bē'ō), river, c 240 mi (390 km) long, rising in the Andes of central Chile and flowing NW to the Pacific Ocean near Concepción. It forms a natural divide between middle and southern Chile. It is navigable for much of its length by flat-bottomed boats. In colonial times bitter fighting took place along its banks between Spanish forces under Pedro de Valdivia and the Araucanian Indians. In 1612 the Bío-Bío was fixed as the boundary to Indian territory.

biochemical oxygen demand: see SEWERAGE

biochemistry, science concerned chiefly with the chemistry of biological processes, it attempts to utilize the tools and concepts of chemistry, particularly organic and physical chemistry, for elucidation of the living system. The science has been variously referred to as physiological chemistry and as biological chemistry. "Molecular biology" is a term recently coined and used to describe the area of research, closely related to and often overlapping biochemistry, conducted by biologists whose approach to and interest in biology are principally at the molecular level of organization. The related field of biophysics brings to biology the techniques and attitudes of the physicist. The domain of the biological chemist is broad and encompasses any biological problem that is amenable to the investigative techniques of both chemistry and physics. Some examples which demonstrate the diversity of the subject matter of biochemistry include the structures and physical properties of biological molecules, including the proteins, the carbohydrates, the lipids, and the nucleic acids, the mechanisms of enzyme action, the chemical regulation of metabolism, the molecular basis of genetic expression, the chemistry of vitamins, the electrochemical properties of cell membranes, chemo-luminescence, biological oxidation, energy utilization in the cell, and the chemistry of the immune response. Biochemistry has seen a great expansion of knowledge in areas bearing upon or related to chemical genetics since the report, made in 1953, of the structure of the genetic material, deoxyribonucleic acid, or DNA (see NUCLEIC ACID). That dramatic achievement in the history of biology was acknowledged by the award of the Nobel Prize in 1962 to three biochemists, James Watson, Francis Crick, and Maurice Wilkins. Much is now known about the way in which the DNA molecule is passed from one generation of cells to the next with maximal integrity of the code. At least as well studied is the chemical process by which the genetic information is translated into cellular protein. Closely related is the field of protein chemistry, which has also expanded rapidly in recent years, especially in the understanding of the mechanism of

enzyme action. The field of membrane structure and function is one today commanding the attention of a great number of biochemical research scientists, the problems posed in attempting to delve into the complexities of biological membranes are thought by many to provide the current great challenge in biology.

biocide (bī'asīd'), synonym for PESTICIDE

biogenetic law, in biology, a law stating that the earlier stages of embryos of species advanced in the evolutionary process, such as humans, resemble the embryos of ancestral species, such as fish. The law refers only to embryonic development and not to adult stages, as development proceeds, the embryos of different species become more and more dissimilar. An early form of the law was devised by the 19th-century Russian zoologist K. E. von Baer, who observed that embryos resemble the embryos, but not the adults, of other species. A later, but incorrect, theory of the 19th-century German zoologist Ernst Heinrich Haeckel states that the embryonic development (ontogeny) of an animal recapitulates the evolutionary development of the animal's ancestors (phylogeny).

biography, reconstruction in print or on film, of the lives of real men and women. Together with autobiography—an individual's interpretation of his own life—it shares a venerable tradition, meeting the demands of different audiences through the ages. Among the most ancient biographies are the narrative carvings and hieroglyphic inscriptions on Egyptian tombs and temples (c. 1300 B.C.), and the cuneiform inscriptions on Assyrian palace walls (c. 720 B.C.) or Persian rock faces (c. 520 B.C.). All these records proclaimed the deeds of kings, although accuracy often gave way to glorification. Among the first biographies of ordinary men, the Dialogues of Plato (4th cent. B.C.) and the Gospels of the New Testament (1st and 2d cent. A.D.) reveal their respective subjects by letting each speak for himself. Even these early achievements of biography, however, lack critical balance. Equilibrium was established by Plutarch in *The Parallel Lives* (2d cent. A.D.). His method was comparative, e.g., Theseus is matched with Romulus, Demosthenes with Cicero. In his conclusions, he evaluates the connection between the moral standards and worldly achievements of each. St. Augustine turned the same critical judgment on himself in his *Confessions* (4th cent.), comparing his character and conduct before and after his conversion to Christianity. During the Middle Ages credibility continued to be sacrificed to credibility. In the hagiographies, or lives of the saints, human flaws and actual events were bypassed in favor of saintly traits and miracles. Yet the few secular biographies produced in that era, Einhard's *Life of Charlemagne* (9th cent.), Eadmer's *Life of St. Anselm* (12th cent.), Jean de Joinville's *Memoirs of St. Louis IX* (13th cent.), and Jean Froissart's *Chroniques* (15th cent.), redeem the genre with their lively depiction of personalities and events. With the Renaissance came rekindled interest in worldly power and self-assertion. Benvenuto Cellini's *Autobiography* (16th cent.), recounting his escapades and artistic achievements, is a monument to the ego. St. Simon's *Memoirs* (late 17th cent.) describe Louis XIV and his court at Versailles and record the effect of the monarch's absolute power on the daily lives of others. In England, Samuel Pepys's *Diary*, John Evelyn's *Diary*, Izaak Walton's *Lives* and John Aubrey's *Lives of Eminent Men* (all mid-17th cent.) introduced informality and intimacy to their treatments. Each wrote about contemporaries who were their friends or acquaintances. By the 18th cent. literary biography (works about poets and men of letters) had become an important extension of the genre. Dr. Johnson's *Lives of the Poets* (1779-81) set the example for James Boswell's *Life of Samuel Johnson* (1791), the first definitive biography. This monumental work was drawn not only from Boswell's exact recollections of conversations with Johnson, but from letters, memoirs, and interviews with others in Johnson's circle as well. Two equally celebrated autobiographies, Benjamin Franklin's, noted for its practicality, and Jean-Jacques Rousseau's, noted for its candor, also mark this age. Among the avalanche of biographies and autobiographies published in the 19th cent. Goethe's *Dichtung und Wahrheit* (1808-31), Thomas Carlyle's *Sartor Resartus* (1833-34) and *Frederick the Great* (1858-65), and Ernest Renan's *Life of Jesus* (1863) are important. Also noteworthy was the publication of the *Dictionary of National Biography* (1882), edited by Leslie Stephen

As a result of Freud's discovery of the unconscious, the 20th cent. produced a new sort of biography—one that used the technique of psychoanalysis on the subject. Examples of such works are Freud's own *Leonardo Da Vinci* (1910) and Anais Nin's *Diaries* (1931-44). As antidotes to the tradition of the official biography Lytton Strachey wrote *Eminent Victorians* (1918) and *Queen Victoria* (1921), works that deflate and debunk. Twentieth-century biographers often sought to make structure a reflection of theme. Henry Adams's *Education of Henry Adams* (1918) explores the metaphor of the title, Thomas Merton's *Seven Storey Mountain* (1948) follows the analogue of Dante's *Inferno*, and Lillian Hellman's *Pentimento* (1973), taking its title from an art historian's term, presents portrait sketches of the people in her life as seen from the vantage point of her maturity. Notable literary and scholarly biographers of the 20th cent. include Harold Nicolson, Allan Nevins, D. S. Freeman, Andre Maurois, J. H. Plumb, Carl Sandburg, Dumas Malone, Elizabeth Longford, and Leon Edel. Motion pictures and television have adapted the form of biography to their own needs. With Paul Muni as Louis Pasteur, Charles Laughton as Rembrandt, or Spencer Tracy as Thomas Edison, films have retraced for new audiences, although sometimes in a romanticized fashion, the paths to success taken by men of intelligence and character. The old Plutarchian formula. Documentary biographies, composed of newsreel clips and photographs, have been made about public figures such as Eleanor Roosevelt, the Duke of Windsor, and Martin Luther King, Jr. Two innovations of television are the dramatic documentary and the interview. Ken Russell's film essays, commissioned by the British Broadcasting Company (1965-70), on Elgar, Rossini, Delius, Richard Strauss, and Isadora Duncan attempt to convey the essence of a person's character and work rather than just the facts of his life. Homage to Plutarch was evident again in the format of Edward R. Murrow's interview program, *Person to Person* (1953-59), where guests like Marilyn Monroe and Sir Thomas Beecham were deliberately paired. The television interview was expanded by such talk show hosts as Dick Cavett, who has led his guests, including Sir Noel Coward and Katharine Hepburn, to talk about their lives for an hour or longer. See H. G. Nicolson, *The Development of English Biography* (1928), E. H. O'Neill, *A History of American Biography* (1961), J. L. Clifford, ed., *Biography as an Art* (1962), R. D. Altick, *Lines and Letters* (1965), Andre Maurois, *Aspects of Biography* (tr. 1966).

biological clock see RHYTHM, BIOLOGICAL

biological warfare, employment in war of microorganisms to injure or destroy men, animals, or crops, also called germ or bacteriological warfare. Limited attempts have been made in the past to spread disease among the enemy, e.g., military leaders in the French and Indian Wars tried to spread smallpox among the Indians. Biological warfare has scarcely been used in modern times and was prohibited by the 1925 Geneva Convention. However, many nations in the 20th cent. have conducted research to develop suitable military microorganisms, including strains of smallpox and plague and certain nonlethal agents. Such microorganisms can be delivered by animals (especially rodents or insects) or by aerosol packages, built into artillery shells or missile warheads and released into the atmosphere to infect by inhalation. In 1971 the United States and the Soviet Union adopted an agreement, endorsed by the United Nations General Assembly, to destroy existing stockpiles of biological weapons and refrain from developing or stockpiling new biological weapons.

biology, the science that deals with living things. It is broadly divided into ZOOLOGY, the study of animal life, and BOTANY, the study of plant life. Subdivisions of each of these sciences include cytology (the study of cells), histology (the study of tissues), anatomy or morphology, physiology, and embryology (the study of the embryonic development of an individual animal or plant). Also included in biological studies are the sciences of genetics, evolution, paleontology, and taxonomy or systematics, the study of classification. The biological aspects of other sciences are studied in such fields as biochemistry (physiological chemistry), biophysics (the physics of life processes), bioclimatology and biogeography (ecology), bioengineering (the design of artificial organs), biometry or biostatistics, bioenergetics, and biomathematics. Evidences of early man's observa-

tions of nature are seen in prehistoric cave art. Biological concepts began to develop among the early Greeks. The biological works of Aristotle include his observations and classification of his large collections of animals. The invention of the microscope in the 16th cent. gave a great stimulus to biology, broadening and deepening its scope and creating the sciences of microbiology, the study of microscopic forms of life, and biomicroscopy, the microscopic study of living cells. Among the many who contributed to the science are Claude Bernard, Cuvier, Darwin, T. H. Huxley, Lamarck, Linnaeus, Mendel, and Pasteur. See MARINE BIOLOGY. See H. G. Wells et al., *The Science of Life* (1934), Karl von Frisch, *Biology: The Science of Life* (tr. 1964), G. G. Simpson and W. S. Berk, *Life: An Introduction to Biology* (2d ed. 1965), Isaac Asimov, *The Intelligent Man's Guide to the Biological Sciences* (1968), U. N. Lanham, *Origins of Modern Biology* (1968), J. H. Painter, *Biology Today* (1972), Ernest Borek, *The Sculpture of Life* (1973), P. R. Ehrlich et al., *Introductory Biology* (1973), J. D. Ebert et al., *Biology* (1973), P. C. Hanawalt and R. H. Haynes, ed., *The Chemical Basis of Life: An Introduction to Molecular and Cell Biology, Readings from Scientific American* (1973).

bioluminescence, production of light by living organisms. Plants that are bioluminescent include certain mushrooms and bacteria that emit light continuously. The dinoflagellates, a group of marine algae, produce light only when disturbed. Bioluminescent animals include such organisms as ctenophores, annelid worms, mollusks, insects such as fireflies, and fish. The production of light in bioluminescent organisms results from the conversion of chemical energy to light energy. In fireflies, one type of a group of substances known collectively as luciferin combines with ADENOSINE TRIPHOSPHATE (ATP), the compound then reacts with oxygen to create an excited state that emits yellow light. The reaction is mediated by an enzyme, luciferase. The active substance in bacterial bioluminescence is *n*-biovavin-5'-phosphate (see COENZYME). Different organisms produce different bioluminescent substances. Bioluminescent fish are common in ocean depths, the light probably aids in species recognition in the darkness. Other animals seem to use luminescence in courtship and mating and to divert predators or attract prey.

Bion (bī'ən), fl. 2d cent. ? B.C., Greek bucolic poet, an imitator of Theocritus, b. Phlossa, near Smyrna. Only fragments of his work survive. The *Lament for Adonis*, attributed to him, was the model for Shelley's *Adonais* and was translated by Elizabeth Barrett Browning.

biophysics, application of various methods and principles of physical science to the study of biological problems. In physiological biophysics physical mechanisms have been used to explain such biological processes as the transmission of nerve impulses, the muscle contraction mechanism, and the visual mechanism. Theoretical biophysics tries to use mathematical and physical models to explain life processes. Radiation biophysics studies the response of organisms to various kinds of radiations. Biophysics has contributed important tools for the study of organic molecules, and especially of large molecules, which play an important part in biological processes. Paper chromatography, a direct development of adsorption techniques, is widely used to analyze tissues for chemical components. X-ray crystallography is used to determine molecular structures and has been particularly useful in studying the structure of NUCLEIC ACIDS. Among the optical methods used in the study of biological problems are photochemistry, light scattering, absorption spectroscopy (including the use of visible, ultraviolet, and infrared radiation), LASER beams, and double refraction birefringence. The recently developed scanning electron microscope gives a three-dimensional quality to pictures of specimens. Other methods in use are tracer techniques with isotopes, ionizing radiation, sedimentation, diffusion, viscosity, electrophoresis (or migration in an electric field), electrical potential differences, magnetic methods, and ultrasounds.

biopsy, examination of cells or tissues removed from a living organism. Excised material may be studied in order to diagnose disease or to confirm findings of normalcy. Preparatory techniques depend on the nature of the tissue and the kind of study intended. Incisions may be made and total or partial lesions removed in the form of wedges or cylindrical

pieces, or scrapings of the surface membranes of internal organs may be collected. Needlelike instruments may be used to pierce the tissues and remove soft inner material. Once the tissue specimen has been obtained it is fixed, i.e., killed and coagulated, and chemical and histologic analyses are carried out. Tumors are routinely biopsied in order to determine whether they are malignant.

biosphere, irregularly shaped envelope of the earth's air, water, and land encompassing the heights and depths at which living things exist. The biosphere is a closed and self-regulating system (see **ECOLOGY**), sustained by grand-scale cycles of energy and of materials—in particular, carbon, oxygen, nitrogen, certain minerals, and water. The fundamental recycling processes are **PHOTOSYNTHESIS**, respiration, and the fixing of nitrogen by certain bacteria. Disruption of basic ecological activities in the biosphere can result from **POLLUTION**.

Biot, Jean Baptiste (zhāN bātēst' byō), 1774-1862, French physicist, grad. École polytechnique (1797). He was professor of mathematics at Beauvais before becoming professor of mathematical physics at the Collège de France in 1800. From 1809 to 1849 he taught astronomy at the Sorbonne. With French physicist François Arago, Biot measured properties of gases, and with French physicist Felix Savart, he formulated a law for the magnetic force near a wire, the force being generated when the wire carries an electric current. He discovered that when light passes through some substances, including sugar solutions, the plane of polarization of the light is rotated by an amount that depends on the color of the light.

biotin* see **VITAMIN**, **COENZYME**

biotite, iron-rich variety of phlogopite, one of the **MICA** minerals.

biplane, aircraft, typically of early design, having two sets of wings fixed at different levels, especially in a vertical stack with the fuselage included between them. See **AIRPLANE**.

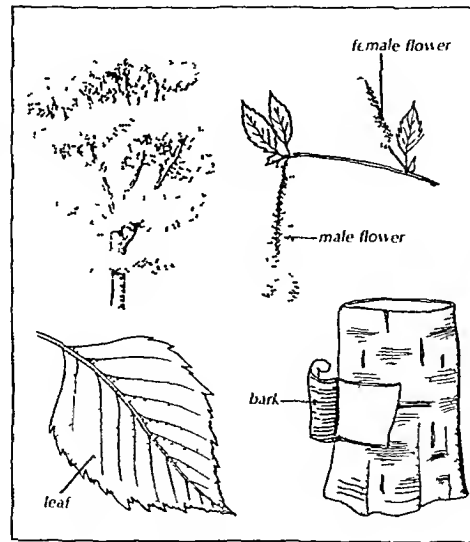
Biqa, Al (āl bēkā') or **El Bika** (ēl bēkā'), upland valley of Lebanon and Syria, 75 mi (121 km) long and 5 to 9 mi (8-14.5 km) wide, between the Lebanon and Anti-Lebanon ranges, highest part of the Rift Valley complex. The village of Baalbek, site of one of the largest temples of the Roman Empire, is located on the divide between the headwaters of the Orontes and Litani rivers in the northern part of the valley. In the area N of Baalbek, located in the rain shadow of the Lebanon mts., nomadic pastoralism is dominant. South of Baalbek, the Litani River (90 mi/145 km long) flows south through the most fertile part of the valley before turning west and cutting through the Lebanon mts. to the Mediterranean Sea. This section of Al Biqa, called the granary of Lebanon, is very flat, and farming is highly mechanized; vegetables, cereals, fruits, grapes, and cotton are the chief crops. A dam and irrigation project on the lower Litani supplies water to the dry, extreme southern part of Al Biqa, where cereals and grazing are important. The Biqa valley, once the heart of ancient Coele-Syria, has been the scene of warfare since the dawn of history. Al Biqa was included in a province of the Persian Empire and was later bitterly contested by the Seleucids and the Ptolemaic kings of Egypt. The city of Antioch, Turkey, was founded by Seleucus I, king of Syria, to dominate the region. The name also appears as El Beqa, El Bukaa, and El Bekaa.

Birch, Samuel, 1813-85, English Egyptologist. He wrote a dictionary of hieroglyphics and translated the Book of the Dead.

Birch, Thomas, 1779-1851, American artist, b. London. Birch settled in Philadelphia in 1793. Famous for his paintings of landscapes and historical scenes, he is also noted for a series of engravings of views of Philadelphia, which he executed with his father. During the War of 1812, Birch painted a series of scenes of naval engagements that include *The Macedonian* (1813).

birch, common name for some members of the **Betulaceae**, a family of deciduous trees or shrubs bearing male and female flowers on separate plants, widely distributed in the Northern Hemisphere. They are valued for their hardwood lumber and edible fruits and as ornamental trees. The species of **Betulaceae** native to the United States represent five genera—*Alnus* (ALDER), *Betula* (the birches), *Corylus* (HAZEL), and *Carpinus* (HORNBEAM) and *Ostrya* (hop hornbeam), both called hornwood. The sixth genus, *Ostryopsis*, is restricted to Mongolia. The birches, beautiful bushes or trees of temperate and arctic regions, are often found mingled with evergreens in northern coniferous forests. Most American species

are trees of the Northeast, a few smaller and scrub species grow in the West. The close-grained hardwood of several of the trees is valued for furniture,



White birch, *Betula papyrifera*

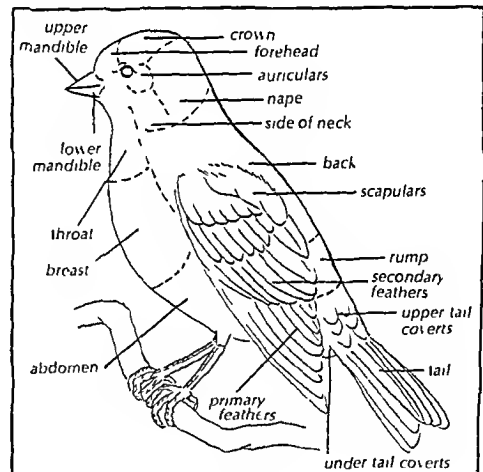
flooring, and similar uses (in America, particularly that of the yellow birch, *B. lutea*), stained birch provides much of the so-called mahogany of lower-priced furniture. White-barked birches are often used as ornamental trees, e.g., the famous paper, or canoe, birch (*B. papyrifera*) of the N United States and Canada. Its bark, which separates in layers, was used by the Indians for canoes and baskets. Another familiar American species is the smaller gray birch (*B. populifolia*), also white-barked. It is often found on poor and rocky soil, especially in New England. Various birches have yielded sugar, vinegar, a tea from the leaves, and a birch beer from the sap. The sweet, or black, birch (*B. lenta*) is now the chief source of oil of WINTERGREEN. The **Betulaceae** is classified in the division **MAGNOLIOPHYTA**, class **Magnoliopsida**, order **Fagales**.

Bird, Isabella: see **BISHOP**, **ISABELLA LUCY** (BIRD)

Bird, Robert Montgomery, 1806-54, American playwright and novelist, b. New Castle, Del., M.D. Univ. of Pennsylvania, 1827. He wrote several prize-winning verse plays for the actor Edwin Forrest, notably *The Gladiator* (1831) and *The Broker of Bogota* (1834). A financial misunderstanding led to a break between the two friends, and Forrest, throughout his life, refused to release the copyrights he claimed to hold for the plays. Bird then began writing prose fiction and published the first of his popular romances, *Calavar* (1834), followed by a sequel, *The Infidel* (1835). Both works used Mexico as a background. *Nick of the Woods* (1837), his most popular novel, drew on his travels through America. In contrast to James Fenimore Cooper, Bird depicted the Indian as violent and debased. His romances, although complicated in plot, are dramatic and contain vivid character portrayal. See biography by his wife, M. M. Bird (1945), study by Dahl Curtis (1963).

bird, warm-blooded, egg-laying, vertebrate animal having its body covered with **FEATHERS** and its forelimbs modified into **WINGS**. Birds compose the class **Aves** (see **CHORDATA**). Like mammals, they have a four-chambered heart, and there is a complete separation of oxygenated and deoxygenated blood. The body temperature is from 2° to 14° higher than that of mammals. Birds have a relatively large brain, keen sight, and acute hearing, but little sense of smell. They are believed to have evolved from reptiles. The fossil remains of the archaeopteryx and of the archaeornis of the Jurassic period, found in S Germany, show reptilian tails, jaws with teeth, and clawed wings, but feathers were well developed. It is thought that the estimated 8,650 living species existed in their present form by the Pleistocene epoch. Birds are highly adapted for **FLIGHT**. Their structure combines lightness and strength. Body weight is reduced by the presence of a horny bill instead of heavy jaws and teeth and by the air sacs in the hollow bones as well as in other parts of the body. Compactness and firmness are achieved by the fusion of bones in the pelvic region and in other parts of the skeleton. The heavier parts of the body—the gizzard, intestines, flight muscles, and thigh mus-

cles—are all strategically located for maintaining balance in flight. Feathers, despite their lightness, are highly protective against cold and wet. The flight feathers, especially, have great strength. Feathers are renewed in the process of **MOLTING**. Some birds, such as the ostrich, the penguin, and the kiwi, lack the power of flight and have a flat sternum, or breastbone, without the prominent keel to which the well-developed flight muscles of other birds are attached. In the majority of species there are differences between male and female in plumage coloring. In these birds the male (except in the phalarope) is usually the more brilliant or the more distinctly marked and is the aggressor in courtship. Unusual courtship displays are performed by several species, particularly by the ruffed grouse, the bird of paradise, the crane, the pheasant, and the peacock. **BIRDSONG** reaches its highest development during the breeding season, and singing ability is usually either restricted to or superior in the male. In spring and fall many birds migrate. Not all of the factors motivating this behavior are fully understood. These trips often involve flights of hundreds and even thousands of miles over mountains and oceans. Most birds build a **NEST** in which to lay their eggs. Some birds, such as the oriole, weave an intricate structure, while others lay their eggs directly on the ground or among a few seemingly carelessly assembled twigs. Eggs vary in size, number, color, and shape. Birds are of enormous value to man because of their destruction of insect pests and weed seeds. Many are useful as scavengers. The bills of birds are well adapted to their food habits. Specialized bills are found in the crossbill, hummingbird, spoonbill, pelican, and woodpecker. The game birds hunted by man for food and sport include grouse, pheasant, quail, duck, and plover. The chief domestic birds are the chicken, duck, goose, turkey, and guinea fowl. Parrots and many members of the finch family are kept as pets. See also **MIGRATION OF ANIMALS**. Among the periodicals devoted to the study of bird life are the *Auk*, the *Condor*, and the *Wilson Bulletin*. See



General anatomy of a bird

the series of books on life histories of North American birds by A. C. Bent, R. M. De Schauensee, *A Guide to the Birds of South America* (1970), Abram Rutgers and K. A. Norris, ed., *Encyclopaedia of Aviculture* (Vol. I, 1971 and Vol. II, 1972), U.S. Bureau of Sports Fisheries and Wildlife, *Birds in Our Lives* (1970), *Avian Biology*, ed. by D. S. Farner and J. R. King (1971-), R. K. Merton, *Man and Birds* (1971), Josselyn Van Tyne and A. J. Berger, *Fundamentals of Ornithology* (1971), Hermann Heinzel, *The Birds of Britain and Europe with North Africa and the Middle East* (1972), Eliot Porter, *Birds of North America* (1972), Peter Matthiessen, *The Wind Birds* (1973).

bird of paradise, common name for any of 43 species of medium- to crow-sized passerine birds of New Guinea and the adjacent islands, known for the bright plumage, elongated tail feathers called wires, and brilliant ruffs of the males. Their common name is derived from 16th-century Spanish explorers, who believed them to be visitors from paradise. The standard-winged bird of paradise, *Semioptera wallacei*, is brownish with a glimmering green gorget at the throat. At the end of the 19th century over 50,000 bird of paradise skins per year were exported, many species were almost wiped out. It is now illegal to import skins into the United States. The 13-in-

(32 S-cm) twelve-wired bird of paradise, *Seleucidis ignotus*, is found in mangrove swamps, and has brilliant yellow plumes and an iridescent green and black throat, which are displayed to the female during courtship. The smallest member of the family is the scarlet king bird of paradise. It is only 6 in (15 cm) long and has green plumes and blue legs. Many species are polygamous, and the drab-colored female assumes all the nesting duties. The biological basis for the elaborate coloration and displays seems to be the need for an accurate means of distinction and recognition between species, since hybridization is disadvantageous. Birds of paradise are classified in the phylum CHORDATA, subphylum Vertebrata, class Aves, order Passeriformes, family Paradisaeidae.

bird-of-paradise flower, large tropical herb (*Strelitzia reginae*) of the family Musaceae (BANANA family), native to S Africa. Its large blue and orange blossom resembles an exotic bird, it is cultivated as an ornamental in warmer regions, as a greenhouse plant, and as a florists' cut flower. It is grown commercially chiefly in California and Hawaii. The bird-of-paradise is classified in the division MAGNOLIOPHYTA, class Liliatae, order Zingiberales, family Musaceae.

bird sanctuary: see WILDLIFE REFUGE

Birdseye, Clarence, 1886-1956, American inventor and founder of the frozen food industry, b Brooklyn, N Y, studied at Amherst College. In 1912 he went to Labrador on a fur-trading expedition and when he returned to the United States in 1916 began experimenting with freezing foods, aiming at commercial application. He developed a method for freezing fish and in 1924 he was one of the founders of the General Foods Company, which began manufacturing various frozen food products. In 1929 the company was bought by the Postum Company (later the General Foods Corp.) for \$22 million. By 1949, Birdseye had perfected the anhydrous freezing process, reducing the time needed for the operation from 18 hr to 1½ hr.

birdsong Song, call notes, and certain mechanical sounds constitute the language of birds. Song is produced in the syrinx, whose firm walls are derived from the rings of the trachea, and is modified by the larynx and tongue. The membranes of the syrinx are controlled by slender muscles, in the oscines, or song birds, there may be as many as eight pairs of these muscles, whereas other birds have four or fewer. The greater development permits intricate patternings of sound (rare outside the oscines) that express a wide range of reactions, from pleasure to distress. Recognizable by man and other animals as well as by other birds, the various calls are classified as flight, feeding, nest, flock, aggressive, alarm, and territorial-defense calls. Song is usually confined to the male and is at its height during the breeding season. Experiments have shown that hormone secretion in the male is directly connected with his propensity to sing as well as with his selecting a territory for courtship and breeding. Among the oscines are such superior singers as the southern mockingbird, the hermit and wood thrushes, the purple and house finches, the canyon wren, and the European skylark and nightingale. Natural mimicry is characteristic of the mimic thrushes, the jays and crows, and the starlings, while birds with imitative faculties developed in captivity are canaries, finches, parrots, ravens, crows, and mynas. There is evidence that songs are learned and that certain calls are inherited. Most birds have preferences regarding the place from which they sing, e.g., fence posts, treetops, thickets, the forest floor, or on the wing. Mechanical sounds include the drumming of the grouse, the tattooing of the woodpecker, and the clattering of the stork. See E. A. Armstrong, *A Study of Bird Song* (2d edn ed 1973), Charles Hartshorne, *Born to Sing* (1973).

Bird Woman: see SACAIAWEA

Biren, Ernst Johann von: see BIRON

Birganj (bêr'gānch), town (1961 pop 10,769), S Nepal, near the Indian border. It is a market town for agricultural products.

Birgitta, Saint: see BRIDGET OF SWEDEN, SAINT

Biringuccio, Vannoccio (vān-nō'chō bē-rēn-gōōt'-chō), 1480-c 1539, Italian metallurgist. He is best known for his practical manual of metallurgy, *De la pirotechnia* (1540, tr 1942). As a young man Biringuccio learned about metallurgy through visits to forges and foundries. He directed an iron mine and forge near Siena and was master of its arsenal and

mint. Exiled twice because of changing regimes, he served in Venice and Florence as a caster of cannon and as a fortifications engineer. He was later called to Rome to head the papal foundry.

Birkat Qarun, lake, Egypt. See MOERIS

Birkbeck, George, 1776-1841, English educator. He established (1800-1804) in Glasgow a popular course of lectures for workingmen, which led to the founding of the Glasgow Mechanics' Institution in 1823. He became (1824) president of the London Mechanics' Institution and was also a founder (1827) of University College of the Univ of London. He did much to further popular scientific instruction in England. Birkbeck Laboratory at University College was established by gifts from his pupils. See biographies by J. S. Godard (1884) and Thomas Kelly (1957).

Birkbeck, Morris, 1764-1825, English pioneer in the United States. One of the most advanced agriculturists in England, he had a huge farm in Surrey. In 1817 he emigrated to the United States. He and another English traveler, George Flower, sought to create a settlement in Illinois. The two quarreled, but the undertaking resulted in the occupation of thousands of acres of land and the founding of Albion, Ill. Birkbeck's *Notes on a Journey to the Territory of Illinois* (1818, repr 1968) and *Letters from Illinois* (1818, repr 1968) helped to bring European settlers to the fertile prairies of the Middle West and are invaluable historical sources.

Birkenhead, Frederick Edwin Smith, 1st earl of, 1872-1930, British statesman and jurist. He was called to the bar in 1899 and entered the House of Commons as a Conservative in 1906. A brilliant orator, he soon gained prominence as a Conservative spokesman, particularly in the fight against Irish Home Rule. He was solicitor general (1915), attorney general (1915-19), in which capacity he prosecuted Sir Roger Casement, and lord chancellor (1919-22). Created earl in 1922, he was (1924-28) secretary of state for India. His books include *International Law* (4th ed 1911), *Famous Trials of History* (1927), *Law, Life, and Letters* (1927). See biography by his son, Frederick, 2d earl of Birkenhead (1933-35, rev ed 1959).

Birkenhead (bûr'kənhēd), county borough (1971 pop 137,738), Cheshire, W central England, at the mouth of the Mersey River, connected with Liverpool by the Mersey tunnel. Flour milling, shipbuilding, and commerce are the key industries. There are also engineering, food-processing, and clothing plants and a cattle market. There are extensive docks. The chief imports are grain and cattle, coal, flour, the byproducts of milling, and machinery are exported. Milling and shipbuilding were responsible for Birkenhead's rapid growth in the 19th cent. The borough has a technical and a theological college. In 1974, Birkenhead became part of the new metropolitan county of Merseyside.

Birkhoff, George David (bûr'kôf), 1884-1944, American mathematician. The son of a physician, he was educated at Harvard (BA, 1905, Ph D, 1907). He is known for his work on linear differential equations and difference equations. He was also deeply interested in the analysis of dynamical systems, celestial mechanics, number theory, and function spaces. In addition he wrote on the foundations of relativity and quantum mechanics and on art and music, e.g., *Aesthetic Measure* (1933). See his *Collected Mathematical Papers* (3 vol., 1950). His son, Garrett Birkhoff, 1911-, is also a mathematician, who has made several important contributions to abstract mathematics and to the teaching of mathematics. From 1934 on he developed the concept of a lattice, or abstract structure, and showed how a number of subjects, e.g., Boolean algebra, projective geometry, and affine geometry, could be treated as special types of lattices. His text *A Survey of Modern Algebra* (with Saunders MacLane, 1941) became a standard undergraduate textbook. See his *Lattice Theory* (1940, 3d ed 1967).

birling (bûr'ling), sport performed on floating logs. It became popular with American lumberjacks after the middle of the 19th cent. In the main event of a birling tournament a contestant tries to spill his rival into the water by superior logrolling. Log-poling races and individual acrobatic performances on logs are also held. National birling contests in the United States have been held occasionally since 1898.

Birmingham, city (1971 pop 1,013,366), central England, since 1974, part of the new metropolitan county of West Midlands. The city is equidistant from Bristol, Liverpool, Manchester, and London,

England's main ports, and near the BLACK COUNTRY iron and coal deposits, it is connected to the Staf fordshire mines by the Birmingham Canal, built in the 18th cent. Birmingham is Britain's second-largest city (in both area and population) and is the center of water, road, and rail transportation in the MIDLANDS. The chief industries are the manufacture of automobiles, motorcycles, and bicycles and their components and accessories. Other products include electrical equipment, paint, guns, and a wide variety of metal products. By the 15th cent, Birmingham was a market town with a large leather and wool trade, by the 16th cent it was also known for its many metalworks. In the English Civil War the town was captured by the royalists. Birmingham's industrial development and population growth accelerated in the 17th and 18th cent. In 1762, Matthew Boulton and James Watt founded the Soho metalworks, where they designed and built steam engines. Joseph Priestley, the discoverer of oxygen, lived for a time in Birmingham. In 1791 a mob, incensed at his radical religious and political views, burned his home. The town was enfranchised by the 1832 REFORM BILL and was incorporated in 1838. John Bright represented it in Parliament from 1857 to 1889. During the 1870s, while Joseph Chamberlain was mayor, Birmingham underwent a large program of municipal improvements, including slum clearance and the development of gas and water works. Birmingham was among the first English localities to have a municipal bank, a comprehensive water-supply system, and development planning. The area of the city was enlarged in 1891 and again in 1911 under the Greater Birmingham scheme. No table buildings include the town hall, built in 1834, modeled after the temple of Castor and Pollux in Rome, the 18th-century baroque-style Cathedral of St Philip, and the 19th-century Cathedral of St Chad, the first Roman Catholic cathedral to be built in England after the Reformation. Bull Ring, in the center of Birmingham, is the site of the city's oldest market. The city library includes an excellent Shakespeare collection. There is a museum and art gallery (noted for its pre-Raphaelite collection) and a museum of science and industry. Annual music festivals date from 1768. In the suburb of Edgbaston are the Univ of Birmingham and the Oratory of St Philip Neri, a Roman Catholic shrine that was formerly the parish house of John Henry Cardinal Newman. In the center of the city is the Univ of Aston. Birmingham was severely damaged in World War II and has been considerably rebuilt since then.

Birmingham (bûr'mĩnghām") 1 City (1970 pop 300,910), seat of Jefferson co., N central Ala., in the Jones Valley near the southern end of the Appalachian system, inc 1871. It is the largest city in the state and the leading iron and steel center in the South. Iron, coal, limestone, and other natural resources from the area supply the city's great iron and steel plants and its metalworking factories. By the middle of the 20th cent the city's economy had become more diversified, and in addition to iron and steel, transportation equipment, construction materials, chemicals, and fabricated metals are produced. Commerce, banking, insurance, research, and government are also economically important. Founded and incorporated in 1871, Birmingham developed rapidly with the expansion of the railroads. An important trade and communications center, the city is connected with the Gulf of Mexico by canal and is a port of entry. Educational institutions in the city include Birmingham-Southern College, Miles College, Daniel Payne College, Samford Univ, the Univ of Alabama in Birmingham, and two junior colleges. Birmingham supports a football and track stadium, botanical and Japanese gardens, a symphony, a ballet group, a theater, and an art museum, a Festival of Arts is held annually. Overlooking the city, on nearby Red Mt., is a huge iron statue of Vulcan, the mythical god of the forge. 2 City (1970 pop 26,170), Oakland co., SE Mich., on the River Rouge, settled 1819, inc as a village 1864, as a city 1933. The city is largely residential.

Birmingham-Southern College, at Birmingham, Ala., United Methodist, coeducational, formed 1918 by the merger of Southern Univ (chartered 1856, opened 1859 at Greensboro, Ala.) and Birmingham College (opened 1898). The Birmingham Conservatory of Music became a part of the college in 1953.

Birmingham University, at Birmingham, England, founded 1900. It has faculties of science and engineering, arts, medicine and dentistry, commerce and social science, and law, as well as a school of education. Associated with the university are the

Barber Institute of Fine Arts and the Shakespeare Institute

Birney, James Gillespie, 1792-1857, American abolitionist, b. Danville, Ky. He practiced law at Danville from 1814 to 1818, before he moved to Alabama, where he served one term in the state legislature. Briefly (1832-34) an agent of the American Colonization Society before becoming an abolitionist, he returned (1833) to Kentucky, freed (1834) his inherited slaves, and helped organize (1835) the Kentucky Anti-Slavery Society. In 1837 he became executive secretary of the American Anti-Slavery Society, and he was a vice president of the World's Anti-Slavery Convention at London in 1840. In contrast to William Lloyd Garrison, Birney constantly advocated political action. He became the acknowledged leader of like-minded abolitionists who, forming the LIBERTY PARTY, nominated him for the presidency in 1840 and 1844. An injury sustained in 1845 took him out of public life. See his letters (ed. by D. L. Dumond, 1938), biographies by W. Birney (1969) and 8 Fladeland (1955, repr. 1969).

Birobidzhan: see JEWISH AUTONOMOUS OBLAST, USSR.

Biron or Biren, Ernst Johann von (ērnst yōhān' fən bē'rōn, bē'rān), 1690-1772, duke of Courland (1737-43, 1763-69), favorite of Czarina Anna of Russia. A Baltic nobleman, he rose to an all-powerful position under Anna, through whose influence he was elected duke of Courland. After Anna's death (1740) he was made regent for her grandnephew Ivan VI. Biron's unscrupulousness had earned him general hatred, and shortly after he became regent a coup d'état ousted and banished him (1741). In 1743, Augustus III of Poland deprived him of his duchy. Czar Peter III later recalled him and Catherine II secured the restoration of his title, but Biron never regained his former influence.

Birrell, Augustine (bī'rēl), 1850-1933, English essayist and public official. As chief secretary for Ireland (1907-16) his failure to end the plotting that resulted in the Easter Rebellion of 1916 led to his retirement from politics. His works include the pleasant and urbane critical essays *Obiter Dicta* (3 vol., 1884, 1887, 1924) and biographies of Charlotte Brontë (1887), William Hazlitt (1902), and Andrew Marvell (1905).

Birsha (būr'shā), king of Gomorrah. Gen. 14:2.

birth or labor, delivery of the fetus by the viviparous mammal. Birth is also known as parturition. Human birth normally occurs about 280 days after onset of the last menstrual period before conception. Onset of labor, the first stage, is heralded by contractions of the uterus felt as cramplike pains in the abdomen or lower back that recur at intervals of 10 to 30 min and last about 40 sec; they increase in frequency until they occur at about 2-min intervals. With each contraction the cervix, or neck of the uterus, dilates until it becomes wide enough, about 4 in. (10 cm), to permit emergence of the baby. In the second stage of labor, the baby passes through the birth canal, most commonly head first, and is born. The effectiveness of uterine contractions in this stage are enhanced by the bearing-down abdominal contractions of the mother. The third stage of labor, which occurs about 15 to 30 min after the child is born, is characterized by the separation of the placenta from the uterine wall and its expulsion. The total time of labor averages 13 to 14 hr in women pregnant for the first time and 8 to 9 hr in women who have previously borne children. The pain of childbirth can be relieved with a variety of analgesic and sedative drugs, including morphine, barbiturates, and chloroform. However, many drugs that relieve pain also slow the uterine contractions or dangerously depress the baby's respiratory system. Spinal anesthetics, injected directly into the spinal cord, while not dangerous to the child, are difficult to administer accurately and are therefore potentially dangerous to the mother. In recent years so-called natural childbirth has come into wide use, the advantages are that the child is born undrugged and the mother can be conscious at the moment of birth. Natural childbirth emphasizes the ability of many women to give birth with a minimal amount of pain-killing drugs or none at all. The Dick-Read method, formulated by the British obstetrician of that name, emphasizes maternal understanding of the birth process as an aid to relaxation and exercises to strengthen muscles and encourage proper breathing. The Lamaze method, or psychoprophylaxis, is of Russian origin, it uses breathing exercises as a conditioned response to uterine contractions. Hypnosis has also been used experimentally. Birth often cannot proceed normally because of a defect of the

cervix or weak uterine contractions, breech births, in which the feet or buttocks emerge first, and transverse births, in which the child is positioned across the uterus, usually require obstetrical intervention, such as forceps delivery, manually turning the baby, or performing a CESAREAN SECTION. About 10% of pregnancies terminate in deliveries that are too early, producing (after at least 200 days of gestation) premature infants requiring special care. Birth of a fetus prior to about 200 days of gestation is termed a miscarriage, birth within the first three months, an abortion. Stillbirth is the delivery of a dead child. Complications of childbirth affecting the newborn include infant blindness attributable to gonorrhea infection, now largely eliminated by routine administration of silver nitrate to the eyes, retrolental fibroplasia, a type of blindness common for some years in premature infants that was found to result from administration of high concentrations of oxygen and is now largely avoided, and ERYTHROBLASTOSIS FETALIS, or Rh disease, which can often be prevented. Puerperal fever, an infection of the mother's genital tract once common following labor and delivery, has now also been largely eliminated by preventive hygiene, especially in labor, and by antibiotic therapy. See PREGNANCY, OBSTETRICS.

birth control, practice of contraception for the purpose of limiting reproduction. Although contraceptive techniques had been known in ancient Egypt, Greece, and Rome, the modern movement for birth control began in Great Britain, where the writings of Thomas Robert MALTHUS stirred interest in the problem of overpopulation. In 1877, Annie BESANT and Charles BRADLAUGH were tried for selling *The Fruits of Philosophy*, a pamphlet on contraceptive methods, written in 1832 by an American, Charles Knowlton. After their famous trial, the Malthusian League was founded. In 1878 the first birth control clinic was founded in Amsterdam by Aletta Jacobs. In 1921, aided by Marie STOPES, the Malthusian League established a birth control clinic in London. The first U.S. birth control clinic, opened (1916) by Margaret SANGER in Brooklyn, N.Y., was closed by the police; she received a 30-day jail sentence. She helped organize (1917) the National Birth Control League; it became in 1921 the American Birth Control League, in 1942 the Planned Parenthood Federation of America, and in 1961 the Planned Parenthood-World Population. In 1936, the Federal law prohibiting dissemination of contraceptive information through the mails was modified. Throughout the 1940s and 50s, birth control advocates were engaged in numerous legal suits. In 1965, the U.S. Supreme Court struck down the one remaining state law (Connecticut) prohibiting the use of contraceptives. The Federal government began to take a more active part in the birth control movement in 1967, when 6% of the funds allotted to the Child Health Act was set aside for family planning; in 1970, the Family Planning Services and Population Act established separate funds for birth control. Sweden was one of the first countries to provide government assistance for birth control, which it did as early as the 1930s. Although the issue of birth control has been a controversial one in Marxist theory, the governments of the Soviet Union and of the People's Republic of China now supply birth control aid to their people. One of the most successful birth control programs is in Japan, where the birthrate has been dramatically reduced. Birth control on the international level is led by the International Planned Parenthood Federation, founded in 1952 and having members in 79 countries by 1973. Among religious bodies, the Roman Catholic Church has provided the main opposition to the birth control movement; Pope Paul VI reaffirmed this stance in a 1968 encyclical. The birth control movement gained new life in the 1960s and 70s as people became increasingly concerned about world POPULATION growth. Several of the underpopulated nations, however, have a stated policy of encouraging an increased birthrate, e.g., Argentina. Male birth control methods include withdrawal of the male before ejaculation (the oldest contraceptive technique) and use of the condom, a rubber sheath covering the penis. Contraceptive methods for women include the rhythm method—abstinence around the most likely time of ovulation—and precoital insertion into the vagina of substances (creams, foams, jellies, or suppositories) containing spermaticidal chemicals. The use of a diaphragm, a rubber cup-shaped device inserted before intercourse, prevents sperm from reaching the uterine cervix, it is usually used with spermaticidal substances. Intrauterine devices, or IUDs, are variously shaped small objects inserted by a doctor into the uterus, they apparently act by creating a uterine en-

vironment hostile either to sperm or to the fertilized egg. The so-called Pill, an oral contraceptive, involves a hormonal method in which estrogen and progestins (progesterone-like substances) are taken cyclically for 21 days a month. The elevated levels of hormones in the blood suppress production of the pituitary hormones (luteinizing hormone and follicle-stimulating hormone) that would ordinarily cause ovulation. Sterilization of the female, often but not always performed during a Cesarean section or shortly after childbirth, consists of cutting or tying both Fallopian tubes, the vessels that carry the egg cells from the ovaries to the uterus. In male sterilization (vasectomy) the vas deferens, the tubes that carry sperm from the testes to the penis, are interrupted. Sterilization, in most cases irreversible, involves no loss of libido or capacity for sex. No contraceptive yet devised is at once simple, acceptable, safe, effective, and reversible. Some, such as the diaphragm, condom, and chemical and rhythm methods, require high motivation by users; the Pill, which must be taken daily, often induces undesirable side effects, such as nausea, headache, weight gain, and increased tendency to develop blood clots. The IUDs, although requiring no personal effort or motivation, are often not tolerated or are expelled, and they sometimes cause uterine infection, septic abortion, and other problems. New birth control techniques, many still experimental, include the use of progestins that could be given by injection every three months, progestins embedded in inert carriers and implanted under the skin to release the hormones slowly and continuously, progestins incorporated into a plastic ring that a woman could insert in the vagina, needing to be changed only periodically, and IUDs carrying some antifertility agent. The use of any of various hormones that induce menstruation, and the use of a safe "morning after" or "minutes after" hormone, could eliminate some of the problems associated with continuous dosage hormones. Another experimental technique is immunization against human chorionic gonadotropin (HCG), a hormone secreted by a developing fertilized egg that stimulates production of progesterone by the ovary, the effect of the anti-HCG antibody would be to inactivate HCG and thereby induce menstruation even if fertilization occurred. See REPRODUCTIVE SYSTEM, MENSTRUATION, STERILIZATION. See Elizabeth Draper, *Birth Control in the Modern World* (1965), B. R. Berelson, *Family Planning Programs* (1969), G. J. Hardin, *Birth Control* (1970), Lawrence Lader, *The Margaret Sanger Story* (1955) and *Breeding Ourselves to Death* (1971).

birthmark, pigmented maldevelopment of the skin that varies in size, either present at birth or developing later. Birthmarks may appear as moles, varying in color from light brown to blue, and are either flat or raised above the surface of the skin. They are usually benign, unless they are situated in areas where constant irritation may cause them to become malignant (cancerous), in which case they should be removed surgically. The so-called port-wine stains and strawberry marks involve vascular tissue. The flat port-wine stains are not amenable to treatment. The strawberry marks generally disappear a few years after birth or may be treated by a physician, usually with caustic applications.

birth rate: see VITAL STATISTICS.

birthstone: see MONTH.

birthwort, common name for the Aristolochiaceae, a family of shrubs and woody climbing vines found in the tropics and other warm regions. The largest genus, *Aristolochia*, includes several plants cultivated in the United States as medicinals (e.g., the Virginia snakeroot and the birthwort) or as ornamentals for their curious flowers (e.g., the pelican flower and the Dutchman's-pipe, or pipe vine). The family also includes the North American wild ginger (*Asarum canadense*), unrelated to the true gingers of Asia. The Aristolochiaceae are classified in the division MAGNOLIOPHYTES, class Magnoliopsida.

Birzavith (bīr'zāvīth), Ashente 1 Chron. 7:31.

Bisanthe: see TEKIRDAG.

Bisbee (bīz'bē), city (1970 pop. 8,328), seat of Cochise Co., SE Ariz., near the Mexican border, inc. 1900. It is the center of one of the greatest copper-producing areas in the country. Gold, silver, and lead are also mined. After the rich copper deposits were discovered (c. 1876), the city was built in two steep-sided canyons, Mule Pass Gulch and Brewery Gulch. Nearby is Coronado National Memorial (see NATIONAL PARKS AND MONUMENTS, table), which commemorates Coronado's entry (1540) into the United States.

Biscay, Bay of, arm of the Atlantic Ocean, indenting the coast of W Europe from Ushant island (Île d'Ouessant) off Brittany, NW France, to Cape Ortegal, NW Spain. The bay is noted for its sudden, severe storms and its strong currents. The rocky northeastern and southern coasts of Biscay are irregular with many good harbors, numerous offshore islands are there. The southeastern shore is straight and sandy. The chief ports are Brest, Saint-Nazaire, La Rochelle, and Bayonne in France and San Sebastián, Bilbao, and Santander in Spain. Nantes and Bordeaux, at the head of the Loire and Garonne estuaries, respectively, in France, are also reached by oceangoing ships. There are several resorts along the French coast, notably Biarritz. The bay has important sardine-fishing grounds.

Biscayne Bay, shallow, narrow inlet of the Atlantic Ocean, c 40 mi (60 km) long, SE Fla. Famous resort areas, including Miami and Miami Beach, are on the northern shore. The house used as a retreat by President Richard Nixon is on Key Biscayne. Biscayne National Monument is at the southern end of the bay (see NATIONAL PARKS AND MONUMENTS, table).

Bisceglie (bëshēl'yēā), city (1971 pop 45,497), Apulia, S Italy, on the Adriatic Sea. It is a seaport and commercial center. Conquered by the Normans in the late 11th cent, the city later developed a prosperous merchant and military fleet. The duchy of Bisceglie was (16th cent) a fief of Alfonso of Aragon, 2d husband of Lucrezia Borgia, and of their son Rodrigo. There are several churches of the 11th-12th cent, a fine Apulian Romanesque cathedral (11th-13th cent), and ruins of an 11th-century Norman castle.

Biscoe, John, d 1848, British navigator. Commanding a British sealer of the Enderby firm of London, he discovered (1831-32) ENDERBY LAND on the coast of Antarctica. His voyage gave Great Britain the chief basis for British claims to Antarctica. He also discovered Alexander Land.

Bishlam, deputy of Artaxerxes Ezra 4:7

Bishop, Elizabeth, 1911-, American poet, b Worcester, Mass. Since her graduation from Vassar in 1934, she has lived in several places including Brazil. Her first volume of poetry, *North and South* (1946), was reprinted with additions as *North and South—A Gold Spring* (1955, Pulitzer Prize). Her poetic vision is penetrating and detached. Without straining for novelty, she finds symbolic significance in objects and events quietly observed. Among her works are her *Complete Poems* (1969) and several travel books, notably *Questions of Travel* (1965) and *Brazil* (1967). With Emanuel Brasil she edited *An Anthology of 20th Century Brazilian Poetry* (1972).

Bishop, Sir Henry Rowley, 1786-1855, English operatic conductor, composer or arranger of 120 dramatic works. He is known today for a setting of Shakespeare's "To, here the gentle lark" and the melody of *Home, Sweet Home* from J. H. Payne's comic opera, *Clari, or, The Maid of Milan* (1823).

Bishop, Isabel, 1902-, American painter, b Cincinnati, Ohio. Influenced by the New York City painters of the 1930s, Bishop produced numerous paintings of working women. Her pensive nude studies, such as *Nude—1934*, demonstrate her understanding of delicate effects of light and shade.

Bishop, Isabella Lucy (Bird), 1831-1904, English traveler and writer, first woman member of the Royal Geographical Society. She traveled extensively and wrote a number of books, including *The English Woman in America* (1856), *The Hawaiian Archipelago* (1875), *A Lady's Life in the Rocky Mountains* (1879), *Unbeaten Tracks in Japan* (1880), *Journeys in Persia and Kurdistan* (1891), and *Korea and Her Neighbors* (1898). She founded several hospitals in China and Korea. See biography by Pat Barr (1970).

bishop* see ORDERS HOLY

Bishop Auckland (ôk'lând), urban district (1971 pop 33,292), Durham, NE England, on the Wear River. It is a busy market area, as well as a mining town producing coal that is highly suitable for coking. Located near the site of a Roman fort, Auckland has been a seat of the bishops of Durham since the 12th cent. The present palace was largely constructed in the 16th cent.

Bishop's University, at Lennoxville, Que., Canada, founded 1843 by the Anglican bishop of Quebec as a liberal arts college. In 1853 it gained university status. The university has faculties of arts, science, and theology, and a school of education.

Bishops' Wars, two brief campaigns (1639 and 1640) of the Scots against Charles I of England. When Charles attempted to strengthen episcopacy in Scotland by imposing (1637) the English Book of Com-

mon Prayer, the Scots countered by pledging themselves in the National Covenant (1638) to restore Presbyterianism. A general assembly of the Scottish church abolished episcopacy. The first war was ended without fighting by the Pacification of Berwick, in which Charles conceded the Scottish right to a free church assembly and a free parliament. However, the assembly that met promptly reaffirmed the covenant. In spite of the refusal of his Short Parliament to vote him money, Charles managed to raise another army, but it was unable to stop the Scots from invading England and occupying Northumberland and Durham. Charles made peace at Ripon (Oct., 1640), and his promise there to pay an indemnity to the Scots necessitated his calling the Long Parliament. See ENGLISH CIVIL WAR.

Bisk* see BISK, USSR

Biskra (bëskra'), city (1966 pop 59,275), NE Algeria, at the foot of the Aures Mts. It is a commercial center for the nomads of the surrounding region. It was the Roman military base of Vescera, later it was an important Muslim town. After 1844 it served as a French base for operations in S Algeria. The surrounding oasis produces dates.

Bismarck, Otto von (bîz'mark, Ger ô'tô fan bîs'mark), 1815-98, German statesman, known as the Iron Chancellor. Born of an old Brandenburg Junker family, he studied at Göttingen and Berlin, and after holding minor judicial and administrative offices he was elected (1847) to the Prussian Landtag [parliament]. There he opposed the liberal movement, advocated unification of Germany under the aegis of Prussia, and defended the privileges of his social class, the Junkers. As Prussian minister to the German diet at Frankfurt (1851-59) and as ambassador to St. Petersburg (1859-62) and to Paris (1862), he gained the insight and the experience that determined his subsequent policy. In 1862, WILLIAM I, to secure adoption of his army program then being strenuously opposed in parliament, appointed Bismarck premier. Bismarck, in direct violation of the constitution, dissolved parliament and collected taxes for the army without parliamentary approval. To expel Austria from the GERMAN CONFEDERATION now became Bismarck's chief aim. The disposition of SCHLESWIG-HOLSTEIN, former Danish territory annexed by Austria and Prussia after their defeat of the Danes in 1864, provided the necessary pretext. By the Gastein Convention of 1865 the two countries agreed to rule jointly—Austria was to administer Holstein and Prussia was to administer Schleswig, but friction soon developed. Bismarck accused Austria of violating the Gastein treaty and thus precipitated the AUSTRO-PRUSSIAN WAR (1866), which ended after seven weeks with the defeat of Austria. By the treaty signed at the end of the war, Germany was reorganized under Prussian leadership in the NORTH GERMAN CONFEDERATION, from which Austria was excluded. Fear of France, skillfully propagated by Bismarck, was to bring the remaining German states into the Prussian orbit when the candidature of a Hohenzollern prince to the throne of Spain caused friction with the French Emperor Napoleon III. To make sure that this friction would provoke war, Bismarck published the famous EMS DISPATCH. In the FRANCO-PRUSSIAN WAR (1870-71) that ensued the states of S Germany rallied to the Prussian cause as Bismarck had anticipated, and in Jan., 1871, WILLIAM I of Prussia was proclaimed German emperor. Bismarck, the creator of the empire, became its first chancellor. When added to his Prussian positions (premier, foreign minister, and minister of commerce) the imperial chancellorship gave him almost complete control of foreign and domestic affairs. To maintain the peace necessary for the consolidation of the empire, he proposed to advance a strong military program, to gain the friendship of Austria, to preserve British friendship by avoiding naval or colonial rivalry, and to isolate France in diplomacy so that revanche would be impossible. Therefore, in 1872, he formed the THREE EMPERORS LEAGUE (Germany, Austria-Hungary, and Russia) and also maintained friendly relations with Italy. The Balkan rivalries of Austria and Russia and the subsequent triumph of Austria at the Congress of Berlin (see BERLIN CONGRESS OF), over which Bismarck presided, caused a rift in Russo-German relations. A defensive alliance with Austria was now concluded (1879), and this Dual Alliance became a Triple Alliance when Italy adhered in 1882 (see TRIPLE ALLIANCE AND TRIPLE ENTENTE). Friendship with Russia was revived in the Reinsurance Treaty of 1887. Bismarck, with his system of alignments and alliances, became the virtual arbiter of Europe and was acknowledged as its leading statesman. Bismarck's influence upon Ger-

man domestic affairs was no less apparent. The empire, soon after its establishment, was disturbed by the KULTURKAMPF, a fierce struggle between the state on the one hand and the Roman Catholic Church and Catholic Center party on the other. The conflict initiated a period of cooperation between Bismarck and the liberals, who were violently anticlerical. However, the struggle lost intensity after Bismarck failed to break the power of the Center party, which made large gains in the Reichstag in 1878. The detente with the liberals foundered in the late 1870s after Bismarck's refusal to appoint three liberals to his ministry and his adoption of protective tariffs in place of the liberals' free trade position. Relations between Bismarck and the Center party continued to improve, and the chancellor turned his attention toward the socialists, who had increased their strength in the Reichstag particularly after the fusion of the Lassalle and Marxian socialists (1875). Bismarck at first met the socialist opposition with extremely repressive measures. The antisocialist law passed in 1878 prohibited the circulation of socialist literature, empowered the police to break up socialist meetings, and put the trial and punishment of socialists under the jurisdiction of police courts. Although the socialists were initially weakened, they again began to increase their number in parliament. Now, partly to weaken the socialists and partly as a result of his policy of economic nationalism, Bismarck instituted a program of sweeping social reform. Between 1883 and 1887, despite violent opposition, laws were passed providing for sickness, accident, and old age insurance, limiting woman and child labor, and establishing maximum working hours. Bismarck's new economic policy also resulted in the rapid expansion of German commerce and industry and the acquisition of overseas colonies and spheres of influence (see GERMANY). The Bismarckian era closed with the death of Emperor Frederick III. A struggle for supremacy between Bismarck and WILLIAM II developed immediately upon that emperor's accession in 1888 and ended with Bismarck's dismissal in 1890. Bismarck, created prince (*Fürst*) after the Franco-Prussian War, was now made duke (*Herzog*) of Lauenburg. He retired and spent the remainder of his life in verbal and written criticism of the emperor and his ministers and in defense of his own policies. See *Bismarck, the Man and the Statesman* (his reminiscences, tr by A. J. Butler, 1898, repr 1966), Erich Eyck, *Bismarck and the German Empire* (3d ed 1968), A. J. P. Taylor, *Bismarck, the Man and the Statesman* (1955, repr 1968), Otto Pflanze, *Bismarck and the Development of Germany* (2d ed 1971).

Bismarck, city (1970 pop 34,703), state capital and seat of Burleigh co., S central N Dak., on hills overlooking the Missouri River, inc 1873. A trade and distributing point for a large spring wheat, livestock, and dairy region, it is also the center for development of the rich oil reserves in nearby Williston Basin. Food items, farm machinery, woodwork, and concrete products are made. Lewis and Clark camped nearby in 1804-5. With the beginning of the river traffic in the 1830s, a steamboat port called the "Crossing on the Missouri" emerged there. In 1872, Camp Greeley (later Camp Hancock) was erected to protect the men who were building the Northern Pacific RR. When the railroad reached the fort the next year, a town was laid out, it was subsequently named Bismarck (for Germany's chancellor) in the hope of attracting German investment in the railroad. Bismarck boomed as a river port and railroad center and as a supply point for the Black Hills gold mines (1874). It became the territorial capital in 1883. Of interest are the state capitol (1932), a skyscraper, the state historical museum, and Camp Hancock museum. Mary College and a junior college are there. The state penitentiary is nearby.

Bismarck Archipelago, volcanic group (1969 est pop 213,000), 19,200 sq mi (49,730 sq km), SW Pacific, a part of Papua New Guinea. The group includes NEW BRITAIN (the largest island), NEW IRELAND, the ADMIRALTY ISLANDS, the Mussau Islands, LAVON GAI, the VITU ISLANDS, and the DUKE OF YORK ISLANDS. The islands are generally mountainous and have several active volcanoes. The chief agricultural products are copra, cacao, coffee, tea, and rubber. Some copper and gold are mined. The inhabitants are mainly Melanesians. Discovered in 1616 by the Dutch explorer Willem SCHOUTEN, the group became a German protectorate in 1884. Seized by Australian forces in World War I, the islands were mandated to Australia by the League of Nations in 1920. Japan operated several naval and air bases in the islands during World War II. In 1947, Australia re-

ceived trusteeship over the group from the United Nations. The archipelago was included in Papua New Guinea when it became self-governing in 1973.

bismuth (bīz'math) [Ger. *Weisse Masse* = white mass], metallic chemical element, symbol *Bi*, at no 83, at wt 208.98, m.p. 271.3°C, b.p. about 1560°C, sp. gr. 9.75 at 20°C, valence +3 or +5. Bismuth is a silver-white, reddish-tinged, brittle metallic element with a rhombohedral crystalline structure. It exhibits more metallic properties than the other members of group Va of the PERIODIC TABLE. It occurs free in nature to a small extent. Bismuth does not tarnish in air, but when heated it burns to form yellow fumes of the trioxide. It reacts with the halogens and with sulfur and is dissolved in nitric acid and hot sulfuric acid. Its soluble compounds are poisonous, but some of its insoluble compounds are used in medicine to treat certain gastric disorders and skin injuries. Bismuth is the poorest heat conductor of all the metals except mercury; it is the most diamagnetic of all metals. The major ores of bismuth, bismuthinite (the sulfide), also called bismuth glance, and bismite (the oxide), are found extensively in South America but are rare in the United States, where bismuth is obtained as a by-product of lead and copper refining. Bismuth expands upon solidification, this unusual property makes it useful in type-metal alloys and for castings. The most important use of bismuth is in the manufacture of low-melting alloys, such as Wood's metal, used in electrical fuses and in automatic fire alarm and sprinkler systems. Bismuth was recognized as a metal by early observers, including Georg Agricola, in the 16th cent., but was believed to be a kind of lead or tin until Claud J. Geoffroy established it as a separate element in 1753.

bison, large hoofed mammal, genus *Bison*, of the cattle family. Bison have short horns and humped, heavily mantled shoulders that slope downward to the hindquarters. The European bison, or wisent, *Bison bonasus*, is larger and has a less luxuriant mane and beard than the American species, *B. bison*. The American bison is commonly called BUFFALO, although true buffalo are African and Asian animals of the same family. *B. bison* is characterized by a huge, low-slung head and massive hump, its legs are shorter than those of the wisent. Males may reach a shoulder height of over 5 ft (1.5 m), a body length of 9 ft (2.7 m), and a weight of 2,500 lb (1,130 kg). The winter coat of the American bison is dark brown and shaggy, it is shed in spring and replaced by a coat of short, light-brown fur. Bison graze on prairie grasses, migrating south in search of food in the winter. They formerly roamed in vast herds over much of North America, especially on the Great Plains, and were hunted by the American Indians for their flesh and hides. With the arrival of European settlers they were subjected to a wholesale slaughter that resulted in their near extinction. They were killed for their tongues, regarded as a delicacy, and shot for sport from trains. At the beginning of the 19th cent. there were over 60 million bison in North America. By the middle of the century the bison was extinct E of the Mississippi, and by 1900 there remained only two wild herds in North America, one of plains bison in Yellowstone Park, and one of the larger variety, called wood bison, in Canada. Protective laws were passed beginning at the end of the last century, and the bison population has since risen from a few hundred to over 20,000. The wood bison may have vanished as a distinct race through hybridization with the plains bison. *Bison* are classified in the phylum CHORDATA, subphylum Vertebrata, class Mammalia, order Artiodactyla, family Bovidae. See F. G. Roe, *The North American Buffalo* (2d ed. 1970), Tom McHugh and Victoria Hobson, *The Time of the Buffalo* (1972).

Bispham, David Scull (bis'pam), 1857–1921, American baritone, b. Philadelphia. He made his operatic debut in London in 1891 and was leading Wagnerian baritone of the Metropolitan Opera Company, New York City, from 1896 to 1903. He advocated English translation of foreign operas and supported native opera in English. In 1921 the Opera Society of America established the Bispham Memorial Medal Award for American composers of such operas. See his *Quaker Singer's Recollections* (1920).

Bissagos Islands: see GUINEA-BISSAU.

Bissau (bisou'), town (1970 pop. 62,101), former capital of Guinea-Bissau (Portuguese Guinea), a port in the Geba estuary, off the Atlantic Ocean. It is the country's largest city, major port, and administrative and military center. Bissau has been a free port since 1869 and handles some transit trade. Peanuts, hardwoods, copra, palm oil, and rubber are the

chief items shipped. Bissau has little industry, except for food and beverage processing. The city was founded in 1687 by the Portuguese as a fortified port and trading center. In 1942 it became the capital of Portuguese Guinea but was replaced by Madina do Boe in 1974.

Bisschop, Simon: see EPISCOPIUS, SIMON.

Bisutun Inscription: see BEHISTUN INSCRIPTION.

bit: see DRILL.

bites and stings: see FIRST AID.

Bithiah (bithi'ah), a Pharaoh's daughter, wife of a Judahite. 1 Chron. 4:18.

Bithron (bith'rōn), unidentified place, E of the Jordan, probably a wadi. 2 Sam. 2:29.

Bithynia (bithin'ēa), ancient country of NW Asia Minor, in present-day Turkey. The original inhabitants were Thracians who established themselves as independent and were given some autonomy after Cyrus the Great incorporated Bithynia into the Persian Empire. After the death of Alexander the Great, the Bithynians took advantage of the wars of the Diadochi to secure freedom from the Seleucids (297 B.C.). They established a dynasty under the leadership of Zipoetes who was succeeded (c.280 B.C.) by Nicomedes I, who founded Nicomedia as the capital of his flourishing state. During his time and the following reigns of Prusias I, Prusias II, and Nicomedes II, wars continued with the Seleucids and with Pergamum. In the 1st cent. B.C., Mithradates V of Pontus had designs on Bithynia, which was ruled by Nicomedes IV (sometimes confused with Nicomedes III), a client of Rome. When Nicomedes died (74 B.C.) he willed Bithynia to Rome. The last of the wars with Mithradates resulted. Bithynia was an important province of Rome. For some time after Pompey's rearrangement of the empire it was combined with western Pontus as a single colony. Pliny the Younger (see under PLINY THE ELDER) was governor of the province (A.D. c.110) under the emperor Trajan. The reign of Hadrian soon after seems to have marked the end of Bithynian prosperity. It was invaded briefly by the Goths (A.D. 298).

Bitlis (bitlis'), town (1970 pop. 20,556), capital of Bitlis prov., E Turkey, on a tributary of the Tigris River, at c.4,500 ft (1,370 m). Grains, fruit, and tobacco are grown nearby. Located on a passage through the Taurus mts., it was an important caravan center for centuries and was captured by Persians, Arabs, Seljuk Turks, Byzantines, and Ottoman Turks. In the 19th cent. the town had a large Armenian population.

Bitola (bē'tōlā), Serbo-Croatian *Bitolj*, formerly *Monastir*, city (1971 pop. 124,648), extreme S Yugoslavia, in Macedonia. It is a commercial and industrial center for the surrounding agricultural area. Bitola was a major agricultural center in Roman times. Later settled by Slavs, it became a bishopric in the 11th cent. In 1395 the Turks conquered Bitola, which became an important military and commercial center in the 15th and 16th cent. and a Balkan administrative center in the 19th cent. The city suffered much damage during the Balkan Wars (during which the Serbs took it from the Turks) and in World War I. Bitola is noted for its numerous mosques, churches, and a former Turkish market.

Bitolj: see BITOLA, Yugoslavia.

Biton (bitōn) and **Cleobis** (kleō'bīs), in Greek mythology, sons of the priestess Cydippe. When their mother wanted to see a famous temple of Hera, which was many miles away, the brothers dragged her chariot there. At the end of the long journey Cydippe prayed to Hera that her sons might receive the greatest of blessings. Their reward was instant and painless death.

Bitonto (bētōn'tō), city (1971 pop. 41,560), Apulia, S Italy. It is an agricultural market and is noted for its olive oil. The Spanish under Charles Bourbon defeated the Austrians there in 1734 during the War of the Polish Succession. The Apulian Romanesque cathedral (12th–13th cent.) is especially remarkable for its fine sculptures.

Bitterfeld (bit'rēft), city (1970 pop. 28,964), Halle district, central East Germany, on the Mulde River. It is an industrial center and rail junction. Manufactures include chemicals, aluminum, machinery, and plastics. Lignite is mined in the region. Bitterfeld was founded in the mid-12th cent. and passed to Prussia in 1815.

bittern, common name for migratory marsh birds of the family Ardeidae (HERON family). The American bittern (*Botaurus lentiginosus*), often called "stake driver" because of the male's booming call in the spring, is widely distributed in E North America. It is mostly nocturnal and feeds on frogs, fish, and in-

sects. When pursued, the bittern escapes detection by standing motionless with bill uplifted, its brown and yellow markings and striped foreneck blending with the marsh grasses. It is about 2 to 3 ft (61–91 cm) tall, the western and eastern least bitterns, genus *Ixobrychus*, are about half this size. Of the 12 species of bitterns, 8 constitute the smaller birds. The female bittern builds the nest, which consists of an unkempt arrangement of sedge grass and reeds. The nests are built on the ground along rivers or lakeshores and house the clutch of 3 to 6 eggs. Both male and female share the incubation duties. Bitterns are classified in the phylum CHORDATA, subphylum Vertebrata, class Aves, order Ciconiiformes, family Ardeidae.

Bitterroot, river, c.120 mi (190 km) long, rising in SW Montana and flowing north to join the Clark Fork River near Missoula. A Roman Catholic mission was built in the river valley in 1841, and the missionaries are credited with establishing farming in the area. The Bitter Root project irrigates c.17,000 acres (6,880 hectares).

bitterroot: see PURSLANE.

Bitterroot Range, part of the Rocky Mts., on the Idaho-Mont. line. The main range, running north-west-southeast, includes Trapper Peak (10,175 ft/3,101 m high), Mt. Garfield (10,961 ft/3,341 m), in an east-running spur to the south, is the highest peak. Discovered in the 1804–5 expedition of Lewis and Clark, this rugged mountain range has long been one of the most impenetrable in the United States, except for its foothills, it remains almost completely unexploited today.

bitters, various alcoholic beverages containing bitter principles, such as angostura bark, cascarilla, quassia, gentian, orange, quinine, and other flavoring agents, and prepared by infusion or distillation. They are used as appetizers, digestives, and flavoring for mixed drinks and frequently attain an alcoholic strength of 40%.

bittersweet, name for two unrelated plants, belonging to different families, both fall-fruited woody vines sometimes cultivated for their decorative scarlet berries. One, called also woody NIGHTSHADE (*Solanum dulcamara*), is an Old World plant now naturalized in North America, belonging to the family Solanaceae (NIGHTSHADE family). The twigs and stems are occasionally used medicinally for a narcotic poison similar to belladonna. The more popular bittersweet (*Celastrus scandens*), a plant of the family Celastraceae (STAFF TREE family), grows in thickets from Maine to North Carolina and W to Nebraska. Its berry is surrounded by an orange-yellow capsule. Both bittersweets are classified in the division MAGNOLIOPHYTES, class Magnoliopsida. *S. dulcamara* belongs to the order Polemoniales, family Solanaceae. *C. scandens* belongs to the order Celastrales, family Celastraceae.

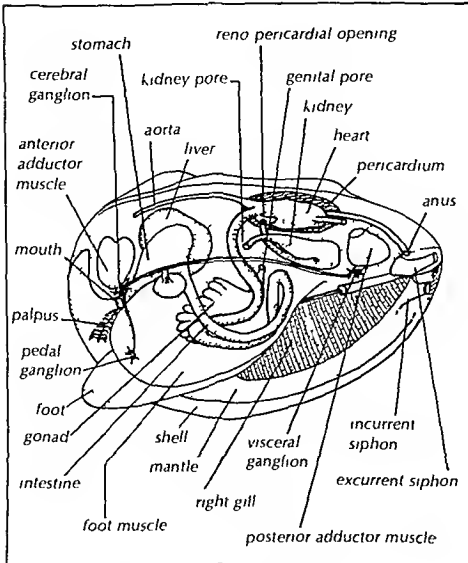
bitumen (bit'yū'mən), any of several mixtures of hydrocarbons, including asphalt, tar, and crude petroleum. Substances containing bitumens are called bituminous (e.g., bituminous coal).

bituminous coal: see COAL.

Bitzias, Albert: see GOTTFELD, JEREMIAS.

bivalve, aquatic mollusk of the class Pelecypoda ("hatchet-foot"), with a laterally compressed body and a shell consisting of two valves, or movable pieces, hinged by an elastic ligament. The valves cover the right and left sides of the animal; they are hinged dorsally (above the body) and open ventrally (below the body). Usually the two valves are similar and equal in size, but in some forms, such as the OYSTER, that attach to the substratum by one valve (i.e., lying on their sides), the left-hand (or upper) valve is larger than the right-hand (or lower) one. Two muscles, called adductors, run between the inner surfaces of the two valves, acting antagonistically to the hinge ligament; they enable the shell to close rapidly and tightly. Within the shell is a fleshy layer of tissue called the mantle; there is a cavity (the mantle cavity) between the mantle and the body wall proper. The mantle secretes the layers of the shell, including the inner nacreous, or pearly, layer. Sometimes a pearl is formed as a reaction to irritation, by the depositing of nacreous layers around a foreign particle. The head is much reduced, without eyes or tentacles, and a muscular hatchet-shaped foot projects from the front end of the animal, between the valves. The foot is used for burrowing, and, in some bivalves (e.g., razor clams), to swim. Many bivalves have two tubes, or siphons, extending from the rear end: one (the incumbent siphon) for the intake of oxygenated water and food, and one (the excurrent siphon) for the outflow of

waste products. The two tubes may be joined in a single siphon, or "neck." The gills, suspended within a mantle cavity, are usually very large and



Internal anatomy of a clam, Anodonta, representative mollusk of the class Pelecypoda (the bivalves)

function in food gathering (filter feeding) as well as in respiration. As water passes over the gills, tiny organic particles are strained out and are carried to the mouth. Members of the order Septibranchia, however, lack gills and feed on small crustaceans and worms. Bivalves have a complete digestive tract, a reduced nervous system, a complete, open circulatory system with a chambered heart, arteries, veins, and blood sinuses, and excretory and reproductive organs. In most species the sexes are separate, and the eggs and sperm are shed into the water, where fertilization occurs. The larval stage is free-swimming and lacks a shell. Bivalves differ in their habits: some, such as the oysters and marine mussels, have a reduced foot and are permanently attached to a substratum; some, such as the clams and freshwater mussels, burrow rather slowly through the sand or mud using the foot; some, such as the cockle shells, live on or near the surface of the ocean floor; still others, such as the shipworm, burrow through rocks or wood seeking protected dwellings and do damage to rock pilings and other marine installations. The scallops swim with great speed by suddenly clapping the shell valves together and ejecting water from the mantle cavity. Bivalves that are exposed at low tide, such as the marine mussels, keep their gills wet with water retained in the mantle cavity. Because of the enormous variety of sizes, shapes, surface sculpturing, and colors, shell characteristics are of great importance in the identification and classification of bivalves. Shells range in size from the tiny ($1/16$ -in/2-mm) seed shells characteristic of members of the freshwater family Sphaeriidae to the GIANT CLAM, *Tidacna*, of the South Pacific, which attains a length of over 4 ft (120 cm) and may weigh over 500 lb (225 kg). Bivalves are an important food source for humans, as well as for gastropods, fish, and shore birds. They are classified in the phylum MOLLUSCA, class Pelecypoda.

Biwa (bē'wa), lake, c 40 mi (60 km) long and from 2 to 12 mi (3.2-19 km) wide, Shiga prefecture, 5 Honshu, Japan. The lake, shaped like the biwa, a musical instrument, is the largest in Japan and is a popular scenic resort. It abounds in fish, textile industries flank its shores. Canals from the lake to Kyoto provide water supply and a transportation route.

Biysk (bē'sk), city (1970 pop. 186,000), 5 central Siberian USSR, on the Biya River. A port and the terminus of a branch of the Turkistan-Siberia RR, Biysk manufactures food-processing equipment. The city was founded as a fortress in 1709; its name is sometimes spelled Bisk or Bisk.

Bizerte (bēzērt'), Arab Banzart, city (1966 pop. 51,708), N Tunisia, on the Mediterranean Sea. It is an important port, strategically situated near the narrowest part of the Mediterranean. The city also has processing industries. Bizerte was founded by Phoenicians. While the French ruled Tunisia, they im-

proved and fortified the outer harbor and deepened the channel to the Lake of Bizerte, where there are naval works and the town of Menzel Bourgiba. The White Russian fleet (1920) and the Spanish republican fleet (1939) were interned at Bizerte. It was a German base in World War II and was heavily bombed (1943) by the Allies. Tunisian insistence that France evacuate its naval installations at Bizerte led to violent confrontations in 1961; the base was turned over to Tunisia in 1963.

Bizet, Georges (zhōrhz bēzā'), 1838-75, French operatic composer. The son of professional musicians, he entered the Paris Conservatory at the age of nine and won the Prix de Rome in 1857. He was a gifted pianist and composed instrumental music in his teens. Bizet is celebrated for his opera *Carmen* (1875), based on a story by Mérimée. One of the most popular operas ever written, *Carmen* has music that is lush, melodic, and brilliantly orchestrated. It unfolds a story of love, hate, jealousy, and murder, set in the exotic world of Spanish gypsies and bullfighters. Bizet's other works include the operas *The Pearlfishers* (1863), *The Fair Maid of Perth* (1867), and *Djamleh* (1872), *Symphony in C Major* (1855), and incidental music to Daudet's *L'Arlesienne*, in the form of two orchestral suites. See biographies by Winton Dean (1965) and Mina Curtiss (1958, repr. 1974).

Bizjōthjah (bīzjōth'jah), name in a geographical list married by copyists. Joshua 15:28.

Biztha, chamberlain of Ahasuerus. Esther 1:10.

Bjerknes, Vilhelm Frimann Koren (vī'hēlm frē'man kō'rən byēr'k'nēs), 1862-1951, Norwegian physicist and pioneer in modern meteorology. He worked on applying hydrodynamic and thermodynamic theories to atmospheric and hydrospheric conditions in order to predict future weather conditions. Bjerknes was professor at the universities of Oslo (1907-12, 1926-32), Leipzig (1912-17), and Bergen (1917-26), where he set up a geophysical institute. His work in meteorology and on electric waves was important in the early development of wireless telegraphy. His publications include *Fields of Force* (1906) and the classic book *On the Dynamics of the Circular Vortex with Applications to the Atmosphere and to Atmospheric Vortex and Wave Motion* (1921); he is also coauthor with J. W. Sandstrom (on Vol. I) and with T. Hesselberg and O. Devik (on Vol. II) of *Dynamic Meteorology and Hydrography* (Vol. I and II, 1910-11, Vol. III, 1951). He evolved a theory of cyclones known as the polar front theory with his son Jakob Aall Bonnevie Bjerknes, 1897-, who became a U.S. citizen in 1946. Jakob Bjerknes served as professor of meteorology at the Univ. of Bergen (1931-40) and at the Univ. of California (from 1940).

Bjorling, Jussi (yōōs'ī byor'ling), 1907-60, Swedish tenor. He studied at the Royal Opera School in Stockholm, making his debut there in 1930 as Don Ottavio in Mozart's *Don Giovanni*. He made guest appearances in leading roles with opera companies in Copenhagen, Dresden, Prague, Vienna, Paris, and Buenos Aires. In the United States he was acclaimed at a recital in 1937 in Springfield, Mass. He appeared that year with the Chicago Civic Opera Company and was engaged for the 1938-39 season at the Metropolitan Opera House. During World War II Bjorling remained in Sweden, returning to the United States to rejoin the Metropolitan Opera Company in 1945. Because his voice was both lyric and dramatic, he had an extensive repertory, including leading roles in *La Bohème*, *Rigoletto*, *Il Trovatore*, and *Faust*.

Bjorneborg, Finland. See PORI.

Bjornøya (byōrn'ōya), island, 69 sq mi (179 sq km), in the Barents Sea, c 275 mi (440 km) N of Norway, southernmost island of Svalbard. It rises to 1,759 ft (536 m). There are polar fox and polar bear on the island. Probably known to Norsemen in the 12th cent., it was rediscovered by Willem Barentz, the Dutch navigator, in 1596, and was formally annexed by Norway in 1915. It is also known as Bear Island.

Bjornson, Bjørnstjerne (byōrn'styēr'nə byōrn'sōn), 1832-1910, Norwegian writer and political leader, one of the major figures of Norwegian literature. A brilliant journalist, he long had great influence in Norway. As a dramatist, he sought to break the Danish yoke on the Norwegian theater, as an orator, to revive Norwegian as a literary language, and as a reformer, to champion the rights of the oppressed. His celebrated *Synnove Solbakken* (1857, first tr. 1881, *Sunny Hill*, 1932), was perhaps the first Norwegian major novel. Bjornson succeeded his friend Ibsen as director of the Ole Bull Theater in Bergen

(1857-59) and then became involved in politics, fighting against Norwegian amalgamation with Sweden and championing parliamentary democracy. To link the resurgent nation with its epic past he created sagalike dramas, the finest of which is the trilogy *Sigurd Slembe* (1862, tr. 1888). Bjornson became national poet of Norway—one of his poems became the national anthem—and reached his pinnacle as a lyric poet while abroad in Europe (1860-63). Returning to Oslo in 1863, he was granted an annuity and directed the Oslo Theater until 1867. In the next years he wrote his finest works: the novel *The Fisher Girl* (1868, tr. 1871), the epic poem *Arnljot Gelline* (1870, tr. 1917), and *The Bankrupt* (1875, tr. 1914). After enduring a religious crisis (1878-79) Bjornson accepted Darwinian evolution in a religious context, rejecting traditional religion. From this time his writings urged the liberation of the human spirit from dogma and prejudice. The story *Dust* (1882, tr. 1884) supported secular education, the play *A Gauntlet* (1883, tr. 1890) attacked the double standard, and the drama *Beyond Our Power* (2 parts, 1883-95, tr. of 1st part, Pastor Sang, 1893, tr. of 2d part, *Beyond Human Might*, 1914) treated basic social and philosophic conflicts in modern society. Bjornson received the 1903 Nobel Prize in Literature. See biography by Harold Larson (1944), separate study in G. M. C. Brandes, *Henrik Ibsen* (1964).

Bjornsson, Sveinn (svān byōrn'sōn), 1881-1952, Icelandic diplomat and political leader, first president of Iceland (1944-52). A distinguished lawyer, he was elected to the Althing (Icelandic parliament) for the first time in 1914. From 1912 to 1920 he was president of the Reykjavik city council. During World War I, Bjornsson undertook numerous diplomatic missions to Great Britain and the United States and afterward served as minister to Denmark (1920-41). He was regent of Iceland from 1941 to 1944, when, on Iceland's independence from Denmark, he became president. He was reelected in 1945 and 1949.

Bk, chemical symbol of the element BERKELIUM.

Blacher, Boris (bla'khər), 1903-, Estonian-German composer, b. Ying-k'ou, China. Blacher lived for six years in Siberia. He studied in Berlin and in 1953 became the director of the West Berlin Conservatory of Music. Blacher has written concertos for various instruments, numerous operas, including *200,000 Taler* (1969, after Sholem Aleichem), ballets, chamber music, and song cycles. He has experimented with variable meters or rhythmic rows, as in *Ornaments* (1953) for orchestra, and with abstract operas concerned with human situations but without plot.

Black, Greene Vardiman, 1836-1915, American dentist, b. Scott co., Ill. Professor at Chicago College of Dental Surgery (now part of Loyola Univ.) from 1883 to 1889 and professor (from 1891) and dean (from 1897) at the Northwestern Univ. dental school, he made large contributions to dentistry as teacher, as originator of methods and instruments, and as author. His works include *Formation of Poisons by Microorganisms* (1884), *Dental Anatomy* (1891), and *Operative Dentistry* (1908). The Black method of preparing amalgam alloys for fillings is still in use.

Black, Hugh, 1868-1953, Scottish-American theologian and author. After serving as a pastor in Paisley and Edinburgh, he emigrated to the United States in 1906 to begin a professorship of practical theology in Union Theological Seminary, New York City. His books include *Culture and Restraint* (1900), *Christ's Service of Love* (1907), *The New World* (1915), *The Adventure of Being Man* (1929), and *Christ or Caesar* (1938).

Black, Hugo Lafayette, 1886-1971, Associate Justice of the U.S. Supreme Court (1937-71), b. Harlan, Clay co., Ala. He received his law degree from the Univ. of Alabama in 1906. He practiced law and held local offices before serving (1927-37) in the U.S. Senate. As Senator he ardently supported New Deal measures, conducted Senate investigations of merchant-marine subsidies (1933) and lobbying (1935), and sponsored (1937) the Wages and Hours bill. His appointment to the Supreme Court by President Franklin Delano Roosevelt met strong opposition from the public and in the Senate because of his earlier membership in the Ku Klux Klan. Black was, however, a staunch defender of civil liberties, and he became the leader of the activists on the Supreme Court, consistently opposing congressional and state violations of free speech and due process. See study by Virginia Hamilton (1972).

Black, James, 1823-93, American temperance leader. A Pennsylvania lawyer, he was active in state and national temperance work. His plan for a National

Publication House was adopted by the National Temperance Convention (1865). In 1872, as presidential nominee of the Prohibition party, he gained some 5,000 votes.

Black, Jeremiah Sullivan, 1810-83, American cabinet officer, b Somerset co, Pa. Admitted to the Pennsylvania bar in 1830, Black became a successful lawyer. As U.S. Attorney General (1857-60) under President Buchanan he hired Edwin M. Stanton, later his successor, to clear up the involved land-title cases in California. Black was less successful, however, in enforcing unpopular legislation concerning slavery. It was his opinion that although the seceding Southern states could not be coerced, Federal property in the South should be protected, and measures taken to resist armed rebellion. He replaced (Dec., 1860) Lewis Cass as Secretary of State and succeeded in persuading Buchanan to send supplies to Fort Sumter. Buchanan appointed him to the Supreme Court in Feb., 1861, but the Senate, with both Democrats and Republicans hostile to Black, refused to confirm him. See P. G. Auchampaugh, *James Buchanan and His Cabinet on the Eve of Secession* (1926), biography by W. N. Brigrance (1934, repr. 1971).

Black, Joseph, 1728-99, Scottish chemist and physician, b France. He was professor of chemistry at Glasgow (1756-66) and from 1766 at Edinburgh. He is best known for his theories of latent heat and specific heat. He also laid the foundations of chemistry as an exact science in his investigations on magnesium carbonate, during which he discovered carbon dioxide, which he called "fixed air."

Black, Max, 1909-, American analytical philosopher, b Baku, Russia, grad Cambridge Univ., Ph.D. Univ. of London, 1939. He taught at the Univ. of Ill. (1940-46) before going to Cornell Univ. (1946). Influenced by Ludwig Wittgenstein, he wrote *A Companion to Wittgenstein's Tractatus* (1964). His concern with clear language was expressed in *Language and Philosophy* (1949), *Models and Metaphors* (1962), *The Labyrinth of Language* (1968), and *Margins of Precision: Essays in Logic and Language* (1970).

black-and-tan coonhound: see COONHOUND, BLACK-AND-TAN

Black Angus cattle: see ANGUS CATTLE

Blackbeard, d. 1718, English pirate. His name was probably Edward Teach, Thatch, or Thach. It is supposed that he began as a privateer in the War of the Spanish Succession (1701-14) and at its end turned pirate. Between 1716 and 1718 he preyed on the shipping and coastal settlements of the West Indies and the Atlantic coast of North America, becoming notorious for his cruelty. His headquarters were in the Bahamas and the Carolinas. The compliant governor of North Carolina shared some of the booty, but despite such protection Blackbeard was killed by a British force sent from Virginia. Legend has romanticized Blackbeard's history.

Black Belt, term loosely applied to several areas of the U.S. South that are characterized by black soil and excellent cotton-growing conditions. The Black Belt of NE Mississippi and S central Alabama, in the heart of the Old South and generally associated with the term, was historically important as the nation's main cotton producer in the mid-1800s. Soil depletion, erosion, the boll weevil, and economic conditions combined to drive cotton from the region. Livestock, peanuts, and truck crops are now the chief crops. The Coastal Cuesta of central South Carolina and Georgia is one of the original cotton-producing areas in the United States. It remains an important cotton producer because of the extensive use of fertilizers and its proximity to textile mills. The Black Prairie of E Texas, extending north from the Gulf coastal plain to the Red River, has the state's richest farmland and is one of the best cotton-growing areas in the United States.

blackberry, name for several species of thorny plants of the genus *Rubus* of the family Rosaceae (ROSE family). See BRAMBLE.

blackbird, common name in North America of a perching bird allied to the bobolink, the meadow lark, the oriole, and the grackle and belonging to the family Icteridae. The European blackbird, *Turdus merula*, is a thrush. The red-winged blackbird of E North America is a familiar sight, its scarlet shoulder patches conspicuous among the tall grasses of the marshes and wet meadows where it nests. It eats grain, insects, and weed seeds. Another common species is the yellow-headed blackbird, *Xanthocephalus xanthocephalus*. Except during the breeding season blackbirds usually travel in flocks. The yellow-headed, the tricolored red-winged, and

brewer blackbirds are found in the West. The rusty blackbird, glossy blue-black in summer when the brown edging of its winter feathers has worn off, winters in the United States. Many members of the family are polygamous, although the incidence of polygamous behavior varies from population to population. For example, in the brewer blackbird, the male becomes polygamous only when there are more females than males, when the balance is even, monogamy is the rule. The female blackbird usually builds the nest, which consists of a cup-shaped structure made of grasses. Flocks of blackbirds may be as large as 5 million birds, and they often do serious crop damage when foraging for food. However, the birds are invaluable because of the insects they consume. Blackbirds are classified in the phylum CHORDATA, subphylum Vertebrata, class Aves, order Passeriformes, family Icteridae.

black body, in physics, an ideal black substance that absorbs all and reflects none of the radiant energy falling on it. Lampblack, or powdered carbon, which reflects almost 2% of the radiation falling on it, approximates an ideal black body. Since a black body is a perfect absorber of radiant energy, by the laws of thermodynamics it must also be a perfect emitter of radiation. The distribution according to wavelength of the radiant energy of a black body radiator depends on the absolute temperature of the black body and not on its internal nature or structure. As the temperature increases, the wavelength at which the energy emitted per second is a maximum decreases. This phenomenon can be seen in the behavior of an ordinary incandescent object, which gives off its maximum radiation at shorter and shorter wavelengths as it becomes hotter and hotter. First it glows in long red wavelengths, then in yellow wavelengths, and finally in short blue wavelengths. In order to explain the spectral distribution of black body radiation, Max Planck developed the QUANTUM THEORY in 1901. In thermodynamics the principle of the black body is used to determine the nature and amount of the energy emitted by a heated object.

blackbuck, small antelope, *Antelope cervicapra*, found in plains and open forest throughout India. Males are dark brown above and white below, with white rings around the eyes; they stand about 32 in (81 cm) at the shoulder and weigh about 90 lb (41 kg). Their heavily ridged, corkscrew-shaped horns are about 18 in (45 cm) long. The smaller, hornless females are fawn-colored above and white below. Blackbucks graze in herds of 10 to 100 individuals and, unlike most antelopes, graze mostly by day, even in intense heat. They are extremely swift animals; a cheetah can run down a blackbuck, but only if it overtakes it in the first few hundred yards. Although they have been hunted intensively by man, sometimes with the aid of cheetahs, blackbucks have survived in large numbers. They are classified in the phylum CHORDATA, subphylum Vertebrata, class Mammalia, order Artiodactyla, family Bovidae.

Blackburn, Joseph, b. c. 1700, d. after 1765, American portrait painter. Little is known concerning him except that from 1750 to 1765 he painted portraits (usually signed J.B.), chiefly of members of distinguished families in Boston and Portsmouth, N.H. Imitating the English rococo style, he painted portraits of Col. Theodore Atkinson (Worcester Art Mus.), three members of the Greenleaf family (Metropolitan Mus.), and the Isaac Winslow Family (Mus. of Fine Arts, Boston).

Blackburn, county borough (1971 pop. 101,672), Lancashire, NW England. It was formerly a great cotton-weaving center, noted especially for calicoes. Textiles are still important, but now there are other large industries that make engineering equipment, radio parts, beer, felt, and carpets. Blackburn is also an agricultural market. The textile industry started very early—Blackburn checks (a linen product made of Irish flax) were well known about the middle of the 17th cent. When James Hargreaves invented (c. 1765) the spinning jenny nearby, the manufacture of cotton goods received a new impetus. The completion of the Leeds-Blackburn-Liverpool Canal in 1816 substantially aided Blackburn's 19th-century economic growth. John Morley, the statesman, was born in Blackburn. There is a technical college in the borough. In 1974, Blackburn became part of the new nonmetropolitan county of Lancashire.

Black Canyon of the Gunnison National Monument: see NATIONAL PARKS AND MONUMENTS (table), GUNNISON, river

black codes, in U.S. history, series of statutes passed by the ex-Confederate states, 1865-66, dealing with the status of the newly freed Negroes. They varied greatly from state to state as to their harshness and

restrictiveness. Although the codes granted certain basic civil rights to Negroes (the right to marry, to own personal property, and to sue in court), they also provided for the segregation of public facilities and placed severe restrictions on the freedman's status as a free laborer, his right to own real estate, and his right to testify in court. The North interpreted the codes as an attempt by the South to reenslave the Negro. The FREEDMEN'S BUREAU prevented their enforcement, and the codes were later repealed by the radical Republican state governments.

Black Country, highly industrialized region, mostly in Staffordshire but partly in Worcestershire and Warwickshire, W central England. It includes the cities of Dudley, Rowley Regis (see WARLEY), Tipton, Walsall, Wednesbury, West Bromwich, and Wolverhampton. From the mid-18th to the mid-19th cent. the area's resources—coal, iron, clay, and limestone—made iron smelting and the manufacture of iron products the main industries. The black smoke from the factories gave the region its name. Today the iron and coal mines are depleted, and the manufacturing industries utilize iron, steel, brass, and copper from outside the region to make metal products. These include hardware, tubes, boilers, machinery and machine tools, home appliances, and road and rail vehicles. There are also chemical and constructional-engineering industries.

Black Death: see PLAGUE

Black Douglas: see DOUGLAS, SIR JAMES DE LORD OF DOUGLAS

black earth: see CHERNOZEM

Blackett, Patrick Maynard Stuart (blāk'it), 1897-1974, English physicist. He was professor of physics at the Univ. of Manchester (1937-53) and in 1953 became professor at the Univ. of London. For his work in improving and extending the use of the Wilson cloud chamber and for his discoveries concerning cosmic rays he received the 1948 Nobel Prize in Physics. He is the author of *Military and Political Consequences of Atomic Energy* (1948, rev. ed. 1949), *American ed. Fear, War and the Bomb* (1949) and *Atomic Weapons and East-West Relations* (1956). In 1965 he was elected president of the Royal Society, London.

black-eyed bean or black-eyed pea: see COWPEA

black-eyed Susan or yellow daisy, North American daisylike wild flower (*Rudbeckia hirta*) of the family Compositae (COMPOSITE family) with yellow rays and a dark brown center. It is a weedy biennial or annual and grows in dry places. The black-eyed Susan and the other rudbeckias are called yellow coneflowers. The most widely cultivated is the golden glow (*R. laciniata hortensis*), a tall double-blossomed perennial. Black-eyed Susans are classified in the division MAGNOLIOPHYTA, class Magnoliopsida, order Asterales, family Compositae.

Blackfeet Indians: see BLACKFOOT INDIANS

black fly, name for any of the FLIES of the family Simuliidae. The black fly is about 1/8 in (32 cm) long and has large eyes, short legs, a stout, humped back, broad gauzy wings, and piercing-sucking mouthparts. Species of black flies occur worldwide. The female inflicts a painful bite, sucking the blood of birds and mammals, including humans. Livestock and other large mammals may be bitten to death by swarms of black flies, the black fly problem of some subarctic regions is so severe as to make human settlement impossible. Some tropical African and American species carry the larvae of roundworms that in human hosts cause swellings of the skin and eyes and sometimes blindness. The eggs of black flies are commonly laid in masses on wet rocks, logs, and plants; the larvae live in fast flowing water, clinging to rocks by means of anal sucking disks and straining out organic matter by fanlike head organs. Pupation occurs underwater; the pupa accumulates a bubble of air in its case, enabling it to rise to the surface and emerge when mature. The Adirondack black fly, *Simulium hirtipes*, the white stockinged black fly, *S. venustum*, the buffalo gnat, *S. pecuarum*, and the turkey gnat, *S. mendonae*, are common species. Black flies are classified in the phylum ARTHROPODA, class Insecta, order Diptera, family Simuliidae. See INSECT.

Blackfoot Indians, North American Indians of the Algonquian branch of the Algonquian-Wakashan linguistic stock (see AMERICAN INDIAN LANGUAGES). They occupied in the early 19th cent. a large range of territory around the Upper Missouri (above the Yellowstone) and North Saskatchewan rivers W to the Rockies. Their name derives from the fact that they dyed their moccasins black. There were three main tribes—the Siksika, or Blackfoot proper, the

Piegán, and the Kainah, or Blood. Although they did not form a unified political entity, they were united in defending their lands and in warfare. The Atsina Indians (related to the Arapaho) and the Athapascan-speaking Sarsi Indians were allied with the Blackfoot group. The Blackfoot were unremittingly hostile toward neighboring tribes and usually toward white men, intrusions upon Blackfoot lands were efficiently repelled. Prior to the mid-18th cent they had moved into the N Great Plains area, acquired horses from southern tribes, and developed a nomadic Plains culture, largely dependent on the buffalo. Their only cultivated crop was tobacco, grown for ceremonial purposes. With the early coming of the white man, the Blackfoot gained wealth from the sale of beaver pelts, but the killing off of the buffalo and the near exhaustion of fur stocks brought them to near starvation. Presently there are some 6,200 Blackfeet on a reservation in Montana and another 2,600 on a reservation in Alberta. They continue to a small degree the rich ceremonialism that earlier marked their religion, important rituals include the sun dance and the vision quest. See J. C. Ewers, *The Blackfeet: Raiders on the Northwestern Plains* (1958, repr. 1967), H. A. Dempsey, *Crowfoot, Chief of the Blackfeet* (1972), Malcolm McFee, *Modern Blackfeet* (1972).

Black Forest, Ger. *Schwarzwald*, mountain range, SW West Germany, extending 90 mi (145 km) between the Rhine and Neckar rivers. Feldberg is the highest (4,898 ft/1,493 m) peak. The range is covered by dark pine forests and cut by deep valleys and small lakes. The Danube and Neckar rivers rise there. Lumbering is an important economic activity. Orchards and cattle are found in the valleys, grains are grown in the highlands. The Black Forest is famous for its clock and toy industries (cuckoo clocks, music boxes). It is a year-round resort area, Baden-Baden and Freiburg are the chief cities.

Black Friday, Sept. 24, 1869, in U.S. history, day of financial panic. In 1869 a small group of American financial speculators, including Jay Gould and James Fisk, sought the support of Federal officials of the Grant administration in a drive to corner the gold market. The attempt failed when government gold was released for sale. The drive culminated on a Friday, when thousands were ruined—the day is popularly called Black Friday. There was great indignation against the perpetrators. Several other days of financial panic have also been occasionally referred to as Black Friday.

black gum, ornamental deciduous tree (*Nyssa sylvatica*) native to E North America. The leaves turn bright scarlet in the fall. The very tough wood has been used for wheel hubs and other purposes. It is sometimes called sour gum, tupelo, and pepperidge, names also given other species of the genus, some native to Asia. The genus *Nyssa* is probably derived from an ancestral dogwood and is included by some botanists in the family Cornaceae (dogwood family) of the division MAGNOLIOPHYTES, class Magnoliopsida, order Cornales.

Black Hand, symbol and name for a criminal and terroristic secret society, and especially associated with the MAFIA and the CAMORRA. The Black Hand flourished in Sicily in the late 19th cent., and in the United States it was especially active in New York City at the beginning of the 20th cent. It is estimated that at one time 90% of New York City's Italian population was blackmailed by letters threatening death and marked with a black hand. Famous incidents associated with the Black Hand include the murder (1890) in New Orleans of chief of police Daniel Hennessy and the shooting (1909), in Palermo, Italy, of Lt. Joseph Petrosino of the New York City police.

black hawk. see HONEYSUCKLE

Black Hawk War, conflict between the Sac and Fox Indians and the United States in 1832. After the War of 1812, whites settling the Illinois country exerted pressure on the Indians. A treaty of 1804, which had no real claim to validity, provided for removal of the Sac and Fox Indians W of the Mississippi. An Indian leader, Black Hawk (1767-1838), who was born in the Sac village near the site of present Rock Island, Ill., and who had fought for the British in the War of 1812, denounced the treaty and resisted removal. Years of intermittent skirmishing followed. In 1831 the whites used force to impose a new treaty that compelled the Indians to retire from their lands. In April, 1832, Black Hawk, with some 400 braves and their families, returned to Illinois. Not receiving the support he expected, he admitted defeat, but when one of the peaceful emissaries he sent was shot down in cold blood, the outraged Black Hawk suc-

cessfully attacked a larger white force, then retired into what is now Wisconsin. A large force of volunteers was gathered under Gen. Henry Atkinson. The last battle of the war took place on the Bad Axe River, where Black Hawk was attacked by these troops and a Sioux war party. Trapped, he displayed a white flag, but this was ignored and almost all of his band, including women and children, were wiped out. Black Hawk himself escaped, surrendered to the Winnebago, was turned over for imprisonment, and was released in 1833 to return to the pitiful remnant of his tribe and his family in Iowa. Lorado Taft's colossal statue (1911) near Oregon, Ill., has come to be known as the Black Hawk Monument. See his autobiography (1833, ed. by Donald Jackson, 1955), Cyrenus Cole, *I Am a Man: The Indian Black Hawk* (1938).

blackhead, yellowish or blackish plug of material accumulated in the duct of a sebaceous gland. The material consists of keratin (horny cells of the epidermis) and modified sebum (oil secretions of the sebaceous gland). Blackheads are the primary lesions in ACNE. Treatment is the same as for acne, with frequent cleansing of the skin followed by the application of astringent solutions. Plugs should be extracted only by a physician, since damage to the surrounding tissues occasioned by squeezing often leads to scarring.

Blackheath, common, 267 acres (108 hectares) in Lewisham and Greenwich boroughs, London, England. It was the gathering place of highwaymen and of several martial groups, including the followers of Wat Tyler in 1381 and of Jack Cade in 1450, who made Blackheath the headquarters for their attacks on London.

Black Hills, rugged mountains, c. 6,000 sq mi (15,540 sq km), enclosed by the Belle Fourche and Cheyenne rivers, SW 5 Dak. and NE Wyo., and rising c. 2,500 ft (760 m) above the surrounding Great Plains. Harney Peak, 7,242 ft (2,207 m) above sea level, is the highest point in the Black Hills and in South Dakota. The mountains received their name from the heavily forested slopes that appear black from afar. Indians, settlers, and railroad companies depended on wood from the Black Hills for fuel and building material. Gold was discovered in the hills in 1874 by an expedition led by Gen. George Custer, and the resulting gold rush drove out the Indians. White settlements grew rapidly after 1876, chiefly in such mining towns in South Dakota as Custer, Deadwood, Lead, Spearfish, and Rapid City, the largest city in the Black Hills. Gold is still mined in the area; Homestake Mine is the largest gold mine in the United States. Other important minerals found in the hills are uranium, feldspar, mica, and silver. The Black Hills are a major recreational area of the northern plains. Most of the slopes are in two national forests: Wind Cave National Park, Jewel Cave National Monument, Mt. Rushmore National Memorial, and Custer State Park are tourist spots.

black hole, in astronomy see GRAVITATIONAL COLLAPSE

Black Hole of Calcutta: see CALCUTTA

black humor, in literature, drama, and film, grotesque or morbid humor used to express the absurdity, insensitivity, paradox, and cruelty of the modern world. Ordinary characters or situations are usually exaggerated far beyond the limits of normal satire or irony. For example, Stanley Kubrick's film *Dr. Strangelove, or, How I Learned to Stop Worrying and Love the Bomb* (1963) is a terrifying comic treatment of the circumstances surrounding an accidental dropping of an atom bomb, while Jules Feiffer's comedy *Little Murders* (1965) is a delineation of the horrors of modern urban life, focusing particularly on random assassinations. The novels of such writers as Kurt Vonnegut, Thomas Pynchon, John Barth, Joseph Heller, and Philip Roth contain elements of black humor.

Black Isle, peninsula, 18 mi (29 km) long and up to 9 mi (14.5 km) wide, Ross and Cromarty co., N Scotland, extending into Moray Firth. It has the best farmland in the county, producing grain and potatoes. Cattle are raised there.

blackjack, one of the world's principal gambling card games, also known as twenty-one or vingt-et-un. Each player receives one card face down and bets that this card plus one or more cards dealt face up will beat the dealer's hand without exceeding 21. An ace counts 1 or 11, a face card 10, and all other cards according to their face value. A score of 21 on the first two cards is the perfect hand, called blackjack.

Black Kettle, d. 1868, chief of the southern CHEYENNE INDIANS in Colorado. His attempt to make peace

(1864) with the white men ended in the massacre of about half his people at SAND CREEK. Despite this treachery on the part of the whites, he continued to seek peace with them, and in 1865 he signed the Treaty of the Little Arkansas. The government ignored its guarantees, and Black Kettle tried again to negotiate, signing the Medicine Lodge Treaty of 1867. The Cheyenne might have retired to the reservation provided for them, had it not been for Gen. George Armstrong Custer. On Nov. 27, 1868, Custer and his 7th Cavalry attacked Black Kettle's camp on the Washita River without warning and killed the chief and hundreds of the Indians.

black lead: see GRAPHITE

blackleg or black quarter, acute infectious disease of cattle, less often of sheep, caused by an organism of the genus *Clostridium*. It is characterized by inflammation of muscles with swelling and pain in the affected areas. Toxins formed by the organism produce severe muscle damage, and mortality is high. Animals between the ages of six months and two years are most commonly affected. Treatment with large doses of antibiotics is only partially successful, in endemic areas, young animals can be vaccinated for prevention.

black letter. see TYPE

black light: see ULTRAVIOLET RADIATION

black locust. see LOCUST

black lung. see PNEUMOCONIOSIS

blackmail, in law, exaction of money from another by THREAT of exposure of criminal action or of disreputable conduct. The term was originally used for the tribute levied until the 18th cent. upon the inhabitants of the Scottish border to provide immunity from raids by Scottish bands. Statutes often treat blackmail as a form of EXTORTION.

black market, term for the selling or buying of commodities at prices above the legal ceiling or beyond the amount allotted to a customer in countries that have placed restrictions on sales and prices. Such trading was common during World War II wherever the demand and the means of payment exceeded the available supply. Most of the warring countries attempted to equalize distribution of scarce commodities by rationing and price fixing. In the United States black-market transactions were carried on extensively in meat, sugar, tires, and gasoline. In Great Britain, where clothing and liquor were rationed, these were popular black-market commodities. In the United States, rationing terminated at the end of the war, but a black market in automobiles and building materials continued while the scarcity lasted. In the decades following World War II, as the countries of Eastern Europe were trying to industrialize their economies, extensive black-market operations developed because of a scarcity of consumer goods. During the prohibition era BOOTLEGGING was a black-market operation under a different name. Black marketing is also common in exchange of foreign for domestic currency, typically in those countries that have set the official exchange value of domestic currency too high in terms of the purchasing power of foreign money. Black-market money activities also grow when holders of domestic currency are anxious to convert it into foreign currency through a fear that the former is losing its purchasing power as a result of inflation. See Walter Rundell, *Black Market Money* (1964).

Blackmore, Sir Richard, c. 1650-1729, English poet. He was physician to William III and to Queen Anne. Of Blackmore's copious writings, his best-known work is "The Creation" (1712), a poem meant to prove the existence of God. A mediocre poet, he was praised by Dr. Johnson and satirized by Pope in *The Dunciad*.

Blackmore, Richard Doddridge, 1825-1900, English novelist. Although trained as a lawyer and called to the bar, he abandoned his legal career because of ill health. His reputation rests chiefly on his romantic novel about the 17th-century outlaws of Exmoor, *Lorna Doone* (1869), but he wrote also 13 other novels—including *The Maid of Sker* (1872) and *Springhaven* (1887)—and several volumes of poetry. See biography by W. H. Dunn (1956, repr. 1974), study by K. G. Rudd (1960).

Black Mountains: see APPALACHIAN MOUNTAINS, MITCHELL MOUNT

Blackmun, Harry Andrew, 1908-, Associate Justice of the U.S. Supreme Court (1970-), b. Nashville, Ill. Admitted to the bar in 1932, he practiced law until he became (1959) a Federal circuit court judge. He was appointed to the Supreme Court by President Richard M. Nixon. Widely praised for his scholarly and carefully drafted opinions, Blackmun tended

toward a liberal view in civil rights cases, while remaining essentially conservative in other areas

Blackmur, Richard P., 1904-65, American poet and critic, b. Springfield, Mass. Although he had no formal education after high school, he was a resident fellow (1940-48) and professor (1948-65) at Princeton. His volumes of literary essays include *The Double Agent* (1935), *Lion and the Honeycomb* (1955), and *Primer of Ignorance* (1967). He also wrote such volumes of poetry as *From Jordan's Delight* (1937) and *Second World* (1942).

Black Muslims, black nationalist religious movement in the United States, also called the Nation of Islam. It was founded (1930) in Detroit by Wali Farad (or W. D. Fard), whom his followers believed to be "Allah in person." When Farad disappeared mysteriously in 1934, Elijah MUHAMMAD assumed leadership of the group, first in Detroit and then in Chicago. Under his leadership the black separatist sect expanded, mainly among poor blacks and in prisons. Although the group numbered only about 8,000 when Muhammad took over, it grew rapidly in the 1950s and 60s particularly as a result of the preaching of one of its ministers, MALCOLM X. Tension between Muhammad and Malcolm developed, however, and Malcolm's subsequent suspension (1963) and assassination (1965), possibly by Muhammad's followers, caused great dissension in the movement, although this later abated. The Black Muslims are an extremely moralistic group and pray five times daily, they are forbidden to smoke, drink, gamble, or take narcotics. Shunning contact with whites as much as possible, they maintain a number of their own businesses, farms, stores, and schools. Black Muslims renounce their legal surnames (which they consider slave names) and adopt the letter X instead.

Black Panthers, U.S. black militant party, founded (1966) in Oakland, Calif., by Huey P. Newton and Bobby Seale. Originally espousing violent revolution as the only means of achieving black liberation, the Black Panthers called on all blacks to arm themselves for the liberation struggle. In the late 1960s party members became involved in a series of violent confrontations with the police (resulting in deaths on both sides) and in a series of court cases, some resulting from direct shoot-outs with the police and some from independent charges. Most notable among the trials were those of Huey Newton for killing a policeman in 1967 (three mistrials, the last in 1971), of Bobby Seale, as one of the "Chicago Seven" charged and convicted of conspiracy to violently disrupt the Democratic National Convention of 1968 (conviction later overturned), and as a codefendant in a Connecticut case charging murder of an alleged informer on the party (acquittal, 1971), and of 13 Panthers in New York City accused of conspiring to bomb public places (acquittal, 1971). The results of these trials were taken by many observers as confirmation of their suspicions that the Black Panthers were being subjected to extreme police harassment. Another incident that supported this view was the killing in a raid by Chicago police of Illinois party leader Fred Hampton and another Panther in 1969; review of this incident revealed that the two Panthers had been shot in their beds without any provocation. While controversy raged over the civil liberties issue, the Panthers themselves were riven with internal disputes. A major split took place, with Newton and Seale (who in 1972 announced their intention of abandoning violent methods) on the one side and Eldridge Cleaver (formerly the chief publicist for the party, who continued to preach violent revolution) on the other. Cleaver headed the so-called international headquarters of the party (until 1973) in Algeria.

Blackpool, county borough (1971 pop. 151,311), Lancashire, NW England, on the Irish Sea. One of England's most popular seaside resorts, Blackpool has 7 mi (11.3 km) of beaches and promenades, many sport and amusement facilities, and a tower 520 ft (158 m) high, modeled on the Eiffel Tower in Paris. Blackpool's manufactures include aircraft, biscuits, candy, and joinery. In 1974, Blackpool became part of the new nonmetropolitan county of Lancashire.

Black Prince: see EDWARD THE BLACK PRINCE

black quarter: see BLACKLEG

Black River, 1. River rising in SE Mo. and flowing c. 300 mi (480 km) SE, then SW to the White River near Newport, Ark. It is partly navigable. Clearwater Dam is on the river near Piedmont, Mo. 2. River of N.Y., c. 120 mi (190 km) long, rising in the Adirondack Mts. and flowing mainly N and W to Black River Bay, an inlet of Lake Ontario. Its falls provide power for many factories, especially paper mills.

3. River, c. 160 mi (260 km) long, rising in central Wis. and winding SW to the Mississippi River at La Crosse, Wis. It was important in the lumbering industry and is now used to transport coal and petroleum products. Big Manitou Falls, the highest falls in Wisconsin (165 ft/50 m), are in the river.

Black Sea, inland sea, c. 159,600 sq mi (413,360 sq km), between Europe and Asia, connected with the Mediterranean Sea by the Bosphorus, the Sea of Marmara, and the Dardanelles. It is c. 750 mi (1,210 km) long, from 75 to 350 mi (120-560 km) wide, and has a maximum depth of 7,364 ft (2,245 m). The largest arm of the Black Sea is the Sea of Azov, which joins it through the Kerch Strait. The Black Sea is enclosed by the USSR on the north and east, by Turkey on the south, and by Bulgaria and Rumania on the west. The Black Sea was once part of a large body of water that included the Caspian and Aral seas. In the Tertiary period, it was separated from the Caspian Sea and was linked to the Mediterranean Sea. The Dnepr, Southern Bug, Dniestr, and Danube rivers are its principal feeders; the Don and Kuban rivers flow into the Sea of Azov. The rivers flowing into the northern part of the Black Sea carry much silt and form deltas, sandbars and lagoons along the generally low and sandy northern coast. The southern coast is steep and rocky. The Black Sea has two layers of water of different densities. The heavily saline bottom layer has little movement and contains hydrogen sulfide; it has no marine life. The top layer has low salinity and flows in a counterclockwise direction around the sea. It has many varieties of fish. There is little tidal action. The Black Sea is subject to severe winter storms, and waterspouts are common in summer. The Black Sea is an important navigation route and remains ice-free in winter. It is the chief sea outlet of the USSR, Odessa, Novorossiysk, and Sevastopol are the main Soviet ports. Other important ports are Constanța in Rumania, Varna and Burgas in Bulgaria, and Trabzon, Samsun and Zonguldak in Turkey. The Black Sea region, especially in the S Crimea and W Caucasus, is a popular resort area. The Pontus Euxinus [hospitable sea] of the ancients, the Black Sea has been navigated since prehistoric times. Its shores were colonized by the Greeks (8th-6th cent. B.C.) and later by the Romans (3d-1st cent. B.C.). Its importance increased with the founding of Constantinople (330 A.D.). In the 13th cent. the Genoese established their colonies on the Black Sea, and from the 15th to the 18th cent. it was a Turkish lake. The rise and expansion of Russia and its ambition to gain control of the Bosphorus and the Dardanelles led it into protracted dispute with the Ottoman empire. In 1783, Russia annexed the Tatar Khanate of CRIMEA, which blocked its access to the sea, but suffered a setback as a Black Sea power as a result of the Treaty of Paris, which ended the Crimean War of 1856.

Black Shirts, colloquial term originally used to refer to the members of the *Fasci di combattimento*, units of the Fascist organization founded in Italy in March, 1919 by Benito MUSSOLINI. A black shirt was the most distinctive part of their uniform. The Black Shirts were mainly discontented ex-soldiers. Ultra-nationalist, they posed as champions of law and order and violently attacked Communists, socialists, and other radical and progressive groups. They broke up strikes, destroyed trade union headquarters, and drove socialist and Communist officials from office. In Oct., 1922, their activities culminated in the famous march on Rome, which brought Mussolini to power. Afterward, while the term "Black Shirts" continued to be used to refer to party militants in general, the name *Fasci di combattimento* designated the local party units.

black snake, name for several snakes, not all closely related, that are black in color. In the United States the name is applied chiefly to the black RACER and to the black rat snake (*Elaphe obsoleta*), both partly arboreal in their habits. The black rat snake, also called pilot black snake and mountain black snake, is found in the NE United States. Like other rat snakes, (*Elaphe* species), it is a constrictor and a valuable destroyer of rats and mice. It has shiny, slightly keeled scales and reaches a length of 8 ft (2.4 m). The poisonous Australian black snake belongs to the cobra family and has a hood. The North American black snakes are classified in the phylum CHORDATA, subphylum Vertebrata, class Reptilia, order Squamata, family Colubridae.

Blackstone, Sir William, 1723-80, English jurist. At first unsuccessful in legal practice, he turned to scholarship and teaching. He became (1758) the first Vinerian professor of law at Oxford, where he inaugurated courses in English law. British universities

had previously confined themselves to the study of Roman law. Blackstone published his lectures as *Commentaries on the Laws of England* (4 vol., 1765-69), a work that reduced to order and lucidity the formless bulk of English law. It ranks with the achievements of Sir Edward Coke and Sir Matthew Hale, Blackstone's great predecessors. Blackstone's *Commentaries*, written in an urbane, dignified, and clear style, is regarded as the most thorough treatment of the whole of English law ever produced by one man. It demonstrated that English law as a system of justice was comparable to Roman law and the civil law of the Continent. Blackstone has been criticized, notably by Jeremy Bentham, for a complacent belief that, in the main, English law was beyond improvement and for his failure to analyze exactly the social and historical factors underlying legal systems. Blackstone's book exerted tremendous influence on the legal profession and on the teaching of law in England and in the United States. In his later life Blackstone resumed practice, served in Parliament, was solicitor general to the queen, and was a judge of the Court of Common Pleas. See *The Sovereignty of the Law*, selections from Blackstone's *Commentaries*, ed. and with an intro. by Gareth Jones (1973), biography by O. A. Lockmiller (1938), Jeremy Bentham, *A Comment on the Commentaries* (ed. by C. W. Everett, 1928), Paul Lucas, *Essays in the Margin of Blackstone's Commentaries* (1962).

Blackstone, river, c. 50 mi (80 km) long, rising near Worcester, Mass., and flowing SE to Narragansett Bay at Providence, R.I. The river's clean water was a major factor in the early development of the area's textile industry.

black studies: see ETHNIC STUDIES

blackthorn or **sloe**, low, spreading, thorny bush or small tree (*Prunus spinosa*) of the plum genus of the family Rosaceae (ROSE family), having black bark, white flowers, and deep blue fruits, usually rather acid and not much larger than peas. Native to the Mediterranean area, the blackthorn is cultivated for hedges; its limbs are used in Ireland for canes and cudgels, and the juice of the berries is used in making brandy, sloe gin, and preserves and as a diluent of port. One of the hawthorns is sometimes called blackthorn. Blackthorn is classified in the division MAGNOLIOPHYTES, class Magnoliopsida, order Rosales, family Rosaceae.

Black Tom, part of Jersey City, N.J., also called Black Tom Island. In July, 1916, German saboteurs demolished U.S. munitions stores there; in Jan., 1917, they destroyed the Kingsland, N.J., munitions plant. Sued by the U.S. government in 1922 but vindicated in 1930 by an international claims commission, the German government, upon new hearings in 1939, was ultimately ordered to pay \$50 million in damages.

Blacktown, city (1971 pop. 156,619), New South Wales, SE Australia. It is a suburb of Sydney.

Black Warrior, navigable river, 178 mi (286 km) long, rising in N central Ala. and flowing generally SW to the Tombigbee River. The Black Warrior drains a rich coal- and cotton-producing area and is an important outlet for the manufactured products of Birmingham, Ala.

Black Warrior, merchant steamer that plied between New York City and Mobile, usually stopping at Havana, Cuba. Her seizure on Feb. 28, 1854, by Spanish authorities at Havana and the imposition of a \$6,000 fine on the grounds that she had violated customs regulations nearly caused war between the United States and Spain. The South, anxious to secure Cuba, was ready for war, but the North refused to support the idea, and after the *Black Warrior* was released the excitement subsided.

Black Watch or **Royal Highland Regiment**, Scottish infantry regiment. The first companies were raised in 1725 to watch the rebellious Scottish highlands and keep the peace, and the regiment was formed 1739-40. It became known as the Black Watch because of the dark colors of the regimental tartan. It was for a time the 43d, but since 1749 it has been the 42d regiment.

Blackwater, river, c. 100 mi (161 km) long, rising in Co. Kerry, SW Republic of Ireland. It flows east through the dairy region of Co. Cork and Co. Waterford before turning abruptly south and entering the Atlantic Ocean at Youghal Bay. Salmon and trout are caught in the river.

Blackwell, Alice Stone, 1857-1950, American feminist, b. East Orange, N.J., grad. Boston Univ., 1881, daughter of Henry Brown Blackwell and Lucy Stone. She was an editor (1881-1917) of the *Woman's Jour-*

nal, first as assistant to her parents and after their death as editor in chief. Among her works are a biography of her mother (1930) and anthologies of poetry translated from several languages.

Blackwell, Antoinette Louisa (Brown), 1825-1921, American Unitarian minister, b. Henrietta, N.Y., grad. Oberlin College, 1847, and Oberlin Theological Seminary, 1850. One of the first women to receive a college education in the United States, she was ordained a Congregational minister in 1853, thus becoming the first ordained woman minister in the country. She later became a Unitarian. She was an active feminist, an abolitionist, and a temperance advocate. She was the sister-in-law of Henry B. Blackwell and Elizabeth Blackwell. Her books include *The Sexes throughout Nature* (1875) and *The Making of the Universe* (1914).

Blackwell, Elizabeth, 1821-1910, American physician, b. England, sister of Henry Brown Blackwell. She was the first woman in the United States to receive a medical degree, which was granted (1849) to her by Geneva Medical College (then part of Geneva College, early name of Hobart). With her sister, Emily Blackwell (1826-1910) who was also a doctor, and Marie Zakrzewska, she founded (1857) the New York Infirmary for Women and Children, which was expanded in 1868 to include a Women's College for the training of doctors, the first of its kind. In 1869, Dr. Blackwell settled in England, where she became (1875) professor of gynecology at the London School of Medicine for Women, which she had helped to establish. She wrote *Pioneer Work in Opening the Medical Profession to Women* (1895) and many other books and papers on health and education. See biographies by Ann McFerran (1966) and D. C. Wilson (1970).

Blackwell, Henry Brown, 1825-1909, American reformer, b. Bristol, England, brother of Elizabeth Blackwell. He was an abolitionist and later, with his wife, Lucy Stone, a worker for woman suffrage.

black whale, name for the black RIGHT WHALE and for the SPERM WHALE.

black widow, poisonous spider of the genus *Latrodectus*, found throughout North and South America and common in the SW United States. The name derives from the fact that the female, like those of many other spider species, may eat the male after mating. The adult is black with a red or reddish-orange hourglass-shaped marking on the lower abdominal surface. The female is somewhat less than 1/2 in. (1.3 cm) long, and the male is much smaller. The bite venom is a neurotoxin and may cause a severe reaction with intense local pain that spreads to other parts of the body. Occasional fatal cases, which result from respiratory paralysis, are usually limited to children. The most effective treatment is an antivenom. Black widow spiders are classified in the phylum ARTHROPODA, class Arachnida, order Araneae, family Therididae.

blackwood, name for several trees, especially an ACACIA.

bladder, urinary, muscular sac located in the pelvis that stores URINE and contracts to expel it from the body. Urine enters the bladder from the kidneys through the URETERS and is discharged from the body via the URETHRA. The bladder of the adult human can hold over a pint (0.6 liters) of urine. When the level of urine reaches about half this amount, pressure of the accumulating fluid stimulates nervous impulses that relax the external sphincter, a muscle that forms a dense band around the urethra at the base of the bladder. This muscle can be controlled voluntarily in most mammals. The muscles in the wall of the bladder also contract, forcing urine out through the urethra. The bladder is subject to infection (commonly called CYSTITIS) and the formation of stones. Its normal function may also be affected by nervous disorders or by external pressure, as from prostatic enlargement or pregnancy. See URINARY SYSTEM.

bladderwort, any plant of the genus *Utricularia*, insectivorous or carnivorous aquatic plants, many native to North America. Small animals are caught and digested in bladderlike organs of the finely divided submerged leaves. Bladderworts and similar related genera are an important element of aquatic and marsh flora on all continents. They are sometimes grown in aquariums as curiosities. Bladderworts are classified in the division MAGNOLIOPHYTES, class Magnoliopsida, order Scrophulariales, family Lentibulariaceae.

Bladensburg (blā'dənzbürg), town (1970 pop. 7,488), Prince Georges co., S central Md., a residential suburb of Washington, D.C., chartered 1742, inc.

1854. The defeat (Aug. 24, 1814) at Bladensburg of American troops under Gen. W. H. Winder permitted the British under Gen. Robert Ross to march on Washington, D.C., and burn many of the public buildings. The town was also the scene of a historic duel in which Stephen Decatur was mortally wounded (1820) by James Barron.

Blaeu, Willem Janszoon (vī'ləm yān'sōn blou), 1571-1638, Dutch cartographer and printer. He studied astronomy and instrument making under the Danish astronomer Tycho Brahe. The printing establishment he founded in Amsterdam was famed for its fine instruments, marine publications, globes and atlases, especially the great folio atlas compiled by Blaeu himself. He designed new presses incorporating important innovations and his shop had some claim to being the best of its time. The sons and grandsons of Blaeu continued his work.

Blagoveshchensk (blāgəv'yēsh'chīnsk), city (1970 pop. 128,000), capital of Amur oblast, Far Eastern USSR, at the confluence of the Amur and Zeya rivers. A river port and railroad hub, Blagoveshchensk is also an agricultural center and a supply point for the Zeya gold-mining basin. Shipbuilding is carried on in the town. Russian pioneers settled Blagoveshchensk in 1644, but the area was returned to China in 1689. The city became a Russian army post in 1856.

Blagoyevgrad (blāgō'yēvgrat), city (1968 est. pop. 35,000), SW Bulgaria, is a farming region known especially for its tobacco. The city has one of the largest tobacco-fermentation factories in the Balkans. In Thracian times a settlement was established around the warm mineral springs that still attract visitors to Blagoyevgrad. The city is named for Dimitar Blagoev, founder of the Bulgarian Communist party.

Blaine, James Gillespie, 1830-93, American politician, b. West Brownsville, Pa. He taught school and studied law before moving (1854) to Maine, where he became an influential newspaper editor. A leader in the formation of the Republican party in Maine, Blaine was state chairman (1859-61) and was elected to three terms in the legislature. In 1863 he entered Congress, serving in the House of Representatives until 1876 and holding the speakership from 1869 to 1875. His friendship with James A. Garfield of Ohio and William B. Allison of Iowa brought him support in the West, but a slighting personal remark he made in 1866 about Roscoe Conkling won him the lifelong enmity of that leader of the "Stalwart" Republicans. Blaine, leader of the "Half-Breed" Republicans, who were against the corrupt patronage practices of the "Stalwarts," was widely considered the logical Republican choice for President in 1876. Shortly before the party convention, however, a Democratic House investigating committee charged him with using his influence as speaker to secure a land grant for a railroad in Arkansas and with selling the railroad's bonds at a liberal commission. Blaine privately secured possession of the famous "Mulligan letters," which had been named as proof, before they could be placed on record, and he never surrendered them. He read portions of them, out of chronological order, before the House in an attempt to defend himself, but the episode was an important factor in his defeat for the presidential nomination at the 1876 Republican convention. Blaine, as U.S. Senator (1876-81), loyally supported President Rutherford B. Hayes. In 1880, Blaine was again a candidate for the presidential nomination, but the Conkling faction successfully prevented his nomination. The deadlock was broken by the choice of Blaine's friend, Garfield, with Chester A. Arthur, a Conkling man, nominated for Vice President. Blaine became Garfield's Secretary of State, but upon the President's assassination resigned. Retiring to private life, he wrote *Twenty Years of Congress* (2 vol., 1884-86). He was finally nominated for President in 1884 and ran against the Democratic candidate Grover Cleveland. Allusions to the "Mulligan letters" and to Cleveland's admitted paternity of an illegitimate child enlivened the bitter campaign. However, reform Republicans (MUGWUMPS) such as Carl Schurz preferred Cleveland's untainted public record to Blaine's private virtue. Their defection was made the more important when a tactless New York Presbyterian clergyman, the Rev. Samuel D. Burchard, spoke, in Blaine's presence, of the Democrats as "the party whose antecedents are rum, Romanism, and rebellion." Blaine's failure to disavow the remark offended the large Irish Catholic vote in New York, he lost that state by a scant thousand votes and thereby lost the election. In 1888, Blaine unexpectedly declined to run for President, supporting Benjamin Harrison, who, upon becoming President, made him

Secretary of State again. Three days before the Republican convention of 1892, Blaine resigned to seek the nomination for President, but Harrison was renominated. Thereafter Blaine's health failed rapidly, and he died the next year. As Secretary of State, Blaine was particularly energetic in fostering closer relations with the Latin American nations. During his second term in office he was able to bring about and preside over the first Pan-American Congress (see PAN-AMERICANISM), thus laying the foundation for subsequent meetings, and the Pan American Union was established. Blaine hoped to increase commercial relations among American nations by reciprocal tariff treaties, and although the McKinley Tariff Act prevented this, his idea of tariff "reciprocity" gained some credence. He also concluded a treaty with Great Britain to submit the fur-seal controversy to arbitration (see under BERING SEA). See biographies by Edward Stanwood (1908) and D. S. Muzzey (1934, repr. 1963), A. F. Tyler, *The Foreign Policy of James G. Blaine* (1927, repr. 1965).

Blaine, city (1970 pop. 20,640), Anoka co., SE Minn., a suburb N of Minneapolis, settled 1862, inc. 1964. Construction is the major industry. The area was organized as a township in 1877 and was named in honor of James G. Blaine, then Senator from Maine.

Blair, Francis Preston, 1791-1876, American journalist and politician, b. Abingdon, Va. Through the *Frankfort, Ky.*, journal *Argus of Western America*, which he edited with Amos KENDALL, Blair was an ardent supporter of Andrew Jackson. At William T. Barry's suggestion, he traveled to Washington and established the *Washington (D.C.) Globe* in Dec. 1830, which exerted great political influence as the Jacksonian "court journal" until 1841. Along with Kendall, Blair also was one of the leading members of the KITCHEN CABINET. In Washington he also founded the *Congressional Globe* (now the *Congressional Record*), in which the daily proceedings of Congress were recorded. When James K. Polk became President, Blair, a Van Buren Democrat, was forced to sell his interest in the *Washington Globe* to Thomas Ritchie. Later, because of his antislavery views, Blair was one of the founders of the Republican party, and he presided over its first national convention in 1856. In 1865 he engineered the futile HAMPTON ROADS PEACE CONFERENCE. An influential adviser to President Lincoln during the early years of the Civil War, he eventually returned to the Democratic party because he was opposed to radical Republicanism. See W. E. Smith, *The Francis Preston Blair Family in Politics* (1933), A. M. Schlesinger, Jr., *The Age of Jackson* (1945), B. J. Hendrick, *Lincoln's War Cabinet* (1946).

Blair, Francis Preston, 1821-75, American political leader and Union general in the Civil War, b. Lexington, Ky., son of Francis Preston Blair (1791-1876). A St. Louis lawyer, Blair led the Free-Soil party in Missouri in 1848, served as state legislator (1852-56), and as Congressman (1857-59, June, 1860, 1861-62). In Congress he attacked slavery as harmful to the interests of poor whites and became an energetic Lincoln supporter in 1860. Instrumental in keeping Missouri loyal to the Union by seizing, with Nathaniel Lyon, secessionist Camp Jackson and the U.S. arsenal early in 1861, he was appointed major general of volunteers (Nov., 1862) and served in the Vicksburg, Chattanooga, and Atlanta campaigns. After the Civil War, Blair was denied political preferment by the radical Republicans and in 1868 ran for Vice President on the unsuccessful Democratic ticket with Horatio Seymour. He helped overthrow the radicals in Missouri in 1870 and was elected to the state legislature, which, in turn, sent him to the U.S. Senate (1871-73). See W. E. Smith, *The Francis Preston Blair Family in Politics* (1933), B. J. Hendrick, *Lincoln's War Cabinet* (1946).

Blair, James, 1656-1743, Church of England clergyman, missionary to colonial Virginia, and founder of the College of William and Mary, b. Scotland. At the request of the bishop of London, Blair traveled to Virginia in 1685 to revive and reform the church in the colony. He returned to England (1691) to petition for a college, which when chartered in 1693 was named William and Mary after the monarchs. Blair was made president for life. In 1694 he was appointed by the king to the Virginia council, of which he was a lifelong member (except for a brief period) and in 1740-41 president. With Henry Hartwell and Edward Chilton, Blair wrote *The Present State of Virginia and the College* (1727, ed. by H. D. Farish, 1940). See biography by Parke Rouse (1971).

Blair, Montgomery, 1813-83, U.S. Postmaster General (1861-64), b. Franklin co., Ky., son of Francis P. Blair (1791-1876). He resigned from the army in 1836 after serving against the Seminole Indians and set

tled in St. Louis as the legal and political protege of Senator Thomas H. BENTON. A successful lawyer and mayor of St. Louis (1842-43), he moved to Washington, D.C., where he was the first U.S. solicitor in the Court of Claims and made many appearances before the U.S. Supreme Court, including one as counsel for Scott in the famous DRED SCOTT CASE. His antislavery views brought him to the Republican party, and he became Postmaster General in the Lincoln cabinet. To appease the radicals in the cabinet, the President forced his resignation before the election of 1864. Opposed to radical Republicanism, he returned to the Democratic party and was one of Samuel J. Tilden's counsel in the disputed election of 1876. See W. E. Smith, *The Francis Preston Blair Family in Politics* (1933), B. J. Hendrick, *Lincoln's War Cabinet* (1946).

Blair, Robert, 1699-1746, English poet and clergyman. His literary reputation rests solely on his didactic, blank-verse poem on death, *The Grave* (1743).

Blair Atholl (äth'äl), parish, Perthshire, central Scotland, at the confluence of the Garry and the Tilt rivers. Blair Castle, begun c. 1269, is the seat of the duke of Atholl and his Atholl Highlanders, Great Britain's only private army. The castle was an important fortress in Scotland's civil wars. In 1975, Blair Atholl became part of the Tayside region.

Blake, Edward, 1833-1912, Canadian Liberal party leader, b. Upper Canada (Ontario). A prominent constitutional lawyer, he was elected to the House of Commons in 1867. In 1871 he became prime minister of Ontario, and he later served as minister of justice (1875-77) in Alexander Mackenzie's government and as leader of the Liberal party (1880-87). After withdrawing from Canadian politics (1890), he sat in the British House of Commons (1892-1907) as an Irish nationalist. See biography by M. A. Banks (1957).

Blake, Nicholas: see DAY LEWIS, CECIL.

Blake, Robert, 1599-1657, English admiral. A merchant, he sat in the Short Parliament (1640) and joined the parliamentary side in the civil war. He defended Bristol, Lyme, and Taunton against royalist attacks (1643-45). Appointed a "general at sea" (1649), he embarked on a brilliant naval career in his middle age. In 1650 he pursued the royalist fleet under Prince Rupert to Portugal, where he intercepted a large Portuguese treasure fleet at the mouth of the Tagus River. He caught up with Rupert in the Mediterranean and virtually destroyed his fleet. In 1651 he captured the Scilly Islands from royalist privateers and helped to reduce Jersey. In the first of the DUTCH WARS he won several major victories against the Dutch and suffered one serious defeat. In 1655 he attacked and destroyed a Barbary pirate fleet at Porto Farino. In the winter of 1656-57 he blockaded the Spanish coast and sank the Spanish fleet at Santa Cruz. Made a member of the council of state in 1651, he helped to develop the effective Commonwealth navy. See Maurice Ashley, *Cromwell's Generals* (1954).

Blake, William, 1757-1827, English poet and artist, b. London. Although he exerted a great influence on English ROMANTICISM, Blake defies characterization by school, movement, or even period. At the same time, no poet has been more sensitive or responsive to the realities of the human condition and of his time. His father, a prosperous hosier, encouraged young Blake's artistic tastes and sent him to drawing school. At 14 he was apprenticed to James Basire, an engraver, with whom he stayed until 1778. After attending the Royal Academy, where he rebelled against the school's stifling atmosphere, he set up as an engraver. In 1782 he married Catherine Boucher, whom he taught to read and write and draw. She became his inseparable companion, assisting him in nearly all his work. Blake's life, except for three years at Felpham where he prepared illustrations for an edition of Cowper, was spent in London. *Poetical Sketches* (1783), his first book, was the only one published conventionally during his lifetime. He engraved and published all his other major poetry himself (the rest remained in manuscript), for which he originated a method of engraving text and illustration on the same plate. But like his artwork, his poetry enjoyed neither commercial nor critical success until long after his death. In *Songs of Innocence* (1789) and *Songs of Experience* (1794) the world is seen from a child's point of view, directly and simply but without sentimentality. In the first group, which includes such poems as "The Lamb," "Infant Joy," and "Laughing Songs," both the beauty and the pain of life are captured. The latter group, which includes "The Tyger," "Infant Sorrow," "The Sick Rose," and "London," reveal a consciousness of cruelty and injustice in the world, for which people,

not fate, are responsible. As parables of adult life, the Songs are rich in meaning and implication. Blake's Prophetic Books combine, in poetry, vision, prophecy, and exhortation. They include *The Book of Thel* (1789), *The Marriage of Heaven and Hell* (c. 1790), *The French Revolution* (1791), *America* (1793), *Europe* (1794), *The Book of Urizen* (1794), *The Book of Los* (1795), *Milton* (1804-8), and *Jerusalem* (1804-20). These comprise no less than a vision of the whole of human life, in which energy and imagination struggle with the forces of oppression both physical and mental. Blake exalted love and pure liberty, and abhorred the reductive, rationalist philosophy that served to justify the political and economic inequities attendant upon the Industrial Revolution. The Prophetic Books are founded in the real world, as are Blake's passions and anger, but they appear abstruse because they are ordered by a mythology devised by the poet, which draw from Swedenborg, Jacob Boehme, and other mystical sources. Despite this, and despite the fact that from childhood on Blake was a mystic who thought it quite natural to see and converse with angels and Old Testament prophets, he by no means forsook concrete reality for a mystical life of the spirit. On the contrary, reality, whose center was human life, was for Blake inseparable from imagination. The spiritual, indeed God himself, was an expression of the human. Blake's paintings and engravings, notably his illustrations of his own works, works by Milton, and of the Book of Job, are painstakingly realistic in their representation of human anatomy and other natural forms. But they are also radiantly imaginative, often depicting fanciful creatures in exacting detail. Nearly unknown during his life, Blake was generally dismissed as an eccentric or worse long thereafter. His following has gradually increased, and today he is widely appreciated. See his complete writings, ed. by Geoffrey Keynes (rev. ed. 1966), his letters, ed. by Geoffrey Keynes (2d ed. 1968), his notebook, ed. by D. V. Erdman (1973), biography by Mona Wilson, ed. by Geoffrey Keynes (3d ed. 1971), studies by K. J. Raine (2 vol., 1968), D. V. Erdman (2d ed. 1969), Geoffrey Keynes (2d ed. 1971), D. G. Gillham (1973), David Wagenknecht (1973), and A. K. Mellor (1974), Anthony Blunt, *The Art of William Blake* (1959), D. V. Erdman and J. E. Grant, ed., *Blake's Visionary Forms Dramatic* (1970).

Blakelock, Ralph Albert, 1847-1919, American landscape painter, b. New York City, son of a doctor. Educated for a medical career, he abandoned it for painting, in which he was largely self-taught. His life was one of hardship. At first his work was flatly rejected, later, those who purchased his paintings took gross advantage of him. Unable to support his family of ten, he went mad. Committed to an asylum in 1899, he was released in 1916, and did not paint again. By this time his paintings had been accorded recognition and brought great prices to dealers, but nothing to him. Blakelock's landscapes are painted in great detail with strong lights and silhouetted dark masses, expressing a melancholy and romantic temperament. The subjects, including landscapes with small Indian figures, are often drawn from his early journey to the West (1896). He is particularly noted for his moonlight effects. Among his well-known works are *Brook by Moonlight* (Toledo Mus. of Art), *Indian Encampment* and *Pipe Dance* (Metropolitan Mus.), and *Sunset and Moonrise* (National Gall. of Art, Washington, D.C.). Blakelock's work was among the most often forged of any American painter. See study by Lloyd Goodrich (1947).

Blakeslee, Albert Francis, 1874-1954, American botanist, b. Geneseo, New York. He received his Ph.D. at Harvard (1904) and was a member of the faculty until 1907. After several years as professor at Connecticut Agricultural College (now the Univ. of Connecticut), he joined the staff of the Carnegie Institution of Washington at Cold Spring Harbor, N.Y., and later served as its director (1936-41). In 1943 he became director of the Smith College Genetics Experiment Station. From his earliest research, the discovery of sexual reproduction in bread molds, his contributions to botany and genetics were of far-reaching significance. His study of the inheritance and geographical distribution of the jimson weed, *Datura*, has provided important information concerning chromosome behavior, genic balance, and species evolution. He introduced the use of the alkaloid colchicine to increase the number of chromosomes in the plant cell.

Blanc, Louis (lwè blaN), 1811-82, French socialist politician and journalist, b. Spain. In his noted *Organisation du travail* (1840, tr. *Organization of*

Work, 1911), he outlined his ideal of a new social order based on the principle "From each according to his abilities, to each according to his needs." He advocated, as a first stage in the achievement of this goal, a system of social workshops (*ateliers sociaux*) controlled by workmen with the support of the state. His attacks on the Louis Philippe government in *Histoire de dix ans* (5 vol., 1841-44, tr. *The History of Ten Years, 1830-1840, 1844-45*) stirred up agitation among the workers. As a member of the provisional government of 1848 he insisted on the establishment of the social workshops, but the plan was sabotaged under the leadership of Alexandre Thomas MARIE. Implicated in the subsequent insurrection of the workers, Blanc fled to England, where he remained until 1871. While in exile, he produced the 12-volume *Histoire de la Revolution française* (1847-64). After his return to France, he became (1871) a member of the national assembly and was later a leader of the left in the chamber of deputies. Blanc's ideas, representing a link between utopian and Marxist socialism, had great influence on the thought of later men, especially Ferdinand Lassalle and the German socialists. See biographies by Eduard Renard (1921) and L. A. Loubere (1961), D. C. McKay, *The National Workshops* (1933), Carl Landaur, *European Socialism* (1959).

Blanc, Mont. see MONT BLANC.

Blanchard, Jean Pierre (zhāN pyēr blaNshār'), or **François Blanchard** (frāNswā'), 1753-1809, French balloonist. In 1785 he made with Dr. John Jeffries of Boston, Mass., the first crossing by air of the English Channel. His ascents at Philadelphia (1793) and New York City (1796) are thought to be the first in America.

Blanche of Castile (kăstēl'), 1185?-1252, queen of Louis VIII of France and regent during the minority (1226-34) of their son LOUIS IX. A forceful and capable ruler, she checked the coalitions of the great lords and frustrated the attempt (1230) of HENRY III of England to regain his father's lands in France. She remained a lifelong adviser to Louis IX, was again regent on his departure (1248) for the Holy Land, and was coregent with her son Alphonse from 1250 until her death.

Blanchot, Maurice (mōrēs' blaNshō'), 1907-, French novelist and literary critic. In his critical works, notably *L'Espace littéraire* (1955), Blanchot propounds the theory that literary compositions are organic entities separate from the external world. Such novels as *Thomas l'obscur* (1941, tr. 1973) and *Le Tres-Haut* (1948) exemplify his theoretical ideas in their complex language and imaginary settings. Blanchot's later fiction has dispensed with plot, character, and other elements of representation.

Blanco, Antonio Guzmán: see GUZMÁN BLANCO.

Blanco Fombona, Rufino (rōfē'nō blāN'kō fōmbō'na), 1874-1944, Venezuelan poet, essayist, and novelist, one of the leaders of MODERNISMO. Active in Venezuelan political affairs, he was several times imprisoned. He lived in exile in France and Spain for a quarter of a century and contributed much toward spreading the knowledge of Spanish American literature abroad. A prolific writer, Blanco Fombona satirized politicians, the clergy, and Yankee imperialism. His poems, such as the collection *Cantos de la prision y del destierro* [songs of prison and exile] (1911), are superior to his novels. The novels include *El hombre de hierro* [the man of iron] (1905) and *El hombre de oro* (1916, tr. *Man of Gold*, 1920). Blanco Fombona was most distinguished in the field of the essay. Well known are "La evolución política y social de Hispanoamérica" (1911) and "El modernismo y los poetas modernistas" (1929).

Bland, Richard Parks, 1835-99, American statesman, b. near Hartford, Ky. He taught in rural schools in Kentucky and Missouri before he went to the gold fields of California in 1855. He was a prospector, miner, lawyer, and local official in mining towns of California, Colorado, and Nevada, and after 10 years he returned to Missouri and small-town law practice. In 1872 he was elected to the House of Representatives, where he served (except for 1895-97) until his death. A champion of Western interests and particularly of the free coinage of silver, he was the author of the original bill that, after major modifications by William B. Allison, became the Bland-Allison Act of 1878. Bland was not satisfied with this or the succeeding compromise, the SHERMAN SILVER PURCHASE ACT of 1890. He was a leader of the Western radicals who took over the Democratic national convention at Chicago in 1896, and was a leading candidate for the presidential nomination on the first three ballots. In the election he worked hard but futilely for the victory of William Jennings

Bryan See W V Byars, *An American Commoner* (1900)

Bland-Allison Act, 1878, passed by the U.S. Congress to provide for freer coinage of silver. The original bill offered by Representative Richard P. Bland incorporated the demands of the Western radicals for free and unlimited coinage of silver. This was passed by the House but was unacceptable to the conservative Senate. Senator William B. Allison then offered an amended version. The act as adopted required the U.S. Treasury to purchase between \$2 million and \$4 million worth of silver bullion each month at market prices; this was to be coined into silver dollars, which were made legal tender for all debts. Attempts of the free-silver forces to replace the act with provision for unlimited coinage were defeated, as were attempts of the gold-standard forces to repeal it altogether. President Hayes and his successors weakened the act's effect by purchasing only the minimum amount of bullion. It remained law until replaced by the **SHERMAN SILVER PURCHASE ACT** of 1890.

Blankenburg (blāŋkən'bōrk), **Blankenburg am Harz** (-am harts), or **Bad Blankenburg** (bāt'-), city (1970 pop. 10,628), Magdeburg district, W. East Germany. It is a spa located at the northern foot of the Harz mts. and also has industries that manufacture woollens and paper. During his residence in Blankenburg (1837-45), the educator Friedrich Froebel founded the first kindergarten.

blanket, sheet, usually of heavy woolen, or partly woolen, cloth, for use as a shawl, bed covering, or horse covering. The blanketmaking of primitive people is one of the finest remaining examples of early domestic artwork. The blankets of Mysore, India, are famous for their fine, soft texture, so delicate that it is said their 18 ft (5.5 m) of length can be rolled inside a hollow bamboo rod. The loom of the American Indian, though simple in construction, can produce blankets so closely woven as to be waterproof. The Navaho, Zuñi, Hopi, and other Southwestern Indians are noted for their distinctive, firmly woven blankets. The Navahos were especially adept in producing beautifully designed blankets that were characterized by geometrical designs woven with yarns colored with vegetable dyes. During the mid-19th cent. the Navahos began to use yarns imported from Europe, because of their brighter colors. The ceremonial Chilcat blanket of the Tlingit Indians of the Northwest, generally woven with a warp of cedar bark and wool and a weft of goats' hair, was curved and fringed at the lower end. In the 20th cent., the electric blanket, with electric wiring between layers of fabric, gained wide popularity.

blanketflower: see GAILLARDIA

blank verse: see PENTAMETER

Blanqui, Jérôme Adolphe (zhārōm' adōlf' blaŋkē'), 1798-1854, French economist. Among his works are *Resume de l'histoire du commerce et de l'industrie* (1826) and *Histoire de l'économie politique en Europe, depuis les anciens jusqu'à nos jours* (tr. 1880, repr. 1968).

Blanqui, Louis Auguste (lwē ōgust'), 1805-81, French revolutionary and radical thinker. While a student in Paris, he joined (1824) a branch of the Carbonari, a revolutionary secret society; thenceforth he was prominent in every revolutionary upheaval in France until his death. More than half his life was spent in prison. In 1847 he set up the Central Republican Society, which was powerful in the February Revolution of 1848. An exile in Brussels (1865-70), Blanqui organized the extremist opposition against Napoleon III, in whose deposition (Sept. 4, 1870) he was instrumental. The crucial role played by Blanqui and his followers in the expulsion (Oct. 1870) of the moderate government of Paris led his opponents to compromise on a government headed by Adolphe Thiers, and shortly before the proclamation of the COMMUNE OF PARIS, Thiers had Blanqui arrested. The commune, whose temporary success was largely Blanqui's work, vainly offered its hostages in exchange for Blanqui. He was released in 1879 and was elected a deputy from Bordeaux, although the government did not allow him to serve. His followers, the Blanquists, were eventually absorbed into the unified socialist party. Advocating direct revolutionary action, Blanqui was among the first to conceive of the professional revolutionary. His social theories, stressing the class struggle and the dictatorship of the proletariat, profoundly influenced Karl Marx. See *Blanqui's Critique Sociale* (1885), R. W. Postgate, *Revolution from 1789-1906* (1920), studies by Neil Stewart (1939) and Alan Spitzer (1957, repr. 1970).

Blantyre (blāntī'ər), city (1971 est. pop. 169,000), S. Malawi, in the Shire Highlands. It is the chief commercial and industrial center of Malawi with cement, food processing, and textile industries. Blantyre was founded in 1876 as a Church of Scotland mission station and was named for the birthplace of David Livingstone. In 1956, Blantyre was combined with Limbe to form one city.

Blarney, village, Co. Cork, SE. Republic of Ireland. He who kisses the Blarney Stone, placed in an almost inaccessible position near the top of the thick stone wall of the 15th-century castle, is supposed to gain marvelous powers of persuasion. The castle was militarily important in the 17th-century wars of Oliver Cromwell and William III. Tweed is manufactured in the village.

Blasco Ibañez, Vicente (vēthān'tā bla'skō ēbā-nyāth) 1867-1928, Spanish novelist and politician, b. Valencia. Outspoken against the monarchy, Blasco Ibañez published a radical republican journal, *El pueblo*, and was imprisoned 30 times for political activism. His novels are primarily realistic in conception. The early ones, set in Valencia, include *Flor de mayo* (1895, tr. *The Mayflower*, 1921), *La barraca* [the cabin] (1898), *Cañas y barro* (1902, tr. *Reeds and Mud*, 1928), and *La catedral* (1903, tr. *The Shadow of the Cathedral*, 1909). He traveled in South America, returning to Spain at the outbreak of World War I. He became a propagandist for the Allies, and his war novel, *Los cuatro jinetes del Apocalipsis* (1916, tr. *The Four Horsemen of the Apocalypse*, 1918), made him world famous. He died a voluntary political exile. See study by A. G. Day and E. C. Knowlton (1972).

Blashfield, Edwin Howland, 1848-1936, American mural painter and mosaic designer, b. New York City, studied with Bonnat in Paris. From the 1890s on he worked chiefly as a muralist, creating large works of a historical or allegorical nature, including *The Evolution of Civilization* (Library of Congress dome), decorations for the Wisconsin, Minnesota, and Iowa state capitols, and a large mosaic for the Church of St. Matthew, Washington, D.C. He also wrote *Mural Painting in America* (1913) and, with his wife, *Italian Cities* (1900, new ed. 1913).

Blasket Islands, group of rock islets, Co. Kerry, SW. Republic of Ireland, a lighthouse is on one of the islets. Most of the inhabitants of the islands were moved to the mainland in 1953. Great Blasket, largest of the islands, was the stronghold of Piaras Ferriter, the last Irish chieftain to surrender to Oliver Cromwell.

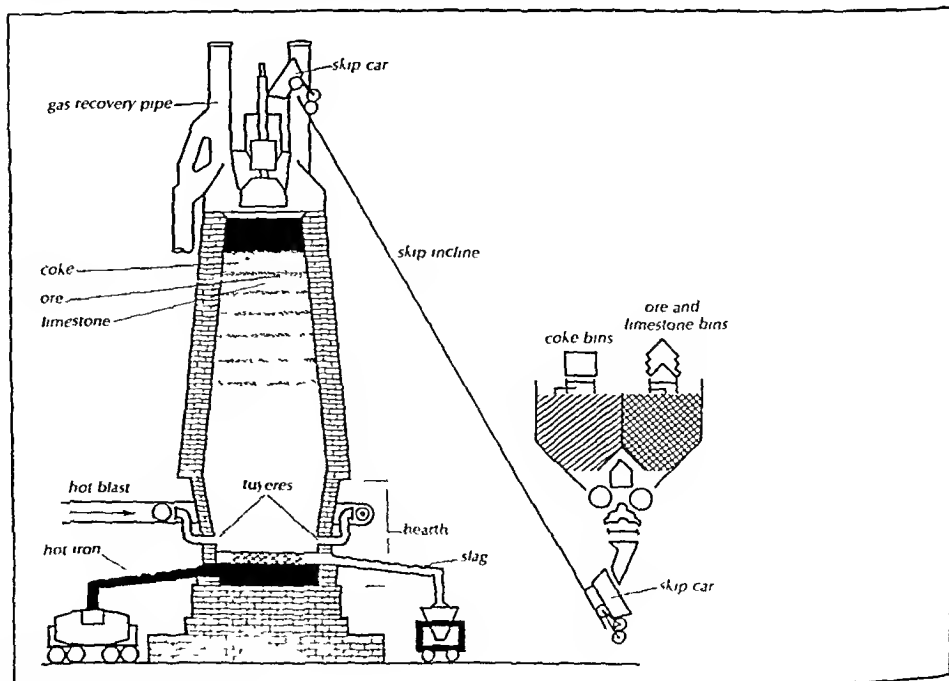
blast cleaning: see SANDBLAST

blast furnace, structure used chiefly in smelting, i.e., for the extraction of metals, mainly iron and copper, from their ores. The principle involved is that of the reduction of the ores by the action of carbon monoxide, i.e., the removal of oxygen from the metal oxide in order to obtain the metal. Blast furnaces differ in construction. The one used in the produc-

tion of iron consists of a chimneylike structure (usually 80-100 ft/24-30 m high) made of iron or steel and lined with firebrick. It is narrow at the top, increasing in diameter downward, but narrowing again suddenly almost at the bottom, to form the hearth or crucible. There the fine molten products are caught. The furnace is fed from the top with a charge of definite quantities of ore, coke, and a flux, mostly limestone. Preheated compressed air is introduced at the bottom through pipes (tuyeres) entering just above the hearth. The air passes upward through the charge. The coke is oxidized to carbon dioxide, which changes to carbon monoxide at the high temperature. The carbon monoxide then reduces the ores and, taking on oxygen, reverts to carbon dioxide. This gas, together with unused carbon monoxide, nitrogen, and other constituents of the air originally introduced, is led off through a pipe from the top of the furnace and, being still at a high temperature, is employed to heat the stoves into which fresh air for the process is brought. As the operation proceeds, the mass in the furnace becomes molten and descends into the crucible. The iron sinks to the bottom, impurities, called the slag, being lighter, float on top. The slag is drained through a pipe in the upper portion of the crucible. The iron is tapped from below and run into sand molds to harden. The product is known as pig iron or cast iron (see IRON). Efforts to increase production rates have led to the addition of pure oxygen and steam and the sizing of ore to obtain better gas-solid contact. Flux and ore are sometimes combined into pellets. Pig iron prepared in the blast furnace is converted into steel by the BESSEMER PROCESS. Copper ore treated in a blast furnace yields a copper matte, from which only a part of the impurities are removed. It is usually further refined by electrolytic methods (see COPPER).

blasting, shattering, breaking, or splitting of rock or other material by the discharge of an EXPLOSIVE placed within or in contact with it. It is a necessary part of many engineering operations. An ancient method of breaking rock consisted of heating the rock by fire and then pouring water on it, the sudden contraction resulting in shattering or cleavage. Modern methods of blasting involve four operations: drilling the holes to receive the charge, placing it, stemming the hole (i.e., filling the hole above the charge with earth or clay), and igniting or detonating the charge. The location, size, and number of holes drilled depend upon local conditions and the nature of the work. The holes vary from 1 to 3 in (2.5-7.6 cm) in diameter and from a few inches up to 20 ft (6.1 m) or more in depth. The charge is made up of some explosive, such as dynamite or ammonium nitrate, black powder, the oldest known explosive, is rarely used today. Multiple charges are sometimes set off, either simultaneously or in sequence.

blastomycosis: see FUNGUS INFECTION



Blast furnace for production of iron

Blastus, Herod's chamberlain, mediator for the Tyrans and Sidonians (Acts 12 20)

Blau, Joseph Leon (blou), 1909–, American Jewish scholar and educator, b Brooklyn, N.Y., grad Columbia (A.B., 1931, M.A., 1933; Ph.D., 1945). He taught at Columbia from 1944, becoming professor of religion in 1962. Like his teacher Salo Wittmayer Baron, he stressed the effect of cross-cultural influences upon the development of Judaism in a number of works, among them *The Story of Jewish Philosophy* (1962), *The Jews of the United States, 1790–1840: A Documentary History* (ed. with S.W. Baron, 3 vol., 1963), and *Modern Varieties of Judaism* (1966). His *Christian Interpretation of the Cabala in the Renaissance* (1944) studied this process at work in the opposite direction. Also a student of John Dewey, Blau published a number of studies in American philosophy, among them *Men and Movements in American Philosophy* (1952).

Blaue Reiter, der (dër blou'ə rī'tər) (Ger., =the blue rider), German expressionist art movement, lasting from 1911 to 1914. It took its name from a painting by Kandinsky, *Le cavalier bleu*. Following the BRÜCKE artists of the previous decade, this second wave of expressionism was led by Kandinsky, Klee, Marc, and Macke, in Munich. They sought to discover spiritual truths that they felt the impressionists had overlooked. Less united stylistically and as a group than the BRÜCKE, their art ranged from the pure abstractions of Kandinsky to the romantic imagery of Marc. In 1911, Kandinsky and Marc prepared a significant collection of articles and illustrations published as the *Blaue Reiter Album*. Common to the artists in the group was a philosophical spirit, an intellectual approach to technique, and great lyrical spontaneity. The group disbanded at the outbreak of World War I. Marc and Macke were killed in battle. See study by H.K. Roethel (tr. 1972).

Blavatsky, Helena Petrovna (blätvăt'skë), 1831–91, Russian theosophist and occultist. She was the daughter of a German named Hahn who had settled in Russia and who was distantly connected with the Russian aristocracy. At the age of 16 she married an elderly man, Nicephore Blavatsky, whom she soon left. She traveled extensively in Asia, the United States, and Europe. An imposing and persuasive woman, she claimed to have spent seven years in Tibet, where she was supposedly initiated into mysteries of the occult. In 1873 she went to New York City, and in collaboration with prominent persons interested in spiritism she founded (1875) the Theosophical Society. The society soon experienced serious schisms, and in 1878 Madame Blavatsky, as she was known, left for India, where she established headquarters at Adyar near Madras. There she devoted herself, with some success, to theosophical organization and propaganda. She demonstrated many supernormal phenomena, which were accepted as miracles by her followers, but published claims of fraud in the 1880s and 90s seriously damaged her reputation. Her major works were *Isis Unveiled* (1877) and *The Secret Doctrine* (1888), which became the textbooks of her disciples. The day of her death (May 8) is celebrated by her followers as White Lotus Day. See bibliography under THEOSOPHY. See her memoirs (comp. by M.K. Neff, 2d ed. 1967), biography by John Symonds (1959, repr. 1960), a harshly critical work is G.M. Williams, *Priestess of the Occult* (1946).

Blaydon, urban district (1971 pop. 32,018), Durham, NE England, on the Tyne River. It manufactures iron and steel goods, bricks, and the by-products of coal from nearby mines. There are also engineering works. In 1974, Blaydon became part of the new metropolitan county of Tyne and Wear.

blazing star or **button snakeroot**, any plant of the genus *Liatris*, showy North American perennials of the family Compositae (COMPOSITE family). The blossoms, rosy purple or white, are in somewhat feathery heads along a usually wandlike stalk. Medicinal use has been made of a few species by both Indians and white men. Some are called gayfeather. Blazing star is classified in the division MAGNOLIOPHYTA, class Magnoliopsida, order Asterales, family Compositae.

blazonry (blā'zən'rē), science of describing or depicting armorial bearings. The introduction, since the Middle Ages, of artificial rules and fanciful medieval terms has complicated the science, particularly in England. The chief part of blazonry is the description of the escutcheon, or shield, the essential part of the coat of arms. This involves the description of the color of the field on which devices are displayed. Arms are identified by their charges, the most common of these, the ordinaries, include lines

of division, e.g., a cross, a chief (a band occupying the top third of the shield), a fess (a band across the shield in the middle), and a bend (a diagonal band). Other characteristic charges are heraldic animals or flowers, e.g., the lion, the fleur-de-lis, and the trefoil. The arms of younger sons should, in theory, show differences, thus a second son should display a crescent in his field. The bend sinister (a band from the upper right to the lower left of the shield) is not a difference and does not necessarily (as is popularly believed) indicate illegitimacy, which is usually blazoned by a wavy border around the shield. Blazonry also involves the description of the CREST above the shield and of the motto. The tinctures, or colors, used in blazonry are gold (or), white or silver (argent), red (gules), blue (azure), green (vert), purple, and black (sable). In England, blazonry is regulated by the HERALDS' COLLEGE. See also HERALDRY.

bleaching, process of whitening by chemicals or by exposure to sun and air, commonly applied to textiles, paper pulp, wheat flour, petroleum products, oils and fats, straw, hair, feathers, and wood. Chemical methods include oxidation, as by hypochlorites, ozone, and the per-compounds, reduction, as with sulphur dioxide, and adsorption, as by bone charcoal used to decolorize sugar solutions. Textiles have long been whitened by grass bleaching, a method virtually monopolized by the Dutch from the time of the Crusades to the 18th cent. They developed a technique in which goods were alternately soaked in alkaline solutions and grassed, or crofted, a procedure in which they are exposed to air and sunlight, the goods were then treated with sour milk to remove excess alkali. Later they substituted dilute sulfuric acid for the milk. In 1785 the French chemist Claude Berthollet suggested the commercial application of chlorine for bleaching, and in 1799 the Scottish chemist Charles Macintosh invented bleaching powder, or chloride of lime, the first of the modern chemical bleaches. Bleaching processes vary for different fibers. Cotton, naturally a grayish yellow, contains waxy and oily impurities that interfere with the action of dyes. It must be scoured and boiled in huge kettles (kiers) before bleaching. Grass bleaching has been combined with or superseded by chemical methods, which are deleterious unless rigidly controlled. Four degrees, ranging from quarter to full bleach, are recognized in the industry. Full bleach is reputed to weaken the fiber as much as 20 percent. Since chlorine bleaches react with the protein of animal fibers, silk and wool are commonly bleached with hydrogen peroxide. Although sulfurous acid or sulfur dioxide are also used for wool, they do not permanently whiten it. For effective bleaching, wool must first be scoured and silk must be degummed. Common bleaching agents used domestically are Javelle water, which is sodium hypochlorite in water, and other chlorine-based mixtures.

bleaching powder, white or nearly white powder that is usually a mixture of calcium chloride hypochlorite, $\text{CaCl}(\text{OCl})$, calcium hypochlorite, $\text{Ca}(\text{OCl})_2$, and calcium chloride, CaCl_2 . Sometimes called chloride of lime, it can be prepared by reacting calcium hydroxide or slaked lime, $\text{Ca}(\text{OH})_2$, with chlorine gas, Cl_2 . It is used as a strong bleaching agent, as a disinfectant, and in making JAVELLE WATER. Bleaching powder was first produced in 1799 by Charles Tennant in Glasgow, Scotland.

Bled (blēt), town, NW Yugoslavia, in Slovenia. Situated in the Julian Alps and on the small Lake of Bled, it is one of the most popular resorts in Yugoslavia. In the vicinity are a medieval castle, a former royal villa, and a church on an islet.

bleeding heart. see FUMITORY

Bleimor: see CALLOCH JEAN PIERRE

blende: see SPHALERITE

Blenheim (blēn'əm), Ger. *Blindheim*, village, Bavaria, S West Germany, on the Danube River. Between Blenheim and nearby Hochstadt, John Churchill, 1st duke of Marlborough, and Prince Eugene of Savoy defeated (Aug. 13, 1704) the French and Bavarians under marshals C. Tallard and F. Marsin in one of the most important battles of the War of the Spanish Succession. In gratitude for this and other military successes by the duke of Marlborough the English Parliament had an immense mansion, Blenheim palace, constructed near Woodstock, Oxfordshire, central England.

Blenheim, battle of, major engagement of the War of the Spanish Succession (see SPANISH SUCCESSION, WAR OF THE), fought on Aug. 13, 1704, at the village of Blenheim, near Hochstadt, Bavaria. Responding to appeals from Vienna, which was threatened by French and Bavarian forces, the English commander,

John Churchill, duke of Marlborough, marched his army from the Netherlands to Bavaria and joined forces with the Austrian general, Prince Eugene of Savoy. At Blenheim their combined army overwhelmed a Franco-Bavarian force under Marshall Tallard and the elector of Bavaria. For the first time in two generations the French suffered a crushing defeat, and the results were immediate and far-reaching. Bavaria was conquered and Vienna saved. The territorial ambitions of Louis XIV beyond the Rhine were checked, and France was placed on the defensive.

Blenheim Park, estate, Oxfordshire, central England, near Woodstock. The stately palace was designed by Sir John VANBRUGH and stands on spacious grounds. Seat of the dukes of Marlborough, the palace was the gift of Queen Anne to the first duke in honor of his victories in the War of the Spanish Succession. Its construction lasted from 1705 to 1724.

Blennerhassett, Harman, 1765–1831, Anglo-Irish pioneer in America, an associate of Aaron Burr. Wealthy and gifted, he fell in love with and married his beautiful niece, Margaret Agnew. The couple was ostracized, and in 1796 Blennerhassett sold his estates and emigrated to the United States, where he bought (1798) part of what came to be called Blennerhassett Island. There he lived as a gentleman scholar interested in experiments in physics until Aaron BURR won (1805) his interest in Burr's plan of Western colonization. Blennerhassett advanced money to Burr. When President Jefferson proclaimed Burr's intentions traitorous, the local militia was mustered. Blennerhassett fled (Dec., 1806) down the river and was taken into custody. He was released after the government failed to convict Burr, but his fortunes were ruined. After a disastrous failure to recoup his losses on a Mississippi plantation, he attempted to practice law in Montreal, returned to England in 1822, and died on the island of Guernsey.

Blennerhassett Island, in the Ohio River, near Parkersburg, W. Va. On it Harman Blennerhassett built a mansion and a laboratory for his study. The island was ransacked by the local militia when Aaron Burr's schemes, with which Blennerhassett was connected, were declared traitorous by President Thomas Jefferson. See N.F. Schneider, *Blennerhassett Island and the Burr Conspiracy* (1938).

blenny, common name of various species of extremely numerous small fishes belonging to the families Blenniidae (combtooth blennies) and Nototheniidae (Antarctic blennies). They are characterized by elongated, tapering bodies and a continuous long dorsal fin. Blennies live among eelgrass in shallow brackish or fresh water and feed on small invertebrates. Some blennies have scales and some do not, certain species have fleshy filaments on the head. Tropical Atlantic species include the striped blenny (found as far north as New York) and the more southerly freckled blenny. The kelpfishes are a closely allied Pacific family. Those that live in kelp beds are mottled in coloration and those found in eelgrass are silver and green, matching their environment. The closely related wolfishes of the family Anarhichadidae, with large, tusklike teeth, are found in arctic Atlantic waters. They average 3 ft (90 cm) in length and are good food fishes, sold commercially as "ocean catfish." Blennies are classified in the phylum CHORDATA, subphylum Vertebrata, class Osteichthyes, order Perciformes, families Blenniidae and Nototheniidae.

Blériot, Louis (lîvê blārêō'), 1872–1936, French aviator and inventor. He devoted the fortune acquired by his invention of an automobile searchlight to the invention and construction of monoplanes. After making several short-distance records, he was the first to cross (July 25, 1909) the English Channel in a heavier-than-air machine.

blesbok: see DAMALISK

Blessington, Marguerite, countess of, 1789–1849, English author and famous beauty, b. Ireland. At the age of 14 she was forced by her father into marriage with Capt. Maurice St. Leger Farmer, a sadist who abused her. She soon left him and after his death married (1818) the earl of Blessington. In 1822 she began a liaison with Count D'Orsay (husband of her stepdaughter), and with him, after Blessington's death, set up a brilliant salon at Gore House, Kensington. To meet expenses she wrote a number of popular novels. Her most successful work, however, is her graphic journal of her *Conversations with Lord Byron* (1834). See biography by Michael Sadleir (rev. ed. 1947).

Blest Gana, Alberto (albār'tō blēst gā'nā), 1830–1920, Chilean novelist. He is considered the princi-

pal 19th-century Spanish American realist. Although as a diplomat he spent much of his life abroad, his novels, both social and historical, depict Chilean scenes. In both *Aritmetica en el amor* (1860) and *Martin Rivas* (1862, tr 1918), his masterpiece, he attacked the mores of the aristocracy and the upper middle class. His novel *Durante la reconquista* (1897) concerns the Chilean revolt against Spain.

Bleuler, Paul Eugen (poul oi'gen bloi' lar), 1857–1939, Swiss psychiatrist and neurologist. He served (1898–1927) as professor at the Univ. of Zurich. In 1911 he made an important contribution to the study of dementia praecox by introducing the term *schizophrenia*. He concluded that the disease was not one of dementia, a condition of diminished mentality, but a disharmonious state of mind in which contradictory tendencies exist together, splitting the harmony of the mind. He postulated a dichotomy of primary and secondary symptoms, the former caused by morbid somatic processes and the latter by psychogenic factors. See his *Dementia Praecox* (1911, tr 1950).

Blida (blé'da), town (1966 pop 99,238), N Algeria, at the foot of the Atlas Mts. It is an administrative center and an agricultural trading town. Blida is surrounded by gardens and by orange, olive, and almond tree plantations. The city is noted for its fruit and flower essences. Built on the site of a Roman military base, Blida was founded in 1553 by Andalusians, who developed irrigation works and orange cultivation. Most of the old town was destroyed by earthquakes in 1825 and 1867.

Bligh, William (bli), 1754–1817, British admiral. He is chiefly remembered for the mutiny (1789) on his ship, the *BOUNTY*, but he had a long and notable career. He was sailing master on Capt. James Cook's last voyage (1776–79). Later he was a commander in the French wars, then (1805–8) governor of New South Wales, where he was briefly imprisoned (1808) by army mutineers in the so-called Rum Rebellion. Bligh was made a rear admiral in 1811 and a vice admiral in 1814. A brave and able officer, he was handicapped in dealing with men by his difficult temper. See biographies by Geoffrey Rawson (1930) and George Mackaness (rev ed 1951), H. V. Evatt, *The Rum Rebellion* (1938).

blight, general term for any sudden and severe plant disease or for the agent that causes it. Blights are characterized by withering and resultant death, without rotting, of the plant or its parts. The term is now applied chiefly to diseases caused by bacteria (e.g., bean blights and fire blight of fruit trees), viruses (e.g., soybean bud blight), and fungi (e.g., potato blights and chestnut blight). Other plant afflictions (caused by insects or unfavorable climatic conditions) that display similar symptoms are also called blights. See DISEASES OF PLANTS.

blimp see AIRSHIP

Blind, Karl (blint), 1826–1907, German revolutionary and German-English writer. Arrested for his part in the German uprisings of 1848–49, he was later freed and from 1852 lived in England. There he became a distinguished writer on politics, history, literature, and especially German folklore and ethnology. He was the stepfather of the poet Mathilde Blind.

blindfish see CAVE FISH

Blind Harry or Henry the Minstrel, fl. late 15th cent., supposed Scottish poet. He is considered the author of the patriotic epic, *The Wallace*, which celebrates the life of Sir William Wallace. Violently anti-English, the poem was popular in Scotland down to the 18th cent. Since the skillful literary technique of *The Wallace* makes its composition by the traditionally blind and humble Harry unlikely, it is felt that the poem owes much to another hand. See edition by W. A. Craigie (1940).

blindness, partial or complete loss of sight. Blindness may be caused by injury, by lesions of the brain or optic nerve, by disease of the cornea or retina, by pathological changes originating in systemic disorders (e.g., DIABETES) and by CATARACT, GLAUCOMA, or retinal detachment. Blindness caused by infectious diseases, such as TRACHOMA, and by dietary deficiencies is common in underdeveloped countries where medical care is inadequate. Most infectious diseases of the eye can be prevented or cured. Blindness may also be congenital. A major cause of congenital blindness in the United States, ophthalmia neonatorum (caused by gonorrhea organisms in the maternal birth canal), is now prevented by placing silver nitrate solution in all newborn infants' eyes. COLOR BLINDNESS is an inability to distinguish colors, most commonly red and green. Snow blindness is a temporary condition resulting from a burn of the cornea caused by the reflection of sunlight on snow.

Night blindness results from a deficiency of vitamin A. See EYE.

Blind River, town (1971 pop 3,450), S Ont., Canada, on North Channel of Lake Huron. It is the center of the Algoma uranium fields. Just to the east of the town is Ontario's first uranium mine (1955).

blink microscope, in astronomy, device for determining a change in position or magnitude (brightness) of a star relative to other stars in the background. Two photographs of the same field or area of the sky are projected so that they precisely coincide. The combined image is viewed through a magnifying eyepiece while light from first one photograph and then the other is interrupted mechanically. A change in position or magnitude of a star can usually be detected since the star will seem to flicker or jump to and fro while the background stars remain steady in both position and brightness.

Bliss, Sir Arthur, 1891–, English composer. Bliss's teachers included Charles Stanford, Ralph Vaughan Williams, and Gustav Holst. He was made Master of the Queen's Musick in 1953. His early works, including pieces for wordless voices, were considered avant-garde. Bliss's works include ballets, cantatas, operas such as *The Olympians* (1949) and *Tobias and the Angel* (1958), the *Colour Symphony* (1932), a piano concerto (1938), quintets for oboe (1927) and clarinet (1931) with strings, and a concertina for cello and orchestra (1969). His autobiography was published in 1970.

Bliss, Daniel, 1823–1916, American missionary, b. Franklin co., Vt., founder of Syrian Protestant College (now the American Univ. of Beirut) in Lebanon. He went to Syria in 1855, returning in 1862 to secure funds and a charter for the college, which was opened in 1866, he was its president until 1902. See his *Reminiscences* (ed. by his son, 1920). His son, **Howard Sweetser Bliss**, 1860–1920, b. Syria, grad. Amherst, 1882, and Union Theological Seminary, 1887, succeeded him as president and enlarged and liberalized the college.

Bliss, Howard Sweetser see BLISS, DANIEL

Bliss, Philip Paul, 1838–76, American evangelist and writer of gospel songs, b. Clearfield co., Pa. A fine baritone voice and a handsome presence aided him in his work, and his songs became tremendously popular. After the publication of his *Gospel Songs* (1874) he became associated with Dwight L. Moody and joined Ira D. Sankey in producing a series of songbooks called *Gospel Hymns*, the first of which appeared in 1875. Among his songs are "Hold the Fort," "Let the Lower Lights Be Burning," and "Jesus Loves Me."

Bliss, Tasker Howard, 1853–1930, American army officer and statesman, b. Lewisburg, Pa., grad. West Point, 1875. He was (1898) chief of staff to Gen. James H. Wilson in the Puerto Rico campaign of the Spanish-American War, served (1898–1902) as collector of customs in Cuba, and in 1902 negotiated the treaty of reciprocity between Cuba and the United States. Several important administration appointments followed in the United States and in the Philippines, and he was appointed (1917) chief of staff of the U.S. army. He helped work out the mobilization plans followed by the United States in World War I. President Wilson promoted (1917) him to the rank of general and appointed him to the Allied Supreme War Council. As a delegate at the Paris Peace Conference, Bliss urged the admission of Germany and the USSR to the League of Nations and advocated postwar disarmament. See biography by Frederick Palmer (1934), study by D. F. Trask (1966).

blister, puffy swelling of the outer skin (epidermis) caused by burn, friction, or irritants like poison ivy. A response of the body to protect deeper tissue, blisters generally contain serum, the liquid component of blood. The so-called blood blister, however, forms over ruptured capillaries and therefore contains whole blood.

blister beetle, common name for certain soft-bodied, usually black or brown, mostly elongate and cylindrical beetles belonging to the family Meloidae. Blister beetles are common insects found feeding on the flowers and foliage of various plants. Occasionally some, e.g., POTATO BEETLES, become serious defoliating pests of potatoes, tomatoes, beets, asters, and other crops and flowers. The larvae are predaceous or parasitic, feeding on the eggs of grasshoppers and of bees. Blister beetles undergo hypermetamorphosis, a complex life cycle with several different larval forms. The first of the six larval stages, called a triungulin, is a minute, active, and

long-legged form that seeks out the host's nest, the following stages are grublike. Adults emerge in mid summer. One group of blister beetles has body fluids that contain cantharidin, a substance that can cause the skin to blister, from which the family gets its name. The Spanish fly (*Lytta vesicatoria*), a bright green or bluish blister beetle, is a common S. European species from which cantharides are extracted and commercially prepared by crushing the wing covers (elytra) of the adults. This quite poisonous chemical is used medicinally as a skin irritant (in plasters), a diuretic, and an aphrodisiac. The lethal dosage for man is about 0.3 grams. Another group of meloid beetles has no cantharidin and is sometimes called the oil beetles because of the oily substance they secrete as protection against predators. Blister and oil beetles may be brushed into pans of kerosene or killed with systemic poisons or contact insecticides (except arsenic compounds). Blister beetles are classified in the phylum ARTHROPODA, class Insecta, order Coleoptera, family Meloidae.

blister gas see POISON GAS

blister rust see RUST

Blixen, Karen see DINESEN, ISAK

blizzard, winter storm characterized by high winds, low temperatures, and driving snow, according to the official definition given in 1958 by the U.S. Weather Bureau, the winds must be 35 mi (56 km) per hr or more and the temperature 20°F (−7°C) or lower. Blizzards are most common in the N. Great Plains states—South Dakota is sometimes called "the Blizzard State"—but they also occur as far south as Texas and as far east as Maine.

bloat, excessive accumulation of gases in the rumen, the first stomach of a cud-chewing animal. Bloat is probably formed to a large extent by bacterial action. It occurs in all ruminants, but is most common in cattle; it appears typically in animals that graze on newly developed, highly productive, lush green pastures, especially during a wet summer on clover-dominant pastures. Bloat can result from excess frothiness of the ruminal ingesta or loss of tone and motility of the rumen. Both of these conditions will prevent the normal eructation process. Treatment consists of passing a tube to the stomach or of reducing the foam formation by oral administration of mineral or vegetable oils. Prevention is attempted by carefully controlled management practices, administration of antibiotics, and the use of nontoxic oils.

bloc, parliamentary [Fr., = block], group of legislators formed to support special interests. A bloc may form because of a specific issue and dissolve when that issue has been resolved, or it may have a more permanent character, based on a more general interest. It is usually more tightly knit and aggressive than a coalition. The bloc has been a common device in legislatures made up of many parties, where it has tended to create two loose groups of "left" and "right." In nominally bipartisan legislatures, such as those of the United States, blocs are smaller groups and are usually organized to promote a specific economic or social interest or policy as, for example, the farm bloc. Recent years have seen the emergence of bloc voting by groups of states in the General Assembly of the United Nations.

Bloch, Ernest (blök), 1880–1959, Swiss-American composer. Among his teachers were Jacques-Dalcroze and Ysaye. He taught at the Geneva Conservatory, 1911–15, and at the Mannes School, New York, 1917–19, he was director of the Cleveland Institute of Music, 1920–25, and of the San Francisco Conservatory, 1925–30. His music is based in the classical tradition, but it has a peculiarly personal intensity of expression and often a distinct Hebraic quality, as in the Hebrew rhapsody *Schelomo* and the symphonic poem *Israel* (both 1916). Other outstanding works are an opera, *Macbeth* (1909), a concerto grosso, for string orchestra and piano (1925), the symphonic poems *America* (1926) and *Helvetia* (1929), a modern setting of the Jewish *Sacred Service* (1933), and *A Voice in the Wilderness*, for cello and orchestra (1937).

Bloch, Konrad E., 1912–, American biochemist, b. Niesse, Germany. He was educated at Munich and at Columbia (Ph.D., 1938). He taught at Columbia and at the Univ. of Chicago before going to Harvard in 1954. He became a U.S. citizen in 1944. He shared the 1964 Nobel Prize in Physiology and Medicine with Feodor Lynen for discoveries concerning the mechanism and regulation of cholesterol and fatty acid metabolism.

Bloch, Marc (blök), 1886–1944, French historian and an authority on medieval feudalism. He taught at the Univ. of Strasbourg from 1919, became professor

at the Sorbonne in 1936, and was cofounder of the journal *Annales*. Bloch did much to promote the study of economic history. As a Jew, he was subject to German restrictions during World War II. He joined the French Resistance in Lyon in 1942, helping to publish the newspaper *Franc-Tireur*, a name adopted by the Resistance forces in the region. His activities led to his execution by the Germans in 1944. His *Strange Defeat* (tr 1949) describes wartime France. Among Bloch's major works are *The Historian's Craft* (tr 1953) and *French Rural History* (tr 1966). His *Feudal Society* (tr 1961) is a brilliant modern synthesis of the subject. In it Bloch stressed feudalism's rise from a mixed society and concluded that German elements reinforced feudal tendencies already present in the late Roman Empire. He described the feudal system as primarily a system of human relationships.

Block, Adriaen, fl 1610-24, Dutch navigator. Eager to establish an Indian fur trade, Amsterdam merchants sent (1613) Block and another Dutch navigator to explore the region discovered by Henry Hudson. After wintering near Albany, Block sailed from the Hudson into Long Island Sound (1614), which he may have been the first European to enter, coming in through the East River passage that he named Hellegat (Hell Gate). He discovered the Connecticut River, sailed past and named Block Island, and explored Narragansett Bay. Block made the *Figurative Map of 1614*, showing details of the southern coast of New England and showing (the first to do so) Long Island and Manhattan as separate.

Block, Herbert Lawrence (Herblock), 1909-, American editorial cartoonist, b. Chicago. Herblock began drawing cartoons (1929-33) for the *Chicago Daily News*, later moving to the *Newspaper Enterprise Association* (1933-43) and to the *Washington Post* (1946-). His work has been syndicated widely and was awarded the Pulitzer Prize in 1942 and 1954. Collections of his cartoons include *The Herblock Book* (1952), *Herblock's Here and Now* (1955), *Straight Herblock* (1964), *Herblock's State of the Union* (1972), and *Herblock's Special Report* (1974).

blockade, use of naval forces to cut off maritime communication and supply. Blockades may be used to prevent shipping from reaching enemy ports, or they may serve purposes of coercion. The term is rarely applied to land sieges. During the Napoleonic wars, both France and Great Britain attempted to control neutral commerce through blockades and embargoes which neither could enforce with sufficient rigor. The Declaration of Paris (see PARIS, DECLARATION OF) proclaimed (1856) that blockades were henceforth to be announced to all affected parties and would be legal only if effectively enforced against all neutrals. In both World Wars blockades were made more effective by the employment, in addition to naval vessels, of mines and aircraft. North Vietnamese ports were mined and blockaded by the United States during later stages of the Vietnam War. Blockades have also occasionally been employed in times of peace as threats to implement diplomacy, as in the blockade of Cuba by the United States in 1962.

block and tackle: see PULLEY

block book Before and after the invention of printing from movable types in the mid-15th cent., some books were printed in Europe from engraved wooden blocks, with one block for each page. This method was developed by the 9th cent. A.D. in China. The practice has a richer history in the Orient than in the Occident since the number of characters used in Chinese writing made printing from movable type exceedingly difficult. Chinese and Japanese illustrated block books are often beautifully printed in colors. European block books, on the contrary, were crude and inexpensive. They were, however, the first examples of printed book illustration in the West. The best-known block book is the *Biblia pauperum* [poor man's Bible].

blockhouse, small FORTIFICATION, usually temporary, serving as a post for a small garrison. Blockhouses seem to have come into use in the 15th cent. to prevent access to a strategically important objective such as a bridge, a ford, or a pass. Later the term was broadened to include all detached and isolated small forts, especially those in country just captured from an enemy. The typical blockhouse was of two stories, with an overhanging second story and loopholes on all sides for gunfire. In the North American colonies, blockhouses were used in frontier communities as protection against Indian attacks; they were built of timber or stone (in New England) or of logs banked with earth (in the South and West). The frontier blockhouses were frequently surrounded by

palisades and thus were technically stockaded forts. The principal use of blockhouses in present-day military fortification is in defending isolated units against small-arms fire. See PILLBOX.

Block Island, 7 mi (11.2 km) long and 3.5 mi (5.6 km) wide, off S.R.I. at the eastern entrance to Long Island Sound. Visited by the Dutch navigator Adriaen Block in 1614, it was settled in 1661. The murder (1637) there of John Oldham, an English trader, was the direct cause of the Pequot War (see PEQUOT INDIANS). Characterized by numerous small ponds, low hills, and a mild climate, the island has long been a favorite fishing and resort area. Possessing two harbors, it accommodates both local fishing boats and summer pleasure craft. There are two lighthouses. The town of New Shoreham (1970 pop 489, inc 1672) is coextensive with the island.

block printing: see textile printing under TEXTILES

block-signal system. See SIGNALING

Blodgett, Katharine Burr, 1898-, American physicist and chemist, b. Schenectady, N.Y., B.A. Bryn Mawr, 1917, Ph.D. Cambridge, 1926. In 1918 she became research physicist for the General Electric Company, where she worked with Irving Langmuir on tungsten filaments and later on monomolecular layers. Further research produced the method of preparing nonreflecting glass and of measuring the thickness of monomolecular films within one micron.

Bloemfontein (bloōm'fōntān'), city (1970 pop 148,282), capital of the Orange Free State and the judicial center of the Republic of South Africa. It is a transportation hub and industrial center, containing railroad workshops, food-processing plants, and factories that produce furniture, plastics, and glassware. Bloemfontein was founded in 1846 and served as the capital of the ORANGE FREE STATE Republic until its capture (1900) by British forces during the South African War. Afterward, it was the site of the final negotiations (1909) that led to the establishment (1910) of the Union of South Africa. Among the city's educational institutions are the Univ. of the Orange Free State (founded 1855, university status 1950) and a technical college.

Blois (bliwa), town (1968 pop 44,762), capital of Loiret-Cher dept., central France, in Orléanais, on the Loire River. A commercial and industrial center with an outstanding trade in wines and brandies, it is also one of the most historic towns of France. The counts of Blois emerged in the 10th cent. as the most powerful feudal lords of France. Their line began with Thibaut the Cheat, who by various means acquired Touraine and Chartres, his successors added (11th-12th cent.) Champagne, Brié, and other lands, although in the west they were checked by the counts of Anjou. The last count of Blois, childless and heavily in debt, sold his fief to Louis, duc d'Orléans, who took possession in 1397. With the accession (1498) of Louis' grandson, Louis XII, as king of France, the countship passed to the crown as part of Orléanais. The town was a favorite royal residence. Louis XII was born in the Renaissance château there. Several States-General of France were held in the château, notably in 1576-77 and in 1588. Henri, duc de Guise, was assassinated there in 1588. The Treaties of Blois, signed in 1504-5, were a temporary settlement of the Italian Wars.

Blok, Aleksandr Aleksandrovich (alyiksan'dar'alyiksan'dravich blök), 1880-1921, Russian poet, considered the greatest of the Russian SYMBOLISTS. As the leading disciple of Vladimir Soloviev, he voiced both mysticism and idealistic passion in an early cycle of love poems, *Verses about the Lady Beautiful* (1904). In 1905 he turned to themes of despair, degradation, and the attraction of evil. *The Unknown Woman* (1906) is his best-known poem of this period. Later he found hope in the idealization of Russia, welcoming the Revolution of 1917 in his epic poem *The Twelve* (1918, tr 1920). This work celebrates the passion, violence, and exhilaration of the revolution, with which Blok later became disenchanted. *The Scythians* (1920) is directed against the Western forces fighting the Bolsheviks. See his selected poems, ed. by Avril Pyman (1972), his account of his journey to Italy, ed. by L. E. Vogel (1973), studies by F. D. Reeve (1962) and Robin Kimball (1965).

Blondel, François (fran'swa' blōNdēl'), 1617-86, French architect. Blondel's best-known work is the triumphal arch called the Porte St-Denis (1672), in Paris. In 1672 he became director of the Academy of Architecture. Blondel's writings, which exerted great influence, include *Cours d'architecture enseignée dans l'Académie royale d'architecture* (2 vol., 1675-

83) and *Nouvelle Manière de fortifier les places* (1684). He advocated a strict adherence to a classical and rationalist doctrine of architecture. His nephew, Jacques François Blondel, 1705-74, opened the first French private school of architecture in 1739. As architect to the king he devised plans for the civic beautification of Metz and Strasbourg. He designed the town hall and Place d'Armes at Strasbourg and the west portal of the cathedral at Metz. His published works include *L'Architecture française* (1752), valuable for its engraved views of buildings that no longer exist, and *Cours d'architecture, ou, Traité de la décoration* (6 vol., 1771-77).

Blondel, Maurice, 1861-1949, French Catholic philosopher, b. Dijon. He was a professor at the universities of Montauban, Lille, and Aix-Marseille during his influential career. Like his contemporary Henri Bergson he was anti-rationalist and scorned science. In his first work, *L'Action* (1893, rev. ed 1950), he laid the groundwork for his later thought. Blondel held that action could never be satisfied by any finite good and could only be fulfilled in God, whom he described as the "first principle and last term." In his positive affirmation of God he was close to St. Augustine, Plato, and Leibniz, he later also accorded legitimacy to the rational proofs of God's existence. His other chief works were *La Pensee* (2 vol., 1934-35) and *Le Problème de la philosophie catholique* (1932). See study by Henri Bouillard (1969).

Blondel de Nesle (blōn'dal də nēl, fr blōNdēl' də nēl), fl. late 12th cent., French troubadour, a favorite of RICHARD I of England. Legend relates that after Richard was captured and imprisoned by Leopold V of Austria in 1193, Blondel wandered through Germany, singing a song known only to him and his lost master, until Richard answered from his prison. Blondel was then able to tell the English where Richard was held captive.

blood, fluid that is pumped by the heart and circulates throughout the body via the arteries, veins, and capillaries. An adult male of average size normally has about 6 qt (5.6 liters) of blood. The blood carries oxygen and nutrients to the body tissues and carries away carbon dioxide and other wastes. The colorless fluid of the blood, or plasma, contains a variety of cells and substances. Most numerous are the erythrocytes, or red blood cells, which number from 4.5 million to 6 million per cubic millimeter of blood. They carry out the exchange of oxygen and carbon dioxide between the lungs and the body tissues. In order to combine effectively with oxygen, the erythrocytes must contain a normal amount of the red protein pigment hemoglobin, which in turn is dependent on the amount of iron in the body. A deficiency of iron and therefore of hemoglobin leads to ANEMIA and poor oxygenation of the body tissues. Nucleated immature erythrocytes develop in the BONE MARROW. As they mature, the erythrocytes also lose their nuclei, become disk-shaped, and begin to produce hemoglobin. After circulating for about 120 days the erythrocytes wear out and are destroyed by the spleen. Although all red blood cells are essentially similar, certain structures on their surfaces vary from person to person, on the basis of these structures blood is classified into BLOOD GROUPS. The leukocytes, or white blood cells, defend the body against infecting organisms and foreign agents both in the tissues and in the bloodstream itself. Human blood contains about 5,000 to 10,000 leukocytes per cubic millimeter, the number increases in the presence of infection. An extraordinary and prolonged proliferation of leukocytes is known as LEUKEMIA, and is usually fatal. Conversely, a sharp decrease in the number of leukocytes (leukopenia), usually the result of drug toxicity, strips the blood of its defense against infection and is an equally serious condition. Leukocytes have nuclei and are classified into three groups. The granulocytes form in the bone marrow and account for about 70% of all white blood cells. There are three subdivisions of granulocytes: neutrophils, eosinophils, and basophils. Neutrophils constitute the vast majority of granulocytes. They are capable of amoeboid movement and can surround and destroy bacteria and other microorganisms. The eosinophils, ordinarily about 2% of the granulocyte count, increase in number in the presence of allergic disorders and parasitic infestations. The basophils account for about 1% of the granulocytes, and they may be the source of heparin, which delays blood clotting. The second group of white blood cells, the lymphocytes, are formed in the lymphoid tissue, under normal conditions they make up about 20% to 35% of all white cells. Lymphocytes tend to migrate into the connective tissue, where they develop into plasma cells that produce anti-

bodies against foreign microorganisms. The third group, the monocytes, are derived from the phagocytic cells that line many vascular and lymph channels, called the reticuloendothelial system, monocytes, which are also produced from lymphocytes, ordinarily number 4% to 8% of the white cells. They attack and destroy organisms left behind by the granulocytes and lymphocytes. In certain diseases of long duration (tuberculosis, malaria, typhoid) the monocytes are thought to be the main instrument of defense. The blood also contains platelets, or thrombocytes, and other substances active in BLOOD CLOTTING. Also circulating in the plasma are the hormones that the endocrine glands secrete directly into the bloodstream. In addition, essential salts (like those of sodium and potassium), essential proteins (albumin, globulins, and fibrinogen), and metabolic wastes (such as urea) circulate in the plasma. Serum, a straw-colored liquid, is essentially plasma without fibrinogen. It is the liquid component of blood that separates from the clot. Serum is removed from whole blood by centrifuging and is put to various medical uses. Normal human serum is sometimes introduced into a patient to counteract surgical or traumatic shock or the loss of fluid resulting from severe burns. Human blood is classified into four major groups, an important distinction in successful BLOOD TRANSFUSION.

blood bank, site for collecting, processing, typing, and storing whole BLOOD and blood plasma. Whole blood may be preserved up to 21 days without losing its usefulness in BLOOD TRANSFUSIONS, an anticoagulant is added to it to prevent clotting. Blood plasma, the fluid portion of the blood, may be frozen and stored indefinitely. The earliest whole blood transfusions were performed during World War I, but the first blood bank was not established until 1937 at Cook County Hospital in Chicago. Today most hospitals maintain their own blood reserves and the U.S. Red Cross provides a nationwide distribution service.

blood clotting, process by which the blood coagulates to form solid masses, or clots. In minor injuries, small oval bodies called platelets, or thrombocytes, tend to collect and form plugs in blood vessel openings. To control bleeding from vessels larger than capillaries a clot must form at the point of injury. The coagulation of the blood is also initiated by the blood platelets. The platelets produce a substance that combines with calcium ions in the blood to form thromboplastin, which in turn converts the protein prothrombin into thrombin in a complex series of reactions. Thrombin, a proteolytic enzyme, converts fibrinogen, a protein substance, into fibrin, an insoluble protein that forms an intricate network of minute threadlike structures called fibrils and causes the blood plasma to gel. The blood cells and plasma are enmeshed in the network of fibrils to form the clot. Blood clotting can be initiated by the extrinsic mechanism, in which substances from damaged tissues are mixed with the blood, or by the intrinsic mechanism, in which the blood itself is traumatized. More than 30 substances in blood have been found to affect clotting, whether or not blood will coagulate depends on a balance between those substances that promote coagulation (procoagulants) and those that inhibit it (anticoagulants). Prothrombin, a substance essential to the clotting mechanism, is produced by the liver in the presence of vitamin K. When the body is deficient in this vitamin, bleeding is more difficult to control. In hemophiliacs, or "bleeders," the blood's coagulation time is greatly prolonged (see HEMOPHILIA). The coagulation of blood within blood vessels in the absence of injury can cause serious illness or death, especially when a clot forms in the coronary arteries (THROMBOSIS) or cerebral arteries (APOPLEXY). To prevent coagulation of the blood in persons with known tendency to clot formation, and also as prophylaxis before performing surgery or blood transfusion, the blood's natural anticoagulating substance, heparin, is reinforced by an additional amount of an anticoagulant such as Dicumarol injected into the body.

blood feud see VENDETTA

blood groups, substances in red blood cells, classified according to their immunological (antigenic) properties. Blood groups are genetically determined. Each has a specific chemical structure that is part of the surface structure of red blood cells. About 200 different blood group substances have been identified and placed within 19 known blood group systems. Like many other chemical substances, blood group substances act antigenically, i.e., when injected into a recipient they will elicit the formation of specific ANTIBODIES. Antigen-anti-

body reactions are studied in IMMUNOLOGY. The most commonly encountered blood group system is the OAB, or LANDSTEINER, system. Individuals may contain the A, B, or AB antigenic substances, or else lack these substances (type O). In the OAB system an individual who lacks one or more of these antigens will spontaneously develop the corresponding antibodies (agglutinins) shortly after birth. Thus a person with A type blood will naturally produce anti-B agglutinins, a person with B blood will produce anti-A agglutinins, and a person with O blood will produce anti-A and anti-B agglutinins, but a person with AB blood will not produce any agglutinins in this blood group system. In the special case of the OAB system, agglutinins are always present in the blood, and in BLOOD TRANSFUSION the donor blood must be compatible with the recipient's blood, i.e., the donor's blood must not contain antigen corresponding to the recipient's antibody. Other blood group systems, such as the MNSs, Lutheran, and P systems, are not as important in transfusion because they act like true antigen-antibody systems, i.e., antibodies do not appear in blood plasma until the individual has been immunized by exposure to the other blood group antigens as in previous transfusions. In general, blood group substances are weak antigens, and antibody formation after transfusion occurs less than 3% of the time. Immunization can occur by pregnancy as well as by transfusion. Thus, in the RH FACTOR blood group system, an Rh-negative mother carrying an Rh-positive fetus produces anti-Rh antibodies against fetal red blood cells that cross the placenta. These maternal anti-Rh antibodies move back across the placenta and cause hemolysis of the red blood cells in the fetal bloodstream. Blood group typing is used legally to establish paternity. Any blood factor that occurs in a child must be present in at least one of the child's biological parents, where a child lacks a blood antigen (as when his blood type is O) both biological parents must also lack that factor. Anthropologists use the frequency of occurrence of various blood groups as tools to study racial or tribal origins.

bloodhound, breed of large HOUND whose ancestors were known in the Mediterranean region before the Christian era. It stands about 25 in. (63.5 cm) high at the shoulder and weighs between 80 and 110 lb (36.3-49.9 kg). Its short, smooth coat may be black and tan, red and tan, or tawny. The skin is very loose and hangs in deep folds over the forehead and at the sides of the face, giving the dog its characteristically mournful expression. The oldest hound breed and probable progenitor of all the hounds, it was introduced into Europe long before the Crusades and became popular with the aristocracy and clergy. The latter, especially, were responsible for the dog's careful breeding and purity of strain, which led it to be called the "blooded hound," i.e., hound of noble ancestry. It was imported into the United States in the early 19th cent. Its sense of smell is second to no other breed and has earned it a singular reputation as a tracker of criminals and missing persons. Unlike the police or war dog, it does not attack the man or animal it is tracking. See DOG.

Blood Indians, see BLACKFOOT INDIANS

bloodletting, also called bleeding, practice of drawing blood from the body in the treatment of disease. General bloodletting consists of the abstraction of blood by incision into an artery (arteriotomy) or vein (venesection, or phlebotomy). Local bloodletting is the abstraction of blood from smaller vessels by watercupping or by leeching. From antiquity through the 18th cent. bloodletting was widely practiced in western medicine. A broad assortment of ailments were believed to result from the impurity or superabundance of blood in the system, periodic bloodletting was felt to assure the patient of good health. In modern times the medicinal leech (*Hirudo medicinalis*) is still used in some areas of the world for the removal of blood from bruises and black eyes. Venesection is employed to treat erythremia, an abnormal condition characterized by the overproduction of red blood cells, and to relieve the congestion of blood resulting from acute heart failure.

blood poisoning see SEPTICEMIA

blood pressure, force exerted by the blood upon the walls of the arteries. The pressure in the arteries is initiated by the pumping action of the heart, and pressure waves can be felt at the wrist and at other points where arteries lie near the surface of the body (see PULSE). Blood pressure is strongest in the aorta, where the blood leaves the heart. It diminishes progressively in the smaller blood vessels and

reaches its lowest point in the veins (see CIRCULATORY SYSTEM). Blood pressure is dramatically manifested when an artery is severed or pierced, and the blood (under pressure) ejects in spurts. Since the heart can pump blood into the large arteries more quickly than it can be absorbed and released by the tiny arterioles and capillaries, there is always considerable inner pressure in the arteries. The contraction of the heart (systole) causes the blood pressure to rise to its highest point, and relaxation of the heart (diastole) brings the pressure down to its lowest point. Since blood pressure varies in different arteries, the pressure in the brachial artery of the forearm is used as a standard. It is measured in millimeters of mercury by means of an instrument known as a sphygmomanometer. The normal readings in young people are about 120 mm for systolic pressure and about 80 mm for diastolic pressure, commonly written as 120/80 and read as "one-twenty over eighty." With age, and the constriction of the small arteries and then the larger ones, blood pressure increases, so that at 50 years it is considered normal to have a systolic pressure between 140 and 150, and a diastolic pressure of about 90. Factors other than heart action and the condition of the arteries also influence blood pressure. Temporary high blood pressure usually occurs during or following physical activity, nervous strain, and periods of rage or fear. Therapy for persistent high blood pressure consists of sufficient rest, mild sedation (especially with pressure-reducing drugs), a diet low in salt and protein, and reduction in weight where there is obesity. Low blood pressure (hypotension) is considered to be advantageous if it is not caused by disease or injury.

bloodroot, see POPPY

bloodstone or **heliotrope**, green CHALCEDONY spotted with red, used as a gem stone. It is obtained from India, the United States, Brazil, and Australia.

blood test, examination of BLOOD routinely or as an aid in diagnosing a suspected disease. Tests may be performed on whole blood or on the plasma portion only. Blood volume tends to fluctuate with various disorders, it decreases after severe hemorrhage and increases with heart disease. Blood typing identifies the proteins at specific sites on the red blood cells, a necessity in determining compatibility for BLOOD TRANSFUSION. Microscopic counts of red blood cells are used in the diagnosis of ANEMIA and POLYCYTHEMIA, while white cell counts are vital in detecting infections or in confirming LEUKEMIA. Plasma may be collected, cultured, and inoculated with bacteria or other pathogens for the purpose of detecting the presence of antibodies, defending substances found in the blood, if the foreign body, or antigen, thrives in the culture there is an antibody deficiency. Plasma may also be examined for evidence of functional disorders, e.g., for blood sugar in testing for diabetes mellitus and for fat and cholesterol content in detecting susceptibility to heart and systemic disease.

blood transfusion, transfer of blood from the venous system of one person to that of another, or from one animal to another of the same species. Transfusions are performed to replace a large loss of blood and as supportive treatment in certain diseases and blood disorders. When whole blood is not needed, or when it is not available, plasma, the fluid of the blood without the blood cells, can be given. In giving a successful whole blood transfusion from one person to another it is necessary for the blood of the donor to be compatible with that of the recipient. Blood is incompatible when certain factors in red blood cells and plasma differ in donor and recipient, when that occurs, agglutinins (i.e., antibodies) in the recipient's blood will clump with the red blood cells of the donor's blood. The most frequent blood transfusion reactions are caused by substances of the Landsteiner, or OAB, BLOOD GROUP system and the Rh factor system. In the OAB system, group AB individuals are known as universal recipients because they can accept A, B, AB, or O donor blood. Persons with O blood are sometimes called universal donors because the red cells of this group are less likely to be agglutinated by the blood of any other group, but even O donor blood, if it has a high concentration of agglutinins, may initiate a transfusion reaction when large quantities are mixed with blood of another type. In the Rh factor system, agglutinins are not produced spontaneously in an individual but only in response to previous exposure to Rh antigens, as in some earlier transfusion. Transfusion reactions involving incompatibility eventually cause hemolysis, or disruption of donor cells. The resulting liberation of hemoglobin

into the circulatory system, causing jaundice and kidney damage, can be lethal. In addition to providing for the compatibility of blood groups in transfusion, it is necessary to determine that the donor's blood is free of organisms that might cause *SYPHILIS*, *MALARIA*, or serum *HEPATITIS*. Sometimes there is a purely allergic reaction because allergic antibodies have been transmitted from the donor's blood, possibly because of some type of food recently ingested by the donor.

bloodworm, name for the larva of the MIDGE and for a red-blooded marine annelid worm.

Bloody Assizes* see JEFFREYS OF WEM, GEORGE JEFFREYS 1ST BARON

Bloom, Hyman, 1913–, American painter, b. Latvia. Bloom was brought to the United States and settled with his family in Boston in 1920. Primarily a philosophical painter of expressionistic style, Bloom reveals in his works the influence of Rouault and Soutine. His canvases are often thickly encrusted with flamboyant color. Many, such as *Slaughtered Animal* (1953), Univ. of California, Los Angeles), are concerned with death.

Bloomer, Amelia Jenks, 1818–94, American reformer, b. Homer, N.Y. She was editor (1848–54) of the *Lily*, first published in Seneca Falls, N.Y., and devoted to woman's rights and to temperance. In 1851 she recommended and adopted the reformed dress of short skirt and full trousers introduced by Elizabeth Smith Miller. Because she advertised it in the *Lily* and wore it in her lecture work, it became universally known as the Bloomer costume, or bloomers. See biography by her husband, D. C. Bloomer (1895), C. N. Gattey, *The Bloomer Girls* (1968).

Bloomfield, Leonard, 1887–1949, American linguist, b. Chicago. Bloomfield was professor at Ohio State Univ. (1921–27), at the Univ. of Chicago (1927–40), and at Yale (from 1940). His specialty for years was Germanic languages, especially in their comparative aspects. He became interested, however, in languages from a scientific, descriptive viewpoint. His masterpiece, *Language* (1933) is a standard text. It had a profound influence on linguistics, for it was a clear statement of principles that became axiomatic, notably that language study must always be centered in the spoken language, as against documents, that the definitions used in grammar should be based on the forms of the language, not on the meanings of the forms, and that a given language at a given time is a complete system of sounds and forms that exist independently of the past—so that the history of a form does not explain its actual meaning. His other works include *Tagalog Texts with Grammatical Analysis* (1917), *Linguistic Aspects of Science* (1939), *Spoken Dutch* (1945), and *Spoken Russian* (1945).

Bloomfield. 1. Town (1970 pop. 18,301), Hartford co., N. Conn., a suburb of Hartford, in a tobacco and dairy region, settled c. 1642, inc. 1835. Aircraft parts are manufactured, and the home office of a large insurance company is there. 2. Town (1970 pop. 52,029), Essex co., N.E. N.J., an industrial and residential suburb of Newark, settled c. 1660, inc. as a town 1812, as a city 1900. Electrical equipment and pharmaceuticals are made in the town, which is also the seat of Bloomfield College. Named for the Revolutionary War general Joseph Bloomfield, who later became governor of New Jersey, Bloomfield was a supply point for both sides during the war. In the 19th cent. it was a trade and transportation hub. The Presbyterian church there dates from 1796. The author Randolph Bourne was born in Bloomfield.

Bloomgarten or **Blumengarten**, **Solomon**, pseud. **Yehoash** (yehō'ash), 1870–1927, American writer in Yiddish, b. Lithuania. He emigrated to America in 1891 and, except for 10 years in Colorado (1900–1910), lived chiefly in New York City. His poetry, which holds a high place in Jewish-American literature, includes the collections *Through Mist and Sunshine* (1913) and *In the Weaving* (2 vol., 1919–21). *The Feet of the Messenger* (1921) was translated into English (1923). Considered to be his greatest work was the translation of the entire Old Testament from Hebrew into Yiddish. With Charles D. Spivak he compiled a Hebrew-Yiddish dictionary (1911). A translation of his poems appeared in 1952.

Bloomington. 1. City (1970 pop. 39,992), seat of McLean co., central Ill., inc. 1839. It is an important rail, commercial, and industrial center in a rich farm and coal area. In 1856 the state Republican party was organized in Bloomington, at which time Lincoln delivered his famous "lost speech" (no copy of which is known to exist). The city is the seat of Illinois Wesleyan Univ. and the Illinois Soldiers and

Sailors Children's Home. Illinois State Univ. is in adjacent Normal (formerly North Bloomington). Of interest are the burial place of Adlai E. Stevenson and the David Davis Mansion, a state historic shrine. 2. City (1970 pop. 42,890), seat of Monroe co., S. central Ind., in a densely forested region, settled 1816, inc. 1878. Electronic machinery, electrical appliances, and elevators are manufactured. Quarrying and marketing of the limestone abundant in the area has sustained the city's economy for many years. It is the seat of Indiana Univ., and its growth is closely related to the development of that institution. In the area are three state parks, a state forest, Hoosier National Forest, and lakes Monroe (Indiana's largest) and Lemon. 3. City (1970 pop. 81,970), Hennepin co., SE Minn., a suburb adjacent to Minneapolis, inc. 1953. Its many manufactures include lawn mowers, electronic equipment, and metal products.

Bloomsburg, industrial town (1970 pop. 11,652), seat of Columbia co., E. Pa., on the Susquehanna River, settled 1772, inc. 1870. Carpets, aluminum products, and silk are among its manufactures. It is the only incorporated town in the state. Bloomsburg State College and a transportation museum are there.

Bloomsbury group, name given to the literary group that made Bloomsbury Square in London the center of its activities from 1904 to c. 1939. It included Lytton Strachey, Virginia Woolf, Leonard Woolf, E. M. Forster, V. Sackville-West, Roger Fry, Clive Bell, and John Maynard Keynes. Not to be confused with a literary school, it was primarily a social clique that assembled on Thursday nights for conversation and became prominent as the fame of its members grew. By the 1920s its reputation as a cultural circle was fully established to the extent that its mannerisms were parodied and *Bloomsbury* became a widely used term connoting an insular, snobbish aestheticism. See J. K. Johnstone, *The Bloomsbury Group* (1954), Leonard Woolf, *Beginning Again* (1964), Quentin Bell, *Bloomsbury* (1969).

Bloor, Ella Reeve, 1862–1951, American radical, popularly known as Mother Bloor, b. Staten Island, N.Y. After an early career in the woman-suffrage and temperance movements she joined the Socialist party in 1902 and was an organizer until 1919 when she broke with the Socialists to help organize the Communist party. She served as chairman of the party's women's commission and was (1932–1948) a member of the national committee. She wrote *Women of the Soviet Union* (1930) and the autobiographical *We Are Many* (1940).

Blount, James Henderson (blūnt), 1837–1903, American public official, b. Jones co., Ga. U.S. Representative from Georgia (1873–93), he was chosen by President Cleveland as a special commissioner to the Hawaiian Islands in 1893. There the creation of an American-fostered provisional government, under Sanford B. Dole, in opposition to Queen Liliuokalani had caused a crisis. After investigation Blount declared against the provisional government, and in consequence Cleveland withdrew the treaty of annexation concluded with that government. He recalled the American minister and appointed Blount U.S. minister instead.

Blount, William, 1749–1800, American political leader, b. near Windsor, N.C. He served in the American Revolution and later became a legislator in North Carolina, a member of the Continental Congress (1782–83, 1786–87), and a delegate to the Federal Constitutional Convention (1787). Washington appointed (1790) him governor of the Territory South of the River Ohio (present-day Tennessee), and there he also had charge (1790–96) of Indian affairs. Blount handled this dual position successfully until financial difficulties forced him into a plan whereby frontiersmen and Indians were to help the British conquer Spanish Florida and Louisiana. Before the plan was discovered he presided over the Tennessee constitutional convention (1796) and became one of the state's first U.S. Senators. When the Florida plot was discovered he was expelled (1797) from the Senate. While impeachment proceedings (later dropped) were being instituted, Blount was elected (1798) to the Tennessee senate and was chosen its speaker. See biography by W. H. Masters (1954, repr. 1969).

Blount, Winton Malcolm, 1921–, U.S. Postmaster General (1969–71), b. Union Springs, Ala. A successful building contractor, he was (1946–68) president and chairman of the board of Blount Brothers Corp. After serving (1968) as president of the U.S. Chamber of Commerce, Blount became (1969) Postmaster General in President Richard M. Nixon's cabinet. He

ended the patronage filling of postmaster vacancies and presided over (1971) the shift of the U.S. Post Office from a cabinet department to a nonprofit government-owned corporation. In 1972 he ran unsuccessfully as the Republican candidate for the U.S. Senate from Alabama.

Blow, John, 1649–1708, English composer. He was organist and choirmaster at Westminster Abbey and the Chapel Royal and the teacher of Henry Purcell. He wrote more than 100 anthems and 10 sacred services, mostly unpublished, and a masque, *Venus and Adonis*.

Blow, Susan Elizabeth, 1843–1916, American educator, b. St. Louis. After study in New York City under a disciple of Froebel, she opened in Carondelet (now in St. Louis) the first successful public kindergarten (1873) and a training school for kindergarten teachers (1874). Among her books are *Symbolic Education* (1894), *Educational Issues in the Kindergarten* (1908), and a translation of Froebel's *Mutter- und Kose-Lieder* (called *Mother Play*) in two volumes (1895).

blowfly, name for FLIES of the family Calliphoridae. Blowflies are about the same size as, and resemble, the housefly, because they are usually metallic blue or green; they are also called bluebottle or greenbottle flies. The eggs are laid on the material that serves as food for the larvae, e.g., decaying flesh and other organic matter. Blowflies are often carriers of disease, such as dysentery. The larvae of certain species of blowfly, raised under germ-free conditions and known as surgical maggots, were formerly used to consume dead tissue and thus promote healing. The screwworm fly, common in the S. United States, may invade wounds or orifices in wild and domestic animals and sometimes in humans. In recent years the screwworm population has been reduced by releasing large numbers of sterilized male flies into the environment, the females, which mate only once, then lay eggs that fail to hatch. Blowflies are classified in the phylum ARTHROPODA, class Insecta, order Diptera, family Calliphoridae. See INSECT.

blowgun, hollow tube from which a dart or an arrow is blown by a man's breath. Blowguns were widely used by prehistoric peoples. In modern times they are still employed in SE Asia and by some Indian tribes of the Amazon and Guiana regions of N. South America.

blowpipe. 1. In its simplest form in the laboratory, a hollow, tapering tube, through the wide end of which air is blown by the operator while the other end is introduced into the FLAME of a gas burner. The jet of flame that results is directed toward a material under study. The reaction caused by the flame can be used to identify the material. A bellows or other apparatus is often employed to produce a steady, continuous stream of air. Blowpipe analysis has been largely replaced by more accurate testing methods, such as the examination of an X-ray powder diffraction spectrum of the material. 2. In glass-making, a long, straight hollow tube used to shape glass. Part of the shaping process involves blowing through the tube. See GLASS.

Bloy, Léon (lōn' blwā), 1846–1917, French writer. A Roman Catholic and a social reformer, Bloy wrote violent and vituperative attacks on religious conformism and bitter portraits of his life and friends. His works decry cruelty and injustice, and their fervor made them influential in Europe. They include the autobiographical novels *Le Desespéré* [the hopeless one] (1886) and *La Femme pauvre* (1897, tr. *The Woman Who Was Poor*, 1939), *Salut par les Juifs* (1892), a tribute to the Jews, and a vast body of correspondence. See studies by Albert Beguin (tr. 1947), M. R. Brady (1969), and Rayner Heppenstall (1969).

Blucher, Gebhard Leberecht von (gēp'härt lā'bā-rēkt fən blū'khar), 1742–1819, Prussian field marshal, an outstanding military opponent of Napoleon I. An officer in the army of King Frederick II from 1760, he incurred royal displeasure when, believing himself passed over for promotion, he abruptly resigned in the early 1770s. He returned to service only in 1787 after Frederick's death. He fought well in the disastrous campaign of 1806 against the French and surrendered with honor near Lubeck. In the dark days that followed he helped Karl vom und zum Stein, K. A. von Hardenberg, and General Scharnhorst recreate the Prussian opposition to Napoleon. He was a leader in the War of Liberation (1813–14). Although ill and subject to delusions, he won brilliant victories at Wahlstatt and Mockern and played a part in the defeat of the French at Leipzig. Crossing the Rhine, he led his army to Paris. In the Waterloo campaign of 1815, he was defeated at Ligny but arrived at the battle of Waterloo in time to

make it a victory. In 1814 he was made prince of Wahlstatt. See study by E. F. Henderson (1911).

Blucher, Vasily Konstantinovich (väsýē'lyē kánstantýē'návich), 1889-1937?, Russian general. An enlisted man in the czarist army, Blucher joined the Bolshevik party in 1916. He rose to high command in the civil war that followed the Bolshevik revolution. Appointed commander in the Russian Far East, he drove the Japanese interventionists from Vladivostok (1922). He was sent (1924) to China as military adviser to the Kuomintang-Communist alliance. The Chinese knew him as "Galen." He later returned to Moscow and was assigned to command Soviet forces in the Far East. He was created marshal in 1936 but was a victim soon afterward of Joseph Stalin's purge of the military hierarchy. He was posthumously rehabilitated in 1956.

blue baby, infant born with a congenital heart defect that causes a bluish coloration of the skin. The color is most noticeable around the lips and at the tips of the fingers and toes, it is caused by cyanosis, or the presence of deoxygenated blood in the arteries. The cyanotic condition occurs when a large portion of the venous blood bypasses the lungs. Normally, deoxygenated blood from the veins is pumped from the right side of the heart to the lungs, where it is oxygenated (see CIRCULATORY SYSTEM). In some blue babies there is a hole in the atrial or ventricular septum between the left and right side of the heart allowing deoxygenated blood to pass directly into the aorta and thereby into the arteries. In other cases the pulmonary artery is too narrow to allow sufficient blood to pass into the lungs for oxygenation. Surgical correction of the defect is usually required and is usually quite successful. An incompatibility of fetal and maternal blood types may also cause a bluish coloration in newborn infants, a condition that results when red blood cells in the infant's blood are destroyed by antibodies in the mother's blood (see RH FACTOR). Sophisticated knowledge of blood types has made this condition increasingly rare.

Bluebeard, nickname of the chevalier Raoul in a story by Charles Perrault. In the story Bluebeard's seventh wife, Fatima, yielding to curiosity, opens a locked door and discovers the slain bodies of her predecessors. She is saved from death by the timely arrival of her brothers, for whose coming her sister Anne has been watching from a tower. Breton tradition links Bluebeard with the seigneur de Retz, but the story occurs in the folklore of several countries.

bluebell, common name for several plants belonging to completely different classes, particularly the BELLFLOWER and the Virginia cowslip, or Virginia bluebell, of the family Boraginaceae (BORAGE family) and the wood hyacinth, a squill of the family Liliaceae (LILY family). Bluebells of the former family are classified in the division MAGNOLIOPHYTA, class Magnoliopsida, order Lamiales, while those of the latter are in the same division but in the class Liliatae, order Liliales.

blueberry, plant of the large genus *Vaccinium*, widely distributed shrubs (occasionally small trees) of the family Ericaceae (HEATH family), usually found on acid soil. They are often confused with the related HUCKLEBERRY. Blueberries were a favorite food of the American Indians, who ate them fresh or dried them for winter use. The berries have been an article of commerce since early days. The high-bush blueberry (*V. corymbosum*) and the low-bush blueberry (*V. angustifolium* or *pennsylvanicum*), native to North America from Minnesota eastward, are the species most often cultivated, and greatly improved varieties are now grown in the East and West. Various species are sometimes called bilberry or whortleberry. The "huckleberry" of florists, sold for greenery, is a West Coast evergreen species, *V. ovatum*, called box blueberry and kinnikinnick. The related cranberry is considered by some botanists to be of the same genus as the blueberries. Blueberries are classified in the division MAGNOLIOPHYTA, class Magnoliopsida, order Ericales, family Ericaceae.

bluebird, common name for a North American migratory bird of the family Turdidae (thrush family). The eastern bluebird, *Sialia sialis*, is among the first spring arrivals in the North. It is about 7 in. (17.8 cm) long. The plumage of the male appears vivid blue in bright light and black at a distance, the breast is cinnamon-red, the under parts white. The female's coloring is duller. The bluebird usually nests in orchards or on the edges of woodlands but will also use nesting boxes. As a destroyer of insects it is of great value, it also eats wild fruits. Related birds are the mountain, the western (genus *Sialia*) or chestnut-backed, and the Florida bluebirds. Bluebirds

have a cheerful call and a sweet, warbling song. They raise several broods during a single mating season. The female is responsible for the incubation duties. Bluebirds are classified in the phylum CHORDATA, subphylum Vertebrata, class Aves, order Passeriformes, family Turdidae.

bluebonnet: see LUPINE

bluebottle: see CORNFLOWER

bluebottle fly: see BLOWFLY

blue crab, common name for a CRUSTACEAN, *Callinectes sapidus*, found on the S Atlantic and Gulf coasts of North America. The blue crab is a member of the family of swimming crabs known as the Portunidae and is characterized by a broad, semitriangular carapace (shell) covering the thorax, by a narrow abdomen tucked under its body, and by five pairs of appendages called pereopods, of which the first two bear large claws (chela) and the last two are flattened paddles modified for swimming. It is the most common edible crab of the Atlantic coast, and several million pounds are fished commercially by trapping or trawling each year. It is sold both as the hard-shell variety and as the familiar delicacy known as the soft-shelled crab. In the hard-shell form, the crab is in an intermolt phase (between molts) and the exoskeleton is fully hardened (sclerotized). In its soft-shell stage, the crab is in the phase just after the molt but before the exoskeleton has hardened. Since, in nature, the crab retires to secluded areas at the time of the molt and is thus difficult to collect, commercial fishermen collect the crabs at the so-called "peeler" stage, which occurs two to three days before the molt. The crabs are then held in pens, on floats in the water, until just after the molt, when they are marketable. The ovaries of the female begin to develop only after mating has taken place. The female carries the young under her abdomen until they hatch as tiny larvae, which are only 1/25 in. (0.1 cm) long. The crabs molt many times and grow to 7 in. (17.8 cm) in about 200 days. Blue crabs are classified in the phylum ARTHROPODA, class Crustacea, order Decapoda, family Portunidae.

Blue Cross plans: see HEALTH INSURANCE

blue-eyed grass: see IRIS

Bluefield, city (1970 pop. 15,921), Mercer co., extreme SW W Va., in the Allegheny Mts. adjacent to Bluefield, Va., settled 1777, inc. 1889. It is a trade center and a shipping point for the Pocahontas coal field. Lumber and electrical equipment are produced. Bluefield State College is there, and nearby are two state parks.

Bluefields, town (1970 est. pop. 22,910), capital of Zelaya dept., SE Nicaragua, on Bluefields Bay at the mouth of the Escondido River. It is Nicaragua's chief Caribbean port. Bananas, hardwoods, and coconuts are exported. Bluefields was a rendezvous for English and Dutch buccaneers in the 16th and 17th cent. and became (1678) capital of the British protectorate over the MOSQUITO COAST. During the U.S. interventions (1912-15, 1926-33) in Nicaragua, marines were stationed at Bluefields.

bluefish, voracious marine fish of the family Pomatomidae, resembling the pompano but more closely related to the sea basses. Bluefish are found in the warm waters of the Indian Ocean, the Mediterranean Sea, and the Atlantic. They average 30 in. (75 cm) in length and 10 to 12 lb (4.5-5.5 kg) in weight. Their sweet and pleasant-tasting flesh and their streamlined agility make them excellent food and game fish. Bluefish wander erratically in dense schools, feeding on menhaden and mullet and leaving a trail of carnage, for they destroy much more than they consume, they are even known to regurgitate in order to gorge themselves more. Bluefish are classified in the phylum CHORDATA, subphylum Vertebrata, class Osteichthyes, order Perciformes, family Pomatomidae.

bluegill: see SUNFISH

bluegrass, any species of the large and widely distributed genus *Poa*, chiefly range and pasture grasses of economic importance in temperate and cool regions. In general, bluegrasses are perennial with fine-leaved foliage that is bluish green in some species. One of the best known and most important is the sod-forming Kentucky bluegrass, or June grass (*P. pratensis*), believed to have been introduced from the Old World and now widely naturalized in the United States. Kentucky is known as the Bluegrass State because this species is so prevalent there. Others are rough bluegrass (*P. trivialis*), used for shady lawns, Sandberg bluegrass (*P. secunda*), the most common native species, and big bluegrass (*P. ampla*), an important range grass. Bluegrass is classi-

fied in the division MAGNOLIOPHYTA, class Liliatae, order Cyperales, family Gramineae.

bluegrass music: see COUNTRY AND WESTERN MUSIC

blue-green algae: see SCHIZOPHYTA

Blue Island, city (1970 pop. 22,958), Cook co., NE Ill., a residential and industrial suburb of Chicago, on the Little Calumet River, inc. 1843. It has oil refineries, railroad yards and shops, canneries, and plants manufacturing electric signals, plastic products, steel forgings, glass, chemicals, and medical and dental supplies.

blue jay, common name for a familiar bird (*Cyanocitta cristata*) of central and E North America, allied to the crow, the raven, and the magpie, belonging to the family Corvidae. Almost a foot (30 cm) long, it is handsome and conspicuous. Its upper parts, including the crest, are grayish violet blue. The wings and tail are bright blue with black and white markings, the neck is collared with black, and the under parts are gray and white. Except during the nesting season it has a raucous cry with hawklike and other imitative sounds. Some winter in their northern range, but many travel south. They feed chiefly on large insects, seeds, and nuts (especially acorns and beechnuts), they also eat eggs and nestlings. Blue jays are classified in the phylum CHORDATA, subphylum Vertebrata, class Aves, order Passeriformes, family Corvidae.

blue laws, legislation regulating public and private conduct, especially laws relating to Sabbath observance. The term was originally applied to the 17th-century laws of the theocratic New Haven colony, they were called "blue laws" after the blue paper on which they were printed. New Haven and other Puritan colonies of New England had rigid laws prohibiting Sabbath breaking, breaches in family discipline, drunkenness, and excesses in dress. Although such legislation had its origins in European SABBATARIAN and SUMPTUARY LAWS, the term "blue laws" is usually applied only to American legislation. With the dissolution of the Puritan theocracies after the American Revolution, blue laws declined, many of them lay forgotten in state statute books only to be revived much later. The growth of the PROHIBITION movement in the 19th cent. and early 20th cent. brought with it other laws regulating private conduct. Many states forbade the sale of cigarettes, and laws prohibited secular amusements as well as all unnecessary work on Sunday, provision was made for strict local censorship of books, plays, films and other means of instruction and entertainment. Although much of this legislation has been softened if not repealed, there are still many areas and communities in the United States, especially those where religious fundamentalism is strong, that retain blue laws. The Supreme Court has upheld Sunday closing laws ruling that such laws do not interfere with the free exercise of religion and do not constitute the establishment of a state religion.

Blue Mountains, uplifted, eroded part of the Columbia Plateau, c. 6,500 ft (1,980 m) high, NE Oregon and SE Wash. Lava flows cover much of the surface. The upper, wooded slopes are used for lumbering. Irrigated farming (especially of peas and green beans) and cattle raising are carried on in the surrounding lowlands. Rock Creek Butte, 9,105 ft (2,775 m) high, is the highest point in the Blue Mts.

Blue Nile, Arab *Al Bahr al Azraq*, river, c. 1,000 mi (1,600 km) long, the chief headstream of the Nile, rising in Lake Tana, NW Ethiopia, at an altitude of c. 6,000 ft (1,800 m). It flows generally S from the Lake Tana region, then W across Ethiopia, and finally NW into the Sudan. At Khartoum the Blue Nile merges with the White Nile to form the Nile proper. The flow of the Blue Nile reaches maximum volume in the rainy season (from June to September), when it supplies about two thirds of the water of the Nile proper. The Blue Nile used to cause the annual Nile flood before the completion in 1970 of the ASWAN HIGH DAM in Egypt. In Ethiopia the Blue Nile, also known there as the Abbai, flows in a deep gorge and receives many tributaries. There are dams on the Blue Nile at Roseires and Sennar in the Sudan, the latter is used to irrigate the AL JAZIRAH region. See Alan Moorehead, *The Blue Nile* (1962).

blueprint, white-on-blue photographic print, commonly of a working drawing used during building or manufacturing, also called a cyanotype. The plan is first drawn to scale on a special paper or tracing cloth through which light can penetrate. The drawing is then placed over so-called blueprint paper, prepared by treatment with a mixture of potassium ferricyanide and ammonium ferric citrate. When the drawing and the blueprint paper thus attached are

exposed to a strong light, the ferric salt not lying beneath the lines of the drawing, and hence unprotected, is changed to a ferrous salt that reacts with the ferricyanide to form Turnbull's blue. This blue is the background of the finished print. The ferric salt under the lines of the drawing, hence protected from the light, remains unchanged and is dissolved away during the washing in water that must follow exposure. As a result, the lines of the original drawing appear white in the finished blueprint.

Blue Rider. see **BLAU REITER DER**

Blue Ridge, eastern range of the Appalachian Mts., extending south from S Pa. to N Ga., highest mountains in the E United States. Mt. Mitchell, 6,684 ft (2,037 m) high, is the tallest peak. Beginning with a narrow ridge in the north, c 10 mi (16 km) wide, the range broadens toward the south, reaching a maximum width of 70 mi (113 km) in North Carolina. Receiving much rain, the region is heavily forested, wood is the area's chief resource. The Blue Ridge was a barrier to the pioneers' westward movement. Numerous gaps cross the ridge, the gap at Harpers Ferry, W Va., is an important railroad traverse. Most of the people of the Blue Ridge live on small farms in sheltered valleys and retain traditional lifestyles and speech. Subsistence agriculture is the main activity; corn is used to make whiskey. Commercial apple orchards are found in Virginia, Maryland, and Pennsylvania. The Blue Ridge is a major East Coast recreation area noted for its resorts and scenery. The APPALACHIAN TRAIL winds atop the range. Skyline Drive, Va., following the crest of the Blue Ridge in Shenandoah National Park, has many roadside lookouts. The Blue Ridge Parkway (see NATIONAL PARKS AND MONUMENTS, table), designed especially for motor recreation, links the Shenandoah and Great Smoky Mts. national parks.

blues: see **JAZZ**.

Blues and Greens, political factions in the Byzantine Empire in the 6th cent. They took their names from two of the four colors worn by the circus choristers. Their clashes were intensified by religious differences. The Greens represented MONOTHEISM and the lower classes, the Blues, orthodoxy and the upper classes. In 532 the two factions joined in the Nika revolt against Emperor JUSTINIAN I and Empress THEODORA. However, Theodora's resolute stand and the aid of Belisarius and Narses ended the revolt. The factions continued to oppose each other into the 7th cent., but by the 9th cent. they had become mostly ceremonial.

bluestocking, derisive term originally applied to certain 18th-century women with pronounced literary interests. During the 1750s, Elizabeth Vesey held evening parties, at which the entertainment consisted of conversation on literary subjects. Eminent men of the day were invited to contribute to these conversations. Hannah MORE, Elizabeth MONTAGU, and Elizabeth CARTER, among others, continued this tradition. Boswell, in his *Life of Dr. Johnson*, states that these "bluestocking clubs" were so named because of Benjamin Stillingfleet, who attended in unconventional blue worsted stockings rather than the customary black silk stockings. In time the name *bluestocking* was applied solely to women of pedantic literary tastes.

bluestone, common name for the blue, crystalline heptahydrate of CUPRIC SULFATE. It also refers to a blue-gray sandstone that occurs in New York state.

bluet. see **MADDER**

blue vitriol, the pentahydrate of CUPRIC SULFATE.

blue whale, a baleen WHALE, *Balaenoptera muscula*. Also called the sulfur-bottom whale and Sibbald's rorqual, it is the largest animal that has ever lived. Blue whales have been known to reach a length of 100 ft (30.5 m) and to weigh as much as 120 tons, however, specimens even 80 ft (24.4 m) long are now very rare because of extensive WHALING. *B. muscula* is slate blue in color and has a dorsal fin. It is toothless, and has fringed baleen, or whalebone, plates in its mouth, which act as a food strainer. As water is expelled from the whale's mouth, plankton is trapped behind the strainer. The neck of the blue whale has 80 to 100 conspicuous furrows called ventral grooves, which alternately expand and contract as the animal takes in and expels water. The blue whale is cosmopolitan in distribution. In summer it inhabits polar seas, feeding in the water of melting icepacks, in winter it migrates to warmer latitudes, occasionally reaching the equator. Mating occurs at the end of winter, with a single calf born every second or third year, after a gestation period of 10 to 11 months. The calf is nursed for 6 months, and reaches puberty in about 3 yr. Blue whales may live

as long as 50 yr. They are classified in the phylum CHORDATA, subphylum Vertebrata, class Mammalia, order Cetacea, family Balaenopteridae. See G. C. Small, *The Blue Whale* (1971).

Blum, Léon (lāōN' blōōm), 1872-1950, French Socialist leader and writer. Well established in literary circles, he entered politics during the DREYFUS AFFAIR and rose to party leadership. In 1936 he brought about the coalition of Radical Socialists, Socialists, and Communists in the Popular Front, which won an overwhelming electoral victory. This first Popular Front government, which he headed, inaugurated the 40-hour week, collective bargaining, and compulsory arbitration, it also reorganized and nationalized the Bank of France, and nationalized the munitions industry. Conservative opposition to Blum's fiscal measures forced his resignation (1937). Blum served as vice premier (1937-38) under Camille CHAUTEMPS, was briefly premier in 1938, and opposed the Munich Pact. Arrested (1940) by the Vichy government, he was among the defendants in the abortive war-guilt trial at Riom in 1942. Blum was imprisoned until the end of the war. After negotiating (1946) a credit agreement with the United States, he was again premier for a little more than a month in 1946-47, heading an active Socialist cabinet. The elder statesman of French Socialists, Blum gradually came to represent the moderate wing. His writings include *Marriage* (tr. 1937) and *For All Mankind* (tr. 1946, repr. 1969). See biographies by L. E. Dalby (1963) and Joel Colton (1966, repr. 1974).

Blume, Peter (blōōm), 1906-, American painter, b. Russia. Blume emigrated to the United States in 1911. In his early work, such as *The Parade* (1930; Mus. of Modern Art, New York City), he sought to depict through symbolism the smooth, hard contours of the industrial world. His paintings, which gained recognition in the 1930s, are precise, linear, and fantastic treatments of modern social themes, painted in microscopic detail. Major works include the powerful antifascist *Eternal City* (1934-37; Mus. of Modern Art) and *The Rock* (1945-48; Art Inst., Chicago). See exhibition catalog by Frank Getlein (1968).

Blumenbach, Johann Friedrich (yōhān' frē'drīkh blōō'manbāk), 1752-1840, German naturalist and anthropologist. He introduced and developed the science of comparative anatomy in Germany. His *De generis humani varietate nativa* (1775, tr. *On the Natural Varieties of Mankind*, 1865, repr. 1969) marked the beginnings of physical anthropology and described the five divisions of mankind which have been the basis of all subsequent racial classifications. Blumenbach's analysis of an extensive skull collection, published as *Collectio craniorum diversarum gentium* (1790-1828), established craniometric study. English translations of his works include *The Anthropological Treatises of Johann Friedrich Blumenbach* (1865, repr. 1969).

Blumengarten, Solomon: see **BLOOMGARDEN SOLOMON**

Blunden, Edmund Charles, 1896-1974, English author. Besides being a poet of rural England, he was an editor, biographer, and critic. His prose works include *Undertones of War* (1928), an account of his experiences in World War I, *Life of Leigh Hunt* (1930), *Charles Lamb and His Contemporaries* (1933), *Shelley* (1946), and *War Poets, 1914-1918* (1962). In 1966 he was named to the poetry chair at Oxford.

Blunt, Sir Anthony Frederick, 1907-, English art historian. Director of the Courtauld Institute of Art since 1947 and professor of the history of art at the Univ. of London, Blunt has also served since 1952 as Surveyor of the Queen's Pictures. His numerous writings include *Artistic Theory in Italy, 1450-1600* (1940), *François Mansart and the Origins of French Classical Architecture* (1941), *The Drawings of Poussin* (with Walter Friedlaender, 3 vol., 1939-53), *Art and Architecture in France, 1500-1700* (1953), *The Art of William Blake* (1959), *The Paintings of Nicolas Poussin* (1968), *Picasso's Guernica* (1968), and *Sicilian Baroque* (1968). He also wrote several catalogs of the drawings at Windsor Castle. See his bibliography, ed. by Elsa Scheerer, in *Studies in Renaissance and Baroque Art*, presented on his 60th birthday (1967).

Blunt, George William, 1802-78, American hydrographer, son of Edmund March Blunt, a pioneer publisher of nautical books and charts in Newburyport, Mass. He established (1821) himself in a similar business in New York and published the numerous editions of *Bowditch's Navigator*, *Blunt's Coast Pilot*, and nautical charts of the entire world. The cop-

perplates of these maps and the copyrights to the *Navigator* and *Coast Pilot* were later purchased by the U.S. Hydrographic Office when that bureau began its publication work. From 1833 until his death, Blunt was first assistant in the U.S. Coast Survey. He served also for 32 years on the Board of Pilot Commissioners and did much to put through needed reforms in the U.S. Lighthouse Service.

Blunt, James Gilpatrick, 1826-81, American physician and Union general in the Civil War, b. Hancock co., Maine. He practiced medicine in Ohio and later in Kansas, where he became associated with John Brown in antislavery activity. Blunt served in the Union forces throughout the war and was made a brigadier general in 1862. The border region of Kansas, Missouri, and Arkansas was the principal scene of his activity. He was victorious at Old Fort Wayne (Oct., 1862) and at Cane Hill (Nov., 1862). With Gen. F. J. Herron, he drove back T. C. Hindman at Prairie Grove (Dec., 1862). In 1864, Blunt was instrumental in repulsing Sterling Price's raid in Missouri.

Blunt, Wilfrid Scawen (sfō'n), 1840-1922, English poet and political writer. After retiring c. 1872 from the diplomatic service, he began a career of travel and political crusading. He wrote several works championing Indian, Egyptian, and Irish independence. His poetry, noted for its emotional force, includes *The Love Sonnets of Proteus* (1880) and *The Wind and the Whirlwind* (1883). See his diaries (1919-20), study by Thomas J. Assad (1964).

Bluntschli, Johann Kaspar (yō'hān kās'pār blōōnch'lē), 1808-81, Swiss jurist and political scientist. Trained at the Univ. of Berlin, he taught law at Zürich and later at Munich and Heidelberg. He expounded the organic theory of the state in *Allgemeines Staatsrecht* (2 vol., 1851-52, partial tr. 1892), carrying the theory to a complete equation of the life of a state and the life of a person. In *Deutsches Privatrecht* [German private law] (2 vol., 1853-54), he attempted to contrast the indigenous elements in German law with those derived from Roman law. Bluntschli was of some political importance in Baden as a spokesman of the liberal Protestant middle class favoring unification of Germany under Prussia, and he was a founder of the Institute of International Law at Ghent.

Bly, Robert, 1926-, American poet, translator, editor, and publisher, b. Madison, Minn., grad. Harvard, 1950. His poems, personal and precisely observant, are informed by the American landscape. Among his volumes of poetry are *The Light Around the Body* (1967) and *Sleepers Joining Hands* (1972). As head of the Sixties Press he has influenced modern writing by printing unconventional poetry and translations from lesser-known foreign poets. His translations include Selma Lagerlöf's *The Story of Gosta Berling* (1962) and *Neruda and Vallejo: Selected Poems* (1973).

Blyth (blith), municipal borough (1971 pop. 34,617), Northumberland, NE England, at the mouth of the Blyth River. It is an industrial center and seaport, with shipbuilding and ship repair and a large trade in coal and timber. Ropes and sails, confectionery, textiles, and clothing are manufactured. The area south of the harbor is a seaside resort.

Blythe, David Gilmour, 1815-65, American artist, b. East Liverpool, Ohio. Working in Pennsylvania, Blythe produced GENRE scenes that depict the rough existence of the early frontier. Many of his paintings are satirical portrayals of the everyday world of early 19th-century America.

Blytheville (blith'vīl), city (1970 pop. 24,752), seat of Mississippi co., NE Ark., near the Mississippi River, inc. 1891. It is the trading center of the state's richest cotton area, soybeans and feed crops are also grown in the region. The city is an industrial center as well, manufacturing food products, office supplies, and chrome trim. Blytheville Air Force Base is there, and a game refuge is nearby.

B'nai B'rith (bənā' brith) [Heb. = Sons of the Covenant], oldest and largest Jewish service organization in the United States. It was founded (1843) by American Jews "to provide service to their own people and to humanity at large." Its broad-based program allows B'nai B'rith to embrace a wide cross-section of American Jewry. Its subdivisions include the Hillel Foundation (for Jewish college students), the Anti-Defamation League (a civil rights organization), and B'nai B'rith Women. B'nai B'rith has about 500,000 members in 75 state and regional groups. The national office, located in Washington, D.C., publishes the *National Jewish Monthly* and other periodicals.

boa, name for live-bearing constrictor SNAKES of the family Boidae, found mostly in the Americas. This

family, which also comprises the egg-laying PYTHONS of the Old World, includes the largest of all snakes, as well as many smaller ones. Members of the boa family have two functional lungs instead of one, as is found in other snakes, and vestiges of hind limbs, these primitive characteristics are indicative of their relationship to lizards. Each of the two tiny, internal leg bones ends in an external horny claw, the claws are much more prominent in males than in females. Boas capture their prey by striking with their teeth and simultaneously throwing their bodies in a coil around the victim. They then squeeze the animal so that, unable to expand its rib cage, it suffocates. Like other snakes, boas swallow the prey whole. Over 30 boa species are found from Mexico to South America, with the greatest variety in the tropics, and two in the United States. Boas may be terrestrial, arboreal, or burrowing. Some are brightly colored, like the green and white emerald tree boa of the tropics (*Boa canina*), or indescend, like the wide-ranging rainbow boa (*Epicrates cenchris*). Best known is the boa constrictor (*Constrictor constrictor*), which lives in a variety of terrestrial habitats from S Mexico to central Argentina. It averages 6 to 9 ft (1.8-2.7 m) in length, occasionally reaching 14 ft (4.3 m), and has dark brown diamond markings on a lighter background. The South American anaconda (*Eunectes murinus*) is a semiaquatic boa that inhabits swamps and river shallows, catching animals that come to drink. The longest member of the boa family and the thickest of all snakes, it may reach 25 ft (7.9 m) in length and 3 ft (90 cm) in girth. The rubber boa (*Charina bottae*) is found in moist regions of the far W United States and extreme SW Canada. It is a burrower, about 18 in (46 cm) long, with a narrow, blunt head, broad, blunt tail, and silver-green skin. It feeds chiefly on lizards and rodents. The rosy boa (*Lichanura roseofusca*) is found in chaparral in the SW United States and N Mexico, it grows about 3 ft (90 cm) long. It has large, dark brown spots on a lighter background. Several species of sand boa (*Eryx*) are distributed from India and central Asia to N Africa and SE Europe, all are burrowers in sand. There are also several boa species on Madagascar and several on Pacific islands. Boas are classified in the phylum CHORDATA, subphylum Vertebrata, class Reptilia, order Squamata, family Boidae.

Boabdil (bōābdēl'), d. 1538, last Moorish king of GRANADA in Spain (1482-92). He seized the throne from his father and thus plunged Granada into civil war at the time the Castilians were beginning their attack on the kingdom. As the Christians overran western Granada, Boabdil secretly promised (1487) them that he would surrender the city of Granada in return for some cities held by the rival Granadian party. However, he repudiated the agreement, and in April, 1491, the Castilians laid siege to Granada. After valiant resistance, Boabdil surrendered in Jan., 1492, and fled to Morocco. His surrender marked the end of Moorish rule in Spain, and he is the subject of a number of romantic legends.

Boadicea (bō'ādīsē'ā), d. A.D. 61, British queen of the Iceni (of Norfolk), properly called Boudicca. Her husband, King Prasutagus, died in A.D. 59 or 60, leaving half his property to the Roman emperor and half to his daughters. The Romans, however, seized the kingdom and began to despoil it, thus provoking the Iceni to revolt. Boadicea led them in sacking Colchester, London, and Verulamium (St. Albans). Her army was eventually crushed by the Roman governor Caius Suetonius Paulinus, and Boadicea took poison.

Boanerges (bō'anūr'jēz), sons of Zebedee. See JAMES, SAINT (St. James the Greater), and JOHN, SAINT **boar**: see SWINE.

Boas, Franz (bō'ās), 1858-1942, German-American anthropologist, b. Minden, Germany, Ph.D. Univ. of Kiel, 1881. He joined an expedition to Baffin Island in 1883 and initiated his fieldwork with observations of the Central Eskimos. In 1886 he began his investigations of the Indian tribes of British Columbia. After securing (1889) at Clark Univ. his first position in the United States, he was associated with the American Museum of Natural History from 1895 to 1905. Boas began to lecture at Columbia in 1896 and in 1899 became its first professor of anthropology, a position he held for 37 years. No one has more greatly influenced American anthropology. Boas re-examined the premises of physical anthropology and pioneered in applying statistical methods to biometric study. He was an early contributor to stratigraphic archaeology in Mexico. As a student of American Indian languages, Boas emphasized the importance of linguistic analysis from internal linguistic structure. His insistence on a rigorous meth-

odology served to establish the scientific value of his contributions, and his methods and conclusions are still influential. Boas taught and inspired a generation of anthropologists, and wrote hundreds of scientific monographs and articles. His best-known works include *The Mind of Primitive Man* (1911, rev. ed. 1938), *Primitive Art* (1927, repr. 1955), *Anthropology and Modern Life* (1928, rev. ed. 1932), and two volumes of collected writings, *Race, Language and Culture* (1940) and *Race and Democratic Society* (1945). He edited *General Anthropology* (1938). See studies by A. L. Kroeber et al. (1943), W. R. Goldschmidt, ed. (1959), and M. J. Herskovits (1953, repr. 1973).

boat, small, open nautical vessel propelled by sail, oar, pole, paddle, or motor. The use of the term *boat* for larger vessels, although common, is somewhat improper, but the line between boats and ships is not easy to draw. A number of special types of boat are generally referred to by their individual names rather than by the generic term, e.g., the CANOE, the KAYAK (Eskimo decked canoe), and the UMIAC (Eskimo open boat). Simple dugouts, made from hollowed-out logs, have been known since prehistoric times to all peoples dwelling on waterways. The ancient Egyptians used boats made of acacia wood and held together with pegs. Modern wooden boats are built in four ways: with fore-and-aft planks laid with their edges flush (carvel-built), with fore-and-aft planks laid with overlapping edges (clinker-built), with inner and outer layers of planks running diagonally in opposite directions, and with planking consisting of large sheets of plywood. Many boats, however, are now made of molded fiber glass or of aluminum. Primitive boats in many parts of the world are stabilized by an outrigger—a parallel float attached by projecting arms. The varieties of boats in modern use are almost infinite. The Chinese junk, with high poop and overhanging bow, is large enough to be classified as a ship, the junk, together with the sampan (a wide, flat-bottomed skiff, often having a mat-covered cabin with living quarters), is a familiar sight in the rivers and coastal waters of the Far East. The lateen-rigged dhow, in which energetic Arab merchants of the Middle Ages plied their trade along all the shores of S Asia and E Africa, is still in use today. A familiar local craft on the Mediterranean is the flat-bottomed, canoe-like, pole-driven gondola of the Venetian canals. A typical Mediterranean vessel of ancient times was the GALLEY, usually propelled by oars. Because the northern seas were stormier, the Viking boats, which the Norsemen were building by the 5th cent. A.D., were more seaworthy, they were believed to be the first clinker-built boats. Deckless or half-decked, with elevated bow and stern, these early boats took the Norsemen to all the coasts of Europe and across the Atlantic. The later rugged whaleboat was developed from the Viking type of construction and came to be used for numerous purposes. The fishing boats of the North and Baltic seas, also built on Viking principles, are roughly similar to whaleboats. Another important fishing boat is the dory, a small, versatile, flat-bottomed craft easily transported on shipboard and used in the entire N Atlantic. For bibliography, see separate articles on various types of boats.

boat-billed heron or **boatbill**, a tropical New World HERON, *Choclearius choclearius*. With shorter legs and a squatter appearance than most herons, this bird is remarkable chiefly for its broad bill, which is shaped like an overturned boat. Its coloring is dull brown, gray, and black and is similar in both the male and female. It is a nocturnal, shallow-water feeder, living on a diet of fishes and insects, it roosts and nests in trees. The boat-billed heron inhabits mangrove swamps from Mexico to S Brazil. It is classified in the phylum CHORDATA, subphylum Vertebrata, class Aves, order Ciconiiformes, family Ardeidae.

boating: see CANOEING ICEBOATING MOTORBOATING ROWING, and SAILING.

Boa Vista (bō'ā vēsh'tā), city (1970 pop. 36,491), capital of Roraima Federal Dist., NW Brazil, on the Rio Branco. Its economy is based on the processing and shipment of minerals (gold, bauxite, quartz, and oil) found in the surrounding region. Boa Vista became the capital when the district was created in 1943.

Boaz (bō'āz) 1 Ruth's husband, ancestor of David. Ruth 2, 3, 4. Boaz. Mat. 15, Luke 3:32. 2 Pillar of Solomon's Temple. See JACHIN AND BOAZ.

bobac (bō'bāk) see MARMOT.

Bobadilla, Francisco de (franthes'kō dā bōbādē'l-lyā), d. 1502, Spanish colonial governor. He super-

seeded Columbus in the West Indies (1500) and sent him home as a prisoner. Recalled in 1502, he was drowned on the voyage to Europe.

bobbin, implement on which thread is wound, used in sewing, spinning, weaving, and lace making. Sometimes the wooden spools of sewing thread are called bobbins. The bobbin of a sewing machine is a metal cylinder, with a flange at each end, on which the lower thread is wound to be carried through the shuttle to the seam. In some primitive handweaving the weft, or woof, was wound on a bobbin flanged at one end and passed or carried by it through the warp. In tapestry weaving, bobbin looms are essential, as weft strands of different colors must go back and forth for the distance required by the design, somewhat in the manner of an embroidery needle darning in a pattern. In making pillow lace, bobbins form an important part of the equipment, as each thread of the pattern requires a different bobbin, intricate patterns call for hundreds of bobbins to hold the fine thread in order. Bobbins for lace making are made in various shapes and sizes, from a variety of materials, as walnut, rosewood, boxwood, and olive wood, glass, metal, ivory, coral, malachite, and bamboo, and are ornamented with carving, painting, or engraving.

Bobbio (bōbb'yō), town, in Emilia-Romagna, N central Italy. It is a commercial center and a summer resort. St. COLUMBAN founded a monastery there in 612, and during the 9th-12th cent. it was a center of European cultural life. The monastery later declined, and the invaluable manuscripts of its great library were dispersed in the 15th and 16th cent. The monastery itself was dissolved in the early 19th cent.

bobcat. see LYNX.

Bobigny (bōbēnyē'), city (1968 pop. 39,453), capital of Seine-Saint Denis dept., N central France, an industrial suburb of Paris. Metals, food products, and toys are among the major manufactures.

bobolink (bōb'əlīŋk'), common name in the N United States and Canada for an American songbird, *Dolichonyx oryzivorus*, related to the blackbird and the oriole, belonging to the family Icteridae. In spring the plumage of the male is black except for the white shoulders and lower back and the buff nape. After the breeding season the male assumes yellowish, brown-streaked plumage like that of the female, and his former voluble singing is reduced to a single call note. Bobolinks winter in South America, in Jamaica they are called butter birds. In the north they are insectivorous, but they may feed on rice crops during migration in the south. They have been known to gorge themselves in the eastern wild rice marshes and in cultivated fields in South Carolina and Georgia, becoming so fat that they used to be hunted as game birds. Because of these feeding habits they did serious damage to crops as they migrated, and they were called rice birds or reed birds. Bobolinks are now a protected species and are no longer hunted. Cup-shaped nests are built by the female in grassy fields. Polygamy occurs, but monogamy is more common. Bobolinks are classified in the phylum CHORDATA, subphylum Vertebrata, class Aves, order Passeriformes, family Icteridae.

Bobruisk: see BOBRUYSK, USSR.

Bobruysk (bābrōō'sk), city (1970 pop. 138,000), Belorussia, W central European USSR, a port on the Berezina River. It is also a railway junction and tire manufacturing center. Bobruysk has been known since the 15th cent.

bobsledding, winter sport in which a bobsled—an open, steel-bodied vehicle, with sledlike runners, that accommodates two or four persons—hurtles down a course of icy, snow-surfaced, steeply banked, twisting inclines. The crew of a four-man bobsled is composed of a driver and three bobsers, the last one being the brakeman. A two-man sled consists of a driver and his brakeman. An offspring of tobogganing, bobsledding was developed by a group of American and English vacationers at St. Moritz, Switzerland, in the late 19th cent. The sport was included in the first Winter Olympic games (1924) and has been an Olympic event since then. The Mt. Van Hoevenberg run at Lake Placid, N.Y., is the only course in the United States. On the straightaways of a course, sleds sometimes reach the exhilarating but dangerous speed of 90 mi (145 km) per hr.

bobwhite, common name for an American henlike bird of the family Phasianidae, which also includes the pheasant and the partridge. The eastern bobwhite quail (*Colinus virginianus*) is about 10 in (25 cm) long. Its plumage is mixed brown, black, and white in the male and brown and buff in the female.

of the origin of the solar system have tried to explain the apparent regularity in the mean orbital distances of the planets, arguing that it could not arise by chance, but must be a manifestation of the laws of physics. Some astronomers hold that the deviation of Neptune and Pluto from their predicted positions signifies that they are no longer at their original positions in the solar system. However, since Bode's law is not a law in the usual scientific sense, i.e., it is not universal and invariant, it alone should not be taken as evidence for such a conclusion.

Bodh Gaya or Buddh Gaya (both bōd ga'ya), village (1971 pop 6,993), Bihar state, E central India. According to tradition, BUDDHA received enlightenment under a pipal tree (bo tree) in Bodh Gaya. There are extensive relics of Buddhist sculpture, dating from the 8th to the 12th cent. A.D.

Bodhidharma: see ZEN BUDDHISM

bodhisattva (bō'disat'wə) [Sanskrit, =enlightenment-being], in early BUDDHISM the term used to refer to the Buddha before he attained supreme enlightenment, more generally, any being destined for enlightenment or intent on enlightenment. The spiritual path of the bodhisattva is the central teaching of Mahayana Buddhism. One becomes a bodhisattva by arousing the "mind of enlightenment," taking a vow to attain supreme enlightenment for the sake of all beings. The bodhisattva does not aspire to leave the round of birth-and-death (samsara) before all beings are saved, he is thus distinguished from the arhant of earlier Buddhism, who allegedly seeks NIRVANA only for himself and is regarded by Mahayanists as having an inferior spiritual attainment. The practice of a bodhisattva consists of the six "perfections" or paramitas: charity (dāna), morality (śīla), forbearance (kṣānti), diligence (vīrya), meditation (dhyāna), and wisdom (prajñā). There are in Buddhism an actual congregation of bodhisattvas, both laymen and monks, and also many celestial bodhisattvas, who are worshiped along with the Gautama Buddha and the buddhas of other worlds. The most important celestial bodhisattvas are Avalokitesvara, the bodhisattva of compassion, Mañjuśrī, the bodhisattva of wisdom, and Maitreya, who in heaven awaits birth as the next buddha. See also SUNYATA.

Bodin, Jean (zhān bōdān'), 1530?-1596, French social and political philosopher. He studied and taught at Toulouse and enjoyed a successful legal career. His most notable book, *Six livres de la république* (1576, tr. *Six Bookes of the Commonweale*, 1606) ranks as a major work of political theory. During the last half of the 16th cent., France was experiencing severe disorders caused by religious disagreements between Roman Catholics and Huguenots (see RELIGION, WARS OF). Dismayed by this chaos, Bodin believed that a restoration of order could only be accomplished by religious toleration and the establishment of a fully sovereign monarch. These suggestions aroused a great deal of opposition in his time, but they now establish Bodin as a major theoretical contributor toward the development of the modern nation-state. His assertion that an absolutely sovereign monarch was necessary for a well-ordered state prefigured Hobbes and was an attack on remnants of feudal society. His economic policies concerning taxation and government involvement in trade were also influential. See studies by J. H. Franklin (1963 and 1973), and Beatrice Reynolds (1931, repr. 1969), J. W. Allen, *A History of Political Thought in the Sixteenth Century* (1961).

Bodhinayakanur (bō'dīnayak'anōr'), town (1971 pop 54,118), Tamil Nadu state, at the foot of the Western Ghats, SE India. A Bodhinayakanur state is said to have been established in 1336. The area was seized by Hyder Ali in 1776 and ceded to the British in 1793. The town is surrounded by hills. It is a market for cardamom, coffee, tea, silk, and cotton, and it has cotton mills.

Bodleian Library (bōd'lēan, bōd'lē'an), at Oxford Univ. The original library, destroyed in the reign of Edward VI, was replaced in 1602, chiefly through the efforts of Sir Thomas BODLEY, who gave it valuable collections of books and manuscripts and in his will left a fund for maintenance. The library has one of the great collections of English books, including a major Shakespearean section, its extensive manuscript collection is especially rich in biblical and Arabic material. A new building for the library was opened in 1946. See H. H. E. Craster, *History of the Bodleian Library, 1845-1945* (1952), M. B. Bennett, *Bodleian Library* (1958).

Bodley, George Frederick (bōd'lē), 1827-1907, English architect. One of the most prominent and prolific ecclesiastical architects of his time, Bodley

was a pupil of Sir George Gilbert Scott, an adherent of the Victorian Gothic revival. A friend of William Morris and the other Pre-Raphaelites, he did much to foster good taste in the applied arts. Among his many works is Queens' College Chapel at Cambridge. His secular buildings include additions to Magdalen and other colleges at Oxford and the London school board offices. Besides his English work, he designed cathedrals in Tasmania, in San Francisco, and, with his pupil James Vaughan, the Cathedral of St. Peter and St. Paul in Washington, D.C. See B. F. L. Clarke, *Church Builders of the Nineteenth Century* (1938).

Bodley, Sir Thomas, 1545-1613, English scholar and diplomat, organizer of the BODLEIAN LIBRARY at Oxford Univ. He was a Greek scholar and teacher at Oxford, and in 1584 he was elected to Parliament. He spent 11 years (1585-96) abroad on diplomatic missions for Queen Elizabeth I. In 1598 his offer to restore Duke Humphrey's library was accepted by Oxford, and he spent the rest of his life and most of his fortune on it. See his *Letters to Thomas James, First Keeper of the Bodleian Library*, ed. by G. W. Wheeler (1926).

Bodmer, Johann Jakob (yō'han ya'kōp bōd'mər), 1698-1783, Swiss critic, poet, and editor. He translated Milton's *Paradise Lost* and *Middle High German poetry*. Inspired by the *Spectator*, Bodmer published, with J. J. Breitinger, the critical journal *Discourse der Mahlern* (1721-23), which greatly influenced 18th-century German poetry. Bodmer, who championed Klopstock, Wieland, and Herder, is famous for his argument with Gottsched, whose rationalism he countered with an essay (1740) on fancy in poetry.

Bodmin, municipal borough (1971 pop 9,204), county town of Cornwall, SW England. The county offices are now in Truro. Bodmin was formerly a busy market for tin and wool. The borough has a psychiatric hospital and a 15th-century church.

Bodo (bō'do), city (1970 pop 29,123), capital of Nordland co., W Norway, at the mouth of the Saltfjord, N of the Arctic Circle. It is a center for coastal shipping, tourism, and fishing and serves as the port of the SULITJELMA copper and pyrite mines. The city was heavily damaged in World War II. Of note is a modern cathedral (1956). Nearby is Bodin Church, a medieval stone structure.

Bodoni, Giambattista (jambat-tē'sta bōdō'nē), 1740-1813, Italian printer b. Piedmont. He was the son of a printer and worked for a time at the press of the Vatican. Under the patronage of the duke of Parma, he produced stately quartos and folios with impressive title pages and luxurious margins. With BASKERVILLE in England and the DIDOT family in France, Bodoni was a leader in originating pseudo-classical typefaces. These were distinguished from the "old style" of CASLON by emphasizing the contrast of light and heavy lines and by long, level serifs. Bodoni's most notable publications include folio editions of Horace (1791), Vergil (1793), *The Divine Comedy* (1795), and Homer (1808). His coldly elegant books were frankly made to be admired for typeface and layout, not to be studied or read. He was apparently indifferent to the quality of the text he printed and to editing and proofreading. William Morris considered Bodoni's mechanical perfection in typography the ultimate example of modern ugliness.

body-marking, painting, tattooing, or scarification (cutting or burning) of the body for ritual, esthetic, medicinal, magic, or religious purposes. Evidence from prehistoric burials, rock carvings, and paintings indicates that body-marking existed in ancient times, ethnographic studies show that it is still practiced today. Markings may indicate religious dedication or alliance with a particular god, they may also serve as protection against some evil such as a disease, as identification with a certain group, such as the tribe, or as evidence of personal rank or status within the group. Among examples of the widespread custom of painting the body are the red ochre found in prehistoric burial sites, the blue woad of the ancient Britons, Kohl used in Asia to enhance the beauty of the eyes, the use of henna on the fingernails in the Middle East, and the war paint of some American Indian tribes. The TATTOO is an extension of the practice. Scarification was used in ancient times as a property mark for slaves and more recently in Europe and elsewhere, until the latter part of the 19th cent., for the identification of criminals. Besides being employed for magical or ritual purposes, scarification has also been used for its supposed curative powers. The forms used in Africa include stretched lips and earlobes, filed teeth, and flattened skulls. See W. D. Hambly, *The History of*

Tattooing and its Significance (1925), Henry Field, *Body-Marking in Southwestern Asia* (1958), W. C. Handy, *Forever the Land of Men* (1965).

body snatching, the stealing of corpses from graves and morgues. Before cadavers were legally available for dissection and study by medical students, traffic in stolen bodies was profitable. Those who engaged in the illicit practice were sometimes called resurrectionists; they were active from about the early 18th cent. to the middle 19th cent. Public opposition to any dissection of bodies was further aroused by discovery of the resurrectionists' activities, outbursts of violence occurred in Europe as well as in America. Robert Knox, an eminent British anatomist, became a victim of public attack because a body he had purchased for dissection proved to be that of one of a number of victims murdered by William Hare and an accomplice named William Burke for the purpose of selling the bodies, the murderers were brought to trial (1828) and convicted. This and other similar cases led to the passage (1832) in Great Britain of the Anatomy Act, which permitted the legal acquisition by medical schools of unclaimed bodies. In the United States dissection of the human body was practiced from the middle of the 18th cent., riots and acts of violence frequently occurred in protest against lecturers on anatomy and medical students, who reputedly dug up bodies for study. In 1788 outraged citizens of New York City precipitated a riot while ransacking the rooms of anatomy students and professors at Columbia College Medical School in search of bodies. The following year body snatching was prohibited by law, thus creating a climate for the growth of an illegal group of professional body snatchers. It was not until 1854 that anatomy students were allowed access to unclaimed bodies from public institutions. See *The Diary of a Resurrectionist* (ed. by J. B. Bailey, 1896), Thomas Gallagher, *The Doctors' Story* (1967).

body temperature, internal temperature of a living organism. Mammals and birds are termed warm-blooded, or homeothermic, i.e., they are able to maintain a relatively constant inner body temperature, whereas other animals are cold-blooded, or poikilothermic, i.e., their body temperature varies according to the temperature of the environment. In man and other mammals, temperature regulation represents the balance between heat production from metabolic sources and heat loss from evaporation (perspiration) and the processes of radiation, convection, and conduction. In a cold environment, body heat is conserved first by constriction of blood vessels near the body surface and later by waves of muscle contractions, or shivering, which serve to increase metabolism. Shivering can result in a maximum fivefold increase in metabolism. Below about 40°F (4°C) the nude human cannot sufficiently increase the metabolic rate to replace heat lost to the environment. Another heat-conserving mechanism, goose bumps, or piloerection, raises the body hairs, although not especially effective in man, in animals it increases the thickness of the insulating fur or feather layer. In a warm environment, heat must be dissipated to maintain body temperature. In man, increased surface blood flow, especially to the limbs, acts to dissipate heat at the surface. At environmental temperatures above 93°F (34°C), or at lower temperatures when metabolism has been increased by work, heat must be lost by evaporation of the water in sweat. Men in active work may lose as much as 4 quarts per hour for short periods. However, when the temperature and humidity are both high, evaporation is slowed, and sweating is not effective. Most mammals do not have sweat glands but keep cool by panting (evaporation through the respiratory tract) and by increased salivation and skin and fur licking. Temperature regulatory mechanisms act through the autonomic nervous system and are largely controlled by the hypothalamus of the brain, which responds to stimuli from nerve receptors in the skin. Continued exposure to heat or cold results in some slow acclimatization, e.g., more active sweating in response to continued heat, and an increase in subcutaneous fat deposits in response to continued cold. Environmental extremes may result in failure to maintain normal body temperature. In both increased body temperature, or hyperthermia, and decreased body temperature, or hypothermia, death may result (see HEAT EXHAUSTION). Controlled hypothermia is used in some types of surgery to temporarily decrease the metabolic rate. FEVER, caused by a resetting of the temperature regulatory mechanism, is a response to fever-causing, or pyrogenic, substances, such as

bacterial endotoxins or leucocyte extracts The upper limit of body temperature compatible with survival is about 107°F (42°C), while the lower limit varies In man the inner body temperature alternates in daily activity cycles, it is usually lowest in early morning and is slightly higher at the late afternoon peak In human females there is also a monthly temperature variation related to the ovulatory cycle In many mammals and birds the body temperature shows more pronounced cyclic variations than in man For example, in hibernators, the body temperature may lower to only a few degrees above the environmental temperature during the dormant periods, mammalian hibernators reawake spontaneously and in their active period are homeothermic Reptiles and other poikilothermic animals bask in warm weather and must hibernate in winter The body temperature of fishes must remain close to that of the surrounding water, because heat is lost directly into the water during respiration, however, in some fishes, such as the bluefin tuna, a special network of fine veins and arteries called the rete mirabile provides a thermal barrier against loss of metabolic heat The mechanism of temperature regulation in homeotherms is considered an important evolutionary advance, in that physical activity in such animals can be relatively independent of the environment

Boece, Roman philosopher see **BOETHIUS**

Boece or Boethius, Hector (bōēs', bois, bōē'thēās), 1465?-1536?, Scottish historian He studied at the Univ of Paris, where he knew Erasmus, and in 1498 he went to Aberdeen as the first principal of the new university The most important of his works is a Latin history of Scotland (1527), it is a vast collection of historical fables from medieval chronicles, generously sprinkled with myths and miracles Despite its shortcomings it was held in high repute until the 18th cent It supplied Holinshed with the Duncan-Macbeth tale from which Shakespeare took his plot In the 16th cent it was translated into a metrical Scottish version by William Stewart and a better-known prose Scottish version by John Bellenden See J B Black and W D Simpson, *Quatercentenary of the Death of Hector Boece* (1937)

Boecklin, Arnold see **BOCKLIN ARNOLD**

Boehm, Martin: see **BEHAIM, MARTIN**

Boehler, Peter (bō'lār), 1712-75, missionary and bishop of the MORAVIAN CHURCH, b Germany He went (1738) to Savannah, Ga, to minister to the Moravians In 1740 he migrated with a group to Pennsylvania and there founded Nazareth and Bethlehem He went to England and organized a new company of emigrants, the "Sea Congregation," which settled in Bethlehem in 1742 He was superintendent (1747-53) of the Moravian Church in England and was made a bishop in 1748 Boehler returned to America and directed the founding of new Moravian settlements from 1753 to 1764

Boehm, Martin (bām), 1725-1812, American evangelical preacher, b Conestoga, Pa He was the son of a Palatinate Mennonite who settled in Lancaster co, Pa Boehm became a Mennonite preacher c 1756 and a bishop in 1759 A personal conversion resulted in dissatisfaction with the formalism of his denomination and his adoption of a more evangelistic type of preaching He was excluded from the Mennonite Church In association with Philip William OTTERBEIN, whom he met c 1768, he traveled as an evangelist through Pennsylvania and Maryland and into Virginia, attracting large audiences, especially in the German settlements Boehm was allied with the Methodists for a time, but finally became one of the founders of the United Brethren in Christ (see EVANGELICAL UNITED BRETHREN CHURCH), of which he was elected bishop at the first annual conference in 1800

Boehme or Bohme, Jakob (bē'mā, Ger yā'kōp bō'ma), 1575-1624, German religious mystic, a cobbler of Görlitz, in England also called Behmen He was a student of the Bible and was influenced by Paracelsus In his major works, *De signatura rerum* (tr *The Signature of all Things*, 1912) and *Mysterium magnum*, Boehme describes God as the abyss, the nothing and the all, the primordial depths from which the creative will struggles forth to find manifestation and self-consciousness Evil is a result of the striving of single elements of Deity to become the whole, conflict ensues as man and nature strive to achieve God who, in himself, contains all antithetical principles Boehme exerted a profound influence on the philosophies of Baader, Schelling, Hegel, and Schopenhauer Boehme claimed divine revelation and had many followers in Germany and Holland Societies of Behmenites were formed in England, many

of them were later absorbed by the Quakers See *The Confessions of Jacob Boehme*, ed by W S Palmer (1954), study by J J Stoudt (1957)

Boeotia (bōē'shā), region of ancient Greece It lay N of Attica, Megaris, and the Gulf of Corinth The early inhabitants were from Thessaly A number of small cities scattered over the rough country—mountainous in the south, hilly in the north—may have had a sort of confederacy before the Boeotian League was formed (c 7th cent B C) Thebes dominated the region and the league The rival cities were Orchomenus, Plataea, and Thespiae The history of Boeotia is largely a record of the vain attempts of these cities to escape the domination of Thebes and the attempts of Thebes to prevent encroachment on the region by others of the great city-states Boeotia, therefore, was the scene of various important battles—PLATAEA, LEUCTRA, Coronea, and Chaeronea After the defeat of the Persians at Plataea (479), the Greeks besieged Thebes for aiding the Persians, and the Boeotian League was disbanded The league was temporarily revived in 457 B C before being defeated in the same year by Athens, which briefly attached the Boeotian cities to the Athenian empire Thebes returned to power at the head of the league in 446 Later, after the victory of EPAMINONDAS over the Spartans, the history of Boeotia was completely absorbed into that of Thebes Boeotia was the home of the poets Hesiod and Pindar

Boer (bōōr, bōr) [Du, =farmer], inhabitant of South Africa of Dutch or French Huguenot descent Boers are also known as Afrikaners They first settled (1652) in what is now CAPE PROVINCE After Great Britain annexed (1806) this territory, many of the Boers departed (1835-40) on the Great Trek (see TREK) and created republics in NATAL, the ORANGE FREE STATE, and the TRANSVAAL Hostility between the Boers and the British resulted in the SOUTH AFRICAN WAR (1899-1902), after which the Boer territories were annexed and the Union of South Africa formed There has been some tension between South Africans of British descent and the Boers South Africa withdrew (1961) from the British Commonwealth and became a republic, an event that was strongly supported by Afrikaner nationalists AFRIKAANS, the local form of Dutch, is an official language of the republic, along with English Boer politicians were largely responsible for the inauguration of the policy of APARTHEID, which is applied to the non-white population of South Africa See Sheila Patterson, *The Last Trek* (1957), John Fisher, *The Afrikaners* (1969)

Boerhaave, Hermann (hēr'mān bōōr'hāva), 1668-1738, Dutch physician and humanist One of the most influential clinicians and teachers of the 18th cent, Boerhaave spent almost his entire life in Leiden, which became a leading medical center of Europe Like Thomas Sydenham he helped to revive the Hippocratic method of bedside instruction, he further insisted on post-mortem examination of patients whereby he demonstrated the relation of symptoms to lesions He thus instituted the clinicopathological conference still in use today Boerhaave's fame was enormous, extending far beyond Europe to China Skilled as chemist, botanist, and anatomist, he adhered to no single tradition but combined the best features of the mechanistic and chemical schools in his own brand of eclecticism His methods of instruction were spread throughout Europe by a host of students The two works by which he is best remembered, the *Institutiones Medicinae* (1708) and the *Elementa Chemiae* (1732), remained standard textbooks for many decades

Boeroe: see **BURU, Indonesia**

Boer War: see **SOUTH AFRICAN WAR**

Boethius (bōē'thēās), **Boetius** (bōē'shās), or **Boece** (bōēs') (Anicius Manlius Severinus Boethius), c 475-525, Roman philosopher and statesman An honored figure in the public life of Rome, where he was consul in 510, he became the able minister of the Emperor Theodoric Late in Theodoric's reign false charges of treason were brought against Boethius, after imprisonment in Pavia, he was sentenced without trial and put to death While in prison he wrote his greatest work, *De consolatore philosophiae* (tr *The Consolation of Philosophy*, 1943) His treatise on ancient music, *De musica*, was for a thousand years the unquestioned authority on music in the West One of the last ancient Neoplatonists, Boethius translated some of the writings of Aristotle and made commentaries on them His works served to transmit Greek philosophy to the early centuries of the Middle Ages See H F Stewart, *Boethius* (1891), H R Patch, *The Traditions of Boethius* (1935, repr 1970)

Boethius, Hector: see **BOECE, HECTOR**

Boethus (bōē'thās), fl 1st half of 2d cent B C, Greek sculptor of genre subjects and worker in silver He was born in Chalcidion and seems to have worked mainly at Rhodes In the writings of Pliny and Pausanias he is mentioned as having made a bronze figure of a boy struggling with a goose and a statue of a seated boy The figure of a boy with a goose in the Louvre may be one of many copies of this work A second authenticated work, a bronze representing Agon, god of contests, as a winged boy (Tunis) was found in the remains of a ship of the 1st cent B C wrecked off Tunis

Boetius, Roman philosopher see **BOETHIUS**

bog, very old lake without inlet or outlet that becomes acid and is gradually overgrown with a characteristic vegetation (see SWAMP) Peat moss, or SPHAGNUM, grows around the edge of the open water of a bog (PEAT is obtained from old bogs) and out on the surface With its continued growth, the moss forms a mat on the water in which other bog plants find a foothold, and humus and soil are slowly built up on the body of the water Because of this formation bogs are sometimes treacherous (quaking bogs shake under the weight of a man) and have occasionally resulted in fatalities when a man or animal breaks through the vegetative crust Because of their extreme acidity, bogs form a natural preservative and have been found to be a valuable repository of animals and plants of earlier times Typical bog plants of today include, besides sphagnum, many orchids, the pitcher plant, the sundew, and the cranberry (old bogs are utilized for cranberry cultivation) Because of the reclamation of old bog lands by drainage and by their natural filling in, bogs in America are becoming rare, and with them their unique flora and fauna One example of the latter is the bog turtle, *Clemmys muhlenbergi*, a tiny animal with a black, sculptured shell and orange head markings The bog turtle has disappeared from most of its original habitat in the middle Atlantic states Another consequence of the drainage and filling of bogs is the decreased water-holding capacity of the land, resulting in rapid run-off during rains and the increased siltation of rivers and streams

Bogalusa (bōgālō'sā), city (1970 pop 18,412), Washington parish, SE La, inc 1914 It is a manufacturing and trading center of the Pearl river valley Its name derives from the Indian-named creek, Bogue Lusa ("smoky or dark waters"), that flows through the city Bogalusa was founded in 1906 when the lumber industry established operations in this extensive pine area The city still has pine nurseries Its manufactures include paper and paper products, furniture, tung oil, machine parts, and food products

Bogan, Louise, 1897-1970, American poet and critic, b Livermore, Maine She spent much of her life in New York City and was for many years poetry editor for the *New Yorker* magazine Her verse is intense, personal, and yet restrained, revealing a metaphysical awareness of the tragedy of life Among her volumes of poetry are *Body of This Death* (1923), *Poems and New Poems* (1941), *Collected Poems* (1954), and *The Blue Estuaries Poems 1923-1968* (1968) Her other works include a literary history, *Achievement in American Poetry, 1900-1950* (1950), and collections of criticism, *Selected Criticism* (1958) and *A Poet's Alphabet* (1970) See her collected letters, ed by Ruth Limmer (1973)

Boganda, Barthélémy (bärtālmē bōgān'dā), 1910-59, premier of the Central African Republic (1958-59) He was a Roman Catholic priest for a decade (1938-48) before turning exclusively to politics Founder of the nationalist movement in the French territory of Ubangi-Shari, he became (1957) president of the federal grand council of French Equatorial Africa When Ubangi-Shari joined the French Community as the Central African Republic in 1958, Boganda was the first premier He died in an air crash and was succeeded by his cousin, David DACKO

Bogarde, Dirk (dūrk bō'gārd), 1920-, English film actor, b Hampstead, his original name was Derek Van den Bogaerde In his early career Bogarde played romantic leads in such films as *So Long at the Fair* (1950) and *A Tale of Two Cities* (1958) He later showed great versatility playing character parts—the sinister valet in *The Servant* (1963), the dying, obsessed composer in *Death in Venice* (1971) His other films include *Esther Waters* (1948), *Doctor in the House* (1954), *Darling* (1965), *Accident* (1967), *The Damned* (1969), and *The Night Porter* (1974)

Bogardus, James, 1800-1874, American architect, b Catskill, N Y Among the first to use cast iron in the

construction of building facades, Bogardus was noted for his commercial building designs. His best-known works include the Iron Building at Centre and Duane streets in New York City. Bogardus's success with cast-iron exteriors led eventually to the adoption of steel-frame construction for entire buildings.

Bogart, Humphrey DeForest, 1899–1957, American film actor, b. New York City. After a succession of stage roles he achieved note with his portrayal of the tough gangster Duke Mantee in *The Petrified Forest* (1934). He was in films after 1930 but it was the re-creation (1936) of that role that brought him fame, and thereafter followed a succession of notable performances in *The Maltese Falcon* (1941), *Casablanca* (1942), *To Have and Have Not* (1944), *The Big Sleep* (1946), *Treasure of the Sierra Madre* and *Key Largo* (1948), and *The Caine Mutiny* (1954). He became famous for his portrayals of tough, cynical heroes. In 1952 he won an Academy Award for his performance in *The African Queen*. His work has had an enormous following since his death.

Boğazkoy or Boghazkeui (bōaz'koy), village, N central Turkey. Boğazkoy (or Hattusas as it was called) was the chief center of the Hittite empire (1400–1200 B.C.), which was consolidated by Shub-biluluma (fl. 1380 B.C.). Hugo Winckler found there (1906–7) the principal Hittite inscriptions on 10,000 tablets, this discovery greatly added to the knowledge of Hittite civilization. Among the impressive remains are huge fortifications, gates, and temples. Below this level, archaeologists have found levels of an earlier period. Nearby is the Hittite carved sanctuary of Yazılıkaya. Boğazkoy is by tradition the site of Pteria, where Croesus and Cyrus the Great fought an indecisive battle (546 B.C.). The name of the village is also written Boghazkoy.

Boghazkeur: see BOĞAZKOY

bog iron ore: see LIMONITE

bog lime: see MARL

Bognor Regis (bōg'nōr rē'jīs), urban district (1971 pop. 34,389), West Sussex, S. central England. It is a seaside resort. At nearby Felpham is the cottage where the poet William Blake lived from 1801 to 1804. The title Regis was granted to the town after George V convalesced there in 1929.

Bogomils (bōgōm'ilz), members of a religious group that flourished in Bulgaria and the Balkans from the 10th to the 15th cent. Their creed, a dualism adapted from the PAULICIANS and modified by other Gnostic and Manichaean sources, is attributed to Theophilus or Bogomil, a Bulgarian priest of the 10th cent. The movement was intensely nationalistic and political as well as religious and reflected resentment of Byzantine culture, Slavic serfdom, and imperial authority. Similar groups were known in other countries as CATHARI, Euchites, and Patarines. In the 12th cent. the Patarines were dominant in Bosnia and neighboring lands and began to proselytize in Italy. From there, the Cathari converted the ALBIGENSES of France. Through the combined efforts of the Western and Eastern churches and of the Holy Roman and Byzantine empires, the Bogomils were weakened and suppressed. They vanished in the expansion of Islam, but bits of their ideas and folklore persisted for centuries in Slavic lands. See Dmitri Obolensky, *Bogomiles* (1948).

Bogor (bō'gōr), formerly **Buitenzorg** (boi'tanzōrk'h) [Dutch, = free from care], city (1961 pop. 154,092), W Java, Indonesia. At the foot of two volcanoes, it is a highland resort and an agricultural research center, known chiefly for its magnificent botanical gardens (laid out 1817). Adjacent to the gardens is the presidential country palace, formerly used by the Dutch governors. Rainfall is heavy in the area, tea is grown on the surrounding highlands, and coffee, rice, and rubber are also important crops. Automobile tires are among the manufactures. The site was selected as the resort residence of the Dutch governor-general in 1745, and the town grew around the palace. Bogor is the seat of the Indonesian general agricultural research station, a state agricultural university, two private universities, an army intelligence school, and forestry and rubber research institutes.

Bogorodsk: see NOGINSK, USSR

Bogota (bōgō'tā'), city (1968 est. pop. 1,966,341, pop. of Bogota Special District 2,148,387), central Colombia, capital and largest city of Colombia, and capital of Cundinamarca dept. A picturesque, spacious city, Bogota is on a high, fertile plateau (c. 8,560 ft/2,610 m) in the E. Andes and has a cool, moist climate. Several rivers join at the site to form the Bogotá, a tributary of the Río Magdalena, the chief means of transportation in colonial times. Today Bogota is the

political, social, and financial center of the republic, although Medellín and Barranquilla enjoy economic supremacy. It is the marketing and processing center for a region of coffee, cocoa, and tobacco. The city is rich in splendid colonial architecture, notably the cathedral and the churches of San Ignacio and San Francisco. It has several universities and a museum with an internationally famous collection of pre-Columbian gold art. The region was a Chibcha Indian center before the city was founded in 1538 by Jiménez de Quesada and named Santa Fe de Bogota (in memory of the Chibcha chief Bacata). As capital and archiepiscopal see of the colonial viceroyalty of NEW GRANADA, the city became an early religious and intellectual center. Alexander von Humboldt called it (c. 1800) the Athens of America in honor of its cultural and scientific institutions. Among them were the first astronomical observatory in South America, founded by Jose Celestino Mutis. The intellectual impact of the French Revolution inspired Antonio Nariño and others to agitate against Spanish rule. Jose Acevedo y Gomez led the first successful revolt in the city against Spain in 1810. Later Santander and Bolívar were prominent in Bogota. After Bolívar's decisive victory at Boyaca (1819), Bogota became the capital of Greater Colombia, when the country was divided in 1830, Bogota became the capital of what was later called Colombia. Much of the city was damaged during rioting in 1948 following the assassination of the radical leader, Jorge Eliecer Gaitan. In 1955, Bogota and the surrounding area were organized as a Special District of 613 sq mi (1,588 sq km). A short distance from the city is the Salto de Tequendama waterfall and the underground cathedral at the salt mines of Zipaquirá.

Bogra (bōg'ra), town (1961 pop. 33,800), N Bangladesh, on the Karatoya River, a tributary of the Jamuna. It is a road junction and commercial center, with soap, match, and metalware industries. Bogra also contains a nursery for sericultural development. It has a college affiliated with Rajshahi Univ.

Bohan (bō'hān), son of Reuben. Joshua 15:6, 18:17.

Bohemia, Czech *Cechy*, historic region (20,368 sq mi/52,753 sq km) and former kingdom, W Czechoslovakia. Bohemia is bounded by Austria in the southeast, by West and East Germany in the west and northwest, by Poland in the north and northeast, and by Moravia in the east. Its natural boundaries are the BOHEMIAN FOREST, the ERZGEBIRGE ("ore mountains") chain, the SUDETES, and the Bohemian-Moravian heights. With MORAVIA and Czech Silesia, Bohemia constitutes the traditional Czech lands of Czechoslovakia, and in its broader meaning Bohemia is often understood to include this entire area, which until 1918 was a Hapsburg crown land. Prague is the traditional Bohemian capital. Although Bohemia, with about 40% of Czechoslovakia's area and 45% of its people, is the country's most urbanized and densely inhabited region, agriculture and rural life and customs retain their importance. Central Bohemia consists of fertile lowlands and plateaus, drained by the Elbe and Vltava (Moldau) rivers. Grain, sugar beets, grapes and other fruit, flax, and the famous hops used in the breweries of PLZEN (Pilsen) are the principal crops. Mining (coal, silver, copper, lead, iron, and, at JACHYMOV, radium and uranium) and textile and glass manufactures are important in the mountain districts. Prague is the center of a heavy industrial region, and Plzeň is also known for the huge Skoda works, producing machinery and munitions. Bohemia is celebrated for its spas and beautiful resorts, notably KARLOVY VARY (Ger. *Karlsbad*) and MARIÁNSKÉ LÁZNĚ (Ger. *Marienbad*). The overwhelming majority of the population is Czech, but there are some Slovak, German, and other minorities. The Romans called the area Boiohaemum after the Boii tribe, probably Celtic, which was displaced (1st–5th cent. A.D.) by Slavic settlers, the Czechs. Subjugated by the Avars, the Czechs freed themselves under the leadership of Samo (d. c. 658). The legendary Queen Libussa and her husband, the peasant PRĚMYSL, founded the first Bohemian dynasty in the 9th cent. Christianity was introduced by saints CYRIL and METHODIUS while Bohemia was part of the great Moravian empire, from which it withdrew at the end of the century to become an independent principality. St. WENCESLAUS, the first great Bohemian ruler (920–29), successfully defended his land from Germanic invasion, but his brother, Boleslav I (929–67), was forced to acknowledge (950) the rule of Otto I, and Bohemia became a part of the Holy Roman Empire. The Bohemian principality retained autonomy in internal affairs, however. Later Přemyslide rulers acquired Moravia and most of SILESIA. German influence in Bohemia in-

creased with the growth of the towns and the rise of trade between East and West. Silver, mined chiefly at KUTNA HORA, greatly added to the wealth and prestige of the dukes, who by the 12th cent. began to take part in the imperial elections. In 1198, OTTO CAR I was crowned king of Bohemia, which became an independent kingdom within the empire. The conquests and acquisitions of OTTOCAR II (1253–78) brought Bohemia to the height of its power and its greatest extent (from the Oder to the Adriatic), but his defeat by RUDOLF I of Hapsburg cost Bohemia all his conquests. After the Přemyslide line became extinct (1306), JOHN OF LUXEMBURG was elected king in 1310. The reign of his son, CHARLES IV (1346–78), who was crowned Holy Roman Emperor in 1355, was the golden age of Bohemia, and Prague became the seat of the empire. His Golden Bull (1356) permanently established the kings of Bohemia as ELECTORS. In the reigns of his successors, emperors WENCESLAUS and SIGISMUND, religious, political, and social tensions exploded in the movement, both religious and nationalist, of the HUSSITES against the Holy Roman Empire. THE HUSSITE WARS led to the defeat (1434) of the radical Taborites at the hands of the moderate Utraquists, who were supported by the great nobles. In 1436, by the so-called Compactata, the Utraquists returned to communion with the Roman Catholic Church and established Utraquism as the national religion. Meanwhile the crown had passed to ALBERT II, a Hapsburg, and then to LADISLAUS V of Hungary (in Bohemia, Ladislaus I). GEORGE OF PODEBRAD actually ruled for Ladislaus and was elected to succeed him as king in 1458. On his death (1471) the crown reverted to the kings of Hungary—ULADISLAUS II (Ladislaus II), MATTHIAS CORVINUS, and LOUIS II. The nobles profited from the disorders of the period and in 1487 secured vast privileges, reducing the peasantry to virtual serfdom. The accession (1526) of Archduke Ferdinand (later Emperor FERDINAND I) began the long Hapsburg domination of Bohemia. Ferdinand began the gradual process by which Bohemia was deprived of self-rule. He also introduced the Jesuits in order to secure the return of Bohemia to Roman Catholicism. The religious situation remained explosive. The conservative wing of the Utraquists had become almost indistinguishable from the Roman Church, and there had arisen a frankly Protestant movement, the Bohemian Brethren (see MORAVIAN CHURCH). The Brethren and their close allies, the Lutherans, won equality with the Utraquists by inducing Emperor Maximilian II to declare (1567) that the Compactata no longer were the law of the land. RUDOLF II was forced to grant freedom of religion by the so-called Letter of Majesty (*Majestatsbrief*) of 1609. When, in 1618, Emperor Matthias disregarded the *Majestatsbrief*, members of the Bohemian diet revolted and dramatized their position by throwing two imperial councillors out of the windows of Hradcín Castle on May 23, 1618. The so-called Defenestration of Prague precipitated the THIRTY YEARS WAR, which came to involve most of Europe. Matthias's son (later Emperor FERDINAND II) was declared deposed, and FREDERICK THE WINTER KING was elected king of Bohemia. Frederick and the Protestants were crushed in the battle of the WHITE MOUNTAIN (1620) by Ferdinand II. The Protestants were suppressed, and in 1627 Bohemia was demoted from a constituent Hapsburg kingdom to an imperial crown land, its diet was reduced to a consultative body. The Thirty Years War laid Bohemia waste, after the Peace of Westphalia (1648), forcible Germanization, oppressive taxation, and absentee landownership reduced the Czechs, except a few favored magnates, to misery. The suppression (1749) of the separate chancellery at Prague by MARIA THE RESA and the introduction of German as the sole official language completed the process. JOSEPH II freed the serfs and permitted freedom of worship, but he incurred the hatred of the Czechs by his rigorous policy of Germanization. LEOPOLD II tried to conciliate the Czechs, he was the last ruler to be crowned king of Bohemia (1791). During the later 18th cent. the foundations of industrialization were laid in Bohemia, but the German population fared better than the mostly peasant Czechs. The 19th cent. brought a rebirth of Czech nationalism. Under the leadership of PALACKÝ a Slavic congress assembled at Prague in the Revolution of 1848, but by 1849, although the Czech peasantry had been emancipated, absolute Austrian domination had been forcibly restored. The establishment (1867) of the AUSTRO-HUNGARIAN MONARCHY thoroughly disappointed the Czech aspirations for wide political autonomy within a federalized Austria. Instead, the Czech lands were relegated to a mere province of the empire.

Concessions were made (1879) by the Austrian minister TAAFFE, Czechs entered the imperial bureaucracy and parliament at Vienna. However, many Czechs continued to advocate complete separation from the Hapsburg empire. Full independence was reached only at the end of World War I under the guidance of T. G. MASARYK. In 1918, Bohemia became the core of the new state of Czechoslovakia. After the Munich Pact of 1938, Czechoslovakia was stripped of the so-called Sudeten area, which was annexed to Germany. In 1939, Bohemia was invaded by German troops and proclaimed part of the German protectorate of Bohemia and Moravia. After World War II the pre-1938 boundaries were restored, and most of the German-speaking population was expelled. In 1948, Bohemia's status as a province was abolished, and it was divided into nine administrative regions. The administrative reorganization of 1960 redivided it into five regions and the city of Prague. See C. E. Maurice, *Bohemia from the Earliest Times to the Foundation of the Czechoslovak Republic* in 1918 (2d ed. 1922), Josef Macek, *The Hussite Movement in Bohemia* (tr. 1965), R. J. Kerner, *Bohemia in the Eighteenth Century* (1932, repr. 1969), S. Z. Pech, *The Czech Revolution of 1848* (1969), Eduard Beneš, *Bohemia's Case for Independence* (1917, repr. 1971), R. J. Evans, *Rudolf II and his World* (1973).

Bohemian Forest, Czech *Český les*, Ger. *Böhmerwald*, mountain range, extending c 150 mi (240 km) along the N Czechoslovakian-West German border and extending into Austria. The Czech name for its southern section is Sumava. A thickly wooded area, it rises to 4,780 ft (1,457 m) in the Grosser Arber (Czech Javor). There are many marshes, swamps, and peat bogs in the Bohemian Forest. Agriculture is limited because of the harsh climate, grazing is common. Coal, lignite, graphite, kaolin, and granite are extracted. The region is known for its glassmaking and woodworking.

Bohemian literature. see CZECH LITERATURE

bohemiaum (bōhē'mēəm), former name of the chemical element RHENIUM

Bohemond I (bō'həmənd), c 1056-1111, prince of Antioch (1099-1111), a leader in the First Crusade (see CRUSADES), elder son of ROBERT GUISCARD. With his father he fought (1081-85) against the Byzantine emperor ALEXIUS I. When his father's duchy of Apulia passed to his younger brother Roger, Bohemond made war against him and obtained S. Apulia as a fief. In 1096 he joined the Crusaders. He swore the oath of fealty to Alexius at Constantinople (1097) and in 1098 at the siege of ANTIOCH devised the stratagem by which the city was captured. He subsequently made himself prince of Antioch, in defiance of his oath to Alexius, and over the opposition of Raymond IV of Toulouse, leader of the crusade. Captured by Muslims (1100), he was released in 1103. Returning to Europe, he married the daughter of Philip I of France and secured support for a crusade against Alexius, by whom he was defeated (1108) and as a result was forced to reaffirm his vassalage. In 1109 he was defeated by the Muslims at Harran. He did not return to Antioch, and his relative Tancred was regent for him. See biography by R. B. Yewdale (1924, repr. 1971).

Böhl de Faber, Cecilia. see CABALLERO FERNAN

Bohlen, Charles Eustis, 1904-74, American diplomat, born Clayton, N.Y. He entered (1929) the U.S. Foreign Service and undertook consular assignments in Prague (1929-31), Paris (1931-34), Moscow (1934-35, 1937-40), and Tokyo (1940-41). A specialist in Russian affairs, Bohlen served as Russian interpreter for President Franklin D. Roosevelt at the Teheran and Yalta conferences and for President Harry S. Truman at the Potsdam Conference. During the Truman administration he played a major role in formulating policy toward the USSR. Appointed ambassador to Russia in 1953, he was confirmed despite the opposition of a group of ultraconservative Senators. Serious differences with Secretary of State John F. Dulles led to his transfer (1957) to the Philippines. In 1959, Dulles's successor, Christian A. Herter, returned Bohlen to his primary field as special assistant for Soviet affairs. Bohlen later served (1962-68) as ambassador to France. He wrote *The Transformation of American Foreign Policy* (1969). See his autobiography, *Witness to History* (1973).

Böhm, Dominikus (dōmē'nēkōōs böm), 1880-1955, German architect. The widely varied styles of Catholic churches designed by Böhm have strongly influenced 20th-century ecclesiastical architecture in Europe and America. The Gothic fantasia of the Suburban War Memorial Church in Neu-Ulm (1923) and the simple parabolic vaulting of the church at

Bischofsheim (1925) are examples of his expressionist period. By 1929, Böhm had achieved a rectangular simplicity in design as, e.g., in the church of Maria Königin at Marienburg outside Cologne (1954). Sankt Engelbert, Cologne-Riehl (1931-33), with its circular plan and paraboloid vaulting, is perhaps Böhm's finest work.

Bohm, Karl, 1894-, Austrian conductor. He studied with the musicologist Eusebius Mandyczewski and took a law degree before turning to conducting. After successful appearances with leading German orchestras, he was appointed director of the Vienna State Opera, a position he held from 1943 to 1945 and from 1954 to 1956. In 1956, Böhm gave his first American performance, conducting the Chicago Symphony Orchestra. He subsequently appeared with many European and American orchestras, including the Metropolitan Opera Orchestra and the New York Philharmonic-Symphony Orchestra. He shows a particular preference for the works of Mozart and Richard Strauss.

Böhm-Bawerk, Eugen (oigān' böm'-ba'vērĭ), 1851-1914, Austrian economist. Three times minister of finance (1895, 1897, and 1900), he initiated important tax reforms and farsighted financial policies. Rejecting the standard theory of value, Böhm-Bawerk posited a theory of interest and of capital that was based on psychological factors and on the nature of production. His theories marked an early point of departure from classical economics. Among his works are *Capital and Interest* (2 parts, 1884-89, tr. 1890, repr. 1970) and *Positive Theory of Capital* (1889, tr. 1923).

Bohme, Jakob. see BOEHME JAKOB

Böhmerwald. see BOHEMIAN FOREST

Bohmisch-Lepa: see ČESKÁ LÍPA, Czechoslovakia

Bohol (bō'hōl'), island (1970 pop. 674,806), 1,491 sq mi (3,862 sq km), the Philippines, one of the Visayan Islands, SW of Leyte. It is a major corn-producing area. Rice, cacao, and hemp are also grown, and manganese and copper are mined. Bohol prov. comprises the main island and several offshore islands; its capital is at Tagbilaran.

Bohr, Niels Henrik David (nēls hān' rēk dā'vēth bö), 1885-1962, Danish physicist, one of the foremost scientists of modern physics. He studied at the Univ. of Copenhagen (Ph.D. 1911) and carried on research on the structure of the ATOM at Cambridge under Sir James J. Thomson and at Manchester under Lord Ernest Rutherford. In 1916, Bohr became professor of theoretical physics at the Univ. of Copenhagen, and in 1920 he was made director of the Institute of Theoretical Physics, which he was instrumental in founding. Rutherford had discovered the nucleus of the atom in 1911, but classical theory was unable to explain the stability of the nuclear model of the atom. Bohr provided the solution to this problem in 1913, when he postulated that electrons move around the nucleus of the atom in restricted orbits and explained the manner in which the atom absorbs and emits energy. He thus combined the QUANTUM THEORY with this concept of atomic structure. Much of the knowledge of modern physics was made possible by Bohr's initial revolutionary assumption that atomic processes cannot be explained by classical laws alone. Bohr was a leading figure in the continuing development of the quantum theory over the next twenty years. He received the 1922 Nobel Prize in Physics. When he visited the United States in 1938 and 1939, Bohr told American scientists of his belief, based on experiments reported by German scientists, that the uranium atom could be split into approximately equal halves. This was verified by scientists at Columbia. Bohr returned to Denmark but fled from the Nazi-occupied country in 1943. He gave valuable assistance in the atomic bomb research at Los Alamos, N. Mex., and in 1945 again returned to Denmark. His writings include *The Theory of Spectra and Atomic Constitution* (1922) and *Atomic Theory and the Description of Nature* (1934). See his collected works, ed. by León Rosenfeld (Vol. I, 1972), biography by R. E. Moore (1966). His brother, Harald August Bohr, 1887-1951, a mathematician, taught (1915-30) at the College of Technology in Copenhagen and in 1930 became professor at the Univ. of Copenhagen. His most noted contribution to mathematics was his formulation of the theory of almost periodic functions. See his collected mathematical works, ed. by Erling Følner and Børge Jessen, (3 vol., 1952).

Bohun, Henry de, 1st earl of Hereford (bōon, hē'rafard), 1176-1220, English nobleman. Although King John granted him the marcher lordship of Hereford in 1199, Henry was one of the barons who

forced the king to accept the Magna Carta in 1215 and one of those appointed to oversee its observance. He fought against the king in the ensuing civil war. He died on a pilgrimage to the Holy Land.

Bohun, Humphrey V de, 2d earl of Hereford and 1st earl of Essex, d. 1275, English nobleman, son of Henry de Bohun, 1st earl of Hereford. A member of the household of Henry III, he inherited the earldom of Essex from a maternal uncle and in 1242 went with the king on his French campaign. In 1258 he joined the baronial opposition to Henry and was one of 24 men who drew up the PROVISIONS OF OXFORD. In the BARONS WAR, however, he returned (1263) to the side of the king and was captured (1264) by Simon de Montfort at Lewes.

Bohun, Humphrey VII de, 3d earl of Hereford and 2d earl of Essex, d. 1298, English nobleman. He was constable of England and with Roger Bigod, earl of Norfolk, led the baronial opposition to EDWARD I that forced the king to sign the important confirmation of the charters (1297).

Bohun, Humphrey VIII de, 4th earl of Hereford and 3d earl of Essex, 1276-1322, English nobleman, son of Humphrey VII de Bohun. One of the lords ordainers who attempted to curb the powers of EDWARD II in 1310, he took part in the execution (1312) of the hated Piers GAVESTON. He fought for Edward at Bannockburn (1314), was captured by the Scots, and was exchanged. He was killed at Boroughbridge fighting on the baronial side against the king and the Despensers.

Boiardo or Bojardo, Matteo Maria (māt-tē'ō mārē'ā böyār'dō), 1441?-1494, Italian poet, count of Scandiano. A favorite at the Este court in Ferrara, he served on diplomatic missions and became ducal captain of Modena and later of Reggio. He wrote Latin eclogues and songs and lyric love poems, and he translated Herodotus, Xenophon, Lucian, and Apuleius. His great unfinished *Orlando Innamorato* (1st complete ed., 1506) is a transformation of the Roland epic, recounting the love of ROLAND for the pagan Angelica and her love for his cousin Rinaldo. In this work Boiardo fused elements of Arthurian and Carolingian poetic cycles with material from classical antiquity. The vigorous beauty of Boiardo's epic was lost in the revision by Francesco Berni, which supplanted it until the 20th cent. ARIOSTO continued the tale in *Orlando Furioso*. See study by Giacomo Grillo (1942).

Boieldieu, François Adrien (frā'nswā' ādrē'āN bwāldyō'), 1775-1834, French composer. He studied with the organist of the cathedral in Rouen and composed one successful opera, *Le Calife de Bagdad* (1800), before he went to St. Petersburg. There he conducted (1803-11) the Imperial Opera. After his return to Paris his graceful *opéras comiques*, such as *Jean de Paris* (1812) and *La Dame blanche* (1825), were popular. He taught piano and composition at the Paris Conservatory.

boil or furuncle, tender, painful inflammatory nodule in the skin, which becomes pustular but with a hard center (see ABSCESS). It may be caused by any of various microbes, the most usual being *Staphylococcus aureus*. If proper care and precautions are not taken it may spread to many sites (a condition called furunculosis). Several adjoining furuncles that coalesce are known as a CARBUNCLE. The point of entry is usually a hair follicle or a sebaceous gland duct. Boils may occur anywhere in the skin but are most common at places where the skin is constantly exposed or chafed—neck, face, ear, armpit, breast, and extremities. The treatment of small boils consists of scrupulous cleanliness, protection from irritation, and applications of antibiotic ointments and moist heat. Large boils, especially those on the nose, upper lip, or near the eyes (where there is the greatest danger of their causing meningitis or blood poisoning), must be treated professionally with antibiotics. Such lesions should be incised and drained by a physician rather than allowed to discharge spontaneously.

Boileau-Despreaux, Nicolas (nēkōlā' bwālō'-dāprāō'), 1636-1711, French literary critic and poet. He was the spokesman of CLASSICISM, drawing his principles from his contemporaries, among them his friends Racine, Molière, and La Fontaine. His critical precepts are embodied in *L'Art poétique* (1674), a verse treatise, *Le Lutrin* (1683), a mock epic, 12 *Satires* (1st collected ed., 1716) and 12 *Épîtres* (1st collected ed., 1701), after Horace, and *Les Heros de roman* (1688), a dialogue in literary criticism. Revered in the 18th cent. as a literary lawgiver, he was later detested by the romantics. Boileau's poetic reputation rests on his satires, especially *Le Lutrin*, on the clerical world, *Satires III* and *VI*, on life in Paris, and

Satire X, on women. He was a zealous polemicist, notably in quarrels with Desmarests de Saint-Sorlin and Perrault. See edition of *Les Héros de roman* by T. F. Crane (1902), studies by Sister Marie Philip Haley (1938) and A. F. Clark (1925, repr. 1971).

boiler, device for generating steam. It consists of two principal parts: the furnace, which provides heat, usually by burning a fuel, and the boiler proper, a device in which the heat changes water into steam. A steam engine is driven by steam generated under pressure in a boiler. The amount of steam that can be generated per hour depends upon the rate of combustion of the fuel in the furnace and upon the efficiency of heat transfer to the boiler proper. Since the rate of combustion of the fuel in a furnace is largely dependent upon the quantity of air available, i.e., upon the draft, a sufficient supply of air is an important consideration in boiler construction. In some large installations the incoming air is preheated by the waste heat of the flue gases, and in order to increase the speed of combustion a forced draft (air at higher than atmospheric pressure) is often used. Two types of boilers are most common—fire-tube boilers, containing long steel tubes through which the hot gases from the furnace pass and around which the water to be changed to steam circulates, and water-tube boilers, in which the conditions are reversed. Water is changed to steam in these continuous circuits and also is superheated in transit. This additional heating of the steam increases the efficiency of the power-generating cycle. The SAFETY VALVE is used to prevent explosions by releasing steam if the pressure becomes too great. The construction of boilers in the United States is governed by the American Society of Mechanical Engineers' Boiler Construction Code. Progress in boiler design and performance have been governed by the continuous development of improved materials.

boiling point, temperature at which a substance changes its state from liquid to gas. A stricter definition of boiling point is the temperature at which the liquid and vapor (gas) phases of a substance can exist in equilibrium. When heat is applied to a liquid, the temperature of the liquid rises until the VAPOR PRESSURE of the liquid equals the pressure of the surrounding gases. At this point there is no further rise in temperature, and the additional heat energy supplied is absorbed as LATENT HEAT of vaporization to transform the liquid into gas. This transformation occurs not only at the surface of the liquid (as in the case of EVAPORATION) but also throughout the volume of the liquid, where bubbles of gas are formed. The boiling point of a liquid is lowered if the pressure of the surrounding gases is decreased. For example, water will boil at a lower temperature at the top of a mountain, where the atmospheric pressure on the water is less, than it will at sea level, where the pressure is greater. In the laboratory, liquids can be made to boil at temperatures far below their normal boiling points by heating them in vacuum flasks under greatly reduced pressure. On the other hand, if the pressure is increased, the boiling point is raised. For this reason, it is customary when the boiling point of a substance is given to include the pressure at which it is observed, if that pressure is other than standard, i.e., 760 mm of mercury or 1 atmosphere (see STP). The boiling point of a SOLUTION is always higher than that of the pure solvent, this boiling-point elevation is one of the COLLAGATIVE PROPERTIES common to all solutions.

Boisbaudran, Paul Émile Lecoq de (pól'âmél' lă-kôk' də bwabōdraN'), 1838-1912, French discoverer of the elements gallium, samarium, and dysprosium. He also made contributions in the field of spectroscopy, including his experimentation with the rare-earth metals.

Boisbrûlés (bwaburulă') [Fr. =burnt wood], name given the descendants of the fur traders and Indians in W. Canada, because of their dark complexion. The boisbrûlés, or brûlés, were in the early 19th cent. an important social group in the west and were particularly notable in the Red River Settlement and in Riel's Rebellion. In the later 19th cent. they were absorbed into the general population.

Bois de Boulogne (bwă də bōlō'nyə), park in Paris, France, bordering on the western suburb of NEUILLY-SUR SEINE. A favorite pleasure ground since the 17th cent., the park contains the race courses of Auteuil and Longchamps and many delightful promenades and bridle paths.

Boise (boi'sē, -zē), city (1970 pop. 74,990), state capital and seat of Ada co., SW Idaho, on the Boise River, inc. 1864. The largest city in Idaho, Boise is an important trade and transportation center. Food

processing and light manufacturing are the major activities, and there are many state and Federal government offices. A gold rush in the Boise valley and the establishment of a military post in 1863 led to the founding of Boise City, which grew as a distributing center for miners and became the capital of Idaho Territory in 1864. Later, particularly with the building of Arrowrock Dam (1911-15), the region was developed for farming, and Boise drew wealth from orchards and fields rather than mines. The BOISE PROJECT has increased the area's agricultural yield. In the city are Boise State College, a veterans hospital, and a state penitentiary.

Boise, river, c.160 mi (260 km) long, rising in SW Idaho and flowing west to join the Snake River at the Oregon line. In 1811 the Boise River, originally called Reed's River, was explored by an expedition financed by John Jacob Astor (1763-1848), an American merchant. Irrigation, hydroelectric power, and flood control are part of the Boise project.

Boise, Fort. see FORT BOISE

Boise project, in the Boise, Payette, and Snake river valleys, SW Idaho and E Oregon, developed in 1905 by the U.S. Bureau of RECLAMATION for irrigation (360,000 acres/145,690 hectares), hydroelectricity (360,000 kw total capacity), flood control, and recreation. The project has turned the area into a major seed-producing area and one of the best dairy regions in the United States. Anderson Ranch, Arrowrock, and Boise dams are the principal facilities of the project's Arrowrock division, located between the Snake and Boise rivers, the Payette division, between the Payette and Boise rivers, includes Black Canyon, Cascade, and Deadwood dams.

Boisguilbert, Pierre le Pesant, sieur de (pyër lă pazaN' syor də bwagēlbër'), 1646-1714, French economist. A local official of Rouen after 1689, he proposed a radical alteration of the French fiscal system in order to revive the finances of the nearly bankrupt state. Seeing the results of King Louis XIV's military expenditures in heavy taxation and oppression of the poor, Boisguilbert urged an income tax of 10 percent, particularly in *Le Détail de la France* (1695) and *Factum de la France* (1707). He insistently forced his advice on Michel Chamillart, controller general to Louis XIV. Chamillart had him exiled for six months in 1707. His name also appears as Boisguillebert. See biography by H. V. Roberts (1935).

Bois-le-Duc, Netherlands. see 'S HERTOGENBOSCH

Boito, Arrigo (ărē'gō bōtēō), 1842-1918, Italian composer and librettist. His opera *Meisofele* (1868, rev. 1875), influenced by Wagner's music-drama, helped to bring about a new dramatic style in Italian opera. Its first performance at La Scala, Milan, caused a riot, but it subsequently became very popular. Another opera, *Nerone*, was posthumously finished and produced by Toscanini in 1924. Many consider Boito's masterpieces to be the librettos for Verdi's *Otello* and *Falstaff*. He also was librettist for Ponchielli's *La Gioconda* and wrote novels and poems.

Bojardo, Matteo Maria see BOLIARDO

Bojer, Johan (yō'han boi'ər), 1872-1959, Norwegian writer. Bojer's novels of contemporary Norwegian life treat social issues from a classical liberal viewpoint. *The Power of a Lie* (1903, tr. 1908) and *The Great Hunger* (1916, tr. 1918) illustrate his humanistic philosophy. The greater depth of *The Last of the Vikings* (1921, tr. 1923) and *Folk by the Sea* (1929, tr. 1931) won critical acclaim in Norway. Bojer's later novels include *The King's Men* (1938, tr. 1940) and *Skyld* (1948).

Bok, Derek Curtis, 1930-, American educator and university president, b. Bryn Mawr, Pa., grad. Stanford (B.A., 1951) and Harvard (LL.B., 1954). He became a professor of law at Harvard in 1958. From 1968 to 1971 he served as Dean of the Law School. In 1971 he was appointed president of Harvard University. He is coauthor of *Labor Law* (1962) and author of *Labor and the American Community* (1970).

Bok, Edward William, 1863-1930, American editor, b. Helder, Netherlands. His family emigrated to the United States in 1870. He founded the *Brooklyn Magazine* (later *Cosmopolitan*) in 1883. As editor (1889-1919), he made the *Ladies' Home Journal* a leading American magazine for women, introducing serious articles and crusades to a medium previously restricted to light entertainment. Bok published fiction by Howells, Twain, Bret Harte, and Kipling and articles by several American Presidents. Of the books he wrote, his autobiographical *Americanization of Edward Bok* (1920) was the most popular and won a Pulitzer Prize. He engaged in

various philanthropic activities including the erection of the Bok Singing Tower, a carillon in Iron Mountain, Fla., and the endowment of the Woodrow Wilson professorship of literature at Princeton.

Bokassa, Jean Bedel (zhaN bēdēl' bōka'sa), 1921-, president of Central African Republic. He served (1939-61) in the French army and then organized his country's army, becoming commander in chief in 1963. In 1966 he led an army coup and became president and prime minister of the republic, holding several other cabinet posts in addition. He was appointed life president in 1972.

Boker, George Henry (bō'kər), 1823-90, American poet and playwright, b. Philadelphia, grad. Princeton, 1842. He is best remembered for his romantic and heroic tragedies, written in the manner of Elizabethan drama. The best of these were *Leonor de Guzman* (1853) and *Francesca da Rimini* (1855), based on the story of Francesca and Paolo. He also wrote a series of love sonnets. See biography by E. S. Bradley (1927, repr. 1972).

Bokhara: see BUKHARA, USSR

Bokher, Elya see LEVITA, ELIJAH

Boksburg (bōks'būrg'), city (1970 pop. 104,745), Transvaal prov., NE South Africa. It is an important gold- and coal-mining center. Manufactures include railroad equipment, electrical and metal goods, clay products, canned foods, and refined petroleum. Boksburg, founded in 1887 as the administrative center of the East Rand, is the second oldest town on the WITWATERSRAND.

Bol, Ferdinand (fēr'dinānt bōl), 1616-80, Dutch painter. He studied with Rembrandt in Amsterdam, and his early work (e.g., *Elizabeth Bas*, Amsterdam) has sometimes been confused with that of his master. His style was modified after 1650 through contact with van der Helst. Thereafter he moved away from a preoccupation with psychological probing and developed lighter tonalities and elegant forms. He is noted mainly for his portraits, a large collection of which is in the Rijks Museum and the Hermitage. Bol also executed a number of engravings.

Bolan Pass or Bholan Pass (both bōlan'), gap in the central Brahui Range, W. Pakistan, c.60 mi (100 km) long, alt. 5,880 ft (1,792 m). A railroad and highway cross the pass en route to the Afghanistan frontier. The pass, which is strategically located, was long used by traders, invaders, and nomadic tribes as a gateway to India.

Boldini, Giovanni (jōvan'nē bōldē'nē), 1842-1931, Italian portrait painter. Having worked in Florence and London, he reached his peak of creativity and success in Paris, painting romantic vignettes and portraits. His works are distinguished by the bravura of the brushwork. A portrait of Consuelo, Duchess of Marlborough, with Lord Ivor Spencer-Churchill is in the Metropolitan Museum.

Boldredwood, Rolf see BROWNE, THOMAS ALEXANDER

bolero (bōlār'ō), national dance of Spain, introduced c.1780 by Sebastian Zerezo, or Cerezo. Of Moroccan origin, it resembles the FANDANGO. It is in 2-4 or 3-4 time for solo or duo dancing and is performed to the accompaniment of castanets, guitar, and the voices of the dancers. Ravel's *Bolero* is in this rhythm.

Boleslaus I (bō'iaslōs), c.966-1025, Polish ruler (992-1025), the first to call himself king, also called Boleslaus the Brave. He succeeded his father, MIESZKO I, as duke of Poland, seized the territories left to his two brothers under their father's will, and set about increasing his holdings. With the sanction of Holy Roman Emperor Otto III, he obtained (1000) the elevation of G涅ZNO into a metropolitan see, thus emancipating the Polish church from German control. Otto also supported plans for Polish political autonomy. Otto's successor, Holy Roman Emperor HENRY II, opposed Boleslaus's ambition, when Boleslaus overran Meissen and the East Mark. Henry refused to confirm his control of these territories. Boleslaus took advantage of dynastic troubles to occupy Bohemia in 1003, expelled in 1004, he still retained Moravia. He repelled a series of invasions of Poland by Henry. In 1018, in the Peace of Bautzen, Boleslaus received Lusatia as a fief of the Holy Roman Empire. Subsequently he campaigned successfully against Kiev. Boleslaus ranks among Poland's foremost rulers, he reorganized the administration, systematized taxation, and created a large standing army. Shortly before his death he was crowned king with the approval of the Holy See. He was succeeded by his son, MIESZKO II.

Boleslaus II, c.1039-1081, duke (1058-76), and later king (1076-79) of Poland, son and successor of Casi-

mir I Throughout his reign he opposed the influence of the Holy Roman Empire. He asserted Polish power in Bohemia, Hungary, and S Russia by interfering in their civil wars. As a reward for submitting his foreign policy to papal control he was crowned king in 1076. He became involved in a sharp conflict with the Polish clergy and nobility, and in 1079 he killed (or procured the death of) Stanislaus, bishop of Krakow. The death provoked immediate reaction, the king's younger brother, Ladislaus Herman, joined in league with the powerful nobles and seized the royal power. Excommunicated and deprived of his title by Pope Gregory VII, Boleslaus died in exile in Hungary.

Boleslaus III, 1085–1138, duke of Poland (1102–38). The kingdom had been divided by his father, Ladislaus Herman, between Boleslaus and his elder brother Zbigniew, whose legitimacy was disputed. Zbigniew was supported by the Holy Roman emperor and other powers, however, Boleslaus defeated Zbigniew and reunited the kingdom. He routed (1109) Holy Roman Emperor Henry V at Hundsfield and warred against Bohemia, Hungary, and Kiev. Having also regained Pomerania, which Mieszko II had lost to Denmark, Boleslaus entrusted the Christianization of its inhabitants to the bishop of Bamberg. In 1135 at Merseburg he signed a treaty with Holy Roman Emperor Lothair II, by which he received Pomerania and Rugen as fiefs of the empire. Vainly seeking to prevent the disintegration of his kingdom, Boleslaus altered the law of succession of his dynasty (see *PIAST*). Among his sons, *CASIMIR II* was the most notable.

Boleslav I, d. 967, duke of Bohemia (929–67). He became duke by assassinating his elder brother, Duke Wenceslaus (see *WENCESLAUS, SAINT*). Although Boleslav was involved in constant warfare against the encroaching Germans, he was able to create a Bohemian state. He built fortresses to control restless tribes, conquered Moravia and part of Silesia, and encouraged the spread of Christianity. In 950 he was forced to recognize German suzerainty, although Bohemia remained largely autonomous.

Boleslav II, d. 999, duke of Bohemia (967–99), son and successor of *BOLESNAV I*. Continuing his father's policies, he largely completed the Christianization of Bohemia. In 973 he agreed to the establishment of the bishopric of Prague under the archbishop of Mainz, and in 993 he founded the first monastery in Bohemia. He supported his German overlords against Poland but also clashed with them in two wars. Boleslav strengthened his internal rule by eliminating princely rivals to his own Premyslide dynasty.

Boleyn, Anne (bōl'ēn, bōl'ēn'), 1507?–1536, second queen consort of *HENRY VIII* and mother of Elizabeth I. She was the daughter of Sir Thomas Boleyn, later earl of Wiltshire and Ormonde, and on her mother's side she was related to the Howard family. After spending some years in France, she was introduced to the English court in 1522. Soon Henry, who had already enjoyed the favors of her older sister, fell deeply in love with Anne. Unlike her sister, however, Anne refused to become his mistress, and this fact, coupled with Henry's desire for a male heir, led the king to begin divorce proceedings against *KATHARINE OF ARAGON* in 1527. In 1532, Anne finally yielded to the king, and the resulting pregnancy hastened a secret marriage (Jan. 1533) and the final annulment (May) by Archbishop *CRANMER* of Henry's previous marriage. Anne was crowned queen on June 1. Her delivery of a daughter (Elizabeth) in Sept., 1533, bitterly disappointed Henry, who soon took up with Jane *SEYMOUR*. In 1536, after the miscarriage of a son, Anne was brought to trial for adultery and incest. Whether she was guilty has never been determined, but a court, headed by her uncle Thomas Howard, duke of Norfolk, condemned her, and she was beheaded. Two days before her death her marriage was declared void by the Church of England. See the often published love letters of Henry VIII, biography by M. L. Bruce (1972), W. S. Pakenham-Walsh, *A Tudor Story: The Return of Anne Boleyn* (1963), M. H. Albert, *The Divorce* (1965).

Bolgari: see *BULGARS, EASTERN*.

bolide (bō'līd): see *FIREBALL*.

Bolingbroke, Henry of: see *HENRY IV (England)*.

Bolingbroke, Henry St. John, Viscount: see *ST. JOHN HENRY, VISCOUNT BOLINGBROKE*.

Bolivar, Simon (sēmōn' bōlē'vār), 1783–1830, South American revolutionary, called the Liberator, b. Caracas, Venezuela, of a wealthy creole family. Educated by tutors such as Andres BELLO and Simon

Rodriguez, he was deeply influenced by the teachings of Jean Jacques Rousseau. When the revolution against Spain broke out in 1810, he became an enthusiastic patriot, but in 1812 his forces were defeated at Puerto Cabello. This ill fortune increased dissension among the revolutionaries, and Bolivar was one of the men who seized and imprisoned the patriot leader, Francisco de MIRANDA. Bolivar went to Cartagena, where he cooperated with the forces of Antonio NARIÑO and won notable victories. In 1815, however, the patriots were again scattered and crushed by a royalist army under Pablo MORILLO. Bolivar escaped to the island of Jamaica and from there fled to Haiti. In the spring of 1816 he led an invasion of Venezuela, which proved a disastrous failure. He was forced to return to Haiti. However, in 1817, when the patriot army had proven unsuccessful against royalist forces, he was recalled as supreme commander. He reinforced the ranks of the rebel army by enlisting the support of José Antonio PÁEZ, leader of the llaneros (plainsmen), and of European volunteers, who were veterans of the Napoleonic wars. With a band of guerrilla fighters he resumed the war, occupied part of the lower Orinoco basin, and at Angostura (now CIUDAD BOLÍVAR) a congress elected him president of Venezuela. There in 1819 he conceived a bold plan of splitting the royalist forces. With a large force—made up largely of llaneros under Francisco de Paula SANTANDER and Páez—he crossed the flooded Apure valley, climbed to the bitterly cold Andean passes, and defeated the surprised Spanish forces at BOYACÁ (Aug. 7, 1819). The same year he was elected president of Greater Colombia (present-day Colombia, Venezuela, Ecuador, and Panama). In June, 1821, his victory at Carabobo sealed the freedom of the north, and Bolivar entered Caracas in triumph. Ecuador, however, was not taken from the Spanish until he and Antonio Jose de SUCRE won the battle of Pichincha in May, 1822. Bolivar then undertook to free Peru and the present Bolivia, where the forces of the great Argentine liberator José de SAN MARTÍN were already operating. At Guayaquil in July, 1822, Bolivar and San Martin joined in secret meetings. The events that occurred there are unknown, although speculation still continues after a century and a half. The outcome, in any case, was the withdrawal of San Martin. Bolivar was the commander in chief of the patriot forces that won at Junin in 1824. A little later the battle of Ayacucho marked the final triumph of the revolution in South America. Bolivar was unrivaled as the most powerful man of the continent. The president of Greater Colombia, he also organized the government of Peru and created Bolivia. In 1826 he expanded his vision of a united Spanish America by calling a conference of all the new republics at Panama, although little was actually accomplished, the meeting was the beginning of Pan-Americanism. There was much murmuring against his power and his somewhat high-handed methods, he was widely accused of imperial designs, and revolts and separatist movements shook the union. Bolivar declared himself dictator in 1828, and the next night, Sept. 24, 1828 ("the September night"), he barely escaped assassination by jumping from a high window and hiding. He was successful in a campaign against Peru to prevent Peruvian interference in Bolivia and Colombia, but he could not halt the crumbling of Greater Colombia. Venezuela and Ecuador seceded, and Bolivar, in poor health and disillusioned ("We have ploughed the sea," he said), resigned the presidency in 1830. Soon afterward he died of tuberculosis near Santa Marta. At the time of his death Bolivar was poor and bitterly hated, but it was not long before South Americans began to pay tribute to this passionate, headstrong idealist, who is today revered as the greatest Latin American hero. Monumental statues of Bolivar may be seen in the major cities of the Andean region. See biographies by Hildegarde Angell (1930), Salvador de Madariaga (1952, repr. 1969), and Gerhard Masur (rev. ed. 1969).

Bolivia (bōlī'vā, Span. bōlē'vya), republic (1973 est. pop. 5,250,000), 424,162 sq mi (1,098,581 sq km), W South America. SUCRE is the legal capital and seat of the judiciary, but LA PAZ is the political and commercial focus of the nation. One of the two inland countries of South America, Bolivia is shut in from the Pacific in the W by Chile and Peru, in the east and north it borders on Brazil, in the SE on Paraguay, and in the S on Argentina. Bolivia presents a sharp contrast between high, bleak mountains and plateaus in the west and lush, tropical rain forests in the east. In the southeast it merges into the semiarid plains of the CHACO. The Andes mountain system reaches its greatest width in Bolivia. Two cordilleras, the western one tracing the border with Chile and

the eastern running north and south across the center of the country, are divided by a high plateau (altiplano), most of it 12,000 ft (3,660 m) above sea



level—barren, windswept, and segmented by mountain spurs. Despite the harsh conditions the altiplano is the population center of Bolivia. Many sections for want of drainage have brackish lakes and salt beds, notably the extensive Salar de Uyuni in the south. In the north are Lake Titicaca, which Bolivia shares with Peru, and Lake Poopo. This region, world famous for its breathtaking scenery, was the home of one of the great pre-Columbian civilizations. Well known are the ruins of TIHUANACO. The eastern mountains, consisting of three major ranges, rise to the cold, forbidding heights of the Puna plateau (as high as 16,000 ft/4,880 m) and in the north to the snow-capped peaks of Illimani (21,184 ft/6,457 m) and Illampu (21,276 ft/6,485 m). In these mountains lies the source of the exploited wealth of Bolivia—its minerals. Tin is by far the most important product, but silver was once the chief metal, and copper, wolframite, bismuth, antimony, zinc, lead, and gold are also mined. The names of some mining towns, notably POTOSÍ and Oruro, are world famous. From the mountains, headstreams cut their way eastward carving deep gorges and fingerlike valleys. In these deep-cut valleys are some of the garden spots of Bolivia—Sucre, Cochabamba, and TARIJA. SANTA CRUZ, just east of the high mountains, is the only major city in tropical Bolivia. In the eastern foothills the headstreams gather to form the Beni, the Guaporé, and the Mamoré (tributaries of the Madera, in Brazil), which flow through the torrid, humid YUNGAS, covered with dense rain forests, not yet adequately exploited, and inhabited mainly by Indians. The region is the most fertile in the country, yielding cacao, coffee, and tropical fruits, and in the early 20th cent. was a major source of wild rubber and quinine. Some of the more accessible valleys, with luxuriant scenery and a pleasantly warm climate, have become popular Bolivian resort areas. To the south, in the Chaco, are major petroleum deposits. Despite the importance of its mines, Bolivia still lives by a subsistence economy. More than half the people eke out a bare living from agriculture. Sugarcane, potatoes, corn, wheat, and rice are the leading crops. Industry is limited to processing and small-scale manufacturing. Bolivia's mineral wealth furnishes the bulk of its exports, foodstuffs, manufactured goods, and chemicals are imported. The United States and Great Britain are the chief trading partners. In 1969, Bolivia's per capita gross national product was \$190. More than half the population of Bolivia is pure Indian, although the whites and the cholos (those of mixed Indian and white blood, or Indians assimilated to white culture) maintain economic, political, and social hegemony. The predominant Indian languages are Aymara and Quechua. Many tribes are untouched by the white culture. Most of the population is Roman Catholic,

although many Indians retain the substance of their pre-Christian beliefs. There are eight universities in the country. The rate of illiteracy is about 70%. Bolivia has had more than 185 revolutions since it became independent in 1825. The latest constitution was adopted in 1967. It provides for a president elected for a four-year term and a bicameral congress. However, the congress has been suspended since Sept., 1969, and no presidential election has been held since 1966. The altiplano was a center of Indian life even before the days of the Inca, but the AYMARA had been absorbed into the Inca empire long before Gonzalo and Hernando PIZARRO began the Spanish conquest of the Inca in 1532. In 1538 the Indians in Bolivia were defeated. Uninviting though the high, cold country was, it attracted the Spanish because of its rich silver mines, discovered as early as 1545. Exploiters poured in, bent on quick wealth. Forcing the Indians to work the mines and the *obrajos* [textile mills] under duress, they remained indifferent to all development other than the construction of transportation facilities to remove the unearthed riches. Indian laborers were also used on great landholdings. Thus began the system of plunder economy and social inequality that persisted in Bolivia until recent years. Economic development was further retarded by the rugged terrain, and conditions did not change when the region was made (1559) into the audiencia of CHARCAS, which was attached until 1776 to the viceroyalty of Peru and later to the viceroyalty of La Plata. The revolution against Spanish control came early, with an uprising in Chuquisaca in 1809, but Bolivia remained Spanish until the campaigns of José de SAN MARTÍN and Simón BOLÍVAR, independence was won only with the victory (1824) at AYACUCHO of Antonio José de SUCRE. After the formal proclamation of independence in 1825, Bolívar drew up (1826) a constitution for the new republic. The nation was named Bolivia, and Chuquisaca was renamed Sucre, after the revolutionary hero. Bolivia inherited ambitions and extensive territorial claims that proved disastrous, leading to warfare and defeat. At the time of independence it had a seacoast, a portion of the Amazon basin, and claims to most of the Chaco, in little more than a century all these were lost. The strife-ridden internal history of Bolivia began when the first president, Sucre, was forced to resign in 1828. A steady stream of egocentric, frequently barbarous caudillos plagued Bolivia thereafter. Andrés SANTA CRUZ, desiring to reunite Bolivia and Peru, invaded Peru in 1836 and established a confederation, which three years later was dissolved in blood on the battlefield of Yungay. Although a few presidents, notably José BALLIVIAN, made efforts to reform the administration and improve the economy, the temptation to wholesale corruption was always strong, and honest reform was hard to achieve. The nitrate deposits of ATACAMA proved valuable, but the mining concessions were given to Chileans. Trouble over them led (1879), during the administration of Hilarión DAZA, to the War of the Pacific (see PACIFIC, WAR OF THE). As a result Bolivia lost Atacama to Chile. The next serious loss was the little-known region of the Acre River, which had become valuable because of its wild rubber. After a bitter conflict, Bolivia, under President José Manuel PANDO, yielded the area to Brazil in 1903 for an indemnity. Attempts at reorganization and reform, especially by Ismael MONTEs, were overshadowed in the 20th cent. by military coups, rule of dictators, and bankruptcy. This repeated sequence led to foreign loans, such as the Nicolaus loan from North American bankers, sometimes at exorbitant rates. This led in turn to an increase of foreign influence, strengthened by foreign interests in mines and oil fields. Attempts to raise Bolivia from its status as an underdeveloped country met with little success, although great personal fortunes were amassed from tin mining by tycoons such as Simón I. PATIÑO. Conflicting claims to the Chaco, which was thought to be oil-rich, brought on yet another disastrous territorial war, this time with Paraguay (1932-35). The fighting ended in 1935 with both nations exhausted and Bolivia defeated and stripped of most of its claims in that area. The war and the defeat aggravated internal discontent, and programs, radical, conservative, and moderate, for curing the ills of the nation were hampered by military coups and countercoups. World War II proved a boon to the Bolivian economy by increasing demands for tin and wolframite. International pressure over pro-German elements in the government eventually forced Bolivia to break relations with the Axis and declare war (1943). Meanwhile, rising prices had aggravated the restiveness of the

miners over miserable working conditions, strikes were brutally suppressed. The crisis reached a peak in Dec., 1943, when the nationalistic, pro-miner MNR (*Movimiento Nacional Revolucionario*) engineered a successful revolt. The regime, however, was not recognized by other American nations (except Argentina) until 1944, when pro-Axis elements in the MNR were officially removed. Bolivia then became a member of the United Nations. In 1946 the leader of the MNR-backed government, Major Gualberto Villaroel, was lynched. The conservative government installed in 1947 was soon threatened by opposition from the MNR and the extreme left, two serious MNR-led revolts broke out in 1949. In the 1951 presidential elections Víctor Paz Estenssoro, the MNR candidate, won a majority of the votes, but was prevented from taking office by a military junta. The MNR, with the aid of the national police (the *carabineros*) and of a militia recruited from miners and peasants, then rebelled and took power. The revolutionary government proceeded to expropriate and nationalize the tin holdings of the huge Patiño, Hochschild, and Aramayo interests and inaugurated a program of agrarian reform. Civil rights and suffrage were extended to the Indians. Education, health, and construction projects were begun. In 1956 the MNR candidate, Hernán SILES ZUASO won the presidential election, and in 1960 the MNR further consolidated its power with the reelection of Víctor Paz Estenssoro. The United States, in spite of losses incurred by American investors, stepped up its program of technical and financial assistance, and Siles Zuaso temporarily succeeded in stemming inflation. But economic and political factors weakened the government. Income from tin exports sank to a postwar low, thus crippling attempts at industrial diversification, technical and administrative incompetence was rife, the fiscal system, never sound, became chaotic, and, worst of all, an incredible eruption of dissident splinter groups, some fostering acts of political terror, brought all attempts at further reform to a virtual halt. In 1964 the government was overthrown by the military. A junta dominated by Gen. René BARRIENTOS ORTUÑO assumed power. The regime used troops to occupy the mines but did not rescind the important reforms of the MNR. Barrientos was elected president in 1966. A radical guerrilla movement, led by the Cuban Ernesto "Che" Guevara, was set back seriously when government troops killed Guevara in Oct., 1967. Barrientos died in a helicopter crash in 1969. His successor, Luis Adolfo Siles Salinas, was overthrown by Gen. Alfredo OVANDO CANDIA. Ovando nationalized, with compensation, the Gulf Oil Company facilities in Bolivia. A rightist military junta overthrew Ovando in Oct., 1970, but lasted only one day, succumbing to a leftist coup led by Gen. Juan José TORRES. Under Torres relations with the Soviet Union, which had been established by Ovando, became closer, to the detriment of ties with the United States. Torres was overthrown in Aug., 1971, by Col. Hugo Banzer Suárez, who was supported by both the MNR and its traditional rightist opponent, the Bolivian Socialist Falange. Banzer closed the universities and returned Bolivia to a pro-U.S. foreign policy. With his power insecure, Banzer frequently arrested politicians, alleging anti-government plots. Churchmen were accused of aiding the guerrilla National Liberation Army. In June, 1974, following months of protests from peasants, miners, students, and opposition politicians, there was an unsuccessful attempt to depose Banzer. The government was reorganized and an all-military cabinet was installed in July. See Harold Osborne, *Bolivia: A Land Divided* (3d ed. 1964), Robert Barton, *A Short History of the Republic of Bolivia* (2d ed. 1968), H. S. Klein, *Parties and Political Change in Bolivia, 1880-1952* (1969), D. B. Heath et al., *Land Reform and Social Revolution in Bolivia* (1969), W. E. Carter, *Bolivia: A Profile* (1971), J. M. Malloy and R. S. Thorn, ed., *Beyond the Revolution: Bolivia Since 1952* (1971), J. V. Fifer, *Bolivia: Land, Location, and Politics Since 1825* (1972), D. B. Heath, *Historical Dictionary of Bolivia* (1972).

Böll, Heinrich (hīn'rikh bōl), 1917-, German novelist, short-story writer, and playwright. Böll presents a critical, antimilitarist view of modern society in a collection of masterful short stories, *Wanderer, kommst du nach Spa* (1950, tr. *Traveller, If You Come to Spa*, 1956), and the novels *Wo warst du, Adam?* (1951, tr. *Adam, Where Art Thou?*, 1955) and *Billard um halb zehn* (1959, tr. *Billiards at Half Past Nine*, 1961). Man's excesses and his inability to alter his destiny are among Böll's principal concerns in the narratives *Und sagte kein einziges Wort* (1953, tr. *Acquainted with the Night*, 1954), *Haus*

ohne Huter (1954, tr. *Tomorrow and Yesterday*, 1957), *Ansichten eines Clowns* (1963, tr. *The Clown*, 1965), and *Entfernung von den Truppen* (1964, tr. *Absent without Leave*, 1965). Many of Böll's works present his critical reflections on Catholicism and the church and his view of contemporary German society. Among his other notable works are a collection of travel essays, *Irish Journal* (tr. 1967), the novel *Gruppenbild mit Dame* (1971, tr. *Group Portrait with Lady*, 1973), and two anthologies in English, *Eighteen Stories* (1966) and *Children Are Civilians Too* (1970). Böll won the Nobel Prize in Literature in 1972. See study by W. J. Schwarz (tr. 1969).

Bollandists (bōl'andists), group of Jesuits in Belgium, named for their early leader, Jean Bolland, a Flemish Jesuit of the 17th cent. They were charged by the Holy See with compiling an authoritative edition of the lives of the saints, the monumental *Acta sanctorum*, which is still being constantly brought up to date.

Bolley, Henry Luke, 1865-1956, American plant pathologist, b. Dearborn, Mich. He is noted for his work on organisms causing diseases of crop plants (including the discovery of the cause of potato scab), for his methods of preventing oat smut, wheat bunt, and other diseases, and for developing varieties of wilt-resistant flax and rust-resistant wheat.

Bollingen (bōl'īng), town (1970 pop. 26,121), Bern canton, W. central Switzerland. It is a dairy and industrial center. There is a 16th-century church in the town.

Bollnas (bōl'nēs'), city (1970 pop. 13,498), E. Sweden, on the Ljusnan River. It is an important trade center and has railroad workshops. A 15th-century church is there.

boll weevil or **cotton boll weevil**, cotton-eating weevil, or snout beetle, *Anthonomus grandis*. Probably of Mexican or Central American origin, it appeared in S. Texas in 1892 and has since spread to most of the cotton-growing regions of the United States, causing losses as great as \$200 million a year to the cotton crop. The adult is grayish when young and black when older. It is about 1/4 in. (6 mm) long, with a snout, about half as long as the body, that is used to bore into the cotton boll, or seed pod. Both adults and larvae feed on the developing cotton fibers within the boll; females lay their eggs in holes made by eating, and the developing larvae eventually eat the entire contents of the boll. Earlier in the season some of the flower buds are destroyed in a similar manner, buds infested with larvae do not mature into bolls. Pupation (see INSECT) occurs within the bud or the boll. The entire metamorphosis from egg to adult takes about three weeks, from 2 to 10 generations occur each season. Adults can be destroyed by insecticides, but the larvae are protected within the boll. Another control measure aimed at the adults is elimination of the rubbish piles in which they take shelter during the winter. Fast-developing strains of cotton have been bred to minimize the amount of damage the larvae can do before harvesting. Devastation caused by the boll weevil has been a major reason for the change from a one-crop economy to more diversified agriculture in the South. The boll weevil is classified in the phylum ARTHROPODA, class Insecta, order Coleoptera, family Curculionidae. See U.S. Agricultural Research Service, Entomology Research Div., *The Boll Weevil* (rev. ed. 1969), bibliographies by H. A. Dunn (1964) and L. L. Millin and Norman Millin (1968).

bollworm, name for the larvae of two different moths. The PINK BOLLWORM is a serious pest of cotton, and the CORN EARWORM, or cotton bollworm, attacks cotton, corn, and other crops.

Bologna, Giovanni, or Giambologna (jūvān'ñē bōlō'nyā, jam'bōlō'nyā), 1524-1608, Flemish sculptor, whose real name was Jean Bologne or Boulogne. Though born in Douai, France, he is identified chiefly with the Italian Renaissance as one of its greatest sculptors. His masterpiece, *Flying Mercury*, is in the Bargello, Florence. *The Rape of the Sabinas* (Florence), with its spiraling forms and multiple viewpoints, is one of the finest examples of mannerist sculpture. This work exerted a profound influence on later art. Among his other works are the equestrian statues in Florence of the Medicis, one of Ferdinand I (see Browning's poem "The Statue and the Bust") and another of Cosimo I, two fountains in the Boboli Gardens, Florence, the bronze doors of the cathedral in Pisa, a Neptune fountain in Bologna, and the colossal statue *Apennines* at Pratolino. There are two of Giambologna's elegant statuettes of the Evangelists in the Metropolitan Museum and one at the museum of the Univ. of Kansas.

Bologna (bōlō'nyā), city (1971 pop. 490,036), capital of Emilia-Romagna and of Bologna prov., N central Italy, at the foot of the Apennines and on the Aemilian Way. It is a commercial and industrial center and a railroad junction. Manufactures include farm machinery, motor vehicles, metal goods, processed food, and chemicals. Originally an Etruscan town called Felsina, it became a Roman colony in 189 B.C. The city came under Byzantine rule in the 6th cent. A.D. and later passed to the papacy. In the early 12th cent. a strong free commune was established. The victory of Bologna over Emperor Frederick II at Fossalta (1249) added political power to the city, then known chiefly as an intellectual center. Bologna's famous university originated (c. 1088) with its Roman law school (founded A.D. 425), where IRENIUS and ACCURSUS taught, medical and theological faculties and courses in the liberal arts were added in the 14th cent. In later years those active at the university included Malpighi, Galvani, and Marconi. Bologna has long been a center of printing, and its observatory (founded 1712) is the oldest in Italy. In politics the rivalry between the Guelphs and the Ghibellines enabled several ambitious families to seize power (13th–15th cent.). The Pepoli were succeeded by the Visconti of Milan and, after a short period of papal rule, by the BENTIVOGLIO (1446). In 1506, Pope Julius II reestablished papal rule, which was interrupted in 1797, when Bologna was made the capital of the Cispadane Republic, but resumed in 1815 after the Congress of Vienna. The coronation of Charles V at Bologna (1530) was the last imperial crowning by a pope. The Council of Trent met at Bologna in 1547–48. There were unsuccessful revolts against papal rule in 1831, 1843, and 1848, and in 1860 Bologna voted to unite with the kingdom of Sardinia. The city was heavily bombed by the Allies in World War II. It has retained a marked medieval aspect, many streets are arcaded. Noteworthy structures include the Palazzo Comunale (13th and 15th–16th cent.), the Renaissance-style Palazzo del Podestà, the palace of King Enzo (13th cent.), the Basilica of San Petronio (begun in 1390), with a 15th-century doorway by Jacopo della Quercia, the Church of Santo Stefano, the Church of San Giacomo Maggiore (founded 1267, major alterations in the 15th cent.), the Church of San Domenico (early 13th cent.), and the Archiginnasio (once the seat of the university and now a library). Bologna has an archaeological museum, an art gallery, with works by Bolognese artists, including FRANCESCA, the CARRACCI, and Guido RENI, and a nuclear research institute. On hills near the city are the Renaissance Church of San Michele (in Bosco) and a former Carthusian monastery.

Bologna, University of, at Bologna, Italy, founded in the 11th cent. It originated as a school where law books brought from Ravenna were interpreted. It has faculties of law, political science, economics and commerce, letters and philosophy, teacher training, medicine, industrial chemistry, pharmacy, veterinary medicine, agriculture, engineering, and mathematics, physics, and natural sciences.

Bologne, Jean: see BOLOGNA GIOVANNI

bolometer (bōlōm'atər, bə-), instrument for detecting and measuring RADIATION, e.g., visible LIGHT, INFRARED RADIATION, and ULTRAVIOLET RADIATION, in amounts as small as one millionth of an erg. The bolometer was invented in 1880 by Samuel P. Langley. Basically it consists of a radiation-sensitive resistance element in one branch of a Wheatstone bridge; changes in radiation cause changes in the electrical resistance of the element. The radiation-sensitive element may be a platinum strip, a semiconductor film, or any other substance whose resistance is altered by slight changes in the amount of radiant energy falling on it.

Bolsena (bōlsē'na), town (1971 pop. 3,953), Latium, central Italy, on picturesque Lake Bolsena, near the site of the second VOLSINI. It is an agricultural and tourist center. Of note are an imposing castle (12th cent.) and the Church of Santa Cristina (11th–16th cent.).

Bolshevism and Menshevism (bōl'shəvīzəm, bōl'-, mēn'shəvīzəm), the two main branches of Russian SOCIALISM from 1903 until the consolidation of the Bolshevik dictatorship under LENIN in the civil war of 1918–20. The Russian Social Democratic Labor party, secretly formed at a congress at Minsk in 1898, was based on the doctrines of MARXISM. At the second party congress, held at Brussels and then London in 1903, Lenin's faction gained a majority. His group was thereafter known as the *Bolsheviks* [members of the majority] and his opponents as the *Mensheviks* [members of the minority], although the Bolsheviks promptly lost their numerical superi-

ority. Lenin favored a small, disciplined party of professional revolutionaries; the Mensheviks wanted a loosely organized mass party. In a pamphlet published in 1905, Lenin outlined his concept of revolution in Russia since the Russian bourgeoisie was too weak to lead its own revolution, the proletarians and peasants must unite to overthrow the czarist regime and establish a dictatorship of the proletariat and peasantry. The Mensheviks, led by PLEKHANOV, believed that Russia could not pass directly from its backward state to a rule by the proletariat and that first an intermediary bourgeois regime must be developed. These differences were not always clear-cut, and many Socialist leaders, such as TROTSKY, passed from one group to the other and back again. The RUSSIAN REVOLUTION of 1905 was a common effort of all revolutionary and reformist movements. In the first Duma of 1906, which was boycotted by the Social Democrats, the Liberal Constitutional Democrats were the strongest party, but in 1907 the Social Democrats took part in the elections. In 1912 the Bolsheviks and Mensheviks formally became separate parties. In World War I, the Bolsheviks hoped for the defeat of czarist Russia and sought to transform the conflict into an international civil war that would bring the proletariat to power. The right wing of the Mensheviks supported Russia's war effort, the left wing called for pacifism. In the Russian Revolution of 1917 the Mensheviks participated in the Kerensky provisional government. Lenin, returning from exile in April, declared that Russia was ripe for an immediate socialist revolution. The Bolsheviks gained majorities in the important SOVIETs and overthrew the government in the October Revolution. The Mensheviks opposed this coup d'état and participated in the short-lived Constituent Assembly (Jan., 1918), but they generally refused to side with the anti-Bolshevik forces during the civil war. The Mensheviks were suppressed by 1921. Meanwhile, in 1918, the Bolsheviks became the Russian Communist party. See Adam B. Ulam, *The Bolsheviks: The Intellectual and Political History of the Triumph of Communism in Russia* (1965, repr. 1968), Leonard Schapiro, *The Communist Party of the Soviet Union* (2d ed., rev. 1970).

Bolshoi Ballet, the principal ballet company of the Soviet Union. It began as a dancing school for the Moscow Orphanage in 1773. Opened in 1856, the Bolshoi Theatre in its early decades competed for preeminence with the Maryinsky Theatre of St. Petersburg. Alexander Gorsky revitalized it in the early 20th cent. and introduced a new dramatic realism to the classical ballets. Igor Moiseyev experimented with folk-dance ballets at the Bolshoi in the 1930s. The company is internationally acclaimed for its superb ensemble skills and for the spectacular realism of its scenery and costumes. Since the mid-1960s Maya PLISETSKAYA has been the company's prima ballerina. The Bolshoi has toured both Europe and the United States with celebrated productions of such classics as *Giselle* and *Swan Lake*.

Bolton, Herbert Eugene, 1870–1953, American historian and teacher, b. Wilton, Monroe co., Wis. He taught history at the Univ. of Texas (1901–9), Stanford (1909–11), and the Univ. of California (1911–44) and became an outstanding authority on Spanish colonial days in the West. He edited and translated numerous important journals of Spanish soldiers and priests, widening the printed sources immeasurably, but he is perhaps better known for such works as *Texas in the Middle Eighteenth Century* (1921, repr. 1970), *The Spanish Borderlands* (1921), *Outpost of Empire* (1931, repr. 1966), the story of the founding of San Francisco, and the biographies *Rim of Christendom* (1936, repr. 1960), on Father Eusebio Francisco Kino, and *Coronado* (1949). For these sound studies of a colorful period Bolton employed a prose that reflected his own vigorous and colorful personality. He also promoted the study of the history of the Americas as a unit of human development, for this purpose he wrote a syllabus, *History of the Americas* (1928), and a survey of the colonial period, *Wider Horizons of American History* (1939, repr. 1967). He was also director from 1916 to 1940 of the Bancroft Library at the Univ. of California. See studies by Lewis Hanke, ed. (1964), and W. R. Jacobs et al. (1965).

Bolton or Bolton-le-Moors (bōl'tən-lə-mōōrz), county borough (1971 pop. 153,977), Lancashire, NW England. Since the late 18th cent., when spinning factories were built and a canal (1791) was constructed to Manchester, Bolton has been a cotton-textile center. Prior to that time, woolen weaving, which was stimulated by the immigration of Flemings in the 14th cent., was important. Besides

the great textile plants (sheets, quilts, towels, bedcovers, and dress materials), there are factories that pack poultry and produce textile and other machinery, chemicals, leather goods, furniture, carpets, and paper. Samuel Crompton, inventor of the spinning mule (1779), was born nearby and is buried in Bolton. Sir Richard Arkwright invented the "water frame" there c. 1768. In 1974, Bolton became part of the new metropolitan county of Greater Manchester.

Boltraffio or Beltraffio, Giovanni Antonio (jōvān'āntō'nyō bōl'trāf'fyo, bāl-), 1467–1516, Italian painter, b. Milan. He was a pupil of Leonardo da Vinci, whose style he adhered to faithfully. There are examples of Boltraffio's work in Milan, the National Gallery, London, and the Louvre.

Boltwood, Bertram Borden, 1870–1927, American chemist and physicist, b. Amherst, Mass., grad. Sheffield Scientific School, Yale, 1892. After graduate study at Leipzig and Yale (Ph.D., 1897), he taught at Yale until his death, serving from 1910 to 1927 as professor of radiochemistry. An expert in laboratory technique and apparatus, he gave much of his energy to planning and supervising the building of the Sloane Physics Laboratory and the Sterling Chemistry Laboratory, both at Yale. He did important research on radioactive elements (he discovered ionium, an isotope of thorium, but believed it to be a new element) and pioneered in the radioactive dating of geological strata.

Boltzmann, Ludwig (lōōt'vīkh bōlts'mān), 1844–1906, Austrian physicist, b. Vienna, educated at Univ. of Vienna. He began teaching (1869) at Graz Univ. In 1873 he became mathematics professor at Vienna and then physics professor at Graz (1876), Munich (1890), Vienna (1895), and Leipzig (1900). Boltzmann made important contributions to the kinetic theory of gases and to statistical mechanics—the Boltzmann constant, the ratio of the mean total energy of a molecule to its absolute temperature, is used widely in statistics and is named for him. Working independently, he demonstrated a law on radiation from a BLACK BODY that had been stated by the Austrian physicist Josef Stefan, hence the law is sometimes known as the Stefan-Boltzmann law.

Bolyai (bō'lyoi), family of Hungarian mathematicians. The father, Farkas, or Wolfgang, Bolyai, 1775–1856, b. Bolya, Transylvania, was educated in Nagyszében from 1781 to 1796 and studied in Germany during the next three years at Jena and Göttingen, where he began a lifelong friendship with Carl F. Gauss. From 1804 to 1853 he was professor of mathematics at Maros Vasarhely. His primary interest was in the Euclidean parallel postulate. His principal work, the *Tentamen* (1832–33), inspired by his mathematically gifted son Janos, is an attempt at a rigorous and systematic foundation of geometry (Vol. I) and of arithmetic, algebra, and analysis (Vol. II). Janos, or Johann, Bolyai, 1802–60, b. Kolosvar, Transylvania, was educated by his father in Maros Vasarhely and from 1818 to 1822 in Vienna, where he received military training at the imperial engineering academy. In 1820 he began to work in a direction that ultimately led him to a non-Euclidean geometry. In 1823, after vain attempts to prove the Euclidean parallel postulate, he developed his system by assuming that a geometry could be constructed without the parallel postulate. His theory of absolute space was published as an appendix to his father's *Tentamen* and constituted the sole work published in his lifetime.

Bolzano, Bernard (bōltsa'nō), 1781–1848, Czech philosopher, mathematician, and theologian. Though as a Catholic priest he himself was primarily concerned with religious and ethical questions, he is known today for his work in philosophy, methodology of science, mathematics, and logic. Among his important works are *Wissenschaftslehre* (1837), an attempt at a complete theory of science and knowledge, *Rein analytischer Beweis* (1817), which contains an early successful attempt to free differential calculus from the concept of infinitesimals, and *Theorie der reellen Zahlen*, which laid the cornerstone of the theory of real numbers. He tried to devise a geometry without the use of Euclid's parallel postulate, developed a fairly complete theory of real functions, and worked at an ideal language. However, his work did not attract the attention of his contemporaries and thus did not influence the development of mathematics.

Bolzano (bōltsa'nō), Ger. Bozen (bō'tsən), city (1971 pop. 103,267), capital of Bolzano prov., in Trentino-Alto Adige, N. Italy, on the Isarco River near its confluence with the Adige. It is the center of the German-speaking part of S. Tyrol and is a tourist and

health resort noted for its Alpine scenery and mild climate. Its position on the Brenner road has made it the chief commercial center of the area since the Middle Ages, when important fairs were held there. The city's manufactures today include steel, plastics, aluminum products, and woolen goods. Bolzano was part of the bishopric of Trent from the 11th cent. until the 16th cent., when it was ceded to the Hapsburgs. It then followed the fortunes of TYROL and was awarded to Italy in 1919. The city was severely damaged in World War II. Noteworthy buildings include the Romanesque-Gothic cathedral (13th-16th cent.) and several houses of the 15th to 17th cent.

Boma (bō'mə), city (1967 est. pop. 79,000), Bas-Zaïre region, W Zaïre, on the Congo estuary. A port and railhead, it exports tropical timber, bananas, cacao, and palm products. Boma was the capital of the Congo Free State (after 1908 the Belgian Congo) from 1887 to 1929.

bombax, common name for the Bombacaceae, a family of deciduous trees, often tall and with unusually thick trunks, found chiefly in the American tropics. The family includes many commercially important members, e.g., the BAOBAB, the balsa, or corkwood (*Ochroma lagopus*), which yields the lightest lumber in the world, and the KAPOK and several species of the genera *Bombax* and *Cerba* whose seed fibers are used as filling material. The Bombacaceae are classified in the division MAGNOLIOPHYTA, class Magnoliopsida, order Malvales.

Bombay (bōmbā'), former state, W central India, on the Arabian Sea. The state contained within its borders the former Portuguese colonies of Goa, Daman, and Diu. The region of Bombay has a rich history, and remains exist from the period (320-184 B.C.) when much of Bombay belonged to the Buddhist Maurya empire. Buddhism was supplanted (c. 5th cent. A.D.) by Hinduism, which has been the major religion except during Muslim control (13th-18th cent.). In the 16th cent., Portugal was the leading foreign power in Bombay, but Great Britain predominated in the 17th cent. and by the early 19th cent. had formed the Bombay presidency, which included Sind. In 1937, Bombay was made a province. After India gained its independence in 1947, all former native states within the provincial boundary joined Bombay, Baroda and Kolhapur were the largest. In 1956, Bombay was reorganized as a state and absorbed parts of Hyderabad and Madhya Pradesh and the princely states of Kutch and Saurashtra. In 1960, however, Bombay state was divided into the new states of Gujarat and Maharashtra. The city of Bombay (1971 pop. 5,968,546), now the capital of Maharashtra state, occupies about 25 sq mi (65 sq km) on Bombay and Salsette islands just off the coast. Bombay Island was created in the 19th cent. by reclamation projects that combined seven basaltic islets. Today it is a peninsula of the larger Salsette Island to the north. Salsette Island itself is connected to the mainland by causeways and railroad embankments. The city of Bombay has the only natural deepwater harbor in W India. It is a transportation hub and industrial center. Industries include cotton-textile and chemical manufacturing and petroleum refining. There is an extensive system of hydroelectric stations, and nearby at Trombay is a nuclear reactor. Bombay University (founded 1857) is in the city. Bombay has many large suburbs. Among the largest are Andheri, Santa Cruz, Thana, and Ulhasnagar, all having populations of more than 100,000. The area of the city was ceded (1534) to Portugal by the sultan of Gujarat. Bombay, after it passed to Great Britain in 1661, was the headquarters (1668-1858) of the East India Company in India, and during the American Civil War it expanded to meet the world demand for cotton and became a leading cotton-spinning and weaving center. On Salsette Island are Buddhist caves. The nearby small island of Elephanta is noted for its antiquities. Bombay has the largest community of PARSIS in India.

Bomberg, David, 1890-1957, English artist. Bomberg was apprenticed to a lithographer in 1905 and studied under Walter Sickert at the Westminster School of Art. His abstract works are filled with angular forms and painted in a hard-edge style.

Bomoseen, Lake (bōmō'sēn'), 7.5 mi (12 km) long, 1.5 mi (2.4 km) wide, W Vt., largest lake wholly within Vermont. Surrounded by wooded hills, it is a popular summer resort. Bomoseen State Park is on the west shore.

Bomu (bō'mō), river, c. 500 mi (800 km) long, rising in NE Zaïre and flowing generally westward. It forms part of the Zaïre-Central African Republic border. The Bomu merges with the Uele to form the Ubangi, a tributary of the Congo.

Bon, Cape (bōn), **Ras at Tib** (ras at tīb), or **Ras Addar** (adar'), peninsula, NE Tunisia, projecting c. 50 mi (80 km) into the Mediterranean Sea toward Sicily. Cape Bon, the eastern terminus of the Saharan Atlas Mts., is a hilly, fertile region that supports citrus groves, vineyards, and tobacco plantations. During World War II the last German forces in North Africa surrendered to the Allies on Cape Bon in May, 1943.

Bona Dea (bō'nā dē'a), in Roman religion, ancient fertility goddess worshiped only by women, also called Fauna. She was said to be the daughter, sister, or wife of Faunus. No man could be present at her annual festival in May.

Bonaire (bōnēr'), island (1970 pop. 8,191), 112 sq mi (290 sq km), in the Leeward Islands group of the Netherlands Antilles. Kralendijk is the chief town. Its good harbor has made Bonaire an export point. Sisal and salt are produced on the island, and goats and sheep are raised. Tourism is increasingly important.

Bonampak (bōnampak'), ruined city of the Late Classic period of the MAYA, close to TUXTLA, in Chiapas, S Mexico. Discovered in 1946, it consists of a group of temples, one of which is remarkable for a number of very well preserved frescoes, painted in bright, flat colors, depicting in considerable detail scenes of Maya life.

Bonanza Creek, stream, c. 20 mi (30 km) long, W Yukon Territory, Canada. It flows NW to the Klondike River near Dawson. The first gold strike in the Yukon occurred there in 1896.

Bonaparte (bō'nəpart'), Ital. *Buonaparte* (bwōnəpar'tā), family name of NAPOLEON I, emperor of the French. His father, Carlo Buonaparte, 1746-85, a petty Corsican nobleman, was a lawyer in Ajaccio. He supported (1768-69) Pasquale PAOLI, then changed sides and became one of the staunchest leaders of the pro-French party in Corsica. He sent his sons to be educated in France. Napoleon's mother, Letizia, or Laetitia, Ramolino Bonaparte, c. 1750-1836, had simple virtues much admired by her son's followers. At Napoleon's court she was given the title Madame Mere. After the final downfall of Napoleon she found refuge in Rome. The eldest of the children of Carlo and Letizia to survive infancy was Joseph Bonaparte, 1768-1844. Having gained some note as French minister to Parma and to Rome and as a member of the Council of Five Hundred, Joseph negotiated a treaty (1800) with the United States and represented France in the peace negotiations at Lunéville (1801) and Amiens (1802). When Napoleon became emperor, Joseph bitterly protested being left out of the line of succession. In 1806, Napoleon made him king of Naples, which Joseph administered very inefficiently, and in 1808 he was made king of Spain instead. Thoroughly unsuccessful in defending his throne during the PENINSULAR WAR, he reluctantly abdicated in 1813. From 1815 to 1841 he lived mainly in the United States—at Bordentown, N.J. He died in Italy. Napoleon I himself was born in 1769. His brother Lucien Bonaparte, 1775-1840, first became prominent as president of the Council of Five Hundred. He took an important part in the coup d'état of 18 Brumaire (1799), by boldly haranguing the troops while the council was about to outlaw Napoleon, who had lost his nerve. Lucien succeeded in dispersing the Five Hundred. The Directory was overthrown, and Napoleon became First Consul. However, Lucien was critical of his brother's policies and married a commoner against Napoleon's wishes. He went to live in Italy under the protection of Pope Pius VII, who made him prince of Canino. When Napoleon made the pope a prisoner, Lucien attempted to flee (1810) to the United States but was captured at sea by the British and interned in England. He returned to Italy in 1814 and became reconciled with Napoleon, who was then in Elba. Lucien returned to France in the Hundred Days, and after Waterloo he tried to secure the throne for Napoleon II. He died in exile in Italy. His sister Elisa Bonaparte, 1777-1820, married Felix Pasquale Bacciocchi, an insignificant captain of infantry. Napoleon made her princess of Piombino and Lucca (1805) and grand duchess of Tuscany (1809). She was a competent administrator and was admired for her intelligence. After Waterloo she lived in retirement. Another brother, Louis Bonaparte, 1778-1846, was king of Holland (1806-10). He reluctantly married (1802) Hortense de Beauharnais. Napoleon forced him to abdicate because Louis, more concerned for the interests of the Dutch people than for those of France, defied the ruinous Continental System. He died in Italy. Pauline Bonaparte, 1780-1825, was Napoleon's favorite sister. A woman of remarkable beauty but of a vain, frivolous

character, she was the subject of considerable scandal. She accompanied her husband, General LECLERC, on the expedition to Haiti. After Leclerc's death Napoleon arranged her marriage (1803) to Camillo Borghese, a member of the Roman nobility. They soon separated, however. Pauline, made princess of Guastalla in 1806, fell into temporary disfavor with her brother because of her hostility to Empress Marie Louise, but when Napoleon's fortune failed, Pauline showed herself more loyal than any of his other sisters and brothers. Another sister, Caroline Bonaparte, 1782-1839, went to France with the family in 1793 and married (1800) General MURAT. Her ambition, joined with that of her husband, made her grand duchess of Cleves and Berg and later (1808-15) queen of Naples. There she did much to stimulate art and letters and encouraged the recovery of the classical treasures of Pompeii and Naples. Her restless ambition was still unsatisfied, the birth of Napoleon's son destroyed her hope of succession for her own son. She and Murat entered upon intrigues with Napoleon's enemies, but with no positive result. After the fall of Napoleon, Clemens von METTERNICH tried to save Murat's throne. Murat's rashness, however, led to his execution, and Caroline fled to Austria. Jérôme Bonaparte, 1784-1860, Napoleon's youngest brother, served in the navy and was sent to the West Indies. On a visit to the United States he met Elizabeth PATTERSON, whom he married in 1803, although, as a minor, he lacked the necessary consent. Napoleon refused to recognize the marriage and had little difficulty in changing the mind of the flighty Jérôme, for whom he made (1807) a new match with Catherine of Württemberg. Jérôme became king of Westphalia (1807-13), fought in the Russian campaign, and led a division at Waterloo. He was more remarkable for his extravagant irresponsibility than for administrative or military skill. Leaving France after Waterloo, he returned in 1847 and later received honors at the court of his nephew, Napoleon III. There he was known as Prince Jérôme. Of the second generation of the family the most important was Louis Bonaparte's son, Louis Napoleon, who became emperor as NAPOLEON III (See separate article for NAPOLEON II, son of Napoleon I and Marie Louise). Other members of the family also became prominent. Charles Lucien Jules Laurent Bonaparte, 1803-57, prince of Canino, son of Lucien, lived in the United States from 1824 to 1833 and was important as a naturalist, particularly as author of *American Ornithology* (4 vol., 1825-33, in English). He took part in the Roman insurrection of 1848. Pierre Napoleon Bonaparte, 1815-81, another son of Lucien, after an adventurous career as soldier of fortune, became a French politician. Although a Republican, he accepted the empire of Napoleon III. In 1870 he killed the journalist Victor Noir in the heat of a quarrel but was acquitted of murder. He was notoriously immoral, as was his cousin Napoleon Joseph Charles Paul Bonaparte, 1822-91, commonly called Prince Napoleon or, more familiarly, Plon-Plon. The son of Jérôme and Catherine of Württemberg, he was named as successor to his cousin Napoleon III, in case the emperor should die childless. He was, however, a liberal and on occasion opposed the emperor's measures. His marriage (1859) to Princess Clotilde, the daughter of King Victor Emmanuel II, was a move in Napoleon III's Italian policy. Prince Napoleon became a pretender to the throne after the death of the only son of Napoleon III, Napoleon Eugene Louis Jean Joseph Bonaparte, 1856-79, the Prince Imperial, who was killed while fighting the Zulus as a member of the British army. Napoleon Victor Jérôme Frédéric Bonaparte (Victor Bonaparte), 1862-1926, inherited the claims of Prince Napoleon, his father. The daughter of Jérôme and Catherine of Württemberg, the princess Mathilde Bonaparte, 1820-1904, was prominent during and after the second empire as hostess to men of arts and letters. Marie Bonaparte, 1882-1962, granddaughter of Pierre Napoleon, was a disciple and friend of Sigmund Freud. She helped Freud escape from Vienna after the German invasion in 1938. By his American wife, Elizabeth Patterson, Jérôme had a son, Jerome Napoleon Bonaparte, 1805-70, from whom the American line is descended. The most prominent of this line was Charles Joseph BONAPARTE. See Walter Geer, *Napoleon and His Family* (3 vol., 1927-29), F. M. Kirichen, *The Jovial King* (1928, tr. 1932), R. McNair Wilson, *Napoleon's Mother* (1933), C. E. Macartney and J. G. Dorrance, *The Bonapartes in America* (1939), Sidney Mitchell, *A Family Lawsuit: The Story of Elisabeth Patterson and Jérôme Bonaparte* (1958), Monica Stirling, *Madame Letizia* (1961), David Stacton, *The Bonapartes* (1966).

Bonaparte, Charles Joseph, 1851-1921, U.S. cabinet official, b. Baltimore, grandson of Jérôme Bonaparte and Elizabeth Patterson. A lawyer and political leader in Baltimore, he identified himself with reform causes. President Theodore Roosevelt appointed him one of the commissioners to investigate conditions in the Indian Territory and in 1905 appointed him Secretary of the Navy. In Dec., 1906, he shifted from this office to that of Attorney General, which he retained until the end of Roosevelt's administration. He was active in suits brought against the trusts and was largely responsible for breaking up the tobacco monopoly. He was one of the founders, and for a time the president, of the National Municipal League. See biography by J. B. Bishop (1922).

Bonar, Horatius (bōn'ār), 1808-89, Scottish clergyman and hymn writer. In 1837 he became minister to the North Parish in Kelso, in 1843, Bonar, with his congregation, seceded in the movement leading to the formation of the Free Church. He wrote religious tracts and edited religious periodicals and collections of hymns, including *Hymns of Faith and Hope* (3 series, 1857-66). He is best remembered, however, for his fine hymn texts, such as *I Heard the Voice of Jesus Say*.

Bonar Law, Andrew: see LAW, ANDREW BONAR

Bonaventure or Bonaventura, Saint (bōnāvēn'-char, bō'nāvāntōō'rā), 1221-74, Italian scholastic theologian, cardinal, Doctor of the Church, called the Seraphic Doctor, b. near Viterbo, Italy. His original name was Giovanni di Fidanza. He entered (1238 or 1243) the Franciscan order, studied at the Univ. of Paris under Alexander of Hales, then taught there with St. Thomas Aquinas until 1255. He was made (1257) general of his order and (1273) cardinal bishop of Albano. He died while attending the Second Council of Lyons, at which he was a papal legate. Among his philosophic and theological works are commentaries on the Sentences of Peter Lombard and the "three little works"—*Breviloquium* (tr. 1947), *Itinerarium mentis in Deum* (tr. *The Mind's Road to God*, 1953), and *De reductione artium ad theologiam* (tr. 1939). He succeeded in reconciling Aristotle's learning to orthodox Augustinianism, and he was a proponent of moderate realism (see REALISM, in philosophy, 1). His later mystical works bring the teachings of St. Bernard of Clairvaux and Hugh of Saint Victor to full flower. He emphasized the total dependence of all things upon God, and he wrote guides to mystic contemplation. He also wrote the official and much-translated life of St. Francis. Feast July 14. See J. C. Bougerol, *Introduction to the Works of Bonaventura* (Am. ed. 1964), Étienne Gilson, *The Philosophy of St. Bonaventura* (new ed. 1965).

Bonaventure Island, 2½ mi (4 km) long and ¾ mi (1.2 km) wide, off E. Que., Canada, in the Gulf of St. Lawrence, c. 3 mi (5 km) N. of Perce Rock. It has the largest bird sanctuary on the N. Atlantic coast.

Bonavista Bay, arm of the Atlantic Ocean, c. 40 mi (60 km) long and 40 mi (60 km) wide, E. N. F., Canada. The bay is irregular and filled with islands. Cape Bonavista, the headland of the Bonavista Peninsula, marks the southern entrance to the bay and is the reputed landfall (1497) of John Cabot, the discoverer of Newfoundland. Bonavista is the chief fishing town.

Bond, Carrie Jacobs, 1862-1946, American song writer, b. Janesville, Wis. A self-taught musician, she composed about 175 songs, both words and music, gave concerts of them, and even published them herself. Eventually the popularity of such songs as *I Love You Truly*, *Just a-Wearyin' for You*, and *A Perfect Day* earned her a fortune. See her autobiography, *The Roads of Melody* (1927).

Bond, George Phillips, 1825-65, American astronomer, b. near Boston, grad. Harvard, 1845. He became the assistant of his father, William Cranch Bond, and in 1859 succeeded him as director of the Harvard College Observatory. Much of his work was done in cooperation with his father. While they were studying Saturn together, George in 1848 discovered its eighth satellite, Hyperion. His observations led him to reject the previously held theory that the rings of Saturn were of solid structure, though his hypothesis of their being in fluid state was in turn soon discarded. His memoir on the Donati comet of 1858 in the *Annals of the Harvard College Observatory*, Vol. III, remains the most complete description of a great comet that has been written. His revision of his father's work on the Orion nebula was published posthumously. His photographs of the moon created a sensation among astronomers in Europe

when taken there in 1851. He was a pioneer in the use of photography in mapping the sky, determining stellar parallax, and measuring double stars. He also used photographs for determining the comparative brightness of the planets. See E. S. Holden, *Memorials of William Cranch Bond and of His Son George Phillips Bond* (1897).

Bond, Julian, 1940-, U.S. civil rights leader, b. Nashville, Tenn. As a student at Morehouse College, he participated (1960) in the sit-ins at segregated restaurants in Atlanta. He was a founder (1960) of the Student Nonviolent Coordinating Committee and served (1961-65) as its communications director. Elected (1965) to the Georgia state assembly, Bond was denied his seat because of his statements opposing the war in Vietnam. Re-elected in 1966, he began serving after the U.S. Supreme Court unanimously upheld (Dec., 1966) his right to hold office. Bond led a group of black delegates to the 1968 Democratic Convention where he successfully challenged the party's unit rule and won representation at the expense of the regular Georgia delegation. He is the author of *A Time to Speak, a Time to Act* (1972). See biographies by John Neary (1971) and R. M. Williams (1971).

Bond, Sir Robert, 1857-1927, Newfoundland political leader. He was educated in England and later entered Newfoundland politics. In 1890, he negotiated a reciprocity agreement between Newfoundland and the United States, but protests from the rest of Canada prevented its ratification. After he became prime minister in 1900, he repurchased the railways and docks from private interests. His ministry was marked by attempts to diversify Newfoundland's economy away from fishing and by disputes over U.S. fishing in provincial waters. Bond's government fell in 1909, and his influence quickly declined. He was knighted in 1901.

Bond, William Cranch, 1789-1859, American astronomer, b. Portland, Maine. He early aided his father in the trades of silversmith and clockmaker in Boston. He soon became an expert in the making of chronometers and by 1812 was fashioning most of the superior ones used by ships sailing out of Boston. He developed a passion for astronomy, and, turning part of his home into an amateur observatory, he devoted all his free time to it. In 1815 he was sent by Harvard College to Europe to visit existing observatories and gather data preliminary to the building of an observatory at Harvard. In 1839 the observatory was founded, Bond supervised its construction and became its first director. In 1847 a 15-in. (37.5 cm) telescope, then matched in size by only one other in the world, was installed. With it, Bond made elaborate studies of sunspots, of the Orion nebula, and of the planet Saturn, publishing his results chiefly in the *Annals of the Harvard College Observatory*. Together with his son he developed the chronograph for automatically recording the position of stars, and he was a pioneer in the use of the chronometer and the telegraph for determining longitude. He and his son George Phillips Bond made the first practical use in America of Daguerre's photographic process applied to astronomy. See E. S. Holden, *Memorials of William Cranch Bond and of His Son George Phillips Bond* (1897).

bond, in finance, usually a formal certificate of indebtedness issued in writing by governments or business corporations in return for loans. It bears interest and promises to pay a certain sum of money to the holder after a definite period, usually 10 to 20 years. Security is usually pledged against a bond, unsecured bonds are regarded as a long-term obligation on the capital of the issuing body. Some bonds are convertible upon maturity into the stock of the issuing company. One method used to retire bonds is the sinking fund, in such a case the issuing body buys back some of its bonds each year and holds them itself, applying the interest to the fund. The entire bond issue, most of which the firm has already acquired, is then retired on maturity. In the case of serial bonds, part of the issue is called in and paid for in full each year. Bonds were sold by the U.S. government to finance both World Wars and are still an important money-raising device. U.S. government savings bonds are available in either the H series, which pay interest semiannually and mature in 10 years, or the E series, which are sold at discount and mature in 7 to 10 years. Government bonds are backed by the full faith and credit of the government issuing them, including its taxing power, and sometimes also by specifically designated security. Bonds are usually bought by those wishing conservative investment. A fidelity bond is a

type of insurance agreement whereby one party guarantees to protect a second party against losses caused by the dishonesty of a third party who holds a position of trust. See Leonard A. Jones, *Bonds and Bond Securities* (4th ed., 4 vol., 1935-50), T. R. Atkinson, *Trends in Corporate Bond Quality* (1967), Alan Rabinowitz, *Municipal Bond Finance and Administration* (1969).

bond, chemical: see CHEMICAL BOND

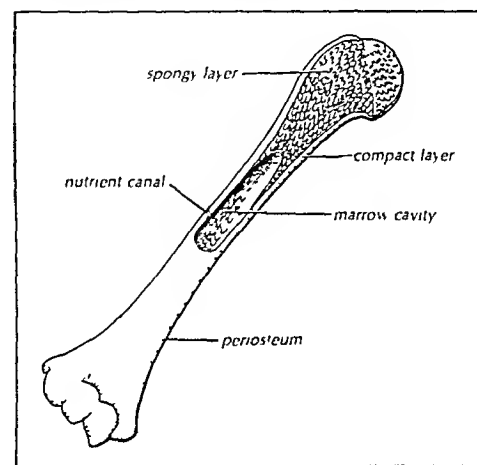
Bondfield, Margaret Grace, 1873-1953, British political and trade union leader. A Labour member of Parliament (1923-24, 1926-31), she served as secretary to the minister of labor (1924) and, under Ramsay MacDonald, as minister of labor (1929-31). She wrote and lectured extensively on labor and socialist movements.

bonding: see INSURANCE

Bond Street, in Westminster, London, England, famous for its fashionable shops. Among the noted residents of Bond St. have been the authors Laurence Sterne, James Boswell, and Jonathan Swift, Admiral Horatio Nelson, and Lady Emma Hamilton.

Bōne: see ANNABA, Algeria

bone, hard substance that forms the SKELETON of the body in vertebrate animals. In the very young the skeleton is composed largely of cartilage and is therefore pliable, reducing the incidence of fracture and breakage in childhood. The inorganic, or min-



Bone

eral, content of bone is mainly calcium and phosphorus salts. The organic content is a gelatinous material called collagen. As the body grows older, the mineral content of the bones increases. In the elderly the extreme brittleness of bones increases the danger of fracture. Bones assume a variety of sizes and shapes, however, all bone tissue has a three-layered structure. A spongy layer forms the interior. Long bones (such as those in the arms and legs) are hollow, the inner spaces being filled with MARROW, important in the formation of blood cells. Surrounding the spongy, inner layer is a hard, compact layer that functions as the basic supportive tissue of the body. The outer layer is a tough membrane called the periosteum, which sheaths most bones. Although bone appears solid, it contains numerous microscopic canals permitting the passage of blood vessels and nerve fibers.

bone black, solid black material, largely carbon, produced by heating animal bones to high temperatures in the absence of air so as to drive off volatile substances. Finely divided bone black is useful as a pigment, bone char, a similar material, is an important source of activated charcoal for use in refining and decolorizing sugar.

bone china, variety of PORCELAIN developed by English potters in the last half of the 18th and early 19th cent. The clay is tempered with phosphate of lime or bone ash. This innovation greatly increased the strength of the porcelain during and after firing. See Bernard and Thérèse Hughes, *English Porcelain and Bone China, 1743-1850* (1955).

bonefish, common name for a fish belonging to either of two species of the family Albulidae. *Albula vulpes* is widespread in warm, shallow marine waters, and *Dixonina nemoptera* is found only in the West Indies. The bonefish is silvery in color, with a long, deeply forked tail and a single dorsal fin, it has a pointed head covered by a thick, transparent cartilage and a receding mouth filled with numerous small rounded teeth. *D. nemoptera* is distinguished by two long trailing filaments, one extending from

its dorsal fin and one from its anal fin. Also known as ladyfish and banana fish, the bonefish may reach 35 ft (107 cm) in length, and 18 lb (8 kg) in weight. It is a bottom dweller of shallow, sandy areas where it feeds on crabs, shrimp, and worms. It is much prized as a game fish, despite the numerous tiny bones that limit its appeal as food. It is classified in the phylum CHORDATA, subphylum Vertebrata, class Osteichthyes, order Clupeiformes, family Albulidae.

bone meal, finely ground bone used as a fertilizer for its content of phosphate and nitrogen (about 23%–30% available phosphate and 2%–4% nitrogen), it is an expensive form of phosphoric acid when compared with SUPERPHOSPHATES. Bone meal is also fed to farm animals to supply needed mineral food constituents, e.g., calcium and phosphorus.

Boner or Bonerius, Ulrich (ōōl'rikh bō'nār, bōnēr'-ēās), fl. 14th cent., Swiss fabulist, a Dominican monk. His *Edelstein* (c.1345), a collection of 100 moralizing beast fables, was one of the first German books to be printed (1461).

boneset or thoroughwort, perennial North American herb (*Eupatorium perfoliatum*) of the family Compositae (COMPOSITE family), having terminal clusters of small, chiefly white blossoms. Indian and white man alike valued the plant for the bitter tea made from its leaves and flowers, for which it was often cultivated in gardens. The tea was used for treating colds, fever, and ague (whence the name agueweed). The herb is still sold for medicinal purposes. Other species of *Eupatorium*, most of which are American, are often called thoroughwort and occasionally boneset, e.g., the purple boneset, or JOE-PYE WEED. Boneset is classified in the division MAGNOLIOPHYTA, class Magnoliopsida, order Asterales, family Compositae.

Bongo, Omar (bōng'gō), 1935–, Gabonese political leader, president of Gabon (1967–), originally named Albert-Bernard Bongo. He entered (1958) the civil service and served in several ministries. He became minister of information and tourism in 1966, vice president in 1967, and succeeded to the presidency later in that year. Reelected in 1973, he held the additional offices of prime minister and defense minister.

bongo (bōng'gō), spiral-horned ANTELOPE, *Taurotragus eurycerus*, found in jungles and thick bamboo forests of equatorial Africa. Shy, elusive animals, bongos never emerge into the open and are seldom seen; they browse singly or in small groups. They are fairly large, heavy-bodied antelopes, with males standing 4 ft (120 cm) at the shoulder. Both sexes have horns, in the male these are up to 3 ft (90 cm) long. The body is rich chestnut brown with narrow white stripes running across the back and down the sides, a pattern that provides excellent camouflage in dense thickets. Bongos have been much prized as trophies by big-game hunters. They are classified in the phylum CHORDATA, subphylum Vertebrata, class Mammalia, order Artiodactyla, family Bovidae.

Bonheur, Rosa (bōnōr'), 1822–99, French painter of animals. She was a pupil of her father, Raymond Bonheur. Her paintings were regularly exhibited in the Salon from 1841. Bonheur's informed and sympathetic pictures of animal life were remarkably enlightened in approach. They gained her wide popularity, particularly in England and America, where much of her work is to be seen. Her most famous painting, *The Horse Fair* (1853–55) is in the Metropolitan Museum.

Bonhoeffer, Dietrich (dē'trikh bōn'hōfər), 1906–45, German Protestant theologian, imprisoned for two years and hanged for his role in the plot to overthrow Adolf Hitler. Bonhoeffer, who was influenced very early by the thinking of Karl Barth, urged a conformation to the form of Christ as the suffering servant in a total commitment of the self to the lives of others. His writings, many of them fragmentary, were collected and published posthumously. They include *The Cost of Discipleship* (tr. 1948), *Prisoner for God: Letters and Papers from Prison* (tr. 1953), *No Rusty Swords* (tr. 1965), and *Ethics* (tr. 1965). See biographies by Eberhard Bethge (1967), Mary Bosanquet (1968), Andre Dumas (1971), and Larry Rasmussen (1972).

Bon Homme Richard see JONES, JOHN PAUL

Bonichi, Gino see SCIPIONE

Boniface, Saint (bōn'fās, -fās), c. 675–754?, English missionary monk and martyr, called the Apostle of Germany, b. Devonshire, England. His English name was Winfrid. He was educated in the Benedictine monastery of Nursling, near Winchester. In 716 he made his first trip to Friesland to aid the mission of St. Willibrord, but unsettled conditions forced his

return to England. In 718 he left England for Rome where Pope Gregory II encouraged his missionary zeal and gave him the name Boniface. Under the protection of the Frankish ruler Charles Martel, Boniface and his companions made many converts in Thuringia, Hesse, Franconia, and Bavaria. His chopping down of Donar's famed sacred oak at Fritzlar symbolized the advance of Christianity in pagan Germany. He established an orderly Christianity there closely tied to the papacy. He became regentary bishop (722) and metropolitan of Germany (731), creating new bishoprics under the supervision of his English disciples. He founded monasteries at Reichenau (724), Murbach (728), and Fulda (744), which became important centers of learning. As papal legate he reformed (c. 745) the decaying Frankish Church. He was consecrated (745) archbishop of MAINZ. He was martyred by pagans in Friesland. Feast June 5. See his correspondence tr. by E. Kyle (1966), biography by G. F. Muller (1964).

Boniface, Saint, d. 1009, German missionary, known also by his lay name, Bruno of Querfurt. He evangelized the Balts and died a martyr. He is known as the Apostle of the Prussians. Feast June 19.

Boniface VIII, 1235–1303, pope (1294–1303), an Italian (b. Anagni) named Benedetto Caetani, successor of St. Celestine V. As a cardinal he was independent of the factions in the papal court, and he opposed the election of Celestine. Boniface was elected on Celestine's abdication, and during his first years he was opposed by those who had suffered from Celestine's retirement—the Neapolitans, the Colonna family, and the extreme Franciscans, among them Jacopone da Todi. To preclude schism, Boniface kept Celestine imprisoned for the rest of his life. Boniface reigned in a time of crisis in Europe. He wished to emulate St. Gregory VII and Innocent III, but he was no such statesman, and the times had changed. He interfered in Sicily, but he was openly flouted when Frederick II and the Sicilians forced Boniface to recognize Frederick as king. He brought CHARLES OF VALOIS into Italy to pacify Florence and succeeded only in stirring up more trouble. Dante was exiled in this struggle of Guelphs and Ghibelines. Boniface's contest with PHILIP IV of France was the principal feature of his career. The pope tried to stop Philip from his illegal levies on the clergy by the bull *Clericis laicos* (1296), enunciating the principle that laymen could not tax clerics without the consent of the Holy See. Philip retaliated by cutting off the contributions of the French church to Rome. In England the Pope faced an equally resistant EDWARD I, and in a subsequent bull (1297) Boniface relaxed the ruling. The dispute began again in earnest in 1301 with the trial of Bernard Saisset, and Boniface never again yielded. Two of his statements in the controversy are famous—the bull *Ausculat filii* (1301), which summoned a synod of French to meet at Rome to discuss the reformation of French affairs, and the bull *Unam sanctam* (1302), an extreme statement (not naming Philip) of the principle that Catholic princes as well as others are subject to the pope in temporal (moral) and religious matters. Philip paid no attention, and in 1303 he sent Nogaret to Italy, soon proclaiming his intention of deposing the pope. Nogaret found the pope at Anagni and harassed him; the pope stood firm and according to tradition was slapped by Nogaret's companion, Sciarra Colonna. The outraged people of Anagni thereupon drove out the soldiery, Boniface was rescued and escorted to Rome. He died in a month. Philip pursued Boniface dead as he had alive. In 1310 he forced CLEMENT V to begin a process to determine that Boniface was heretical, that accusation was abandoned, but Clement consented to repudiate such of Boniface's acts as had hurt Philip. Boniface, an excellent canon lawyer, planned and promulgated a new revision of the code called the *Sext* (1298). He was the first to establish (1300) a holy year. He was succeeded by Benedict XI. See biography by T. S. Boase (1933), C. T. Wood, *Philip the Fair and Boniface VIII: State vs. Papacy* (1967).

Boniface IX, c. 1345–1404, pope (1389–1404), a Neapolitan named Pietro Tomacelli, successor of Urban VI. The Avignon antipopes Clement VII and Benedict XIII were his contemporaries during the Great Schism. He succeeded in imposing his rule on the Papal States. He fortified Rome and brought Naples under the Roman obedience. His attempt to replenish the papal treasury proved unpopular, and he was accused of nepotism and simony. Boniface decreed the feast of the Visitation. He was succeeded by Innocent VII.

Boniface (bōn'fās), d. 432, Roman general. He defended (413) Marseilles against the Visigoths under Ataulf. Having supported GALLA PLACIDIA in her strug-

gle with her brother, Emperor Honorius, Boniface fled to Africa in 422. There, as semi-independent governor, he supported (424) VALENTINIAN III against the usurper John and was rewarded with the title count of Africa. Recalled in 427, he rebelled, a civil war between Africa and the imperial government began. This struggle prepared the way for the invasion (429) of Africa by the Vandals under Gaiseric. A truce was arranged between Africa and Rome, and Boniface attacked the Vandals. He was defeated and besieged (430) at Hippo, during the siege his good friend St. Augustine died. Beaten again in 431, Boniface was recalled to Italy by Placidia to assist her against the general AETIUS. He defeated (432) Aetius but died of a wound received in the battle. The historian Procopius, without convincing evidence, held Boniface responsible for inviting the Vandals into Africa.

Bonifácio, José (zhōōzā' bōnēfā'sēō), 1763–1838, Brazilian statesman and scientist. He studied in Europe and gained international fame as a geologist before returning (1819) to Brazil. Seeking a peaceful solution to Brazilian unrest against Portuguese rule, he urged the establishment of a constitutional monarchy and influenced the prince regent to declare (1822) Brazilian independence and proclaim himself Emperor PEDRO I. Bonifácio served as first minister in the new empire, but his insistence upon a liberal constitution led to his banishment from Brazil (1823–29). Many of his ideas were included in the 1824 constitution, however, and he later (1831–33) served as tutor to Pedro II. He is regarded as the architect of Brazilian independence. His full name was José Bonifácio de Andrada e Silva.

Bonifacio (bōnēfā'cho), town (1968 pop. 2,433), S Corsica, France. A picturesque port with trade in olive oil and fish, Bonifacio faces Sardinia across the Strait of Bonifacio (7 mi/11.3 km wide). The oldest town of Corsica, it was founded (c. B28) on the site of a citadel built by Boniface I, count of Tuscany. It later passed to Pisa and to Genoa. There is a Pisan-style church (12th–13th cent.). The town, surrounded by a rampart, is medieval in character.

Bonington, Richard Parkes, 1802–28, English painter. Moving to Calais at the age of 15, his first art study was with Louis Francia, who taught him watercolor and lithography. Bonington studied in Paris at the École des Beaux-Arts and in 1820 entered the studio of Gros. At that time he formed a close friendship with Delacroix, with whom he traveled to England. Bonington was the embodiment of the close link between the English landscape painters Constable and Turner and the budding school of French romanticists. He won early recognition from the Salon, but died of tuberculosis at the age of 26. Best known for his sparkling watercolors painted rapidly, directly from nature, Bonington also brought to his oil painting an immediacy and dexterity unusual in his day. He was a masterly lithographer as well. Represented in the Louvre and in most important British galleries, Bonington's work is best seen in the Wallace Collection, London. The Metropolitan Museum has two marines and a landscape. See study by R. P. Dubousson (tr. 1924).

Bonin Islands (bō'nin), Jap. *Ogasawara-gunto*, volcanic island group (1967 est. pop. 200), c. 40 sq mi (100 sq km), in the W Pacific Ocean, c. 500 mi (800 km) S of Tokyo, part of Tokyo prefecture, Japan. The largest and principal island is Chichi (formerly Peel Island), c. 10 sq mi (30 sq km), the site of Omura, the capital of the group, and Futami-ko (Port Lloyd), the chief harbor. The principal products are sugarcane, cocoa, bananas, and pineapples. The majority of the inhabitants are Japanese, there are some Koreans and Formosans. Discovered by the Japanese in the 16th cent. and later by the Spanish, the islands were claimed by the British in 1827. The islands were claimed by Japan in 1875 and placed under the Tokyo prefecture in 1880. In World War II the islands formed a major Japanese military stronghold and were the scene of land, sea, and air battles. The U.S. navy occupied the islands in 1945. Japan regained technical sovereignty over them in 1951, but they continued to be under U.S. military administration until 1968, when they were returned to Japan.

bonito: see MACKEREL

Bonivard, François de: see BONNIVARD, FRANÇOIS DE

Bonn (bōn, Ger. bōn), city (1970 pop. 274,518), capital of the Federal Republic of Germany, North Rhine-Westphalia, W West Germany, on the Rhine River. It is the administrative center of West Germany and the site of foreign embassies. Villa Hammerschmidt there is the residence of the federal president, and Palais Schaumburg is the home of the federal chancellor. The parliament house (Ger.

Bundeshaus, built in the early 1950s) is located near the Rhine. Manufactures of the city include light-metal products, ceramics, office equipment, chemicals, and pharmaceuticals. Bonn was founded in the 1st cent AD as the Roman garrison of *Castra Bonnensia*. It was devastated by the Normans in the 9th cent and later became the residence (1238-1794) of the electors of Cologne and the scene of the coronations of Frederick the Handsome (1314) and Charles IV (1346) as kings of the Romans. During the Palatine Succession War (1689), Bonn was destroyed by Elector Frederick III of Brandenburg. The city was rebuilt thereafter, largely in the baroque style. Bonn was occupied (1794) and later annexed (1798-1814) by France. In 1815 it passed to Prussia. In 1948-49 delegates from the parts of Germany occupied by France, Great Britain, and the United States met in Bonn and drafted a constitution for the Federal Republic of Germany. In 1949, Bonn was also made the capital of West Germany. In 1969 a number of nearby towns, including Bad Godesberg, were incorporated into Bonn. The house where Ludwig van Beethoven was born (1770) has been preserved and is a museum. Bonn is the seat of a famous university (founded 1784), whose main building formerly was the electoral palace (built 1697-1725). The city has a noteworthy church (11th-13th cent.) and museums of zoology and Rhenish culture.

Bonnard, Pierre (pyër bônârd'), 1867-1947, French painter, lithographer, and illustrator. In the 1890s he was associated with the Nabis. His delight in familiar views of everyday life was transmitted to canvas with joy and gentle fantasy. Sometimes called an intimist, he explored the play of sunlight in domestic interiors in an exuberant style close to impressionism (e.g., *Bowl of Fruit*, 1933, Philadelphia Mus. of Art). His later works exhibit more vivacious color and dynamic brushwork. Bonnard also designed sets for the stage. See studies by J. Elliott et al. (1964) and Andre Fermigier (1970).

Bonnat, Léon Joseph Florentin (lädN' zhôzêf' flôraNtân' bônâ'), 1833-c.1922, French portrait and historical painter. He received many academic honors and is best known for his portraits of famous men, including Thiers, Victor Hugo, and Dumas fils. Bonnat is represented in the Metropolitan Museum.

Bonnet, Charles (sharl bônâ'), 1720-93, Swiss naturalist and philosopher. He drew attention to parthenogenesis in aphids, but his theories to explain his findings were highly fanciful and unscientific. His books include *Traite d'insectologie* (1745) and *Contemplation de la nature* (1764-65).

Bonnet, Georges (zhôrzh), 1889-1973, French politician. He entered politics as a Radical Socialist. A financial expert, he was prominent at international conferences on reparations and other economic questions. He was ambassador (1937) to the United States and several times finance minister, notably in the Camille Chautemps cabinet (1937-38). His stringent fiscal policy was partially responsible for the fall of the Chautemps government. As foreign minister (1938-39) in Édouard Daladier's cabinet, Bonnet helped to draft the Munich Pact, and as a member of the Vichy National Council (1941), he supported collaboration with Germany. Excluded from the Radical party, Bonnet entered the French national assembly in 1956 as a dissident radical, serving until May 1968.

bonnet shark: see HAMMERHEAD SHARK

Bonneville, Lake (bôn'ävîl, bôn'ëvîl, bôn'vîl), ancient lake, once covering c. 19,500 sq mi (50,500 sq km), NW Utah. The lake expanded during the period of heavy precipitation brought on by the advancing glaciers of the Pleistocene epoch. At the end of the Pleistocene epoch the lake's area rapidly shrank. Its six terraces still exist and locate the different lake levels. Great Salt Lake, Lake Sevier, and Utah Lake are remnants of Lake Bonneville, which was named for U.S. explorer Benjamin de Bonneville.

Bonneville Dam, one of the major dams on the Columbia River, between Oregon and Wash. The dam, 2,690 ft (820 m) long and 197 ft (60 m) high, was built between 1933 and 1943 by the U.S. Corps of Engineers and was one of the largest hydroelectric projects undertaken under the NEW DEAL. It is used for navigation, flood control, and power production (518,400 kw annually). Locks permit ships to pass around the dam, and fish ladders allow salmon to spawn upriver.

Bonnie Prince Charlie: see STUART CHARLES EDWARD

Bonnivard or Bonivard, François de (both fraNsvâ' də bônëvâr'), c.1493-1570, Swiss patriot and historian. The prior of St. Victor, near Geneva,

he supported the revolt of GENEVA against Charles III of Savoy, who imprisoned him from 1519 to 1521. He was again imprisoned from 1530 to 1536 in the castle of Chillon, romanticized in Lord Byron's poem "Prisoner of Chillon." Released by the Bernese, he later became a Protestant. Geneva honored him with a pension. His chronicle of Geneva was first published in 1831.

Bonny (bôn'ë), town, SE Nigeria, in the Niger River delta, on the Bight of Biafra. In the 18th and 19th cent., Bonny was the center of a powerful trading state, and in the 19th cent. it became a leading exporter of palm oil. From 1885 to 1894 it was the administrative center of the British Oil Rivers Protectorate. Bonny declined in the 20th cent. but revived after 1961, when its port was modernized as the export point for petroleum refined at PORT HARCOURT.

Bononcini (bônônchë'në) or **Buononcini** (bwö-), musical family of Modena, Italy. Giovanni Maria Bononcini, 1642-78, choirmaster and organist at Bologna and Modena, was a composer and the author of a treatise entitled *Musico pratico* (1673). His son Giovanni Battista Bononcini, 1670-c.1750, was a composer, chiefly of operas. In London he was the associate and later the rival of Handel. The opera *Muzio Scevola* (London, 1721) was a *pasticcio* by Bononcini, Filippo Mattei, and Handel. After failing in his operatic ventures Bononcini, charged with plagiarism, left England and spent the rest of his life in obscure wanderings. He composed operas, produced in Venice, from 1748. Another son, Marc Antonio Bononcini, 1677-1726, became musical director to the duke of Modena in 1721. He wrote many operas, most of which were produced in Venice. His opera *Camilla* (London, 1706) was one of those that helped begin the English fashion for Italian opera.

bonsai (bôn'sî), art of cultivating DWARF TREES. Bonsai, developed by the Japanese more than a thousand years ago, is derived from the Chinese practice of growing miniature plants. In bonsai cultivation, woody plants are kept small and in true proportion to their natural models by growing them in small containers, feeding and watering them only enough for healthy growth, pruning, and training branches in the desired shape by the application of wire coils, the term bonsai also refers to the plants dwarfed by this method. Weathered trees in harsh climates serve as natural models for aged-looking, gnarled, bent, and overhanging miniature trees. The selection of containers, the position of the plant in the container, and the choice of single plants or plant groupings are important aesthetic considerations. In Japan, various native evergreens, i.e., junipers, spruces, and pines, as well as many flowering deciduous trees are cultivated, in America many native species have been found suitable. The Brooklyn Botanic Garden in New York City houses an extensive bonsai collection. See Brooklyn Botanic Garden *Handbook on Dwarfed Potted Trees*. The *Bonsai of Japan* (1974).

bontebok: see DAMALISK

Bontecou, Lee (bôn'təkō), 1931-, American artist, b. Providence, R.I. Bontecou is best known for her wall reliefs, constructions made of canvas stretched over wire armatures. Their large, bulging, roughly concentric shapes converging in a black, seemingly endless hole in the center give them a menacing quality. Examples of her work are in the Jewish Museum, New York City.

bontequagga (bôn'tëkwäg'ə) see ZEBRA

bonus, extra amount in money, bonds, or goods over what is normally due. The term is applied especially to payments to employees either for production in excess of the normal (wage incentive) or as a share of surplus profits. The wage incentive was designed during the late 19th cent. not only to increase production but to reward the more skillful and more energetic workers. The hourly or weekly wage was to be figured as payment for a standard rate of work, and the workers who exceeded that standard were to receive a bonus. However, the system fell into disfavor with labor unions because rate cutting was often resorted to when bonuses became too high. Industrial engineers of the 1930s realized that definite standards of accomplishment and quality must be set to make wage incentives workable. Many firms have used an annual bonus plan for distributing abnormal profits to employees. The term is also applied to payments to former servicemen in addition to regular pensions and insurance. Veterans of World War I lobbied to obtain a bonus for their military service. In 1924 each veteran received an adjusted compensation certificate entitling him to a payment averaging \$1,000 to be made in 1945. In 1932 about 15,000 unemployed veterans formed the

"Bonus Expeditionary Force," or BONUS MARCHERS, and marched to Washington to demand immediate payment of the certificates. President Hoover ordered troops to oust them from Federal property. In 1936 Congress passed a law permitting the veterans to exchange their certificates for cashable bonds. A number of states voted veterans' bonuses after World War II and the Korean War. See W. W. Waters, *B.E.F. The Whole Story of the Bonus Army* (1933, repr. 1969), V. D. Kennedy, *Union Policy and Incentive Wage Methods* (1945, repr. 1969), J. K. Loudon, *Wage Incentives* (2d ed. 1959), Reginald Marriott, *Incentive Payment Systems* (3d rev. ed. 1968).

Bonus Marchers, in U.S. history, more than 20,000 veterans, most of them unemployed and in desperate financial straits, who, in the spring of 1932, spontaneously made their way to Washington, D.C. They demanded passage of a bill introduced by Representative Wright Patman providing for immediate payment of their World War I bonus. Calling themselves the Bonus Expeditionary Force, they camped in vacant government buildings and in open fields made available by police superintendent Pelham D. Glassford. The veterans conducted themselves in a peaceful and orderly way, but when the Senate defeated the Patman bill (June 17, 1932) the marchers refused to return home. On July 28, President Herbert Hoover ordered the army, under the command of Douglas MacArthur, to evict them forcibly. MacArthur had their camps set on fire, and the army drove the veterans from the city. Hoover was much criticized by the press and the general public for the severity of his response.

Bonvalot, Pierre Gabriel Édouard (pyër gabrêl' ädwar' bônvalô'), 1853-1933, French explorer and author. In 1880-82 he visited central Asia, explored Kohistan, and returned to France by way of Bukhara, the Caspian sea, and the Caucasus. In 1886 he made the first crossing of the Pamirs, from Ferghana to Chitral, India. He crossed Tibet from Lob Nor to Tengri Nor (1889), traversed Asia from Siberia to Tonkin (1889-90), and led an official mission to Entotto, Ethiopia. His works include *De Moscou en Bactriane* (1884), *De Paris au Tonkin à travers Tibet inconnu* (1892), *L'Asie inconnue* (1896), and *Marco Polo* (1925).

booby, common name for some members of the family Sulidae, large, streamlined sea birds. Tropical and subtropical members of the family are called boobies; those of northern waters are called gannets. These birds have heavy bodies, long, pointed wings, long, wedge-shaped tails, and short, stout legs. They fish by diving on their prey from great heights and pursuing it underwater, air sacs under their skin cushion the impact with the water and provide buoyancy, as with pelicans. The masked, red-footed (*Sula sula*), and brown (*S. leucogaster*) boobies are found the world over, the Peruvian and blue-footed (*S. nebouxii*) boobies, on the west coasts of the Americas, and the Abbott's booby, in the Indian Ocean. The common gannet of the North Atlantic, *Morus bassanus*, breeds in the British Isles, in the Gaspé region of Canada, and on Bird Island in the Gulf of St. Lawrence. A Pacific gannet is one of the chief guano producers of the offshore islands of Peru. Gannets build crude nests of debris on narrow cliff ledges. The female lays a single egg, which she and the male incubate by covering it with their feet. Gannets have strong migration tendencies, while the boobies do not. The name booby is descriptive not only of the rather stupid facial expression of these birds, but also of their unwary, gullible behavior when hunted by man—a factor that accounts for their diminishing numbers. Boobies and gannets are classified in the phylum CHORDATA, subphylum Vertebrata, class Aves, order Pelecaniformes, family Sulidae.

book. The word book has come to have many meanings, e.g., any collection of sheets of paper, wood, or other material sewn or bound together (such as a bankbook), a division of a written work (books of the Bible, books of Caesar's *Galic War*), and statements of financial accounting (bookkeeping). The primary meaning today is, however, a written work either in manuscript or in printed form that is of substantial length. A printed book is distinguished from a PAMPHLET in that it is larger (some publishers limit the term book to works of more than 64 or more than 96 pages). It is distinguished from a periodical in that it is a unit and issued as such. Early in the history of bookmaking the printed book was distinguished in size by the number of times the original large sheet of paper on which the type was printed had been folded, i.e., folio, quarto, octavo, and duodecimo. With the advent of machine-made

paper, these sizes were standardized to measurements, the standard octavo is, according to the American Library Association, between 20 cm and 25 cm in height. Books apparently did not come into existence until long after writing, e.g., INSCRIPTION, was widespread. Fragmentary early papyrus represented literature in ancient Egypt and may possibly be considered as books, although it is customary to speak of the BOOK OF THE DEAD as the first of the Egyptian papyrus books. The CUNEIFORM tablets gathered into the great Assyrian library of Assurbanipal represented an enormous collection of works, but the book as we know it may be said to be derived from the Egyptian writings on papyrus. The vast literature of the Greeks, collected in the greatest library of the ancient world, in Alexandria, was generally written on large sheets of papyrus, which were glued together and rolled up. The rolls varied greatly in size, many of them were about 1 ft (30 cm) wide and about 30 ft (9 m) long when unrolled. In the Hellenistic era large works were divided into tomes [from Gr. = cutting] that were stored together in cylinders and labeled. The method of having the leaves held together in quires (24 or 25 sheets) in the fashion of the modern book seems not to have originated until about the 2d cent. A.D. The manuscripts in leaves are commonly called codices (although the term *codex* may also be loosely used for any ancient manuscript). Most Roman production of books, therefore, was also in rolls. From at least the early part of the 2d cent. B.C. the more permanent vellum (a type of fine PARCHMENT first used in the Middle East) was also used for writing books, and this grew to be very popular in the Middle Ages when books were copied by monks in the scriptoria of monasteries. The codices were the first books to receive the protection of BOOKBINDING, an art that was highly developed before the advent of printing. In the scriptoria the art of ILLUMINATION flourished, making artistic masterpieces of many medieval liturgical volumes. An astonishing number of copies of books were made by hand copying. In ancient Rome hundreds of copies of a popular book were made in a fairly short time. The production of books in great quantity had to await the mechanical processes of printing from movable type. Printing was invented in China, where the first printed book is thought to date from the 9th cent. In the West movable metal type was developed by Johann GUTENBURG of Mainz, and to a very large extent the history of the book was henceforth the history of PRINTING. Book production developed very rapidly, the craft becoming enormously sophisticated by the 16th cent. Italian printers set the standards of format and quality retained in Europe until the 19th cent. Great printing houses arose in France and the Netherlands and, after a general decline in the 17th cent., in England and the United States. The 19th cent. witnessed machine replacement of all the old manual processes. By the end of the century printing quality had been so debased that a revolution, led by William MORRIS during the ARTS AND CRAFTS movement in England, was necessary to restore the concept of beauty to bookmaking. The bookselling business increased over the centuries with widespread education and improvement of transportation. In recent years the printing and distribution of comparatively inexpensive softcover books, or paperbacks, is responsible for a vastly expanded publishing industry. The standing of the book as an information source has been threatened since World War II by other media including television and computer systems. See BLOCK BOOK, BOOK CLUBS, BOOK COLLECTING, BOOK PUBLISHING, INCUNABULA, LIBRARY, MANUSCRIPT, TYPE, WRITING. For a brief and excellent bibliography, see Hellmut Lehmann-Haupt, *One Hundred Books about Bookmaking* (1949). See F. G. Kenyon, *Books and Readers in Ancient Greece and Rome* (2d ed. 1951), Edward Chiera, *They Wrote on Clay* (1958), F. L. Schick, *The Paperbound Book in America: The History of Paperbacks and Their European Background* (1959), R. B. McKerrow, *An Introduction to Bibliography for Literary Students* (1965), H. D. Verriest, ed., *The Book through Five Thousand Years* (1972).

bookbinding The art and business of bookbinding began with the protection of parchment manuscripts with boards. Papyrus had originally been produced in rolls, but sheets of parchment came to be folded and fastened together with sewing by the 2d cent. A.D. In the Middle Ages the practice of making fine bindings for these sewn volumes rose to great heights, books were rare and precious articles, and many were treated with exquisite bindings: they were gilded, jeweled, fashioned of ivory, wood, leather, or brass. The techniques of folding

and sewing together sheets in small lots, combining those lots with tapes, and sewing and fastening boards on the outside as protection changed but little from the medieval monastery to the modern book bindery. The invention of PRINTING greatly increased the demand for the bookbinder's work, establishing it as a business. The finest binding is still done by hand. In machine binding (called casing), the cover, or case, is made separate from the book and then glued to it. The covering of the boards, usually called the binding, is most frequently of cloth, heavy paper, vellum, leather, or imitations of leather. The preferred leathers are oasis goat and levant. Leather bindings are sometimes decorated by MARBLING, tooling, or EMBOSSEING. See Hellmut Lehmann-Haupt, ed., *Bookbinding in America* (1941, repr. 1967), Ivor Robinson, *Introducing Bookbinding* (1968), F. E. Comparato, *Books for the Millions* (1971).

book clubs As a phenomenon in American cultural life, book clubs have made an impact in two widely separated periods of history. During the 18th and 19th cent. book clubs were formed for the purposes of discussion and debate. Foremost among these was the Junto, a literary society formed by Benjamin Franklin in 1726, more representative was the Cadmus Club of Galesburg, Ill., founded in 1895, whose aims were the promotion of good fellowship, good reading, and literary works of local interest. What most people in the 20th cent. understand by the term "book club" is not a club at all but an organization that promotes the mail-order sale of books. Among the best known are the Book-of-the-Month Club, the Literary Guild, and the Book Find Club. There are also clubs to match more specialized interests, such as the Antiques Book Society, the Cook Book Club, and the Gamblers' Book Club. The workings of mail-order clubs—set up as they are to ensure that the tastes and choices of their readership will be met—are models of mass production and distribution methods aimed to supply individual selection. The Book Find Club buys publishers' printing plates in order to print its selections cheaply and bind them sturdily for mailing. In exchange, it offers the publisher a 10% royalty on sales. Club members must select a minimum number of books from a monthly list. They order negatively, that is, they let the club know which books they do not want by returning an order card. Although mail-order book clubs enjoy large memberships, they have lost ground to the paperback book industry since the 1950s.

book collecting, or bibliophily, is the acquiring of printed books that are, or are expected to become, rare and that possess permanent interest in addition to their text. Collecting has traditionally concentrated on first editions in the field of pure literature. Contemporary accounts mention personal manuscript collections in ancient Egypt, Greece, and Rome, but because manuscript media—scrolls and papyrus—were scarce and expensive (and illiteracy general), collecting was done only by religious leaders and heads of state. During the Middle Ages monastic institutions were the main accumulators of valuable manuscripts. Book collecting proper began after the invention of movable type in the West (c. 1437), which produced widespread literacy and a proliferation of inexpensive books. The aim of early collectors, such as Willibald Pirckheimer (1470–1530) and Jean GROlier DE SERVIÈRES, was to assemble personal working libraries. Many early collections became the cornerstones of public libraries. The BODLEIAN LIBRARY at Oxford and the HARLEIAN LIBRARY of the British Museum were founded respectively on the private collections of Sir Thomas Bodley and Robert Harley, 1st earl of Oxford. By the end of the 17th cent., book auctioning was common throughout Europe. In the 18th cent. collectors shifted their focus from building up libraries to seeking original editions, including INCUNABULA, of earlier works. At first, criteria were more visual than literary: early printing, fancy binding, and colorful illumination. Richard Heber (1773–1833), whose collection of first editions of literature and history filled several houses, was one of the first collectors to consider contextual factors primary. During the 19th cent. first editions of native contemporary literature began to attract book collectors. The two most notable collectors of the second half of the century were Henry Huth (1815–78), an Englishman, and Robert Hoe, the first important American collector. In 1884, Hoe became the first president of the newly founded Grolier Club, a New York-based society dedicated to the appreciation of fine book production. The three greatest American book collectors were Henry Clay FOLGER, John Pierpont MORGAN,

and Henry E. HUNTINGTON. During the 20th cent. book collecting on the massive scale practiced by Huntington has declined. The incursion into the field by institutional libraries has limited the circulation of rare books formerly dispersed by auction and through antiquarian bookshops. The three traditional approaches to collecting first editions are the author collection, the subject collection, and the cabinet collection. The latter is a collection of deliberately small size (originally a single bookcase) designed to represent the epitome of one bibliophilic category, such as 15th-century French illumination. The desirability of the first edition is based not only on speculative but also on historical considerations; a first edition is one step from a manuscript. Dealers and collectors usually define a first edition as the first appearance of a written work in book form, although some collectors have shown an interest in periodical serializations of works later published integrally. The most valuable first editions are of literary classics and early or obscure works of famous authors. Original editions of Shakespeare, Poe, and books issued by William Caxton have traditionally been the most sought-after items. Modern collectors who cannot afford the very few incunabula offered to the public—a Caxton printing of *The Canterbury Tales* was sold at a 1965 London auction for \$84,000—collect in peripheral fields. Such fields include AMERICANA, books illustrated by famous artists, early books on natural history (especially those with colored plates), books printed by such noted private presses as the KELMSCOTT PRESS, the CUALA PRESS, and the NONESUCH PRESS, early books recounting travel and exploration, ancient manuscripts, and letters. But even books in these fields, sold at places of auction like Christie's in London and the Sotheby Parke-Bernet Gallery in New York City, bring substantial prices. For example, the following sales were reported in *American Book Prices Current* for the year 1969–70: first edition, first issue, of Walt Whitman's *Leaves of Grass* (1855)—\$9,000, Kelmescott Press edition of Chaucer's works (1896)—\$3,250, letter written by George Washington while at Valley Forge—\$2,600. Individual pages of incunabula are also popular with collectors; single leaves of the Gutenberg Bible sold for \$2,200 in 1969–70. During the 1960s and 70s works by 20th-century writers have brought substantial fees, e.g., in 1974 a first edition of W. H. Auden's *Poems*, privately published in 1928 and later autographed by the author with marginal notes by Auden and Stephen Spender, sold for \$8,500. Book collectors use points, such as broken type and text excisions, to distinguish between different issues of first editions. Information on the existence, location, and prices of collector's items can be found in author bibliographies, dealer and auction catalogs, and book-collecting periodicals such as *The Colophon* (1930–1950), *The Book Collecting World*, and the *Antiquarian Bookman*. *American Book Prices Current* (published annually since 1895) lists titles and prices of books sold at important auctions in the United States, England, and Canada. See John T. and David A. Randall, *A Primer of Book Collecting* (rev. ed. 1966), John Carter, *Books and Book Collecting* (1957) and *Taste and Technique in Book Collecting* (1948, repr. 1970).

Booker T. Washington National Monument. See NATIONAL PARKS AND MONUMENTS (table).

book gill See HORSESHOE CRAB.

bookkeeping, maintenance of systematic and convenient records of money transactions in order to show the condition of a business enterprise. The essential purpose of bookkeeping is to reveal the amounts and sources of the losses and profits for any given period. Proper bookkeeping should also reveal the nature and value of the assets and liabilities of a firm, as well as its net worth at the close of that period. Such records are kept in columnar form, using separate columns for the date of transaction, an explanation of the nature of the transaction, and its value. Other columns may be added. In general, two sets of columns are used, the assets being placed in one set of columns and the liabilities in another set (a money value having been assigned to all assets and all liabilities of the business). Such an arrangement is called double entry. A balance sheet may be compiled at any time by totaling each column and subtracting the smaller total from the greater to give either a surplus or a deficit. The result is called the net worth, and it gives an indication of the financial state of a firm. A detailed balance for a period between two balance sheets is called a profit and loss statement. The process of deciding whether to enter items into one set of columns or the other, i.e., into the debit side or the credit side, is called

journalizing, since the analyzed items are placed in a journal, or daybook, soon after the transactions occur. Separate accounts of persons or sections are kept in a book called a ledger. The transfer of items from the journal to the ledger is called posting. In large businesses, the journal is broken into many sections, each concerning a separate function of the business, such as sales, purchases, accounts receivable, accounts payable, sales return, purchases return, and cash. Books from which or to which postings are made are known as principal books. Another class, called auxiliary books, includes invoice, inventory, order, cash, sales, bill, and check-books. Single-entry bookkeeping enters all debits and credits in a single set of columns in a journal and labels each entry *Dr* (debit) or *Cr* (credit). Thus in a single entry only one element of a transaction is entered. Single-entry bookkeeping fails to give detailed information as to the sources of gain or loss. The slip system uses carbon copies of original invoices, or slips, to be arranged as convenient, or the slips themselves constitute the original entries and are kept in filing cabinets. Card ledgers have each account on a separate card in a file case. The slip system, card ledgers, and loose-leaf ledgers are adapted to the use of bookkeeping machines. Such equipment ranges from the simple adding machine to the high-speed electronic computer, the use of which has revolutionized bookkeeping. All of the routine operations and most of the more complicated procedures, except overall organization of the accounts, can be performed by computers. The Babylonians, Egyptians, Greeks, and Romans kept business records. Double entry seems to have been first developed by the people of N Italy during the great commercial expansion of the 14th and 15th cent. and has consequently been called the Italian method. The system then spread to the Netherlands, England, and elsewhere. Single entry developed later. See also ACCOUNTING, AUDITING. A standard work is A G Hall, *Introduction to Modern Bookkeeping* (2d ed 1970).

book lung, terrestrial respiratory organ characteristic of arachnids such as scorpions and primitive spiders. Each book lung consists of hollow flat plates. Air bathes the outer surface of the plates and blood circulates within them, facilitating the exchange of gases. In most species, adequate gas exchange occurs without any muscular movement to ventilate the lung.

Book of Changes (I Ching), classic ancient Chinese book of prophecy and wisdom. The oldest parts of its text are thought to have attained their present form in the century before Confucius. Its images and concepts were taken from mythology, history, and poetry of earlier ages and from the individual insights of the book's original authors. The *I Ching* consists of eight trigrams, corresponding to the powers of nature, which according to legend were copied by an emperor from the back of a river creature. The trigrams are used to interpret the future with the textual help of supplementary definitions, intuitions, and Confucian commentary. The best-known English edition is that by Cary F. Baynes (3d ed 1970), it is a translation of the German version by Richard Wilhelm.

Book of Common Prayer, title given to the service book used in the Church of England and in other churches of the Anglican Communion. The first complete English Book of Common Prayer was produced, mainly by Thomas Cranmer, in 1549 under Edward VI. Essentially it was a selection and translation from the breviary and the missal, with some additions from other sources. It was made compulsory by the Act of Uniformity (1549). Revision, undertaken by Cranmer, resulted in the Prayer Book of 1552, which showed the influence of foreign reformers then resident in England, for it made possible a wide diversity of views regarding the Eucharist, all justified by this official service book. The prayer book was in use only about eight months before Queen Mary's repeal legislation restored Roman Catholicism in England. In 1559, under Elizabeth I, the Prayer Book of 1552 was restored in a slightly altered version. From 1645 to 1660, under the Commonwealth and Protectorate, the prayer book was suppressed. In a new revision after the Restoration, it was again declared the only legal service book for use in England by an Act of Uniformity (1662). Alterations in the 1662 revision were largely those making for liturgical improvement. In 1927 a revised form was submitted to Parliament, whose approval was (and is) still required, and passed by the House of Lords but rejected by the Commons, it was resubmitted (with certain modifications) in 1928 and

again rejected. Nonetheless, the revised prayer book was quite widely adopted in the Church of England with episcopal approval. This situation was finally legalized by the Prayer Book Measure, passed by Parliament in 1965. In addition to authorizing revisions already in use, the act approved the experimental use of new forms of worship drawn up by a liturgical commission. In 1789, when the first General Convention of the Protestant Episcopal Church in the United States met, a revised version of the Book of Common Prayer was adopted, it embodied such changes as were required by the new conditions. In the U.S. Episcopal Church, as in other churches of the Anglican Communion over which the British Parliament has no control, there has been greater freedom in liturgical revision. See histories of the prayer book by J. H. Blunt (1868), F. E. Brightman (2d ed 1921, repr 1970), W. K. Lowther Clarke (1932, repr 1959), and Verney Johnstone, Ernest Evans, and L. C. Lewis (1949), J. W. Suter and G. J. Cleaveland, *The American Book of Common Prayer* (1949), M. H. Shepherd, *The Oxford American Prayer Book Commentary* (1950), for a comparison of revisions, see J. H. Arnold, ed., *Anglican Liturgies* (1939).

Book of Concord, name under which the collected documents of the authoritative confessions of faith of the Lutheran Church were published in 1580, the 50th anniversary of the Augsburg Confession. The Apostles', Nicene, and Athanasian creeds were included with the particular Lutheran confessions that had appeared from 1530 to 1580. These were the Augsburg Confession, Apology of the Augsburg Confession, Schmalkald Articles, Luther's Larger and Smaller Catechisms, and the Formula of Concord.

book of hours, form of prayer book developed in the 14th cent. from the prayers of clerics appended to the main service. The subjects of the miniature illustrations (see MINIATURE PAINTING) were frequently derived from the appendix of the Psalter. The book of hours served as a devotional work containing various prayers and meditations appropriate to seasons, months, days of the week, and hours of the day. Many such books are masterpieces of illumination and were symbols of refinement and wealth in fashionable houses of the 15th cent. Jean, duc de Berry, was among the most renowned collectors of books of hours, and his *Tres Riches Heures* (Musée Condé, Chantilly), illustrated in part by the LIMBOURG BROTHERS (c 1415), is among the greatest achievements in this genre.

Book of Kells: see CEANANNUS MOR.

Book of the Dead, term used to describe Egyptian funerary literature. The texts consist of charms, spells, and formulas for use by the deceased in the afterworld and contain many of the basic ideas of EGYPTIAN RELIGION. At first inscribed on the stone sarcophagi, the texts were later written on papyrus and placed inside the mummy case. The earliest collection, known as the Helopolitan Recension, dates from the XVIII dynasty (1580-1350 B.C.). It also contains selections from the two previous collections of Egyptian religious literature—the Coffin Texts of the Middle Kingdom (c 2000 B.C.) and the Pyramid Texts of the Old Kingdom (c 2600-2300 B.C.). The Theban Recension, a text that may be contemporary or slightly later, is distinguished by its distinctive format. There are several noteworthy papyri, valuable for their art. Among them are the *Papyrus of Ani* and *The Book of the Dead of Hunefer*. The two most celebrated English translations were made by Sir Peter le Page Renouf (1892-97) and Sir E. Wallis Budge (1895, repr 1967).

bookplate, label pasted in a book to indicate ownership, also called *ex libris* [Lat., =from the books of]. The bookplate is usually of paper on which heraldic or other designs are engraved or printed. The earliest printed bookplates date from c 1480 in Germany. Dürer and Holbein designed and engraved a number of bookplates. A Stephen Daye bookplate of 1642 may have been among the first printed in the United States, the John Cotton plate of 1674 certainly was. Paul Revere was well known for his bookplate engravings, as was Nathaniel Hurd. The practice of designing bookplates flourished throughout the 18th and 19th cent. Fine examples are still being produced mainly for collectors and connoisseurs by a number of graphic artists including Leonard Baskin and Peter Lippman. See J. B. L. Warren (Lord De Tabley), *Guide to the Study of Bookplates* (1880), Walter Hamilton, *Dated Bookplates* (1895), E. J. Kavanagh, ed., *Bookplates* (1966), C. D. Allen, *American Bookplates* (1895, repr 1968).

book publishing. The term *publishing* means, in the broadest sense, making something publicly

known. Usually it refers to the issuing of printed materials, such as books, magazines, periodicals, and the like. There is, however, great latitude of meaning, because publishing has never emerged, and cannot emerge, as a profession completely separate from printing on the one hand and the retailing of printed matter on the other. In the ancient world the making of extra copies of manuscripts for sale or distribution was widely practiced. There is some evidence of such treatment of manuscripts in Athens in the 5th cent. B.C., and the great libraries of the Hellenistic world encouraged the making of copies of manuscripts. In Rome there were booksellers—Horace mentions the *Sosii*, who were apparently brothers—and the copying of books by trained slaves reached considerable proportions. During imperial times there seems to have been an organized business of making and selling books. After the decline of Rome, the church was the sole preserver of learning, and the copying of manuscripts was limited to the monastic *scriptoria*. The humanists of the early Renaissance revived manuscript publication somewhat, but the immense labor required always kept reproduction at a minimum. With the introduction of printing to Europe in the middle of the 15th cent. (see TYPE), publishing at once sprang into lively existence. The author, the printer, and the publisher of a work were sometimes all the same man, as in the case of members of the Estienne family. The differentiation of printer, publisher, and bookseller appeared astonishingly early, however, as patrons of literature had books printed for distribution and booksellers had their printing done by others to meet the growing demand. The first important publishing house was that of the Elzevir family (see ELZEVR, LOUIS), which first issued a book in 1583. The Elzevirs were businessmen rather than scholars like the Estiennes, and the business of bookselling grew as literacy spread. Conversely, printing, publishing, and bookselling spread learning across the West. Religious controversy bred polemics, and arguments committed to broadsides, pamphlets, and books were handed out zealously and bought eagerly by partisans. Not long after the appearance of printing came censorship, one of the bugaboos of publishing ever since. The opponents of censorship today are taking a short view when they say that censorship is increasing, it was not so long ago, in the days of the Puritan Revolution in England, that a man could have his ears cropped for injudiciously publishing works critical of the authorities. An interest in knowing the future also increased the amount of literature issued by bookseller-publishers, and almanacs and the like were issued for the wider public. With the steadily broadening mass of readers, great publishing houses slowly came into being, many were well established by the late 18th cent. Leipzig had become a printing center in the 15th cent. and retained its eminence, along with Munich, most of the larger German cities had flourishing publishing concerns by the end of the 19th cent. Modern cities with long traditions of publishing are Vienna, Florence, Milan, Zurich, Paris, London, and Edinburgh. The rate of literacy is very high in the Scandinavian countries, and publishing occupies a relatively larger place in the economy than in most Western countries. In the United States, Boston, Philadelphia, and New York City early took the lead in publishing, with the weight ultimately swinging to New York, in the 20th cent. this lead has been challenged somewhat by Western cities. During the 19th cent. specialization became increasingly evident. Music publishing became almost a completely separate business, as did map publishing. Somewhat less rigidly divorced from general publishing are the houses specializing in religious books, in textbooks, in art books, in technical books, and in reprints. Frequently a house issuing works for the general trade may also have a strong textbook department, a strong juvenile department, or a good list of sports books. Some houses founded for more or less special purposes may broaden their scope, as is sometimes the case with the UNIVERSITY PRESS. In the late 19th and 20th cent. specialization has also grown within many of the houses themselves. Thus, editorial departments become distinct from production, and both may be quite separate from sales, promotion, and distribution. The multiplication of technical specialties often goes much farther. For example, the copy editor who prepares a book for printing may have nothing to do with the policy-setting editor who chooses or helps to choose books for publication. This splintering of functions varies from one publishing firm to another. The necessity for numerous skills and specialties, however, creates a financial problem, par-

ticularly in the United States, where the extent of the country and the generally high standard of living tend to have a bearing on publishing and restrict much of the book trade to titles aimed at a large mass market. Also, since books are a luxury item, a purchaser can dispense with them when hard times cut down his spending money. One partial solution of the problem in the United States has been the issuance of paperback books, long a standard form of book publication in Europe. During the 1930s and 1940s the paperback, pocket-size book rose meteorically in popularity in English-speaking countries, and in the 1950s the "quality" paperback appeared, presenting durable yet inexpensive editions of well-known writers. Indeed, it seemed probable that by 1980 the majority of books published would be paperbacks. Publishing has traditionally been an industry of numerous, small, family-owned firms. During the great publishing boom of the 1960s, however, American publishing houses were continually being bought by and consolidated with other companies. For example, Rinehart & Company and the John C. Winston Company were purchased by Henry Holt to form Holt, Rinehart & Winston, Inc. In addition, publishing firms were being taken over by conglomerate companies, e.g., Holt, Rinehart & Winston, Inc., was purchased by the Columbia Broadcasting System. During the 1960s the publishing industry expanded considerably: in 1963 total book sales were \$1.5 billion, and in 1972, despite a cutback in federal school library funds, sales totaled \$3.2 billion (some of the increase due to inflation) with a total of 37,000 titles sold. By the mid-1970s, however, it was evident that the effects of inflation and recession were causing the industry to contract. Companies were cutting their publication lists drastically, and many announced that they would no longer publish first novels by unknown authors. Historically, publishers cooperated in having copy-right laws passed to halt pirating of books and succeeded in establishing considerable regulation of book sales to enforce fixed prices. There are today active associations among publishers, the most notable in the United States being the American Book Publishers Council. In addition certain associations present awards for books of unusual merit, e.g., the National Book Committee presented the National Book Awards in five categories: fiction, poetry, arts and letters, history and biography, and science, philosophy, and religion. For material on magazine and newspaper publishing see JOURNALISM, NEWSPAPER, PERIODICAL; see also BOOK COLLECTING, CHILDREN'S LITERATURE. See Chandler Grannis, ed., *What Happens in Book Publishing* (2d ed. 1967); H. S. Bailey, Jr., *The Art and Science of Book Publishing* (1970); A. P. Wales, ed., *Classified World Directory of Publishing* (1971); J. W. Tebbel, *A History of Book Publishing in the United States* (1972).

bookworm, popular name for the larvae of several beetles that bore through books, e.g., the drugstore, spider, and deathwatch beetles. Almost any insect that feeds on dry, starchy material (e.g., the book louse and the silverfish) may damage books.

Boole, George, 1815-64, English mathematician and logician. He became professor at Queen's College, Cork, in 1849. Boole wrote *An Investigation of the Laws of Thought* (1854) and works on calculus and differential equations. He developed a form of SYMBOLIC LOGIC, called Boolean algebra, that is of fundamental importance in the study of the foundations of pure mathematics and is also at the basis of computer technology.

boomerang (bōō'marāng'), special form of throwing stick, used mainly by the aborigines of Australia. Other forms of throwing sticks were used by the peoples of ancient Egypt, Ethiopia, and India and by the Indians of the SW United States. The boomerang is sickle-shaped with arms slightly curved in opposite directions as in a propeller. The trajectory of a boomerang is usually an arc, but in some cases it is a full circle. The boomerang of the Australian aborigines (from whom the name is derived) is made in two types. The smaller boomerang, 12 to 30 in. (30.5 to 76.2 cm) long, is used only for sport and is thrown so that it returns to the thrower. The larger war boomerang is 24 to 36 in. (61 to 91.4 cm) long and does not return, it is used for hunting and warfare.

Boone, Daniel, 1734-1820, American frontiersman, b. Oley (now Exeter) township, near Reading, Pa. The Boones, English Quakers, left Pennsylvania in 1750 and settled (1751 or 1752) in the Yadkin valley of North Carolina. Daniel served as a wagoner in Braddock's ill-fated expedition (1755) against Fort Duquesne (Pittsburgh) and almost certainly took part in Gen. John Forbes's successful march on the

same place in 1758. He became interested in Florida, but his wife, the former Rebecca Bryan, whom he married in 1756, refused to accompany him. He explored (1769-71) the Kentucky region thoroughly, and its prospects delighted him. Indian attacks turned back his first colonizing attempt (1773), but in March, 1775, as advance agent for Richard HENDERSON and the TRANSYLVANIA COMPANY and with an armed band of 30 men, he blazed the famous WILDERNESS ROAD and founded Boonesboro (or Boonesborough) on the Kentucky River. Henderson arrived in a few weeks with additional settlers, and later in the same season Boone guided a second party, including his family. When Kentucky was made a county of Virginia in 1776, he was elected a captain of militia. In the American Revolution, while on an expedition to find salt in the Blue Licks on the Licking River, Boone and his party were captured (Feb., 1778) by Shawnee Indians and taken to British headquarters at Detroit. Highly regarded by the Indians, he was adopted as a member of the tribe. He led his captors to think that he would prevail on the other settlers to surrender, but, after four months of captivity, he escaped in time to prepare Boonesboro for an attack by the Indians, which failed. A disgruntled element charged Boone with disloyalty, and although he was promptly acquitted and elected major, he left Boonesboro and, after collecting his family, which had returned to North Carolina after his capture, founded (1779) a new settlement, Boone's Station, near what is now Athens, Ky. He served several terms as representative in the Virginia legislature. His titles to large tracts of land were adjudged imperfect, and despite his services to Kentucky he lost his best holdings through ejectment suits. Disgusted, he and Rebecca followed (1799) a son to Missouri, where the Spanish government granted him a large tract in the Femme Osage valley and made him district magistrate. When the United States assumed jurisdiction over this territory after the Louisiana Purchase (1803), his land titles were again found to be defective, but the direct intercession of Congress (1814) restored part of his acreage. His adventures became well known through the so-called autobiographical account that appeared in the widely read *Discovery, Settlement, and Present State of Kentucke* (1784), by John Filson, and Lord Byron's verses on him in *Don Juan* gave his name international prominence. Historical scholarship has disproved many of the legends about him, nevertheless these still attest to those qualities of courage and determination that earned him enduring popularity. See biographies by John Bakeless (1965), R. G. Thwaites (1963, repr. 1971), and R. E. McDowell (1972).

Boone, city (1970 pop. 12,468), seat of Boone co., central Iowa, on the Des Moines River, inc. 1865. It is a railroad and industrial center with plants making machinery, steel fabrications, and plastic signs. It was laid out (1865) by the railroad, which built a long, high double-track bridge there. In 1887 it annexed the nearby rival town of Boonesboro (founded 1851). A junior college is in Boone, and a state park is nearby.

Boonesboro, former settlement, central Ky., on the Kentucky River. It was named for Daniel BOONE, who in 1775 built a small fort there under orders from the TRANSYLVANIA COMPANY, organized by the American colonizer Richard HENDERSON. The seat of the government of Transylvania for several years, Boonesboro was later abandoned because of repeated Indian attacks.

boot. See SHOE.

Bootes (bō-ō'tēz) [Gr., =the herdsman], northern CONSTELLATION located to the SE of the Big Dipper in Ursa Major and W of Corona Borealis, the Northern Crown. It contains the brilliant orange star ARCTURUS. The figure traditionally associated with Bootes shows a man holding a staff in one hand and two leashed dogs in the other (the Hunting Dogs of the constellation Canes Venatici). Bootes is also known as the Keeper of the Bear because it follows Ursa Major, the Large Bear. It reaches its highest point in the evening sky in June.

Booth, family prominent in the SALVATION ARMY, founded by William BOOTH. His wife, Catherine Mumford Booth (1829-90), whom he married in 1855, played a leading part in the foundation and development of the Salvation Army, devoting herself particularly to the work among women and children. Their eldest son, Bramwell Booth (1856-1929), succeeded his father in 1912 as general of the Salvation Army. Another son, Ballington Booth (1859-1940), was commander (1885-87) of the Army in Australia and then commander (1887-96) in the

United States, where his wife, Maud Charlesworth Ballington Booth (1865-1948), shared his labors, in 1896 they withdrew from the Salvation Army and founded the VOLUNTEERS OF AMERICA. A daughter of William Booth, Emma Moss Booth-Tucker (1860-1903), was in charge (1880-88) of the international training homes of the Salvation Army. She and her husband, Frederick St. George de Latour Booth-Tucker (1853-1929), who had resigned from the India civil service to join the Salvation Army, jointly commanded the Army in the United States from 1896 until her death in 1903. See BOOTH, EVANGELINE CORY.

Booth, Charles, 1840-1916, English social investigator, pioneer in developing the social survey method. Aided by the notable social scientist Beatrice Potter WEBB, he made an exhaustive statistical study of poverty in London, showing its extent, causes, and location. This was published as *Life and Labour of the People in London* (17 vol., 1891-1903). Booth was also active in reform groups interested in the poor and aged. His other writings include *Old Age Pensions and the Aged Poor* (1899) and *Industrial Unrest and Trade Union Policy* (1914). See his selected writings (1967), study by Thomas Simey and Margaret Simey (1960).

Booth, Edwin, 1833-93, one of the first great American actors, b. "Tudor Hall," near Bel Air, Md. The second son of Junius Brutus BOOTH, he made his debut at the Boston Museum (1849) as Tresselt to his father's Richard III. After years of touring with his father in California, Hawaii, and Australia, in 1857 he appeared in New York City, being particularly successful as Richard III. His style was gentle and restrained, a far cry from the bombast of Edwin Forrest, and his portrayals were exquisitely detailed. He toured (1861-63) England and on the death of his first wife returned to New York and leased the Winter Garden Theatre, where in 1864 he presented his famous 100-night run of *Hamlet* (a record which was not broken until John Barrymore's 101-night run in 1922). His magnificent Shakespearean productions at the Winter Garden terminated in 1865, when his brother John Wilkes BOOTH assassinated President Lincoln. Because of the scandal that followed, Edwin Booth was forced to retire, but he returned to the Winter Garden in 1866. When it burned down, he built Booth's Theatre, New York (1869), where he acted with his second wife, Mary McVicker, and presented such stars as Salvini and Ristori in Shakespeare until his bankruptcy in 1873. He again toured (1880-82) England, at one time alternating with Henry Irving in the roles of Iago and Othello. Associated with Lawrence Barrett, he later appeared (1889-90) with Helena Modjeska. In 1891 he made his last appearance at the Brooklyn Academy of Music as Hamlet. The founder (1888) and first president of the Players' Club, he bequeathed his New York house to the organization. See his letters, ed. by D. J. Watermeier (1971), recollections by his daughter Edwina Booth Grossman (1894, repr. 1969), biographies by Eleanor Ruggles (1953), William Winter (1893, repr. 1968), and Richard Lockridge (1932, repr. 1971), C. H. Shattuck, *The Hamlet of Edwin Booth* (1969).

Booth, Evangeline Cory, 1865-1950, general of the SALVATION ARMY, b. England, daughter of William Booth. At the age of 17, she began evangelistic preaching. She was field commissioner of the Salvation Army in London for five years, commander of the Army in Canada from 1895 to 1904, and commander in the United States from 1904 to 1934. Booth was general of the international Salvation Army from 1934 to 1939. Her works include *Love Is All* (1925), *Songs of the Evangel* (1927), and *Woman* (1930). See BOOTH, family. See biography by P. W. Wilson (1948).

Booth, John Wilkes (wīlks), 1838-65, American actor, the assassin of Abraham LINCOLN, b. near Bel Air, Md., son of Junius Brutus Booth and brother of Edwin Booth. He made his debut at the age of 17 in Baltimore, toured widely, and soon became a star, winning acclaim for his Shakespearean roles. Unlike the rest of his family, Booth was an ardent Confederate sympathizer. He had joined (1859) the Virginia militia company that assisted in the capture of John Brown, but he did not enter Confederate service in the Civil War. Instead, he continued with his theatrical career in the North. For some six months in 1864-65 Booth, an egomaniac, laid plans to abduct Lincoln and carry him to Richmond, a scheme that was frustrated when Lincoln failed to appear (March 20, 1865) at the spot where Booth and his six fellow conspirators lay in wait. On Good Friday, April 14, 1865, Booth, having learned that Lincoln planned to

attend Laura Keane's performance of *Our American Cousin* at Ford's Theater in Washington on that evening, plotted the assassination of the President, Vice President Andrew Johnson, and Secretary of State William H. Seward. Lewis Thornton Powell, who called himself Payne, guided by David E. Herold, seriously wounded Seward and three others at Seward's house. George A. Atzerodt, assigned to Johnson, lost his nerve. The main act, Booth, naturally reserved for himself. His crime was committed shortly after 10 P.M., when he entered the presidential box unobserved, suddenly shot Lincoln, and vaulted to the stage (breaking his left leg in the process) shouting "Sic semper tyrannis! The South is avenged!" He then went behind the scenes and down the back stairs to a waiting horse upon which he made his escape. Not until April 26, after a hysterical two-week search by the army and secret service forces, was he discovered, hiding in a barn on Garrett's farm near Bowling Green, Caroline co., Va. The barn was set afire and Booth was either shot by his pursuers or shot himself rather than surrender. Although it has been said that no dead body was ever more definitely identified, the myth—completely unsupported by evidence—that Booth escaped has persisted. For the fate of others involved, see SURRATT, MARY EUGENIA. See memoir by his sister, Asia Booth Clarke, biographies by Philip Van Doren Stern (rev. ed. 1955) and Francis Wilson (1929, repr. 1972).

Booth, Junius Brutus, 1796–1852, Anglo-American actor. After experience in the provinces, he appeared at Covent Garden. In 1817, with his portrayal of Richard III, he established himself as a rival of Edmund Kean. In 1821 he emigrated to the United States, where he spent most of his remaining life. An imposing tragic actor with a full, rich voice and a rugged grandeur, Booth had an erratic personal life complicated by intemperate habits. He had three sons of whom two were in the theater: Junius Brutus Booth, Jr., who excelled as a manager and Edwin BOOTH, who surpassed his father as an actor. His third son was the assassin of President Lincoln, John Wilkes BOOTH. See Stanley Kimmel, *The Mad Booths of Maryland* (2d ed., 1969).

Booth, William, 1829–1912, English religious leader, founder and first general of the SALVATION ARMY, b. Nottingham. Originally a local preacher for the Wesleyan Methodists, he went (1849) to London and entered (1852) the ministry of the Methodist New Connexion Church, but in 1861 he began independent evangelistic work. In 1865, with the able help of his wife, Catherine Booth, he started the East London Revival Society (soon known as the Christian Mission) in Whitechapel, London. The Christian Mission developed in 1878 into the Salvation Army. General Booth, a remarkable organizer, traveled widely, extending the field of labor to other parts of the world and winning recognition wherever he went. In 1890 he published *In Darkest England and the Way Out* in collaboration with W. T. Stead. See BOOTH, family, BOOTH, EVANGELINE CORY. See biographies by G. S. Railton (2d ed. 1912), Harold Begbie (1920), St. John Ervine (2 vol., 1934), Harold C. Steele (1954), Edward Bishop (1964), and Richard Collier (1965).

Boothia Peninsula (bōō'thēa), 12,483 sq mi (32,331 sq km), S central Franklin dist., Northwest Territories, Canada, the northernmost (71°58'N) tip of the North American mainland. It is almost an island, being connected with the mainland only by the narrow Isthmus of Boothia. Topographically and in climate it is like the islands of the Arctic Archipelago. A narrow strait separates it in the north from Somerset Island. To the east the Gulf of Boothia separates it from Baffin Island. It is virtually uninhabited except for a few hundred settlers at Spence Bay and Thom Bay. The peninsula was discovered and explored (1829–33) by John Ross, the British explorer, and named for a patron of the expedition, Sir Felix Booth. Near the southwest end the expedition of Sir John Franklin, the British explorer, ended in tragedy. Roald Amundsen, a Norwegian, explored the peninsula in 1903–5.

Bootle, county borough (1971 pop. 74,208), Lancashire, NW England, at the mouth of the Mersey River. It has extensive docks adjacent to those of Liverpool. Besides shipping, Bootle's industries include tanning, tin smelting, engineering, and flour milling. In 1974, the borough became part of the new metropolitan county of Merseyside.

bootlegging, in the United States, the illegal distribution or production of liquor and other highly taxed goods. First practiced when liquor taxes were high, bootlegging was instrumental in defeating early attempts to regulate the liquor business by tax-

ation. After the appearance of local and state option, those areas that voted to prohibit liquor were supplied with bootlegged liquor. There was also considerable smuggling from foreign countries in order to evade customs duties. In the period of PROHIBITION (1920–33) these activities increased greatly, and by 1930 they were well organized as a large illegitimate industry. Certain areas were dominated by gangs that fought to defend or extend their territory. Infamous gangsters such as AL CAPONE in Chicago and Legs Diamond in New York City were heavily involved in bootlegging. The retail outlet in the prohibition period was the speakeasy, though a house-to-house delivery system to established customers was also well developed. A high degree of organization also prevailed in international liquor SMUGGLING. The combination of graft and violence accompanying this industry became so intolerable that it was an important factor in the final repeal of prohibition. Bootlegging remains a practice in many areas where prohibition is still in practice. Other highly taxed products may also become a target for bootleggers, e.g., a system of bootlegging untaxed cigarettes into New York City existed in the early 1970s. See Kenneth Allsop, *The Bootleggers* (1961, repr. 1970), Andrew Sinclair, *Prohibition: The Era of Excess* (1962, repr. 1964), Harold Waters, *Smugglers of Spirits* (1971).

Booz (bō'ōz), the same as BOAZ 1.

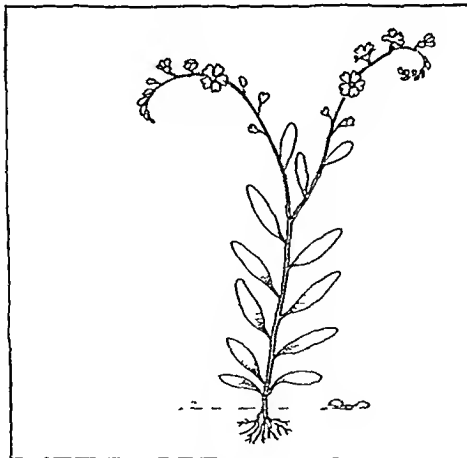
Bopp, Franz (fränts bōp), 1791–1867, German philologist. A professor at the Univ. of Berlin from 1821 to 1864, he did research in many languages and earned a great reputation as a scholar by demonstrating the relationship of the Indo-European languages in his *Vergleichende Grammatik* [comparative grammar] (1833–52).

Bora, Katharina von: see LUTHER, MARTIN

Bora-Bora (bō'ra bō'ra), volcanic island, 15 sq mi (39 sq km), South Pacific, in the Leeward group of the SOCIETY ISLANDS, FRENCH POLYNESIA. It is a mountainous island, with Mt. Taimanu (2,379 ft/725 m) the highest peak. Bora-Bora has a good harbor, which is a large lagoon surrounded by coral islets. Copra, oranges, and vanilla are produced on the island.

boracic acid: see BORIC ACID

borage (bō'rāj, bū'r-), common name for the Boraginaceae, a family of widely distributed herbs and some tropical shrubs or trees characterized by rough or hairy stems, four-part fruits, and usually fragrant



Forget-me-not, Myosotis virginica, a member of the borage family

blossoms. Its species are most abundant in the Mediterranean area, but many are native to North America and are cultivated, e.g., the Virginia cowslip, or Virginia bluebell (*Mertensia virginica*), species of forget-me-not (genus *Myosotis*), and species of HELOTROPE (genus *Heliotropium*). The family is classified in the division MAGNOLIOPHYTES, class Magnoliopsida, order Lamiales.

Borah, William Edgar, 1865–1940, U.S. Senator (1907–40), b. near Fairfield, Ill. Admitted to the bar in Kansas in 1887, after 1890 he became prominent in law and politics at Boise, Idaho. Shortly after election to the Senate, he gained (1907) national attention by his prosecution of William HAYWOOD and two other leaders of the Western Federation of Miners, who were accused of conspiring to murder (1905) ex-Governor Frank STEUBENBERG. In the Senate he was outstanding as an orator, as an expounder of the Constitution, and as a Republican notable for

his independent stands (he was sometimes called "the great opposer"). Borah was one of the Senate leaders in defeating the Versailles Treaty and the League of Nations after World War I. From 1924 to 1933 he was chairman of the Senate Committee on Foreign Affairs, and his major interest was in foreign policy. He early asked for recognition of the USSR, favored the collection of war debts, and opposed intervention in Latin American countries to protect U.S. investments. An advocate of disarmament and the outlawing of war, he suggested the Washington Conference of 1921–22 and promoted the Kellogg-Briand Pact, in 1939 he fought revision of the Neutrality Act. In domestic affairs, Borah staunchly favored prohibition. He spoke against economic monopoly and for enforcement of the antitrust laws, but he was opposed to extension of governmental powers and disapproved of the National Recovery Administration and many other New Deal measures. See biographies by C. O. Johnson (1936, new ed. 1967, repr. 1969) and M. C. McKenna (1961), studies by J. C. Vinson (1957), R. J. Maddox (1969), and LeRoy Ashby (1972).

Borah, Mount [for William E. Borah], peak, 12,662 ft (3,859 m) high, central Idaho, in the Lost River Mts., highest point in the state.

Borås (bōōrōs'), city (1970 pop. 73,475), Älvsborg co., SW Sweden, on the Viskan River. It is a transportation and commercial center and has numerous cotton and woolen textile factories. Borås was founded in 1632 by Gustavus II.

borax or sodium tetraborate decahydrate (sō'dēam tē'trabōr'āt dēk'ahī'drāt), chemical compound, Na₂B₄O₇ · 10H₂O, sp. gr. 1.73, slightly soluble in cold water, very soluble in hot water, insoluble in acids. Borax is a colorless, monoclinic crystalline salt; it also occurs as a white powder. It readily effloresces, especially on heating. It loses all water of hydration when heated above 320°C and fuses when heated above 740°C, a "borax bead" so formed is used in chemical analysis (see BEAD TEST). Borax is widely and diversely used, e.g., as a mild antiseptic, a cleansing agent, a water softener, a corrosion inhibitor for antifreeze, a flux for silver soldering, and in the manufacture of enamels, shellacs, heat-resistant glass (e.g., Pyrex), fertilizers, pharmaceuticals, and other chemicals. It is sometimes used as a preservative but is toxic if consumed in large doses. Naturally occurring borax (sometimes called tincal) is found in large deposits in the W United States (Borax Lake in Death Valley, Calif., Nevada, and Oregon) and in Tibet. Borax can also be obtained from borate minerals such as kernite, colemanite, or ulexite. California is the chief source of borate minerals in the United States.

borax bead test: see BEAD TEST

Borchgrevink, Carsten Egeberg (kar'stan ā'gōbēr bōrk'grā'vīngk), 1864–1934, Norwegian-Australian antarctic explorer. He emigrated to Australia in 1888, and in 1894 he went south in a whaling vessel and at Cape Adare took part in the first landing on the continent of Antarctica. In 1898 he left England in command of a British-sponsored expedition on the Southern Cross. He disembarked at Cape Adare and sent the ship back to New Zealand. To prove that man could withstand the harsh climate of Antarctica, he and his companions spent the winter on the continent, the first to do so. In the spring he explored the Ross Sea, did extensive mapping of the Ross Barrier, and described its flora and fauna. See his *First on the Antarctic Continent* (1901).

Bordeaux (bōrdō'), city (1968 pop. 270,996), capital of Gironde dept., SW France, on the Garonne River. Bordeaux is a major economic and cultural center, and a busy port accessible to oceangoing ships from the Atlantic through the Gironde River. Although Bordeaux has important shipyards and industries (machines, chemicals, and airplanes), its principal source of wealth is the wine trade. Bordeaux wine is the generic name of the wine produced in the Bordelais region, which is dotted with châteaux that give their names to many vineyards. Known as Burdigala by the Romans, Bordeaux was the capital of the province of Aquitania and a prosperous commercial city. It became an archiepiscopal see in the 4th cent. Bordeaux's importance declined under Visigothic and Frankish rule (c. 5th cent.), but was revived when the city became (11th cent.) the seat of the dukes of AQUITAINE. Eleanor of Aquitaine, who was born there, precipitated through her successive marriages to Louis VII of France and Henry II of England the long struggle between the two nations. As a result of these wars Bordeaux came under English rule, which lasted from 1154 to 1453. The city's commercial importance dates from this pe-

riod Reconquered by France, Bordeaux became capital of the province of Guienne Louis XI established the powerful PARLEMENT of Bordeaux and granted great privileges to the university founded (1441) by Pope Eugene IV The intellectual reputation of Bordeaux was made by Montaigne and Montesquieu, who were born nearby and who were both magistrates in the city Bordeaux reached the height of its prosperity in the 18th cent Its relations with England were always close, many English firms exporting wine and spirits established themselves in the city Bordeaux was the center of the GIRONDIS in the French Revolution and the site of the National Assembly of 1871 that established the Third Republic In 1914 and again in 1940, at the onset of the World Wars, the city was the temporary seat of the French government The Place des Quinconces, with its statues of Montaigne and Montesquieu, dominates the center of the city Other points of interest are the Gothic Cathedral of St Andre, several art museums, and some elegant 18th-century buildings designed by Victor Louis and Jacques Gabriel An engineering school and a research center studying mass-media communications are also in Bordeaux

Bordeaux mixture (bördö'), fungicide consisting of CUPRIC SULFATE and lime in water Its fungicidal activity is associated with the slow formation of copper compounds, the ultimate toxicant being the cupric ion It originated in France in 1885 and was widely used for spraying orchards, dusting crops, and treating seeds until c 1930 Since it was found that Bordeaux mixture frequently caused russetting of fruit, injured the leaves, and led to premature defoliation, it has been generally replaced by solutions made with powdered fixed copper Sal soda Bordeaux, or Burgundy mixture, containing cupric sulfate and sodium carbonate (sal soda), was formerly used to spray small fruits but has been replaced by more convenient preparations See PESTICIDE

Borden, Sir Frederick William, 1847-1917, Canadian statesman, b Cornwallis, NS He entered (1874) the Canadian House of Commons as a Liberal and served (1896-1911) as Wilfrid Laurier's minister of militia and defense During his ministry, the last British troops were withdrawn from Canada (1901), the practice of appointing a British general to command the Canadian militia was ended, and Canada took control from Great Britain of the naval bases of Halifax and Esquimalt

Borden, Gail, 1801-74, American dairyman, surveyor, and inventor, b Norwich, NY He was for several years a deputy surveyor in Mississippi, afterward he joined the colony of Stephen F AUSTIN in Texas There, besides farming, stock-raising, and newspaper activities, he superintended the surveying of lands for Austin He laid out the city of Galveston, where he became collector of customs After returning (1851) to New York, he worked on a process of evaporating milk, which he patented in 1856 Jeremiah Milbank backed him financially, and the Borden Milk Company (now Borden, Inc) opened its first evaporating plant in 1858 During the Civil War his product was found to be of the greatest value for the army, and its use spread rapidly afterward Borden subsequently also patented processes for concentrating fruit juices and other beverages See biography by J B Frantz (1951)

Borden, Lizzie Andrew, 1860-1927, American woman accused of killing her father and her stepmother, b Fall River, Mass The elder Borden was hacked to death with an ax on Aug 4, 1892 Although Lizzie Borden claimed that she was out in the barn at the time, she was accused of the murders and tried The trial, which aroused great public interest, ended with a verdict of not guilty The case was never solved See E D Radin, *Lizzie Borden: The Untold Story* (1961), Victoria Lincoln, *Private Disgrace* (1967), Robert Sullivan, *Goodbye Lizzie Borden* (1974)

Borden, Sir Robert Laird, 1854-1937, Canadian political leader, prime minister during World War I, b Grand Pre, NS Called to the bar in 1878, he won a reputation as a constitutional lawyer He was elected to the House of Commons in 1896 and in 1901 succeeded Sir Charles Tupper as leader of the Conservative party He led the opposition until 1911, when Sir Wilfrid Laurier's Liberal government fell During the election campaign Borden had opposed the creation of a separate Canadian navy and had criticized Laurier's reciprocity agreement with the United States The agreement, which would have lowered tariffs between the two countries, was opposed by powerful economic interests in Canada

As prime minister, Borden headed a Conservative government until 1917 and a Union (coalition) government until his resignation in 1920 He is remembered for his leadership in carrying Canada through World War I and, subsequently, in defining the new status of the self-governing dominions in the British Empire Largely through his efforts the dominions were given separate representation in the League of Nations, and the Canadian Parliament ratified the treaties that resulted from the peace conference of 1919 Borden later represented Canada at the naval armament conference in Washington (1921-22) and in the League of Nations He was also chancellor of Queen's Univ (1924-30) His *Canadian Constitutional Studies* (1922) and *Canada in the Commonwealth* (1929) are significant works See his memoirs, ed by Henry Borden (1938), H A Wilson, *Imperial Policy of Sir Robert Borden* (1966)

Border, the, region surrounding the boundary between England and Scotland From the coast near Berwick along the Tweed River through the Cheviot Hills and on to Solway Firth, the narrow, rugged country is dotted with sites of battles between the Scots and the English The wild country figures much in literature—in legend, in folklore, and particularly in the Border ballads

border collie, breed of medium-sized, sheepherding dog developed in the British Isles It stands about 18 in (45.7 cm) high at the shoulder and weighs from 30 to 45 lb (13.6-20.4 kg) Its double coat consists of a soft, fuzzy underlayer and a harsh, very dense, wavy or slightly curly topcoat of varying lengths Its color is black with white around the neck and on the chest, face, feet, and tip of tail Bred for many years exclusively to develop its herding instinct, the border collie is unsurpassed as a sheep dog and has been used with equal success for herding cattle, swine, and poultry It is exhibited in the miscellaneous class at dog shows sanctioned by the American Kennel Club See DOG

border terrier, breed of hardy, medium-sized TERRIER developed in the Border districts of N England in the 18th and 19th cent It stands about 12 in (30 cm) high at the shoulder and weighs from 13½ to 15½ lb (6.1-6.9 kg) Its weather-resistant double coat is composed of a short, dense underlayer and a close-lying, very wiry topcoat It may be red, grizzle and tan, blue and tan, or wheaten in color, occasionally with a small amount of white on the chest The border terrier was bred to hunt and kill the large hill fox of its native Border districts and came to be used against a wide variety of vermin Raised today chiefly as a pet, it is a relatively rare breed in the United States See DOG

Bordet, Jules (zhul bördä'), 1870-1961, Belgian serologist and immunologist, M D Univ of Brussels, 1892 He became director of the Pasteur Institute in Brussels in 1901 and professor at the Univ of Brussels in 1907 With Octave Gengou he devised (1900) the technique of the complement-fixation reaction (applied by Wassermann to the diagnosis of syphilis) and discovered (1906) the bacillus of whooping cough For his work in immunity he received the 1919 Nobel Prize in Medicine

Bordone, Paris (pa-rēs bördō'nā), 1500-71, Venetian painter of the Renaissance, pupil of Titian Skillful in his use of color, he was particularly interested in variations of texture in fabric, as seen in his numerous portraits (Brera, Milan, National Gall, London, Louvre, Uffizi, and Vienna) Bordone's conception of space changed from a precise rendering of architectural settings in his famous *Fisherman Presenting the Ring to the Doge* (Academy, Venice) to a more contorted mannerist treatment in *Christ and the Doctors* (Gardner Mus., Boston) and the *Gloria* (Academy, Venice) He created many sensual mythological paintings, including *Diana and Minerva at the Forge of Vulcan* (National Gall of Art, Washington, D C)

bore, inrush of water that advances upstream with a wavelike front caused by the progress of incoming tide from a wide-mouthed bay into its narrower portion The tidal movement tends to be retarded by friction as it reaches the shallower water and meets the river current, it therefore piles up and forms a low wall of water that moves upstream with considerable force and velocity as the tide continues to rise In the mouth of the Amazon River a tidal bore known locally as the pororoca occurs every spring tide It has a wall of water from 5 to 15 ft (1.5-4.6 m) high and advances at a speed of from 10 to 15 mi (16-24 km) per hr The highest recorded bore (15 ft/4.6 m) is found in the Ch'ien-tang River near Hangchow, China Bores are found also in the Bay of Fundy, in Solway Firth, in the Severn, Seine, and Hooghly rivers, and in Hangchow Bay

Boreas (bōr'ēas) see EOS

borecole: see KALE

Borel, Félix Édouard Émile (fālēks' ādwar' āmēl' bōrēl'), 1871-1956, French mathematician He is noted for his work in infinitesimal calculus and the calculus of probabilities He was professor at the Univ of Paris (1904-41), director of the Henri Poincaré Institute (from 1927), and a representative in the French chamber of deputies (1924-36)

Borel, Petrus, pseud of Joseph-Pierre Borel D'Hauterive, 1809-59, French novelist, poet, and translator Although trained as an architect, he soon turned to writing Borel was the most extreme of the *bousingos*, a group of extravagant young romantic artists and writers He loathed the bourgeoisie and believed in the hatred of men for each other Among his works, whose aim was to shock, are *Rhapsodies* (1832) and *Madame Putip-her* (1839), both of which are horrifying and melodramic

Borelli, Giovanni Alfonso (jōvan'nē alfōn'sō bōrēl'le), 1608-79, Italian physiologist, physicist, astronomer, and mathematician, son of a Spanish infantryman His wide interests led to original contributions in many fields, including anatomy, epidemiology, the study of fermentation, volcanology, magnetism, fluid dynamics, and the observation of comets In his study of disease he concluded, against most contemporaries, that meteorological and astrological causes were not at work, but that something entered the body and could be remedied chemically In *Euclides restitutus* he reworked Euclid's *Elements* into a more concise form He is perhaps best known for his *De motu animalium* (1679), a study of the mechanical basis of respiration, circulation, and muscular contraction in animals

Boreman, Arthur Ingram, 1823-96, first governor of West Virginia (1863-69), b Waynesburg, Pa A member (1855-61) of the Virginia house of delegates, Boreman opposed secession and presided over the Wheeling Convention of June, 1861, which set up the loyal government of Virginia with Francis H PIERPONT as governor It was this government that consented to the partition of Virginia, and on June 20, 1863, Boreman was inaugurated as governor of the new state of West Virginia Re-elected governor in 1864 and 1866, he was elected in 1869 to the US Senate, where he served until 1875

Borenus, Tancred, 1885-1948, art historian and teacher, b Finland He became professor of the history of art at University College, London, in 1922 In 1933 he became director of the excavations of Clarendon Palace near Salisbury, England Borenus was managing editor of the *Burlington Magazine* from 1940 to 1945 Among his many publications are *The Painters of Vicenza* (1909), *The Iconography of St Thomas of Canterbury* (1929), and *Rembrandt Selected Paintings* (1942)

borer, name applied to various animals that are injurious because of their ability to penetrate plant or animal tissues Among insects, some borers are beetles, e.g., the flatheaded apple-tree borer, a serious pest of many shade and fruit trees, the roundheaded apple-tree borer, and the bronze birch, locust, elm, shot-hole, and poplar borers Other boring insects are moths that are harmful in the larval stage, e.g., the peach, currant, squash, lilac, and southern cornstalk borers and the European CORN BORER Marine borers include the boring sponge, certain marine worms, and some bivalve mollusks, e.g., the rock borer, the SHIPWORM, and the piddock, which are thought to secrete acids that dissolve rock and other substances The HAGFISH, or borer, is a marine pest that burrows into the bodies of other fish

Borgå (bōr'gō) or **Porvoo** (pōr'vō), city (1970 pop 16,684), Uusimaa prov., S central Finland, on the Gulf of Finland at the mouth of the Porvoonjoki River It is an export center for forest products and has plywood and cellulose mills, breweries, and a publishing industry A trade center in the early Middle Ages, it was chartered in 1350 In 1809, Alexander I of Russia granted Finland a constitution at Borgå Most of the population is Swedish-speaking The home and grave of the Finnish national poet J L Runeberg is in Borgå

Borger (bōr'gar), city (1970 pop 14,195), Hutchinson co., extreme N Texas, in the Panhandle, inc 1930 After the discovery of oil in 1925, Borger grew as the industrial center of a vast natural-gas and oil field In the area are refineries, carbon-black plants, synthetic-rubber factories, and related enterprises A junior college is in Borger

Borgerhout (bōrkharhout), city (1970 pop 49,002), Antwerp prov., N Belgium, on the Albert Canal, an industrial suburb of Antwerp

Borges, Jorge Luis (hòr'hā lōōēs' bôr'hās), 1899–, Argentine poet, critic and short-story writer, b. Buenos Aires. Borges has been widely hailed as the foremost contemporary Spanish American writer. He was educated in Switzerland and afterwards lived in Spain, where he became an exponent of *ultraísmo*, a poetic movement that followed the decline of MODERNISMO after World War I. *Ultraísmo* advocated the use of bold images and daring metaphors in an attempt to create pure poetry, divorced not only from the past but from reality. Borges, who brought the movement to Argentina, never adhered strictly to its tenets. He helped to found three avant-garde journals and served as director of the National Library and professor of English at the Univ. of Buenos Aires. His poems, collected in *Fervor de Buenos Aires* (1923), *Luna de enfrente* (1925), *Cuadernos San Martín* (1954), *Dreamtigers* (tr. 1964), *A Personal Anthology* (tr. 1967), *Selected Poems 1923–1967* (1972), and *In Praise of Darkness* (tr. 1974), are often inspired by events of daily life or episodes of Argentine history. Characterized by lyricism, imagination, and boldness, they are, in his own words, "spiritual adventures." His essays, collected in *Inquisiciones* (1925) and *Otras inquisiciones* (1960, tr. 1964), deal with philosophical problems and questions of literary criticism. His tales, ranging from metaphysical allegories and fantasies (e.g., *The Book of Imaginary Beings*, 1967, tr. 1969) to sophisticated detective yarns, reveal a wide variety of influences (Kafka, Chesterton, Virginia Woolf) but are nevertheless strikingly original. Major collections of his short stories include *Historia universal de la infancia* (1935, tr. 1972), *Ficciones* (1944, tr. 1962), *El Aleph* (1949, tr. 1970), *Extraordinary Tales* (1955, tr. 1971), and *Dr. Brodie's Report* (tr. 1972). *Labyrinths* (tr. 1962) is a collection of stories and selected writings in translation. See studies by A. M. Barrenechea (tr. 1965), R. J. Christ (1969), Carter Wheelock (1969), Jaime Alazraki (1971), L. Dunham and Ivar Ivask, ed., *The Cardinal Points of Borges* (1971). See also Richard Burgin, *Conversations with Jorge Luis Borges* (1969).

Borgese, Giuseppe Antonio (jōōzēp'ā antō'nyō bōrjā'zā), 1882–1952, Italian-American author, b. near Palermo, Ph.D. Univ. of Florence, 1903. From 1910 to 1931 he taught at the universities of Rome and Milan. An anti-Fascist, he emigrated to the United States in 1931 and was naturalized in 1938. He taught at Smith (1932–35) and the Univ. of Chicago (from 1936). Secretary of the Committee to Frame a World Constitution, he was the chief author of its Chicago draft (1947). All his activities—philosophic, poetic, political—were colored by his concept of spiritual unity or, in his word, *syntax*. His works of criticism, fiction, and poetry include the novel *Rube* (1921, tr. 1923) and, written in English, *Goliath*, *The March of Fascism* (1937) and *Common Cause* (1943).

Borghese (bōrgē'zā), Roman noble family, originally of Siena. It produced one pope, PAUL V, several cardinals, and many prominent citizens. The Borgheses were noted patrons of arts and letters. Scipione Cardinal Borghese built the fine Villa Borghese in Rome. Camillo Borghese, a general under Napoleon I, married his sister Pauline BONAPARTE.

Borghese Villa or **Villa Umberto I** (vēl'la ōōmbēr'io prēmō), summer palace built by Scipione Cardinal Borghese outside the Porta del Popolo, Rome. Begun in 1605, the villa was transformed in the 18th cent. into a more elaborate edifice. In 1806 it yielded much of its priceless art to Paris. It is now government owned and has become the repository for many of the paintings from the Borghese Palace.

Borgholm (bōr'yāhōlm'), town (1970 pop. 2,409), Kalmar co., SE Sweden, on Öland Island and on the Kalmarsund, an arm of the Baltic Sea. It is a seaside resort. Of note are the ruins of Borgholm castle (13th cent., rebuilt 16th–17th cent.), destroyed by fire in the early 19th cent.

Borgia (bōr'ja), Span. *Borja* (bōr'ha), Spanish-Italian noble family, originally from Aragon. When Alfonso de Borja, cardinal-archbishop of Valencia, was pope as Calixtus III (1455–58), several relatives followed him to Rome. His nephew Rodrigo became pope as ALEXANDER VI, and Rodrigo's illegitimate children were Cesare and Lucrezia Borgia, the later reputations of these Borgias made the family name a synonym for avarice and treachery. To the Spanish branch of the family belonged St. FRANCIS BORGIA and Francisco Borja (1581–1658), a Spanish general and viceroy of Peru. The direct line of the family, whose senior members bore the title duke of Gandia, died out in the 18th cent. See study by E. R. Chamberlin (1974).

Borgia, Cesare or **Caesar** (chā'zārā), 1476–1507, Italian soldier and politician, younger son of Pope ALEXANDER VI and an outstanding figure of the Italian Renaissance. Throughout his pontificate Alexander VI used his position to aggrandize his son and establish a papal empire in N and central Italy. Archbishop of Valencia and a cardinal by 1493, Cesare resigned the dignity after the death (1498) of his elder brother, the duke of Gandia, in whose murder he was probably involved. He now began his political career as papal legate to France. He struck an alliance with King Louis XII who made him duke of Valentinois (Valence), and married (1499) Charlotte d'Albret, a sister of the king of Navarre. The French having overrun Italy (see ITALIAN WARS), Cesare, with his father's encouragement, subdued (1499–1500) the cities of the ROMAGNA one by one. Made duke of Romagna (1501) by the pope, Cesare also seized (1502) Piombino, Elba, Camerino, and the duchy of Urbino, and he crowned his achievements by artfully luring his chief enemies to the castle of Senigallia, where he had some of them strangled. By killing his enemies, packing the college of cardinals, pushing his conquests as fast as possible, and buying the loyalty of the Roman gentry, he had hoped to make his position independent of the papacy or at least to insure that the election of any future pope would be to his liking. But before his schemes could be realized, Cesare was struck in 1503 by the same poison (or illness) that suddenly killed his father. Cesare recovered, however, his political power had suffered a fatal blow. Pius III, after a short reign, was succeeded by JULIUS II, an implacable enemy of Cesare Borgia. Louis XII then turned against him. Julius demanded the immediate return of what territory remained to Cesare and had him temporarily arrested. Returning to Naples, Cesare was soon arrested by the Spanish governor there as the result of collusion between Julius II and the Spanish rulers, Ferdinand and Isabella. Sent to prison in Spain, he escaped and finally found refuge (1506) at the court of the king of Navarre. He died fighting for him at Viana. His former possessions had passed under direct papal rule, thus, Cesare must be regarded as instrumental in the consolidation of the Papal States, even if that was not his purpose. Cesare has long been considered the model of the Renaissance prince, the prototype of Niccolò Machiavelli's *Prince*—intelligent, cruel, treacherous, and ruthlessly opportunistic. See biographies by W. H. Woodward (1913) and Rafael Sabatini (1923), Michael Mallett, *The Borgias* (1969).

Borgia, Francis: see FRANCIS BORGIA SAINT

Borgia, Lucrezia (lōōkrā'tsya), 1480–1519, Italian noblewoman, famous figure of the Italian Renaissance, daughter of Pope ALEXANDER VI. Her first marriage (1492) to Giovanni Sforza of Pesaro was annulled in 1497, and she was married to Alfonso of Aragon, illegitimate son of Alfonso II of Naples. Her brother, Cesare Borgia, had her second husband murdered in 1500, and, in 1501, Lucrezia was married to Alfonso d'Este, who became duke of Ferrara in 1505. As duchess of Ferrara, Lucrezia at last escaped the vicious atmosphere of her family. Her brilliant court attracted many artists and poets, notably Anosto, and her beauty and kindness won esteem for her. Rumors of her participation in her family's poison plots, of incestuous relations with her father and brother, and of her supposed extravagant vices have not been proved. Nevertheless, Lucrezia Borgia remains best known as portrayed in Victor Hugo's drama and Donizetti's opera, both based on these legends. See biographies by Maria Bellonci (tr. 1953) and Ferdinand Gregorovius (rev. ed. 1875, in German, tr. 1949, repr. 1968).

Borgia, Rodrigo: see ALEXANDER VI

Borglum, Gutzon (John Gutzon de la Mothe Borglum), 1867–1941, American sculptor, b. Idaho, son of a Danish physician and rancher. He studied at the San Francisco Art Academy and in Paris at Julian's academy and the École des Beaux-Arts. His first commission after his return to New York in 1901 was the statue of Lincoln which stands in the rotunda of the Capitol, Washington, D.C. Other works of his earlier period were a statue of Henry Ward Beecher (Brooklyn), *Mares of Diomedes* (Metropolitan Mus.), and figures of the apostles for the Cathedral of St. John the Divine, New York City. He designed and began carving (1916) a Confederate memorial on Stone Mt., Ga. The work was interrupted by World War I but was resumed in 1924. As the result of a controversy with the Stone Mountain Memorial Association, Borglum ceased working and destroyed his models. His supervision of the gigantic MOUNT RUSHMORE NATIONAL MEMORIAL in South Dakota was

begun in 1927. One of the largest sculptural projects in existence, with heads 60 ft (18.3 m) high, the Memorial was also a great engineering feat. Borglum had finished the heads of the four Presidents (Washington, Jefferson, Lincoln, and Theodore Roosevelt) when he died. The work was finished by his son Lincoln Borglum. Borglum was a man of tremendous vitality and decided opinions which led him into frequent controversies. His brother Solon Hannibal Borglum, 1868–1922, was also a sculptor, noted especially for his portrayal of horses, cattle, Indians, and cowboys. See R. J. Casey and Mary Borglum, *Give the Man Room: the Story of Gutzon Borglum* (1952), Willadene Price, *Gutzon Borglum, Artist and Patriot* (1961).

Borgognone: see BERGOGNONE

Bori, Lucrezia (bō'rē), 1887–1960, Spanish soprano, whose real name was Borja (Ital. *Borgia*). She made her debut (1908) in Rome as Micaela in *Carmen*, later sang *Manon Lescaut* opposite Caruso in Paris (1910), and was long a leading performer at the Metropolitan Opera in New York City (1912–15, and, after a throat operation, 1920–36). After 1935 she was a director of the Metropolitan Opera Association. She was notable for her beauty and her stage presence as well as her lyric voice.

boric acid, any one of the three chemical compounds, orthoboric (or boracic) acid, metaboric acid, and tetraboric (or pyroboric) acid, the term often refers simply to orthoboric acid. The acids may be thought of as hydrates of boric oxide, B₂O₃. Orthoboric acid, H₃BO₃ or B₂O₃ · 3H₂O, is colorless, weakly acidic, and forms triclinic crystals. It is fairly soluble in boiling water (about 27% by weight) but less so in cool water (about 6% by weight at room temperature). When orthoboric acid is heated above 170°C it dehydrates, forming metaboric acid, HBO₃ or B₂O₃ · H₂O. Metaboric acid is a white, cubic crystalline solid and is only slightly soluble in water. It melts at about 236°C, and when heated above about 300°C further dehydrates, forming tetraboric acid, H₂B₄O₇ or 2B₂O₃ · H₂O. Tetraboric acid is either a vitreous solid or a white powder and is water soluble. When tetraboric or metaboric acid is dissolved it reverts largely to orthoboric acid. The major uses of the boric acids are in forming other boron compounds and in borate salts, e.g., BORAX. A dilute water solution of boric acid is commonly used as a mild antiseptic and eyewash. Boric acid is also used in leather manufacture, electroplating, and cosmetics. Boric acid can be crystallized from an acidified borax solution. It occurs as the mineral sassolite in the Tuscan region of Italy, where it is also recovered from hot springs and vapors. In the United States boric acid is recovered from brines from Seales Lake in California.

Borinage (bōrēnazh'), region, Hainaut prov., S Belgium, surrounding Mons and extending to the French border. A coal-mining district, it was formerly known for the miserable conditions of its miners.

boring mill, machine tool used to increase the size of a hole previously made in a workpiece, usually with the purpose of obtaining a required degree of finish and accuracy in the final hole. In a horizontal boring mill the workpiece is held stationary on a vertical table whose position can be adjusted. A spindle attached to a vertically adjustable head holds the cutting tool, which is fed horizontally into the work. In a vertical boring mill the workpiece is made to revolve on a horizontal circular table as the tool is fed in.

Boris I, d. 907, khan [ruler] of Bulgaria (852–89). Baptized in 864, he introduced Christianity of the Byzantine rite among the Bulgarians. There followed a rivalry between Rome and Constantinople for the loyalty of the Bulgarian church. In 889, Boris abdicated and retired to a monastery. His son was Czar Simeon I.

Boris III, 1894–1943, czar of Bulgaria (1918–43), son of Czar FERDINAND, on whose abdication he succeeded to the throne. He ruled constitutionally until 1934, then set up a military dictatorship under his premier, Kimon Georgiev, and in 1935 began his personal dictatorship. He turned toward the Axis Powers and in 1940 forced Rumania to restore S. DOBRUJA to Bulgaria. While visiting Hitler in Berlin, he agreed to declare war on Great Britain and the United States, but not on Russia. His mysterious death soon followed. His son, SIMEON II, succeeded under a regency.

Boris Godunov: see GODUNOV, BORIS

Borlänge (bōrlēng'ə), city (1970 pop. 29,652), Kopparberg co., S central Sweden, on the Dalälven

River, chartered 1944. It has major factories manufacturing iron and steel and paper and also sawmills, machine shops, and a school of engineering.

Borlaug, Norman Ernest (bôr'lôg), 1914-, U.S. agronomist, b. Cresco, Iowa, grad. Univ. of Minn. (Ph.D., 1941). He worked as researcher with the E. I. du Pont Company until 1944, when he joined the Rockefeller Foundation in Mexico. He became a director at the Foundation and headed a team of scientists from 17 nations experimenting with improvement of grains. In 1970 he was awarded the Nobel Peace Prize for his efforts to eradicate hunger and build international prosperity. His "green revolution," which involves the use of improved wheat seed, new types of higher-yield rice, and more efficient use of fertilizer and water, has provided larger food crops in many of the less-developed countries of the Middle East and Latin America. Borlaug is credited with Mexico's self-sufficiency in wheat production.

Bormann, Martin (bôr'man), 1900-1945, German National Socialist (Nazi) leader. He met Adolf Hitler in 1924 and soon became an important figure in the Nazi party hierarchy. He succeeded Rudolf Hess in Hitler's inner circle in 1941 after Hess's flight to Scotland. In 1942 he became Hitler's personal secretary. After Hitler's suicide in 1945, Bormann disappeared and was assumed dead. He was tried in absentia at Nuremberg and sentenced to death. Rumors persisted, however, that Bormann had escaped to Argentina. In 1973, after identification of a skeleton unearthed in West Berlin, the West German government declared him dead, a suicide on May 2, 1945.

Born, Bertrand de. see BERTRAND DE BORN

Born, Max, 1882-1970, British physicist, b. Germany, Ph.D. Univ. of Göttingen, 1907. He was head of the physics department at the Univ. of Göttingen from 1921 to 1933. When Nazi policies forced him to leave Germany, he went to England, where he was a lecturer at Cambridge Univ., then became (1936) a professor of natural philosophy at the Univ. of Edinburgh. Born was made a British citizen in 1939. In 1953 he retired to West Germany. Known for his research in quantum mechanics, he shared the 1954 Nobel Prize in Physics with Walter Bothe. Born's writings include *Problems of Atomic Dynamics* (1926, tr. 1960). See his autobiography, *My Life and My Views* (1968).

Borne, Karl Ludwig (lôôt'vîkh bôr'na), 1786-1837, German journalist, of Jewish origin. His original name was Lob Baruch. He studied medicine and political science and held office in Frankfurt until, after the fall of Napoleon, a policy of racial discrimination was restored. His lucid and incisive writings, notably his *Briefe aus Paris* (1830-33), bitterly attacked German despotism and upheld the rights of the individual. With Heine, Borne was an initiator and leader of the revolutionary Young Germany movement in German literature.

Borneo, island (1970 est. pop. 6,800,000), c. 287,000 sq mi (743,330 sq km), largest of the Malay Archipelago and third largest island in the world, SW of the Philippines and N of Java. Indonesian Borneo (called Kalimantan by the Indonesians) covers over 70% of the total area, and the Malaysian states of SABAH and SARAWAK and the British-protected sultanate of BRUNAI stretch across the north coast. The island largely consists of dense jungle and mountains, reaching its highest point at Mt. Kinabalu (13,455 ft/4,101 m) in Sabah. Much of the terrain is virtually impassable, and large areas are unexplored. Many of the rivers are navigable to small craft, however, and provide access into the interior. The largest rivers are the Kapuas in the west and the Barito in the south. The coastal area is generally swampy and fringed with mangrove forests. Banjarmasin, Pontianak, Balikpapan, Tarakan, Kuching, Brunei, and Sandakan are leading ports. The climate is tropical, i.e., hot and humid, annual rainfall averages more than 100 in (254 cm), and there is a prolonged monsoon (generally from November to May). The fauna is roughly similar to that of Sumatra and includes the elephant, deer, orangutan, gibbon, Malay bear, and crocodile, and many varieties of snakes. Rhinoceroses, once numerous, have been extensively hunted and are now almost extinct. The island is one of the most sparsely populated regions in the world. The two major ethnic groups are the primitive DYAKS and the coastal Malays. Kalimantan was also a center for Chinese settlement. Kalimantan contains Indonesia's greatest expanse of tropical rain forests, including valuable stands of camphor, sandalwood, and ironwood, and many palms. The thick jungle and myriad insects discourage large-scale agriculture,

but rice, sago, tobacco, millet, coconuts, pepper, sweet potatoes, sugarcane, coffee, and rubber are grown. Kalimantan contains some of Indonesia's most productive oilfields (discovered in 1888). Coal has been mined there for more than a century, and gold since earliest times. Other mineral resources include industrial diamonds, bauxite, and extensive reserves of low-grade iron ore, which are, however, little exploited. Borneo was visited by the Portuguese in 1521, and shortly thereafter by the Spanish, who established trade relations with the island. The Dutch arrived in the early 1600s, and the English c. 1665. Dutch influence was established on the west coast in the early 1800s and was gradually extended to the south and east. The British adventurer James Brooke took the north edge of the island in the 1840s, and present-day Sabah, Sarawak, and Brunei were declared British protectorates in 1880. The final boundaries were defined in 1905. In World War II the island was held by the Japanese from 1942 to 1945. Dutch Borneo became part of the republic of Indonesia in 1950. The union of Sabah and Sarawak with the federation of Malaysia in 1963 was resented by Indonesians, Indonesian guerrilla raids against both areas, begun in 1964, continued sporadically until Aug., 1966.

Bornholm (bôr'nôlm), island group (1971 pop. 47,241), 227 sq mi (588 sq km), extreme E. Denmark, in the Baltic Sea, near Sweden. Bornholm, the main island, constitutes almost all of the land area and population of the group. Christiansholm, Frederiksholm, and Graesholm are also part of the group. Bornholm is a low tableland, rocky and steep on its northern and western coasts. Farming, fishing, handicrafts, and tourism are the chief occupations, granite and kaolin are the main exports. Rønne is the principal town. Bornholm was divided (1149) between Denmark and Sweden, ruled (1327-1522) by the Danish archbishops, governed (1525-76) by Lübeck merchants, and ceded (1658) to Denmark. After Germany's surrender (May, 1945) in World War II, German forces made a desperate stand on Bornholm before Soviet troops forced them to surrender.

Bornu (bôr'nô), former Muslim state, mostly in NE Nigeria, extending S and W of Lake Chad. It began its existence as a separate state in the late 14th cent. From the 14th to the 18th cent. Bornu exported slaves, eunuchs, fabrics dyed with saffron, and other goods to N. Africa. Bornu reached its peak under the mai (ruler) Idris Alawma (ruled 1570-1610), when it was the leading state in the central Sudan region. Bornu declined from the 17th cent. In the early 19th cent. it was severely threatened by the FULANI but maintained its independence when Muhammad al-Kanemi (ruled 1814-35), who established a new dynasty, revived the state. However, Bornu began to decline again after c. 1850 because of weak rulers, and was conquered (1893-96) by the forces of Rabih, a Sudanese slave trader. In 1898, Bornu was divided among Great Britain, France, and Germany. In 1922 the German portion became part of the British Cameroons mandate of the League of Nations.

Borobudur or **Boroboeider** (both bô'rôbôôdôor'), ruins of one of the finest Buddhist monuments, in central Java, Indonesia. Built by the Sailendras of Sumatra, this magnificent shrine dates from about the 9th cent. It is a huge, truncated pyramid, covered with intricately carved blocks of stone that illustrate episodes in the life of the Buddha. A seated Buddha within may be seen from three platforms above the seven stone terraces that encircle the pyramid.

Borodin, Aleksandr Porfirevich (alyiksan'dar porfêrivich bôrôdyên'), 1833-87, Russian composer, chemist, and physician. He studied at the academy of medicine in St. Petersburg, where he later taught chemistry. He also helped found a school of medicine for women. An amateur musician, he had little musical training, consisting mainly of study with Balakirev. His principal works are two symphonies, several fine songs, an orchestral tone poem, *In the Steppes of Central Asia* (1880), and an opera, *Prince Igor*, left unfinished, which Rimsky-Korsakov and Glazunov completed. It was first performed in St. Petersburg in 1890. He was one of a group of Russian nationalist composers known as The Five. See biography by Gerald Abraham, V. I. Seroff, *The Mighty Five* (1948), M. O. Zetlin, *The Five* (tr. 1959).

Borodino (bôradyîno'), village, central European USSR, c. 70 mi (110 km) W of Moscow. It was the site, on Sept. 7, 1812, of a battle between Napoleon's Grande Armée and Gen. Mikhail Kutuzov's Russian forces defending Moscow. The battle, which cost some 108,000 casualties, is described in Tolstoy's

War and Peace. Napoleon entered Moscow on Sept. 14 after severely battering but not totally defeating the Russians.

Boroimhe, Brian see BRIAN BORU

boron (bôr'ôn) [New Gr. from *borax*], chemical element, symbol B, at no. 5, at wt. 10.811, mp. about 2100°C, bp. about 2500°C, sp. gr. 2.3 at 25°C, valence +3. Boron is a nonmetallic element existing as a dark brown to black amorphous powder or as an extremely hard, usually jet-black to silver-gray, brittle, lustrous, metallic crystalline solid (see ALLOTROPY). One tetragonal and two rhombohedral forms of crystalline boron are known. The chemistry of boron more closely resembles the chemistry of SILICON than that of the other elements in group IIIa of the PERIODIC TABLE, of which it is a member. The chemical reactivity of boron depends on its form; generally, the crystalline form is far less reactive than the amorphous form. For example, the amorphous powder is oxidized slowly in air at room temperature and ignites spontaneously at high temperatures to form an oxide, the crystalline form is oxidized only very slowly, even at higher temperatures. Boron forms compounds with oxygen, hydrogen, the halogens, nitrogen, phosphorus, and carbon (only diamond is harder than boron carbide). It also forms organic compounds. It is most commonly used in its compounds, especially BORAX and BORIC ACID. Boron is used as a deoxidizer and degasifier in metallurgy. Because it absorbs neutrons, it is used in the shielding material and in some control rods of nuclear reactors. Boron fibers, which have a very high tensile strength, can be added to plastics to make a material that is stronger than steel yet lighter than aluminum. Boron does not occur free in nature. Large deposits of borax, kermite, colemanite, and other boron minerals are found in the arid regions of the W. United States. It occurs also in the mineral TOURMALINE. The simplest method of preparing boron is the reduction of boron trioxide by heating with magnesium; this yields the amorphous powder. Boron was first isolated in England in 1807 by Sir Humphry Davy and then in France in 1808 by Joseph Louis Gay-Lussac and Louis Jacques Thenard.

Borough, Stephen, 1525-84, English navigator. Under the direction of Richard CHANCELLOR he was master of the *Edward Bonaventure*, the first ship to round (1553) North Cape and reach Russia by the arctic route, and the only ship to return safely from the expedition. Thereupon, Sebastian Cabot and others who had fostered the plan formed the MUSCOVY COMPANY, establishing a profitable trade with Russia. Sailing again for that company, Borough in a voyage of 1556-57 reached Novaya Zemlya and discovered the strait south of it leading to the Kara Sea.

Borough, William, 1536-99, British naval officer. A younger brother of Stephen Borough, William accompanied him on early voyages and was himself a captain for the Muscovy Company. As a naval officer he took part in Sir Francis Drake's attack on Cadiz (1587) and also fought against the Spanish Armada (1588). He wrote accounts of his voyages and a treatise on the variation of the compass and compiled several charts.

borough: see CITY GOVERNMENT

borough-English, a custom of inheritance in parts of England whereby land passed typically to the youngest son in preference to his older brothers. Of Anglo-Saxon origin, the custom was abolished by law in 1925. For alternative systems of inheritance in England see GAVELKIND and PRIMOGENITURE.

Borromean Islands see MAGGIORE, LAGO, Italy

Borromeo, Charles: see CHARLES BORROMEO, SAINT

Borromini, Francesco (franchâ'skô bôr-rômê'nê), 1599-1677, major Italian baroque architect. His first independent commission (begun 1634) was San Carlo alle Quattro Fontane, Rome. The church is noted for its undulating rhythm of architectural elements within a basically geometric plan. In 1642 he began the designs for Sant' Ivo della Sapienza, Rome, a dynamic hexagonal structure. He was also entrusted with the reconstruction of St. John the Lateran, as well as the completion of Sant' Agnese in the Piazza Navona and Sant' Andrea della Fratte. Borromini's innovations in palace as well as church design had a tremendous influence in Italy and northern Europe.

Borrow, George Henry, 1803-81, English writer and traveler. He led a nomadic life in England and on the Continent, where he was a translator and agent for the British and Foreign Bible Society. His friendship with the gypsies, whose language he learned, resulted in *The Zincali*, or *The Gypsies of Spain* (1841). Although his most famous book is *The Bible in Spain* (1843), his best is probably the

autobiographical *Lavengro* (1851), with its sequel, *Romany Rye* (1857). All Borrow's works are based on his wanderings. See Norwich edition of his works (16 vol., 1923-24), biography by C. K. Shorter (1920), study by R. R. Meyers (1966).

Borstal system, rehabilitation method in Great Britain for delinquent boys aged 16 to 21. The idea originated (1895) with the Gladstone Committee as an attempt to reform young offenders. The first institution was established (1902) at Borstal Prison, Kent, England. Main elements in the Borstal programs include education, regular work, vocational training, and group counseling. Those showing sufficient improvement are paroled to the Central After-Care Association, which supervises them during the period after release. Some Borstals, such as Lowdham Grange, are open, having no walls or gates. See Brendan Behan, *Borstal Boy* (1958), Roger Hood, *Borstal Re-Assessed* (1965).

bort, see DIAMOND

Borten, Per (për bôr'tôn), 1913-, Norwegian political leader and agronomist. Active in the agricultural administration and provincial government of Sør-Trøndelag (1946-65), he served as head of the region's Agrarian Youth Movement. He became a member of the Storting (parliament) in 1950 and in 1955 was made chairman of the Agrarian party. In 1965 he became prime minister. His coalition government of four non-Socialist parties resigned in 1971 after Borten had revealed confidential information about Norway's negotiations for Common Market membership.

Bortniansky, Dmitri Stepanovich (dämë'trë sty'pā'nāvich būrtnyān'skë), 1751-1825, Russian composer, studied with Galuppi in St. Petersburg and Venice. After producing two operas in Italy, in 1779 he returned to St. Petersburg. There, in 1796, he became director of the Imperial Chapel Choir, for which he set a high standard. He wrote mainly church music, combining Russian church style and Italian style. In 1882, Tchaikovsky completed an edition of his works, published in 10 volumes.

Boru, Brian: see BRIAN BORU

Borysthenes, USSR: see DNEPR

borzoi (bôr'zoi), breed of tall, swift HOUND developed in Russia in the early 17th cent., also called Russian wolfhound. It stands from 26 to 31 in. (66-81.2 cm) high at the shoulder and weighs about 85 lb (38.6 kg). Its long, silky coat may be flat, wavy or curly, and forms fringes of longer hair, or feathers, on the chest, back of legs, and tail. The coat may be any color but is usually white with lemon, brindle, tan, gray, or black markings. Originally bred for hunting wolves and coursing hares, it is now most popular as a show competitor and pet. See DOG.

Bos, Jerom: see BOSCH, HIERONYMUS

Bosanquet, Bernard (bô'zankit), 1848-1923, English philosopher, educated at Oxford. He lectured there (1871-81) and at St. Andrews (1903-8). His major works include *A History of Aesthetic* (1892), *The Philosophical Theory of the State* (1899), and *The Value and Destiny of the Individual* (1913). They exemplify the idealists' discontent with British empiricism at the end of the 19th cent. See biography by Helen Bosanquet (1924), J. H. Muirhead, ed., *Bernard Bosanquet and His Friends* (1935).

Bosboom-Toussaint, Anna Louisa Geertruida (a'nā lōō'bē'zā härtroī'da bōs'bōm-tōōsān'), 1812-86, Dutch novelist. She published her first novel, *Almagro*, in 1837. Her perceptive historical fiction was written in ornate and purposely archaic style. One of her chief works treated modern life, this epistolary novel, *Majoors Frans* (1874, tr. *Major Frank*, 1886), exhibits a real appreciation of the problems of women.

Boscán Almogáver, Juan (hwan bōskān' almōgā'vër), c. 1495-1542, Spanish poet. A Catalan aristocrat, Boscán was a literary figure at the court of Ferdinand V. He introduced Italian poetic forms into Spanish poetry, thus revolutionizing its traditional system of metrics. Among his compositions, written in different combinations of the 11-syllable line, are sonnets and canciones. He also translated Castiglione's *Courtier*. His works were first printed in 1543 together with those of his collaborator and friend GARCILASO DE LA VEGA.

Boscath, the same as BOZKATH

Boscawen, Edward (bōskō'wən), 1711-61, British admiral. He was a popular naval hero, famous for his decisive courage displayed against France and Spain at Portobelo (1739), Cape Finisterre (1747), and Lagos Bay (1759). He is noted also for attempts to improve health conditions in the fleet.

Bosch, Hieronymus, or Jerom Bos (hērōn'tmās, yā'rōm bōs), c. 1450-1516, Flemish painter. His sur-

name was van Aeken. Bosch refers to Hertogenbosch, where he was born and worked. Little is known of his life and training. His paintings, executed in brilliant colors and with an uncanny mastery of detail, are filled with animated objects, bizarre plants and animals, and monstrous, amusing, or diabolical figures believed to have been suggested by folk legends, allegorical poems, moralizing religious literature, and aspects of late Gothic art. Some of his works appear to be intricate allegories, their symbolism, however, is obscure and he has consistently defied satisfactory interpretation. Feverishly imaginative, Bosch had a passion for the grotesque, the exuberant, and the macabre. King Philip II of Spain collected some of his finest creations, such as the *Garden of Earthly Delights* (Prado). The *Temptation of St. Anthony* (Lisbon) and *The Last Judgment* were favorite themes. Other examples of his art may be seen in the Escorial and in Brussels. Examples of the *Adoration of the Magi* are in the Metropolitan Museum and in the Philadelphia Museum, which also has the *Mocking of Christ*. Bosch, who deeply influenced the work of Peter Bruegel the Elder, was hailed in the 20th cent. as a forerunner of the surrealists. See his paintings, ed. by G. Martin (1966, repr. 1971), studies by Charles de Tolnay (tr. 1966) and James Snyder, ed. (1973).

Bosch, Juan (hwān bōsh), 1909-, president of the Dominican Republic (Feb.-Sept., 1963). A teacher and writer, he spent 25 years in exile during the dictatorship of Rafael Trujillo and helped found the Dominican Revolutionary party. He returned (1961) to the Dominican Republic after the assassination of Trujillo and was elected president in the first free elections (Dec., 1962) held in 38 years. He introduced sweeping social and economic reforms but was ousted after seven months by military leaders who viewed him as too leftist. An attempt by his supporters to restore him to power in April, 1965, brought civil war and provoked armed intervention by U.S. troops. In 1966, Bosch was overwhelmingly defeated for the presidency by Joaquín BALAGUER. After a voluntary exile in Europe, Bosch returned (1970) and joined the opposition to President Balaguer. In 1973 he founded the Dominican Liberation party.

Boscobel (bōs'kəbəl), parish, Shropshire, W. central England. The oak in which Charles II supposedly hid after his defeat by Oliver Cromwell in the battle of Worcester (1651) was near Boscobel House, which is still standing.

Boscoreale (bōs'kōrā-a'lā), town (1971 pop. 18,674), in Campania, S. Italy, at the foot of Vesuvius. Roman villas have been excavated in the town. Also, a celebrated collection of gold coins, jewelry, and silverwork (consisting mostly of plates and cups with relief ornamentation) dating from the 1st and 2d cent. A.D. was unearthed there in the late 1800s.

Boscovich, Ruggiero Giuseppe (rōdō-jā'rō jōōzēp'pā bōs'kōvēch), 1711-87, Italian mathematician, astronomer, and physicist. He became a Jesuit and taught at Rome, Pavia, and Milan. Later he was director of optics for the French navy. An early advocate of Newton's theories, he wrote many works including one in which he introduced his molecular theory.

Bose, Sir Jagadis Chandra, or Sir Jagadis Chunder Bose (jagā'dēs chūn'drā bōs, chūn'dar), 1858-1937, Indian physicist and plant physiologist, educated in Calcutta and at Christ's College, Cambridge. He was professor of physical science (1885-1915) at Presidency College, Calcutta, and founded the Bose Research Institute in Calcutta. He is noted for his researches in plant life, especially his comparison of the responses of plant and animal tissue to various stimuli. One of his inventions is the crescograph, a device for measuring plant growth. Among his publications are *Comparative Electro-Physiology* (1907), *Researches on Irritability of Plants* (1913), *The Physiology of Photosynthesis* (1924), *The Nervous Mechanism of Plants* (1926), and *Growth and Tropic Movements of Plants* (1929).

Bose, Subhas Chandra (shōōbhāsh' chūn'drā bōs), 1897-1945, Indian nationalist. He began his political career in Calcutta and soon became the leader of the left wing of the Indian National Congress party. He was president of the party in 1938-39 but was forced to resign after a dispute with Mohandas K. Gandhi, he advocated militancy to achieve independence for India and believed in dictatorship to unify the country. Jailed by the British for his Axis sympathies in World War II, he escaped (1941) and fled to Germany. In 1943 he headed in Singapore a Japanese-sponsored "provisional government of India" and organized an "Indian national army." Al-

though sympathetic to totalitarianism, his collaboration was principally directed toward freeing India from British rule and the establishment of an independent regime. He was killed in an airplane crash. See his collected writings and letters, ed. by J. S. Bright (2d ed. 1947), biography by D. K. Roy (1966), study by Hugh Toye (1959).

Bosio, François Joseph, Baron (fra'Nswā' zhōzēf' barōn' bōsyo'), 1769-1845, French sculptor. He was employed by Napoleon I to make the bas-reliefs for the column of the Place Vendôme and also as portraitist to the imperial family. At that time he produced one of his best portrait busts—that of Empress Josephine (Dijon). Louis XVIII made him court sculptor, and Charles X conferred the title baron on him. Of his larger works the most important are the equestrian statue of Louis XVI (Place de Victoires), the quadriga (four-horse chariot) of the Arc de Triomphe du Carrousel, and *Hercules Struggling with a Serpent* (garden of the Tuileries).

Bosnia and Herzegovina (bōz'nēā, hērtsəgōvē'nā), Serbo-Croatian *Bosna i Hercegovina*, constituent republic of Yugoslavia (1971 pop. 3,742,852), 19,741 sq. mi. (51,129 sq. km), W. central Yugoslavia. It consists of two regions—Bosnia in the north, and Herzegovina in the south. SARAJEVO, in Bosnia, is the capital. The chief city of Herzegovina is MOSTAR. The republic lies mostly in the Dinaric Alps and has one narrow outlet to the Adriatic Sea, but no port facilities. The Sava and its tributaries are the chief rivers. Half of the area is forested, and timber is an important product of Bosnia. Much of Herzegovina's terrain is denuded. About one fourth of the republic's land is cultivated, corn, wheat, and flax are the principal products of Bosnia and tobacco, cotton, fruits, and grapes of Herzegovina. Mining is important, and there are large deposits of lignite, iron ore, and bauxite, as well as smaller quantities of such minerals as copper and manganese. Despite some industrialization and development of the republic's extensive hydroelectric resources, it remains one of the poorer areas of Yugoslavia. The population speaks Serbo-Croatian and is divided among the Muslim, Roman Catholic, and Eastern Orthodox religions. The area was part of the Roman province of Illyricum. Bosnia was settled by Serbs in the 7th cent., it appeared as an independent country by the 12th cent. but later at times acknowledged the kings of Hungary as suzerains. Medieval Bosnia reached the height of its power in the second half of the 14th cent., when it controlled many surrounding territories. Bosnia also annexed the duchy of Hum, which, however, regained autonomy in 1448 and became known as Herzegovina. During this period the region was weakened by religious strife among Roman Catholics, Orthodox, and Bogomils. Thus disunited, Bosnia fell to the Turks in 1463. Herzegovina held out until 1482, when it too was occupied and joined administratively to Bosnia. The nobility and a large part of the peasantry accepted Islam. Under Turkish rule, Bosnia and Herzegovina's economy declined. Physical remoteness facilitated the retention of medieval social structure, including serfdom (remnants of which lasted until the 20th cent.). Refusal by the Turkish to institute reforms led to a peasant uprising (1875) that soon came to involve outside powers and led to the Russo-Turkish War of 1877-78. After the war, the Congress of Berlin (1878) placed Bosnia and Herzegovina under Austro-Hungarian administration and occupation, while recognizing the sovereignty of the Turkish sultan. Austria-Hungary improved economic conditions in the area but sought unsuccessfully to combat rising Serbian nationalism, which mounted further when Bosnia and Herzegovina were completely annexed in 1908. The assassination (1914), by a Serbian nationalist, of Archduke Francis Ferdinand in Sarajevo precipitated World War I. In 1918 Bosnia and Herzegovina were annexed to Serbia. The dismemberment of Yugoslavia during World War II led to Bosnia and Herzegovina's incorporation into the German puppet state of Croatia. Much partisan guerrilla warfare raged in the mountains of Bosnia during the war. In 1946, Bosnia and Herzegovina became one of the six constituent republics of Yugoslavia. See 8 E. Schmitt, *The Annexation of Bosnia, 1908-1909* (1937, repr. 1971), J. G. Wilkinson, *Dalmatia and Montenegro* (2 vol., 1848, repr. 1971).

Bosor (bō'sōr), the same as BEOR 1.

Bosporus (bōs'pōrəs) [Gr., =ox ford, in reference to the story of Io], Turk. *Boğaziçi*, strait, c. 20 mi. (30 km) long and c. 2,100 ft. (640 m) wide at its narrowest, separating European from Asian Turkey and joining the Black Sea with the Sea of Marmara. Istanbul is situated on the Bosporus, which is lined with many

historic remains and modern villas. At its narrowest point are two famous castles: Anadolu Hisar, built in 1390, on the Asian side and Rumeli Hisar, completed in 1452, on the European side. The strait was re-fortified by Turkey after the Montreux Convention of 1936 (see DARDANELLES). The Bosphorus Bridge, one of the world's longest suspension bridges (3,524 ft/1,074 m long, opened 1973) spans the strait at Istanbul.

Bosporus, University of the, at Istanbul, Turkey, opened 1863 as Robert College, with funds contributed by Christopher R. Robert and other Americans for the higher education of Turkish men. Its name was changed in 1971. It has schools of engineering, arts and sciences, and administrative sciences. Instruction is in Turkish and English.

Bosse, Abraham (abra-am' bōs), 1602-76, French engraver and painter. He studied art in Paris and became a teacher of perspective in the Académie royale. A prolific and skillful worker, he engraved more than 1,400 pieces. He is best known for his faithful representation of French civil life and costumes during the period of Louis XIII. Bosse wrote several valued treatises on art and perspective. One of his rare paintings, *The Foolish Virgins*, is in the Cluny Museum, Paris.

Bossier City (bō'shār), city (1970 pop. 41,598), Bossier parish, NW La., on the Red River, across from Shreveport, with which it is connected by several bridges, inc. 1907. Barksdale Air Force Base, home of the Second U.S. Air Force, is the major employer.

bossism, in U.S. history, system of political control centering about a single powerful figure (the boss) and a complex organization of lesser figures (the machine) bound together by reciprocity in promoting financial and social self-interest. Bossism depends upon manipulation of the voters and thus always has some aspects of corruption and fraud, even though particular bosses and particular machines may do much good service for the community, the state, or the nation. Control of blocks of votes enables boss and machine to secure the nomination and election or appointment of candidates for public office; the officers thus chosen respond by advancing the interests of the machine. The boss became important in U.S. political life in the mid-19th cent., when many poor immigrants crowded into the cities. In return for their votes the boss offered them protection; he saw that the newcomers got financial and other help. The contact was direct and personal; the boss and his cohorts gave away coal and food, got the sick into hospitals, obtained leniency for the wayward through the courts, and secured government jobs and other work for the unemployed. Bossism was primarily on the local level, but the machines in very large cities soon exerted state and national influence, sometimes very powerful. The highly invidious implications of the term date from the exposure of the Tweed Ring (see under TWEED, WILLIAM MARCY) in New York City in 1872 (see also TAMMANY). Some of the men who came to nationwide notice as connected with bossism and machines in the late 19th and 20th cent. were Richard CROKER and Charles MURPHY of New York, Frank HAGUE of New Jersey, Thomas J. PENDERGAST of Kansas City, James M. CURLEY of Boston, William Hale THOMPSON of Chicago, William VARE of Philadelphia and Abraham RUEF of San Francisco. The original sort of bossism gradually declined with the assimilation of older immigrant stocks and reduction of new immigration, growing literacy, extension of government into the social-welfare area previously cared for by the machine, and increase in the number of jobs falling under civil-service requirements. In contemporary politics a new and more sophisticated type of boss has come into being; he uses techniques of public relations rather than personal contacts to build up his power and that of the machine. See H. F. Gosnell, *Machine Politics* (1937, repr. 1968), Samuel Lubell, *The Future of American Politics* (3d ed. 1965), E. C. Banfield and J. Q. Wilson, *City Politics* (1963, repr. 1966).

Bossuet, Jacques Bénigne (zhak bānē'nə bōsuā'), 1627-1704, French prelate, one of the greatest orators in French history. At an early age he was made a canon at Metz, he became bishop of Condom and was (1670-81) tutor to the dauphin (father of Louis XV), for whom he wrote his great *Discourse on Universal History* (1681, tr. 1778, 1821), *Politics Derived from Holy Writ* (1709), and *Treatise of the Knowledge of God and One's Self* (1722). In 1681 he became bishop of Meaux. Unrivaled for his eloquence, he is celebrated for his *Funeral Orations* (1689), particularly those on Henrietta of England, on her daughter, and on Condé, which are master-

pieces of their kind. He was also a great moralist, a magnificent stylist, and a powerful controversialist, brilliantly attacking Fenelon and the quietists, the Jesuits, and the Protestants. See biographies by E. K. Sanders (1921) and E. E. Reynolds (1963), studies by Pierre Floquet (1864), G. Lanson (1895), Alfred Rabbellau (5th ed. 1900), and M. C. Gotaas (1953, repr. 1970).

Bostanai ben Chaninai (bō'stānī bēn kha-nēnī'), c. 618-670, first Jewish exilarch (i.e., ruler of the Jewish exiles in Babylonia) under Arab rule. He is the subject of many legends. His name is also spelled Bostanai ben Haninai. ANAN BEN DAVID is said to have been among his descendants.

Boston, municipal borough (1971 pop. 25,995), administrative center of the Parts of Holland, Lincolnshire, E. central England, on the Witham River. Boston's fame as a port dates from the 13th cent., when it was a Hanseatic port trading wool and wine. Having recovered from a decline in the 18th and 19th cent. caused by silting, Boston now exports coal, grain, agricultural machinery, potatoes, and cattle; it imports timber, grain, fruit, vegetables, and fertilizers. It is also a shellfishery center and a market for a rich lowland farm area. There are food-processing plants and other light industries. Puritans under John COTTON sailed in 1633 from Boston to Massachusetts Bay (renamed Boston). St. Botolph's Church is on the site of a 7th-century monastery, founded by St. Botolph, for whom the town is named (Botolph's tun, or town). The 288-ft (88-m) tower (called the Stump, because it does not come to a point) is a landmark. The guildhall, begun in 1545, was restored in 1911 and is now a museum.

Boston, city (1970 pop. 641,071), state capital and seat of Suffolk co., E. Mass., at the head of Boston Bay, inc. 1822. The largest city in New England, Boston is a major financial center, a leading port, and an important market for fish and wool. Its industries include publishing, food processing, and the manufacture of shoes, textiles, machinery, and electronic equipment. Established by the elder John Winthrop in 1630 as the main colony of the MASSACHUSETTS BAY COMPANY, Boston was an early center of American Puritanism, with notable ministers and theocratic-minded statesmen contributing to the vigorous intellectual life. The Boston Public Latin School was opened in 1635; Harvard University was founded at nearby Cambridge in 1636; a public library was started in 1653, and the first newspaper in the Thirteen Colonies, the *Newsletter*, appeared in 1704. With its excellent port, Boston soon gained commercial ascendancy over the other towns of colonial Massachusetts. As the American Revolution approached, it became a center of opposition to the British. The Battle of Bunker Hill, fought there on June 17, 1775, was one of the first battles of the Revolution, and Boston was under siege until the British withdrew in March, 1776. After a short post-war depression, Boston entered a period of prosperity that lasted until the middle of the 19th cent. Ships built there made Boston known around the world. Prominent Boston families—the Cabots, the Lowells, the Lodges, and others—made fortunes from shipping and from mills and factories built on New England rivers to produce textiles and shoes. These prominent families built substantial houses on Beacon Hill and in the Back Bay sections and patronized the arts and letters, making Boston "the Athens of America." Despite the generally conservative tone of their culture, they backed reformers, notably the ABOLITIONISTS. Their influence persisted long after the growth of industry brought many immigrants (at first mostly Irish), and Boston changed from a commercial city surrounded by farms to an industrial metropolis. The city limits were expanded to include nearby cities and towns, some with traditions as old as Boston's own—Roxbury and West Roxbury (with the Roxbury Latin School, Forest Hills Cemetery, and BROOK FARM), Dorchester (where Richard Mather had been the minister), Charlestown, Brighton, and Hyde Park. The city of today, with its broad avenues running into the crooked narrow streets of colonial Boston, cherishes the landmarks of the past: the 17th-century house in which Paul Revere lived, Old North Church, famous for its part in Revere's story, Old South Meetinghouse, a rallying place for patriots during the Revolution, the old statehouse (1713), now a museum, the Boston Common, one of the oldest public parks in the country, Faneuil Hall, the golden-domed statehouse, with its facade designed by Charles Bulfinch, and the red-brick houses of Louisburg Square. Among notable Boston churches are King's Chapel, the birthplace of American Unitarianism (1785), the

Mother Church of Christian Science, and Trinity Church (1872-77), designed by H. H. Richardson and decorated by John LaFarge. Boston Light (1716), at the entrance to Boston Harbor, is the oldest lighthouse in the United States. Boston is one of the great cultural centers of the nation. In the city are the Massachusetts Historical Society (founded 1791), the Boston Athenaeum (1807), the Boston Public Library, the New England Conservatory of Music, the Boston Symphony Orchestra, the Museum of Fine Arts, the Isabella Stewart Gardner Museum, and the offices of the *Christian Science Monitor*. Harvard Medical School is in Boston proper, as are the New England Medical Center and Massachusetts General Hospital. Other educational institutions include Boston Univ., Simmons College, Emerson College, Emmanuel College, and Northeastern Univ. The Boston Naval Shipyard (est. 1800, closed 1973) was the berth of the restored U.S.S. *Constitution*, which was originally launched (1797) a short distance away. The city has an international airport and a War Memorial Auditorium. It fields professional teams in the big leagues of all major sports. See H. and J. Kirker, *Bulfinch's Boston, 1787-1817* (1964), A. Taylor, *A Book of Boston* (3 vol., 1960-1964), W. M. Whitehill, *Boston in the Age of John Fitzgerald Kennedy* (1966) and *Boston: A Topographical History* (2d ed. 1968), G. B. Warden, *Boston, 1689-1776* (1970), P. R. Knights, *The Plain People of Boston: A Study in City Growth, 1830-1860* (1973), G. J. Lankevich, *Boston* (1974).

Boston College, mainly at Chestnut Hill, Mass., co-educational, Jesuit, est. and opened 1863. The liberal arts school is at Lenox, and the schools of philosophy, theology, and geophysics are at Weston.

Boston ivy or **Japanese ivy**, tall-climbing woody vine (*Parthenocissus tricuspidata*) from the Orient, one of the most popular of city wall coverings. Of the same genus as the Virginia creeper and sometimes called AMPELOPSIS, it climbs by disk-tipped tendrils and has three-lobed, or three-parted, leaves, which develop vivid colors in the fall. Boston ivy is classified in the division MAGNOLIOPHYTES, class Magnoliopsida, order Rhaminales, family Vitaceae.

Boston Latin School, at Boston, opened 1635 as a school for boys, one of the oldest free public schools in the United States. Many famous men attended the school, including five signers of the Declaration of Independence and four presidents of Harvard Univ. In 1972 it became coeducational. See Philip Marson, *Breeder of Democracy* (1963).

Boston Massacre, 1770, pre-Revolutionary incident growing out of the resentment against the British troops sent to Boston to maintain order and to enforce the TOWNSHEND ACTS. The troops, constantly tormented by irresponsible gangs, finally (March 5, 1770) fired into a rioting crowd and killed five men—three on the spot, two of wounds later. The funeral of the victims was the occasion for a great patriot demonstration. The British captain, Thomas Preston, and his men were tried for murder, with Robert Treat Paine as prosecutor, John Adams and Josiah Quincy as lawyers for the defense. Preston and six of his men were acquitted, two others were found guilty of manslaughter, punished, and discharged from the army. See study by H. B. Zobel (1970).

Boston Mountains, most rugged part of the Ozarks, NW Ark. and E. Okla., rising to 2,700 ft (823 m). Isolated because of its physical makeup, the region developed its own life-style, mountain people occupy small farms, cultivating the narrow valleys and living on the ridges. The Boston Mts., along with the rest of the highlands, have become a popular recreation center, Ozark National Forest is there.

Boston Museum of Fine Arts: see MUSEUM OF FINE ARTS, at Boston, Mass.

Boston Port Bill: see INTOLERABLE ACTS

Boston Public Library, founded in 1852, chiefly through the gift of Joshua Bates. It is the oldest free public city library supported by taxation in the world. Its present building on Copley Square, designed by McKim, Mead, and White, was completed in 1895. The main hall is decorated with murals by Puvis de Chavannes. Other rooms have murals by Edwin Abbey and John S. Sargent. The library holds about 2.5 million volumes, its special collections include Spanish and Portuguese literature, histories of printing, the theater, and the woman's rights movement, the libraries of John Adams and Nathaniel Bowditch, and the Albert H. Wiggin collection of paintings and etchings. The library opened a new wing designed by Philip Johnson and John Burgee in 1973. See W. M. Whitehill, *Boston Public Library: A Centennial History* (1956).

Boston Symphony Orchestra, founded in 1881 by Henry Lee Higginson, who was its director and financial backer until 1918. Its outstanding conductors have been Sir George Henschel (1881-84), Arthur Nikisch (1889-93), Pierre Monteux (1919-24), Serge Koussevitzky (1924-49), Charles Munch (1949-62), Erich Leinsdorf (1962-69), William Steinberg (1969-73), and Seiji Ozawa (1973-). Symphony Hall, built for concerts of the orchestra, was opened in 1900. One of America's oldest orchestras, it has summer activities which include the Berkshire Festival and the Boston Pops Concerts. See M. A. De Wolfe Howe, *The Boston Symphony Orchestra* (1931), H. E. Dickson, *Gentlemen, More Dolce, Please* (1969).

Boston Tea Party, 1773 In the contest between British Parliament and the American colonists before the Revolution, Parliament, when repealing the TOWNSHEND ACTS, had retained the tea tax, partly as a symbol of its right to tax the colonies, partly to aid the financially embarrassed East India Company. The colonists tried to prevent the consignees from accepting taxed tea and were successful in New York and Philadelphia. At Charleston the tea was landed but was held in government warehouses. At Boston, three tea ships arrived and remained unloaded but Gov. Thomas Hutchinson refused to let the ships leave without first paying the duties. A group of indignant colonists, led by Samuel Adams, Paul Revere, and others, disguised themselves as Indians, boarded the ships on the night of Dec. 16, 1773, and threw the tea into the harbor. In reply Parliament passed the Boston Port Bill (see INTOLERABLE ACTS). See study by B. W. Labaree (1964).

Boston terrier, breed of small, lively NONSPORTING DOG developed in the United States in the second half of the 19th cent. It stands between 14 and 17 in (35.6-43.2 cm) high at the shoulder and weighs from 13 to 25 lb (5.9-11.3 kg). Its short, smooth, glossy coat may be brindle or black, both with white markings. One of the few breeds native to the United States, it was developed in Boston from a cross between the bulldog and a now extinct white English terrier. Since its perfection in the 1880s, the Boston terrier has steadily increased in popularity as a companion and house pet. See DOG.

Boston University, at Boston, Mass., coeducational, founded 1839, chartered 1869, first baccalaureate granted 1871. It is composed of 16 schools and colleges. Among its notable research facilities are a medical center (including the school of medicine, school of graduate dentistry, and university hospital), an urban institute, and an African studies center. See E. R. Speare, *Interesting Happenings in Boston University's History* (1957), W. O. Ault, *Boston University: The College of Liberal Arts, 1873-1973* (1973).

Boswell, James, 1740-95, Scottish author, b. Edinburgh, son of a distinguished judge. At his father's insistence young Boswell reluctantly studied law. Admitted to the bar in 1766, he practiced throughout his life, but his true interest was in a literary career and in associating with the great men of his day. Boswell first met Samuel Johnson on a trip to London in 1763. The same year he traveled about the Continent, where he made the acquaintance of Rousseau and Voltaire. He achieved literary fame with his *Account of Corsica* (1768), based on his visit to that island and on his acquaintance with the Corsican patriot Pasquale Paoli. Boswell married his cousin Margaret Montgomerie in 1769. In 1773 he became a member of Johnson's club, to which Burke, Garrick, Reynolds, and Goldsmith belonged. Later that year he and Johnson toured Scotland, a visit Boswell described in *The Journal of a Tour of the Hebrides with Samuel Johnson, LL.D.* (1785, complete edition from manuscript, 1936). His great work, *The Life of Samuel Johnson, LL.D.*, appeared in 1791. In it Boswell recorded Johnson's conversation minutely, but with a fine sense of critical judgment. So skillful was his work that Johnson is perhaps better remembered today for his sayings in the biography than for his own works. The curious combination of Boswell's own character (he was vain-glorious, a heavy drinker, and a libertine) and his genius at biography have intrigued later critics, who conclude that he is probably the greatest biographer in Western literature. Misconduct led to poverty and ill health in his final years. In the 20th cent. great masses of Boswell manuscripts—journals, letters, and other papers—were discovered, most of them at Malahide Castle, Ireland. Lt. Col. Ralph H. Isham purchased the first in 1927 and sold these and later finds to Yale Univ. Publication of these "Yale Editions of the Private Papers," under the general editorship of Frederick A. Pottle, had reached many

volumes by 1970. The recent findings, most particularly his voluminous journals, have enhanced Boswell's literary reputation. Always lively and, at times, even exciting, the journals portray Boswell's daily life in extraordinary detail. They are written in an easy, colloquial style, which resembles the style of many 20th-century authors. See Frederick A. Pottle, *James Boswell* (1966), the first volume of a definitive biography, studies by James L. Clifford, ed. (1970), David L. Passler (1971), Hesketh Pearson (1958, repr. 1972), and W. R. Siebenshuh (1972).

Bosworth Field, Leicestershire, central England. It was the scene of the battle (1485) at which Richard III was killed and the crown was passed to his opponent the earl of Richmond (Henry VII), first of the Tudors.

botanical garden, public place in which plants are grown both for display and for scientific study. An arboretum is a botanical garden devoted chiefly to the growing of woody plants. The plants in botanical gardens are labeled, usually with both the common and the scientific names, and they are often arranged in cultural or habitat groups, such as rock gardens, aquatic gardens, desert gardens, and tropical gardens. Botanical gardens perform diversified functions, e.g., the collection and cultivation of plants from all parts of the world, experimentation in plant breeding and hybridization, the maintenance of botanical libraries and herbariums, and the administration of educational programs for adults and children. The two most important gardens in the United States are the New York Botanical Garden, Bronx Park, New York City (est. 1891) and the Missouri Botanical Garden, St. Louis, Mo. (the earliest in the United States, founded c. 1860 and affiliated with Washington Univ.). The Santa Barbara Botanic Garden, formerly Blakely Botanic Garden, Santa Barbara, Calif. (est. 1926), is noted for its collection of desert and subtropical ornamental plants. Other well-known botanical gardens are the Arnold Arboretum, near Boston, Mass. (est. 1872 as part of Harvard Univ.), Brooklyn Botanic Garden, Brooklyn, N.Y. (est. 1910), Highland and Durand-Eastman parks, Rochester, N.Y., Bartram's Gardens, Philadelphia (founded 1728), Fairchild Tropical Garden, Coconut Grove, Fla. (est. 1938), Fort Worth Botanic Garden, Fort Worth, Texas (est. 1933), Rancho Santa Ana Botanical Garden, Anaheim, Calif. (est. 1927), Huntington Botanical Garden, San Marino, Calif., the botanical gardens at Ottawa, Montreal, and Toronto, Canada, and the innumerable major botanical gardens of Europe, including the Royal Botanic Gardens, known as Kew Gardens, London, and the Jardin des Plantes, Paris. See Donald Wyman, *The Arboretum and Botanical Gardens of North America* (rev. ed. 1959), H. R. Fletcher et al., ed., *International Directory of Botanical Gardens* (2d ed. 1969).

botany, science devoted to the study of plants. Botany, microbiology, and zoology together compose the science of BIOLOGY. Man's earliest concern with plants was with their practical uses, i.e., for fuel, clothing, shelter, and, particularly, food and drugs. The Assyrians and Egyptians were experienced cultivators more than 8,000 years ago, and at approximately the same period the pre-Incas in Peru developed the techniques of maize cultivation that later dominated the Americas. The establishment of botany as an intellectual science came in classical times. In the 4th cent. B.C., Aristotle and his pupil Theophrastus worked out descriptions and principles of plant types and functions that remained the prototype for botanical observation for 1,000 years. During the stagnant period of the Middle Ages the knowledge of the classical scholars was preserved in the European monasteries and by the Arabs in the Middle East. In the 16th and 17th cent. an interest in botany revived in Europe and spread to America by way of European conquest and colonization. At that time the art of gardening (see GARDEN) stressed the utility of plants for man, the popular HERBAL, describing the medical uses of plants, mingled current superstition with fact. In the late 17th and the 18th cent. the influence of the ancient scholars was modified by the growth of scientific botany. Through careful and accurate observation the sciences of taxonomy and morphology (see BIOLOGY) were developed, providing the basis for the first systematic CLASSIFICATION of organisms, chiefly in the work of LINNAEUS. With the microscope came the development of plant anatomy and researches on the cell. New knowledge of the principles of chemistry and physics spurred experimentation in plant physiology, notably the early work of Stephen Hales on the sources and manufacture of plant food, which led to studies of such basic processes as PHO-

TOSYNTHESIS. Modern botany has expanded into all areas of biology. Perhaps most significant was the work of MENDEL in plant BREEDING at the middle (1859) of the 19th cent., from which grew the science of GENETICS. Allied with experimental botany are the various practical aspects that have developed into specific scientific disciplines (e.g., AGRICULTURE, AGRONOMY, HORTICULTURE, and FORESTRY). See Julius von Sachs, *History of Botany* (tr. 1890, repr. 1967), C. L. Wilson and W. E. Loomis, *Botany* (4th ed. 1967), C. B. Lees, *Gardens, Plants and Man* (1970).

Botany Bay, inlet, New South Wales, SE Australia, just S of Sydney. It was visited in 1770 by James Cook, who proclaimed British sovereignty over the east coast of Australia. The site of the landing is marked by a monument on Inscription Point. The bay was named by Cook and Sir Joseph Banks because of the interesting flora on its shores. Although Australia's first penal colony was often called Botany Bay, its actual site was at Sydney on Port Jackson.

Botev, Khristo (khris'tō bō'tēf), 1848-76, Bulgarian poet and patriot. At 17, Botev was sent to Russia, where he became enamored of socialist doctrine. He sought to promote revolution against the Ottoman domination and was killed in action leading a band of his own organizing. His few lyrics and ballads are filled with patriotic fervor. English translations of his work appear as *Khristo Botev Selections* (1948) and *Poems* (1955).

botfly, common name for several families of hairy FLIES whose larvae live as parasites within the bodies of mammals. The horse botfly secretes an irritating substance that is used to attach its eggs to the body hairs of a horse, mule, or donkey. When the animal licks off the irritant, the larvae are carried into the host's mouth and later migrate to the stomach. They attach themselves to the lining, where they feed until ready to pupate, and then drop to the ground with the feces. The larvae, which may cause serious damage to the digestive tract and weaken the animal, can be eliminated by a veterinarian. Sheep botflies lay their eggs in the nostrils of the host without alighting. The larvae work their way up into the head cavities causing fits of vertigo known as blind staggers, failure to eat because of irritability may result in death. Old World species of this family attack camels, elephants, horses, mules, donkeys, and deer. The warble flies, also called heel flies, or bomb flies, parasitize cattle and other animals. The larvae, called cattle grubs or cattle maggots, penetrate the skin of the host immediately after hatching, they migrate through the flesh, causing irritability, loss of weight, and decreased milk production, and then settle under the skin of the back, producing cysts, or warbles. Breathing holes made in the warbles by the larvae damage the hide. A species of human botfly found in Central and South America attaches its eggs to a bloodsucking mosquito that it captures and then releases. When the mosquito comes in contact with humans or other warm-blooded animals, the fly eggs hatch and the larvae fasten to the mammal's skin. The larvae bore into muscle tissue, infestation is called myiasis. For control methods, see bulletins of the U.S. Dept. of Agriculture. The botflies are classified in the phylum ARTHROPODA, class Insecta, order Diptera. Horse botflies are classified in the family Gasterophilidae, sheep botflies and warble flies are classified in the family Oestridae, the human botfly is classified in the family Cuterebridae. See INSECT.

Botha, Louis (bō'tā), 1862-1919, South African soldier and statesman. A Boer, he participated in the founding (1884) of the New Republic, which joined (1888) the Transvaal. Although Botha had little previous military experience, he brilliantly commanded Boer troops in the South African War. He besieged the British at Ladysmith and defeated their forces at Colenso. In 1900 he succeeded General Joubert as commander of the Transvaal army and led its remnants in guerrilla fighting. After the war (1902) he favored cooperation with the British. Botha was (1907-10) premier of the Transvaal. As the leader of the United South African, or Unionist, party he was prime minister of the Union of South Africa from its organization (1910) until his death, and he was ably assisted by Jan Christiaan Smuts. In World War I, Botha declared South Africa a belligerent on the side of the Allies. He suppressed a Boer revolt and in 1915 led the forces that conquered the German colony of South West Africa. See biography by Earl Buxton (1924), Basil Williams, *Botha, Smuts, and South Africa* (1946), N. G. Garson, *Louis Botha or John X. Merriman* (1969).

Bothnia, Gulf of: see BALTIC SEA.

Bothwell, James Hepburn, 4th earl of (hē'bərn, bōth'wəl), 1536?-1578, Scottish nobleman, third husband of MARY QUEEN OF SCOTS. Though a Protestant, he was a strong partisan of the Catholic regent, Mary of Guise, mother of Mary Queen of Scots. In 1562, Bothwell's old enemy, James Hamilton, earl of Arran, accused Bothwell of proposing to kidnap the queen, and Bothwell was imprisoned. He escaped and started for France, but was imprisoned for a year by the English before he reached it. Mary recalled him in 1565 to help her put down the rebellion by the earl of Murray, her half brother. In 1566, Mary's secretary, David Rizzio, was murdered by conspirators, among them her husband, Lord DARNLEY. Thereafter she trusted only Bothwell and was with him constantly. In Feb., 1567, Darnley was murdered. Bothwell was undoubtedly responsible, but he was acquitted in a trial that was a judicial mockery. Shortly after the trial, Bothwell abducted Mary and, having divorced his wife, married the queen. The Scottish nobles now rose against Bothwell and forced Mary to give him up (June, 1567). He fled to Denmark, where he was imprisoned and died insane.

bo tree or pipal (pē'pəl), fig tree (*Ficus religiosa*) of India held sacred by the Buddhists, who believe that Gautama received enlightenment under a bo tree at Bodhi Gaya. A slip of this tree was planted at Anuradhapura to become one of the oldest known trees. The bo tree attains great size and age, the leaves, which hang from long, flexible petioles, rustle in the slightest breeze. Pipal is also spelled peepul or pipul. The bo tree is classified in the division MAGNOLIOPHYTES, class Magnoliopsida, order Urticales, family Moraceae.

Botsford, George Willis, 1862-1917, American historian, b. West Union, Iowa. After some years (1895-1901) at Harvard, he taught (1901-17) ancient history at Columbia. An outstanding authority on ancient history, he wrote numerous monographs and scholarly works but is best remembered for his high school and college textbooks. His *Hellenic History* (1922) was especially well received. He collaborated with E. G. Sihler on a source book, *Hellenic Civilization* (1915, repr. 1965).

Botswana (bōtswā'nə), formerly **Bechuanaland** (bēchōō'a'nəlānd'), republic (1971 pop. 630,379), 231,804 sq mi (600,372 sq km), S central Africa. GABORONE is the capital. Botswana is bordered by South West Africa on the west and north, by Zambia at a

the principal subsistence crops, and cotton, peanuts, and sunflowers are the main cash crops. Many citizens of Botswana work in the mines of South Africa, and lesser numbers are employed in Rhodesia. Botswana's bleak economic outlook was dramatically brightened during the 1960s with the discovery of significant quantities of several minerals. The only known minerals in the country at the time of independence were manganese and some gold and asbestos. Large nickel, copper, and diamond deposits have since been found, as well as salt and soda ash, antimony and sulfur are known to exist, and the discovery of oil is a serious possibility. Vast coal deposits are also being worked. Development of a tourist industry has been based partly on the attraction of one of Africa's few remaining large natural game reserves. Despite the promise of growing wealth and economic diversification, Botswana is likely, because of its landlocked position, to remain heavily dependent on its white-ruled neighbors. South Africa provides port facilities, and Rhodesia controls and operates the railroad from Cape Town that passes through Botswana. There are also road links with South Africa and Rhodesia. South Africa has a customs union with Botswana, whose currency is the South African rand and whose chief trading partners are South Africa and Rhodesia. The country's population consists mainly of the Tswana, who are divided into eight major groups, all speaking Bantu languages. English and Tswana are the country's official tongues. The great majority of the people practice traditional religions, but there is a small Christian minority. San (Bushmen) were the original inhabitants of what is now Botswana. In the 18th cent. the Tswana supplanted the San, who remained as serfs. David Livingstone and other European missionaries visited the area in the mid-19th cent. Beginning in the 1820s, the region was disrupted by the expansion of the Zulu and their offshoot, the Ndebele. However, Khama, chief of the Ngwato (the largest Tswana tribe), curbed the depredations of the Ndebele and established a fairly unified state. A new threat arose in the late 19th cent. with the incursion of Boers from neighboring Transvaal. After gold was discovered in the region in 1867, the Transvaal government sought to annex parts of Botswana. Although the British forbade annexation, the Boers continued to encroach on tribal lands during the 1870s and 80s. German colonial expansion in South West Africa caused the British to reexamine their policies, and, urged on by Khama, they established (1884-85) a protectorate called Bechuanaland. The southern part of the area was incorporated into Cape Colony in 1895. Until 1961, Bechuanaland was administered by a resident commissioner at Mafeking, in South Africa, who was responsible to the British high commissioner for South Africa. Britain provided for the eventual transfer of Bechuanaland to the Union of South Africa, which was established in 1910, in succeeding years, however, South Africa's attempts at annexation were countered by British insistence that Bechuanaland's inhabitants first be consulted. The rise of the National party in South Africa in 1948 and its pursuit of apartheid turned British opinion against the incorporation of Bechuanaland into South Africa. Although Bechuanaland spawned no nationalist movement, Britain granted internal self-government in 1965 and full independence on Sept. 30, 1966. Seretse Khama, grandson of Khama, was elected the first president. Botswana remained in the Commonwealth of Nations. The country has maintained close ties with its white-ruled neighbors and has refused to let its territory harbor guerrilla operations against them. Botswana's 1966 constitution provides for a parliament composed of the president and the national assembly. There is an advisory house of chiefs. See Isaac Schapera, *The Tswana* (1953), Anthony Silillery, *Founding a Protectorate* (1965), Zdeněk Červenka, *Republic of Botswana* (1970), Philippus Smit, *Botswana: Resources and Development* (1970), Anthony Silillery, *Botswana: A Short Political History* (1974).

Botta, Paul Émile (pól ā'mēl' bōtā'), 1805-70, French archaeologist and government official. While consular agent at Mosul (1843) he made his renowned discoveries of Assyrian inscriptions at Khorsabad. Botta wrote *Monument de Ninive* (S vol., 1849-50).

Böttger, Johann Friedrich (yō'hān frē'drīkh bōt'gar), 1682-1719, German chemist and originator of Dresden china. When the Swedish invasion of Saxony occurred (1706), Böttger and his aides were removed from Dresden to protect the secret of the process. He developed a variety of glazes, including black and a delicate violet, later much used. He

made use of silver and gold in the decoration. His potteries were under royal patronage, and he was made director of the extensive works in 1708. He perfected white porcelain in 1715. The following year he was imprisoned because of an attempt to sell his secret.

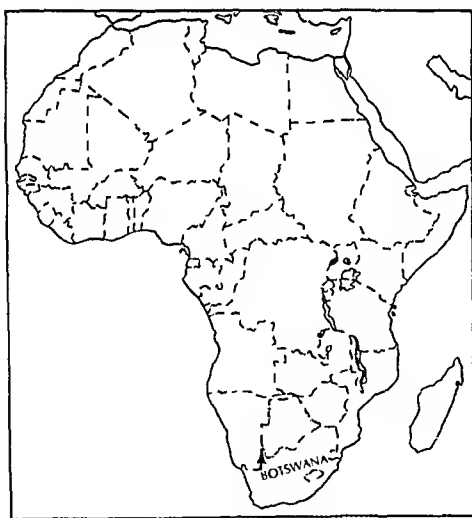
Botticelli, Sandro (san'drō bōt'lichēll'ē), c.1444-1510, Florentine painter of the Renaissance, whose real name was Alessandro di Mariano Filipepi (alēssān'drō dē marē'ānō fēlēpā'pē). He was apprenticed to Fra Filippo Lippi, whose delicate coloring can be seen in such early works as the *Adoration of the Kings* (National Gall., London) and *Chigi Madonna* (Gardner Mus., Boston). Elements of the more vigorous style of Pollaiuolo and Verrocchio soon entered his paintings, e.g., *Fortitude* (Uffizi), *St. Augustine* (Ognissanti), and *Portrait of a Young Man* (Uffizi). He became a favorite painter of the Medici, whose portraits he included, in addition to a self-portrait, among the splendid figures in the *Adoration of the Magi* (Uffizi). In 1481 Pope Sixtus IV asked him to help decorate the Sistine Chapel. After painting three biblical frescoes he returned to Florence, where he reached the height of his popularity. Through the Medici he came into contact with the Neoplatonic circle and was influenced by the ideas of Ficino and Poliziano. His enchanting mythological scenes, *Spring*, *Birth of Venus*, *Mars and Venus*, and *Pallas Subduing a Centaur*, have allegorical implications. In general they allude to the triumph of love and reason over brutal instinct. Probably in the 1490s he drew the visionary illustrations for the *Divine Comedy*. He painted a set of frescoes for the Villa Tornabuoni (Louvre) and created a series of radiant Madonnas, including the *Magnificat* and the *Madonna of the Pomegranate* (Uffizi). From Alberti's description, he re-created the famous lost work of antiquity, *The Calumny of Apelles*. The religious passion of Savonarola's sermons was reflected in Botticelli's work. His piety is evident in the *Nativity* (National Gall., London), *Last Communion of St. Jerome* (Metropolitan Mus.) and *Pieta* (Fogg Mus., Cambridge). His reputation probably declined, as he received fewer commissions. In the 19th cent. the Pre-Raphaelites rediscovered him. Supported by Ruskin, they admired the extreme refinement and poignancy of his conceptions. He is undoubtedly one of the greatest colorists of Florence and a master of rhythmic line. See studies by H. P. Horne (1908), Lionello Venturi (1949, repr. 1961), and G. C. Argan (tr. by J. Emmons, 1957).

Bottomley, Gordon, 1874-1948, English poet and dramatist, b. Yorkshire. His major artistic efforts were directed at reviving verse drama in English. Among his plays are *The Crier by Night* (1902), *The Riding To Lithend* (1909), *King Lear's Wife* (1915), and *Gruach* (1921), the latter two are "prefaces" to the action of *Lear* and *Macbeth* respectively. His volumes of poetry include *A Vision of Giorgione* (1910).

Bottrop (bōt'rōp), city (1970 pop. 106,657), North Rhine-Westphalia, W. West Germany, in the RUHR district. It was a small town until 1863, when it began to develop as a coal-mining center. The city is today also an industrial center, its manufactures include chemicals, electrical equipment, and textiles. There are large carbonization plants there. Bottrop was known around the 11th cent. as Borgthorpe.

botulism (bōch'aliz'əm), acute poisoning resulting from ingestion of food containing toxins produced by the bacillus *Clostridium botulinum*. The bacterium can grow only in an anaerobic atmosphere, particularly in canned foods. Consequently, botulism is almost always caused by preserved foods which have been improperly processed, usually a product canned imperfectly at home. The toxins are destroyed by boiling canned food for 30 min at 176°F (80°C). Once the toxins (which are impervious to destruction by the enzymes of the gastrointestinal tract) have entered the body, they interfere with the transmission of nerve impulses, causing disturbances in vision, speech, and swallowing, and ultimately paralysis of the respiratory muscles, leading to suffocation. Symptoms of the disease appear about 18 to 36 hr after ingestion of toxins. Botulinus antiserum is given to persons who have been exposed to contaminated food before they develop symptoms of the disease and is given to diagnosed cases of the disease as soon as possible. Botulism has a high mortality rate (about 65%) and requires expert nursing and medical care. See FOOD POISONING.

Botvinnik, Mikhail (mēkhayēl' bōt'venyik), 1911-, Russian chess player, b. St. Petersburg (now Leningrad). He ranked as a master at the age of 16 and



narrow strip in the north, by Rhodesia on the east, and by the Republic of South Africa on the east and south. The terrain is mostly an arid plateau (c. 3,000 ft/910 m high) of rolling land. In the east are hills. The Kalahari Desert lies in the south and west. In the northwest the Okavango River drains into the vast region of the Okavango swamp and Lake Ngami, thus forming a huge marshland. Rainfall varies from less than 9 in (23 cm) per year in the southwest to about 25 in (64 cm) in the north. The climate ranges from subtropical to temperate. Most of Botswana's people are pastoralists, and cattle raising and the export of beef and other cattle products are the chief economic activities. The country's water shortage and consequent lack of sufficient irrigation facilities have hampered agriculture, only a small percentage of the potentially arable land is under cultivation. Sorghum, maize, millet, and beans are

won the USSR championship at 20. An electrical engineer by profession, he won the world championship after a round-robin tournament in Moscow in 1948. Botvinnik lost the title to Vassily Smyslov in 1957 but regained it in 1958. He lost again, to Mikhail Tal, in 1960, regained the title for two years, but was defeated by Tigran PETROSIAN in 1963.

Bouake (bwa'kã, bwakã'), town (1963 est. pop. 53,000), central Ivory Coast. It is a transportation hub and a commercial center and was once the crossroads for the caravan trade. Tobacco products are produced in the town, and gold and manganese are found nearby. A variant spelling is Bwake.

Bouchardon, Edme (ēdmã' bōōshardōN'), 1698–1762, French sculptor, pupil of Guillaume Coustou. He is known for his fountain in the Rue de Grenelle, Paris, and for numerous works at Versailles, in the Louvre, and in Saint-Sulpice, Paris. Bouchardon was famous for the classical purity of his style.

Boucher, François (fraNswã' bōōshã'), 1703–70, French painter. Boucher's art embodied the spirit of his time, it was elegant, frivolous, and artificial. He studied briefly with François Le Moyne but was also influenced by Watteau, many of whose works he engraved. At the age of 20 he won the Grand Prix, and from 1727 to 1731 he studied in Italy, being particularly attentive to works by Tiepolo and Albani. On his return he rapidly became the most fashionable painter of his day and a teacher and favorite of Mme de Pompadour. He produced a vast number of pictures, decorations, tapestry designs, stage settings for ballet and opera, and fine etchings. As a result, Boucher enjoyed many academic and official honors including that of director of the Gobelins tapestry works. He is best known, however, as a decorator and above all for his brilliant, voluptuous decorations of boudoirs. Fragonard was his pupil for a time. The Louvre and the Wallace Collection, London, excel in selections of Boucher's work. He is well represented in the United States by his *Peace and War* in the Museum of Fine Arts, Boston, his *Toilet of Venus and Birth and Triumph of Venus* in the Metropolitan Museum, and his *Voluptuary and Winter Scene* in the New-York Historical Society. Fine examples of his work are in the Frick Collection, New York City.

Boucher de Crevecoeur de Perthes, Jacques (zhak, də krēvkōr' də pērt'), 1788–1868, French writer and archaeologist. He was the first to show that man had existed in the Pleistocene epoch, thereby disputing the theory of diluvial CATASTROPHISM. He collected roughly chipped flint artifacts near Abbeville, France, and demonstrated that these man-made objects came from the same period as Ice Age fauna. See PALEOLITHIC PERIOD.

Bouches-du-Rhône (bōōsh-du-rōn), department (1968 pop. 1,470,271), in Provence, SE France. It includes the island of Camargue in the Rhône delta. MARSEILLES is the capital.

Boucicault, Dion (bōō'sīkō), 1822?–1890, Anglo-Irish dramatist and actor. At 19 he had success with his play *London Assurance* at Covent Garden, London. In 1853 he went to the United States with his wife, Agnes Robertson, an actress who was the adopted daughter of Charles Kean. Boucicault became known for his work there as well as in London. A prolific writer who successfully employed theatrical tricks, he wrote or adapted over 300 farces, comedies, and melodramas, in which he often acted. The most notable of these were *Grimaldi* (1855), *The Sidewalks of New York* (1857), *The Octoroon* (1859), *The Colleen Bawn* (1860), *Arrah-na-Pogue* (1864), *Rip Van Winkle* (1865, with Joseph Jefferson), *The O'Dowd* (1873), and *The Shaughraun* (1874). The growth of the road company that performs one play owes much to Boucicault's influence. See his *Art of Acting* (1916), study by R. G. Hogan (1969).

Boucicaut (bōōsēkō'), c. 1366–1421, marshal of France and crusader against the Ottoman Turks, whose real name was Jean le Meingre. Captured by Ottoman Sultan Beyazid I at NIKOPOL (1396), he was ransomed. In 1399 the French sent him to defend Constantinople against Beyazid I. He was governor (1401–7) of Genoa, then under French protection, was captured by the English at Agincourt (1415), and died in England. He wrote several ballads and other poems.

Boucicaut Master (bōōsēkō'), active c. 1375–1400, Franco-Flemish manuscript illuminator. The master was named for his greatest work, *The Hours of the Marechal de Boucicaut* (Musée Jacquemart-André, Paris). In this work were combined the Italian advances in painting techniques, such as perspective, and the French style of ILLUMINATION.

Boudin, Eugène Louis (ozhēn' lwē bōōdāN'), 1824–98, French painter. He began painting at 25 in Paris. His best-known paintings are little beach scenes of Brittany, Normandy, and the Netherlands. Noted for the pervasive clarity and directness of his outdoor scenes, Boudin excelled in depicting nuances of light and atmosphere. He painted from nature, influencing the impressionists, notably Monet, to use this working method. Boudin is represented in the Louvre by several works and in the Metropolitan Museum by *Baie de Fourmis*, *Beaulieu* and *On the Beach at Trouville*. See study by G. J. Aubry (tr. 1969).

Boudinot, Elias (bōō'dīnōt), 1740–1821, political leader in the American Revolution, b. Philadelphia. A lawyer of Elizabethtown (now Elizabeth), N. J., he took an active part in anti-British activities and was a member of the Continental Congress both before and after the adoption of the Articles of Confederation (1777–78, 1781–84), serving as its president from 1782 to 1783. He ardently supported the U.S. Constitution and helped secure its ratification by New Jersey. He served in Congress (1789–95) and was director of the U.S. mint (1795–1805). He was an ardent philanthropist, notably for the Indians, and he was first president (1816–21) of the American Bible Society. See his *Journal of Events in the Revolution* (1894, repr. 1968), biography by G. A. Boyd (1956).

Boufflers, Louis François, duc de (lwē fraNswã' duk də bōōflēr'), 1644–1711, marshal and peer of France. He served under the French commanders François de Crequy and the vicomte de Turenne. King Louis XIV created him a duke in 1694. His best-known exploits are his defense of Namur (1695) in the War of the Grand Alliance, and in the War of the Spanish Succession his defense of Lille against the duke of Marlborough and Prince Eugene (1708), and his skillful retreat from the field of Malplaquet (1709).

Bougainville, Louis Antoine de (lwē āNtwān' də bōōgāNvēl'), 1729–1811, French navigator. He accompanied Montcalm to Canada as aide-de-camp, and he later (c. 1764) established a colony on the Falkland Islands but had to surrender the settlement to Spain (1766). Accompanied by naturalists and astronomers, he made a voyage around the world (1767–69), visiting Tahiti in the Society Islands, the Samoan group, and the New Hebrides, and rediscovering the Solomon Islands, the largest of which is named for him. In the American Revolution he fought Admiral Hood at Martinique. His name is also given to the strait between Bougainville and Choiseul Island, to a strait in the New Hebrides, and to the bougainvillea vine. Bougainville's *Description d'un voyage autour du monde* (2 vol., 1771–72, tr. 1772) helped to popularize Rousseau's theories on the morality of man in his natural state and inspired Diderot to write (1772) his *Supplément au voyage de Bougainville*, a defense of sexual freedom.

Bougainville (bōō'ganvīl, Fr. bōōgāNvēl'), volcanic island (1964 pop. 64,100), c. 3,880 sq mi (10,050 sq km), SW Pacific, largest of the SOLOMON ISLANDS. With the neighboring island of Buka, it forms a part of Papua New Guinea. Bougainville is rugged and densely forested. There are several good harbors, with the main port at Kieta. The economy is mainly agricultural; major exports are copra, ivory nuts, green snails, cocoa, tortoise shells, and trepang. Copper and gold are mined. The center of administration is at Sohano, a coral island in the Buka Passage. The island was discovered in 1768 by the French navigator Louis de Bougainville. Unlike the rest of the Solomon Islands, which became a British territory, Bougainville and Buka became part of German New Guinea in 1884. Occupied by Australian forces during World War I, Bougainville was mandated to Australia by the League of Nations in 1920. During World War II the island was the last Japanese stronghold in the Solomons.

bougainvillea or **bougainvillaea** (both bōō'-ganvīl'ēa) [for L. A. de Bougainville], any plant of the genus *Bougainvillea* of the family Nyctaginaceae (FOUR-O'CLOCK family), chiefly tropical American woody vines with showy petallike bracts, usually in shades of brilliant red or purple. Bougainvillea are classified in the division MAGNOLIOPHYTA, class Magnoliopsida, order Caryophyllales, family Nyctaginaceae.

Bouguer see BEJAJA, Algeria.

Bouguer, Pierre (pyēr bōōgēr'), 1698–1758, French mathematician and hydrographer. He made some of the first photometric measurements, calculating the intensity of the light of the sun as compared with that of the moon, and invented (1748) the heliometer.

His works include *Essai d'optique sur la gradation de la lumière* (1729) and *La Figure de la terre* (1749).

Bouguereau, Adolphe William (adōlf', bōōgrō'), 1825–1905, French academic painter. Best known for his glossy nudes, he was also highly popular in the 19th cent. as a painter of historical and religious subjects. His *La Jeunesse et l'Amour* is in the Louvre.

Bouillon, Frédéric Maurice de La Tour d'Auvergne, duc de (frādrāk' mōrēs' də la tōōr dōvēr'-nyā duk də bōōyōN'), c. 1605–1652, French general, son of Henri de Bouillon. Brought up a Protestant, he campaigned in Holland under his uncle MAURICE OF NASSAU. In 1635 he entered the service of France. He rebelled against Cardinal RICHELIEU in 1641, but after a reconciliation he was given command (1642) of the French forces in Italy. Soon afterward he was arrested in the CINQ MARS conspiracy and, in return for pardon, ceded to France the sovereign principality of Sedan, which his family had held. He embraced Roman Catholicism, went to Rome, and commanded the papal troops. In 1649 he returned to France and took part in the FRONDE on the side of the princes. In 1651, however, he submitted and exchanged Sedan and Rocourt, which he then held as fiefs, for other territories.

Bouillon, Godfrey of. see GODFREY OF BOUILLON.

Bouillon, Henri de La Tour d'Auvergne, vicomte de Turenne, duc de (aNrē', vēkōNt' də turēn'), 1555–1623, marshal of France, diplomat, and Protestant leader. He served with Henry IV against the Catholic LEAGUE but fled (1603) to Geneva when he was ordered arrested for his part in a conspiracy against the king. Under Marie de' Medici he returned and entered the council of regency, from which he withdrew after a quarrel with the queen. He participated in a series of pro-Calvinist intrigues but later retired to his independent duchy, which he had acquired through marriage in 1591. He founded a library and a Protestant college at Sedan. Bouillon was the grandson of Anne de Montmorency and the father of TURENNE.

Bouillon, town (1970 pop. 2,944), Luxembourg prov., SE Belgium, in the Ardennes on the Semois River, near the French border. It is a small manufacturing and tourist center. Its old castle belonged to Godfrey of Bouillon, one of the leaders of the First Crusade, who pledged (1095) the town and the surrounding duchy to the bishop of Liege to raise funds for the Crusade. Bouillon was nominally under the suzerainty of the prince-bishops of Liege until it passed (15th cent.) to William de la Marck, the "Boar of the Ardennes," whose descendants assumed the titles duke of Bouillon and prince of Sedan. The duchy was taken (1676) by Louis XIV of France and given to the La Tour d'Auvergne family. It was under direct French rule from 1794 to 1815, when it passed to the Netherlands. It became part of Belgium in 1830.

Boulanger, Georges Ernest (zhōrhzh ērnēs't' bōōlanzhã'), 1837–91, French general and reactionary politician. He served in North Africa and Indochina, and in the Franco-Prussian War. Later, he was briefly commander of French troops in Tunisia. A protégé of Georges Clemenceau, the radical republican leader, he was appointed minister of war in 1886. Appealing to the French desire for revenge against Germany, he attracted the disparate elements hostile to the Third Republic. Boulanger's personal ambition soon alienated his republican supporters, who recognized in him a potential military dictator. Although he was forced from his ministry in 1887 and later deprived of his army command, Boulanger's ardent nationalism increased his mass appeal. Numerous royalists gave him financial aid, although Boulanger saw himself as a future dictator rather than a restorer of kings. Many times elected a parliamentary deputy, he was ineligible for the post until the government retired him from the army (1888); nevertheless, he built up wide electoral support and was overwhelmingly elected in Paris in Jan., 1889. A coup d'état seemed probable, but Boulanger failed to act. Shortly afterwards the French government issued a warrant for his arrest for treasonable activity. Boulanger fled to Belgium. After his flight support for him dwindled, and the Boulangerists, as his followers were called, were defeated in the general elections of July, 1889. Two years later, while still in exile, he committed suicide. See studies by F. H. Seager (1969) and James Harding (1971).

Boulanger, Nadia (nadya'), 1887–, French conductor and musician, b. Paris. Boulanger is considered the outstanding contemporary teacher of composition. She studied at the Paris Conservatory, where in 1945 she was appointed professor. Boulanger taught

at the École normale de Musique, Paris, and (since 1921) at the American Conservatory, Fontainebleau, becoming its director in 1950. As the teacher of such American composers as Walter Piston, Aaron Copland, Virgil Thomson, Roy Harris, and Marc Blitzstein, she has profoundly influenced contemporary American music. She has often visited the United States, as teacher, lecturer, organist, and guest conductor of the Boston Symphony (1938) and the New York Philharmonic (1939). She is noted for her conducting of choral works. Boulanger's sister Lily (1893–1918) was a distinguished composer.

Boulder, city (1970 pop. 66,870), seat of Boulder co., N central Colo., inc. 1871. Situated c 5,350 ft (1,630 m) above sea level, it is a major resort of the Rocky Mts. and has mineral springs. Its manufactures include aircraft, computers, electronic equipment, chemicals, and sporting goods. The Univ. of Colorado, the National Center for Atmospheric Research, and many other scientific and research facilities are in the city. A U.S. atomic energy plant is nearby.

boulder, large stone formed and detached from its parent consolidated rock by weathering and erosion. In engineering and geology, especially in the United States, the term is applied to loose rocks having specific sizes according to various systems of classification. For example, in the Wentworth scale (for C. K. Wentworth, American geologist), a boulder has one linear dimension of at least 10.1 in. (25.4 cm). Boulders usually can be transported only by glacial ice. Hence, the occurrence of large boulders in abundance in a region is taken as evidence that the region has been subjected to glacial action in the past. See DRIFT, MORAINÉ, BOULDER CLAY.

Boulder City, residential city (1970 pop. 5,223), S Nev., just W of HOOVER DAM near Lake Mead, inc. 1959. Built (1932) by the Federal government as headquarters during the dam's construction, it became a self-governing municipality by act of Congress in 1958. It is a year-round tourist center and the headquarters of Lake Mead National Recreation Area.

boulder clay, see DRIFT.

Boulder Dam, see HOOVER DAM.

Boulez, Pierre (pyër bööl'ez'), 1925–, French composer and conductor. He studied at the Paris Conservatoire with Olivier Messiaen (1944–45) and studied 12-tone technique with René Leibowitz (1946). A radical leader of the avant-garde in music, Boulez produces compositions in which the techniques of SERIAL MUSIC are applied not only to melody and counterpoint but also to melody and rhythm. Because of its complexity, Boulez's work is difficult to perform and has elicited violent reactions from audiences. Among his compositions are *Le Soleil des eaux* (1948), for voice and orchestra, *Symphonie concertante* (1950), for piano and orchestra, *Pli selon pli* (1960), and *Éclat* (1965), for 15-piece chamber orchestra. Boulez was director of music for Jean-Louis Barrault's theater in Paris, and there he founded the Concerts Marigny and the Domaine Musical to present avant-garde works. He has conducted major orchestras throughout the world and has published several works in French. In 1971 he became music director and conductor of the New York Philharmonic-Symphony Orchestra.

Boule or Buhl, André Charles (both aNdrä' sharl bööl), 1642–1732, French cabinetmaker, the master of a distinctive style of furniture, much imitated, for which his name has become a synonym. In 1672 he was admitted to a group of skilled artists maintained by Louis XIV in the Louvre palace, and thereafter he devoted himself to creating costly furniture and objects of art for the king and court. Boule's pieces, having in general the character of Louis XIV and RÉGENCE design, were built for the immense formal rooms of the period. Boule, a master of MARQUETRY, specialized in the inlaying of ebony with precious woods and mother-of-pearl. Large areas were covered with tortoise shell, inlaid with arabesques of gilded brass. He added splendid bas-relief compositions, as well as sculptured rosettes, masks, and acanthus scrolls, all in gilded bronze. Superb examples of his art exist at Versailles, Fontainebleau, and the Louvre and in England at Windsor Castle and in the Wallace Collection, London. The title cabinetmaker to the king passed to his four sons, Jean Philippe, Pierre Benoît, André Charles, and Charles Joseph.

Boulogne, Jean, see BOLOGNA, GIOVANNI.

Boulogne-Billancourt (böölö'nya-bēyāNkōr'), city (1968 pop. 109,380), Hauts-de-Seine dept., N central France, a suburb SW of Paris. One of the largest automobile factories in France is in the city.

Other manufactures include airplanes, electrical goods, chemicals, bicycles, and processed foods. Part of the city is residential, with elegant homes bordering on the BOIS DE BOULOGNE. There is a 14th-century Gothic cathedral.

Boulogne-sur-Mer (böölö'nya-sur-mër'), city (1968 pop. 50,138), Pas-de-Calais dept., N France, in Picardy, on the English Channel. It is a great commercial seaport and the leading fishing port of France. It has canning and shipbuilding industries. From there the Romans sailed (A.D. 43) to conquer Britain, and there again Napoleon assembled an invasion fleet (which never sailed) in 1803–5. The port was a main base for British armies in World War I and a German submarine base in World War II. Most of the city was destroyed during the latter conflict. The Cathedral of Notre Dame (built 19th cent., damaged 1941, since restored) is a great shrine of pilgrimage; it stands on a site where miracles were believed to have occurred in the 7th cent.

Boult, Sir Adrian, 1889–, English conductor. Boult studied conducting in Leipzig with Arthur Nikisch (1912–13). In 1930 he became conductor of the newly formed BBC Symphony Orchestra, and he was conductor of the London Philharmonic from 1950 to 1957. Boult led the premieres of many works by British composers and is considered an authoritative interpreter of Elgar and Vaughan Williams. He wrote *A Handbook on the Technique of Conducting* (1968). Boult was knighted in 1937. See his autobiography, *My Own Trumpet* (1973).

Boumedienne, Houari (hōār'ē böömēdēēn'), 1932?–, president and prime minister of Algeria. While studying in Cairo during the early 1950s he joined a group of expatriate Algerian nationalists that included Ahmed Ben Bella. Boumedienne secretly reentered Algeria (1955) to join a group of guerrillas operating in the province of Oran. He was (1960–62) chief of staff of the exiled National Liberation Army in Tunisia and served as Algeria's minister of defense from the time of its independence. After a series of disputes with Ben Bella, Boumedienne led a coup d'état that overthrew his former ally's government. After the coup, Boumedienne assumed the posts of president, prime minister, and chairman of the revolutionary council. His government assumed a rigorous anti-Israeli stand.

bouncing bet, see PINK.

Boundary Peak, 13,140 ft (4,005 m) high, SW Nev., in the White Mts. near the Calif. line. It is the highest point in Nevada.

Bound Brook, borough (1970 pop. 10,450), Somerset co., N central N.J., on the Raritan River, settled 1681, inc. 1891. It has large orchid and gardenia nurseries and chemical manufactures. The city's land was purchased from the Raritan Indians. In the Revolution, George Washington maintained an outpost there, and American forces were defeated (April, 1777) by Cornwallis. Local attractions include Washington's camp grounds and several 18th-century houses.

Bountiful, city (1970 pop. 27,853), Davis co., N central Utah, inc. 1892. It is a residential suburb N of Salt Lake City. Bountiful was settled by Mormons in 1847.

Bounty, British naval vessel commanded by William BLIGH. She set sail for the Pacific in Dec., 1787, to transport breadfruit trees from the Society Islands to the West Indies. In April, 1789, the ship's mate, Fletcher Christian, led a successful mutiny against Bligh. The captain and 18 of his crew were set adrift in a small open boat. By remarkable seamanship they went 3,618 mi. (5,822 km), reached Timor in June, and proceeded to England. Some of the mutineers were later captured and court-martialed in England, three were executed. Other mutineers under Christian landed at PITCAIRN ISLAND, burned the Bounty, and founded a colony where their descendants continue to live. See George MacKane, ed., *A Book of the Bounty* (1938), Alexander McKee, *H.M.S. Bounty* (1961).

bounty, amount paid by a government for the achievement of certain economic goals considered to be desirable. It is usually a premium paid for the increased production or export of certain goods. The bounty was an important technique of mercantilist economic policy. Whereas a SUBSIDY is a lump sum given in exchange for the meeting of some previously established condition, a bounty is given as a gratuity per unit of production. Bounties are usually in the form of direct cash payments. However, bounties can be in a concealed form such as exports relieved from payment of a tax or excise duty, special railway rates, rebates on taxes and import du-

ties, credit facilities, and export credits guaranteed by the government. Effects of an export bounty can be destroyed by a countervailing duty imposed by an importing country. The compensatory export bounty is aimed at compensating producers for duties paid on imported raw materials used in making the particular commodity. Bounties have been also granted by states for roads, canals, railroads, and other public works. Bounties were frequently used by nations as an inducement to army enlistment. State governments in the United States give bounties for the killing of destructive animals.

Bouquet, Henry (böökä'), 1719–65, British army officer in the French and Indian Wars. A French Swiss, he came to America in 1756 and distinguished himself as second in command to Gen. John FORBES in the successful expedition (1758) against Fort Duquesne (Pittsburgh). In PONTIAC'S REBELLION he decisively defeated the Indians in a hotly contested battle at Bushy Run (Aug., 1763) near Pittsburgh. In 1764, Bouquet, on an expedition into the Ohio country, forced the Shawnee and other Indians to lay down their arms. He was brigadier general commanding the Southern Dist. at his death. See his papers, ed. by S. K. Stevens et al. (2 vol., 1951–72), M. C. Darlington, *History of Colonel Henry Bouquet and the Western Frontiers of Pennsylvania* (1920, repr. 1971).

Bourassa, Henri (aNrē' böörāsā'), 1868–1952, Canadian political leader and publisher, b. Montreal, grandson of Louis Joseph Papineau. He was elected as an Independent Liberal to the Canadian House of Commons in 1896 but resigned in 1899 in protest against sending Canadian troops to the South African War, he was almost immediately reelected. A man of oratorical and literary gifts, he rallied around him various groups discontented with the regime of Sir Wilfrid Laurier and welded them into a powerful opposition party in Quebec that became known as the Nationalist party; it took the stand that Canada should hold aloof from diplomatic entanglements with Great Britain and the United States. Opposing (1909–11) the bill to construct a Canadian navy, Bourassa withdrew enough support from Laurier to cause the fall of the government. In 1910 he founded, as the Nationalist journal, *Le Devoir*, a Montreal daily, and was its editor for many years. He led French Canadian opposition to participation in World War I, denouncing in violent terms the conscription act of 1917. See studies by Casey Murrow (1968) and Joseph Levitt (1969).

Bourbaki, Charles Denis Sauter (sharl dānē' sōtā' böörbakē'), 1816–97, French general of Greek ancestry. In the Algerian campaigns and the Crimean War he gained one of the highest military reputations in Europe. Offered the Greek throne (1862), he declined. In the Franco-Prussian War, put in command of the Army of the East by the provisional government, he failed to raise the siege of Belfort and was pursued to Switzerland, where his troops were dispersed and interned (Feb. 2, 1871).

Bourbon (böörbōN'), royal family, originally of France, a cadet branch of the Capetian dynasty. Its branches ruled Spain, the Two Sicilies, and Parma. It takes its name from the now ruined castle of Bourbon, at Bourbon-l'Archambault, Allier dept., which was the seat of a powerful family descended from Adhemar, a noble of the 9th cent. Robert of Clermont, sixth son of Louis IX of France, married (1272) Beatrice, heiress of Bourbon, and thus is considered the founder of the royal line. Robert's son, Louis, was created (1327) 1st duc de Bourbon. The ducal title remained with the descendants of his eldest son until 1527, when Charles, duc de Bourbon, died without issue. Because of his treason, his extensive fiefs (Bourbonnais, Marche, Auvergne, Forez) were seized by the crown and the ducal title was discontinued. A younger son of Louis, 1st duc de Bourbon, gave issue to the line of Bourbon-Vendôme. The marriage (1548) of Antoine de Bourbon, duc de Vendôme, with Jeanne d'Albret added vast territories in 5 France (see ALBRET) and the title king of Navarre to his other fiefs (Vendôme, Périgord, Rouergue). From Antoine's brother, Louis I de Conde, the houses of CONDE and CONTI were issued. Antoine's son became (1589) the first Bourbon king of France as HENRY IV, the older branches of Louis IX's issue having become extinct (see VALOIS). Henry IV was succeeded by his son, Louis XIII, and his grandson, Louis XIV. Louis XIV's descendants ruled France (except during the French Revolution and the Napoleonic era, 1792–1814) until the deposition (1830) of Charles X (see FRANCE), with the death (1883) of Henri, comte de CHAMBOARD, grandson of Charles X, the senior French branch of Bourbon came to an

end From Louis XIV's brother Philip the cadet branch of Bourbon-Orleans (see ORLÉANS, family) is issued, it furnished one king, Louis Philippe (1830-48), and inherited the claim to the French crown in 1883. The line of Bourbon-Spain began with the accession (1700) of PHILIP V, a grandson of Louis XIV, to the Spanish throne. He was succeeded by Ferdinand VI, Charles III, Charles IV, and FERDINAND VII. Ferdinand VII set aside the Salic law of succession, introduced into Spain by Philip V, in favor of his daughter, ISABELLA II. Her succession was contested by the partisans of Don Carlos, second son of Charles IV, and of his descendants (see CARLISTS). Relative order was reestablished after Isabella's son was proclaimed (1874) king as Alfonso XII. His son, Alfonso XIII, was deposed in 1931 and died in exile in 1941. His marriage (1906) with Victoria of BATTENBERG introduced HEMOPHILIA into his family. His first and fourth sons died of minor accidents in 1938 and 1934, respectively. His second son, Jaime, early renounced his right of succession, which fell to Alfonso's third son, Don Juan, who was free from the disease. His son Juan Carlos, who married Princess Sophia of Greece, was chosen by the Spanish dictator Francisco FRANCO as his successor and future king of Spain. The line of Bourbon-Sicily came out of the Spanish line, it was founded by Ferdinand I of the TWO SICILIES, who succeeded (1759) his father as king of Naples and of Sicily when the latter became king of Spain as CHARLES III. His great-grandson, Francis II, was deposed in 1860, he had issue. The house of Bourbon-Parma was established (1748) in the duchy of PARMA and Piacenza by Philip, a younger son of Philip V of Spain and ELIZABETH FARNÈSE of Parma. Robert, fifth duke of the line, was deposed in 1859. Among his numerous children were Empress ZITA of Austria, SIXTUS OF BOURBON-PARMA, and Prince Rene, who married Princess Margaret of Denmark. Rene's and Margaret's daughter, Anne, married (1948) MICHAEL of Rumania.

Bourbon, Antoine de (āntwān' də), 1518-62, duc de Vendôme, king of Navarre through his marriage to JEANNE D'ALBRET, father of Henry IV of France. He converted to Protestantism after his marriage (1548), becoming one of the most influential Huguenot leaders. Although he did not take part in the conspiracy of Amboise (March, 1560), which was masterminded by his brother Louis I de Conde (see under CONDÉ, family), he supported Conde in another plot later that year. It miscarried, and Antoine was forced to hand Conde over to Catherine de' Medici. Upon the death of Francis II in Dec., 1560, Antoine renounced his right to the regency for the minor Charles IX in return for Conde's release, he was awarded the prestigious but powerless position of royal lieutenant general. In 1561 he reembraced Roman Catholicism, joining the Guise-Montmorency alliance, which hoped to replace Catherine's regency with his own. He was killed the next year fighting the Protestants at Rouen.

Bourbon, Charles, duc de (sharl, dūk də), 1490-1527, constable of France and governor of Milan. He distinguished himself at the battle of Marignano (1515) in the Italian Wars between King Francis I and Holy Roman Emperor Charles V. Enmity, encouraged by the queen mother, LOUISE OF SAVOY, arose between King Francis I and the duke, who went over to the emperor, after long negotiations, in 1523. His estates were confiscated. He fought against the French in Italy, notably at the battle of Pavia (1525), and was killed in an attack on Rome, which was sacked by his unpaid, mutinous troops. See biography by Charles Hare (1911).

Bourbonnais (bōrbōnā'), former province, central France, in the northern part of the Massif Central. It was approximately the same area as today's Allier dept. The chief cities are Moulins, Montluçon, and Vichy. It is a largely arid plateau (except for the fertile Limagne area in the west), used for grazing and cattle raising. There are coal mines near Commentry and a large steel industry at Montluçon. Moulins, the ancient capital, has many historical monuments. The counts (later dukes) of Bourbon held the Bourbonnais as an appanage until 1527, when Francis I of France confiscated it upon the death of the constable Charles of Bourbon.

Bourbon-Parma, Bourbon-Sicily, and Bourbon-Spain see BOURBON, royal family.

bourbat (būr'bat) see COD.

Bourdelle, Émile Antoine (āmēl' āntwān' bōördēl'), 1861-1929, French sculptor, son of a cabinetmaker of Montauban. He went to Paris in 1884, where he studied successively under Falguière, Dalou, and Rodin. Bourdelle differed sharply from Ro-

din in his preoccupation with the relation of sculpture to architecture. Seeking his inspiration in archaic Greece and the Gothic, he achieved his greatest success in heroic and monumental works such as *Hercules*, of which there is a cast in the Metropolitan Museum, his colossal *Virgin of Alsace*, his bas-reliefs for the Théâtre des Champs Élysées, and his monument to Americans who died in World War I (Pointe de Grave). He is also noted for his numerous portrait heads. See study by I. Jianu (1966).

Bourdon, Sébastien (sābastyān' bōördōn'), 1616-71, French painter. He imitated the styles of several painters including Claude Lorrain, Le Nain, and Poussin. Bourdon was active in Rome (1634-37), in Sweden (1652-54) as Queen Christina's court portrait painter, and in Paris, he also worked in his native Montpellier, where he painted *The Fall of Simon Magus* for the cathedral. *The Finding of Moses* is in the National Gallery of Art, Washington, D.C.

Bourdon gauge: see PRESSURE.

Bourg-en-Bresse or Bourg (bōörk-ān-brēs'), town (1968 pop. 40,407), capital of Ain dept., in Burgundy, E. central France. A major transportation hub, farm market, and gastronomic center, it is the chief city of Bresse. Machinery, morocco leather, furniture, shoes, and ceramics are also made. The church (late 15th cent.) of nearby Brou is one of the finest in France.

Bourgeois, Léon (lāōn' bōörzhwā'), 1851-1925, French statesman and social philosopher. He held cabinet posts, notably the premiership (1895-96) and was a delegate to the first and second Hague peace conferences and a member of the Permanent Court of Arbitration at The Hague. One of the earliest proponents of the League of Nations, he headed the French delegation in the League. In 1920 he was awarded the Nobel Peace Prize. His influential book, *Solidarité* (1896), advocated the use of public authority to achieve the solidarity increasingly necessary within and among nations.

bourgeoisie (bōörzhwāzé'), originally the name for the inhabitants of French medieval towns who worked as artisans and craftsmen and who occupied a socio-economic position between the peasants and the landlords in the countryside. The term was extended to include the middle class of France and subsequently of other nations. The bourgeoisie as a historical phenomenon did not begin to emerge until the development of medieval cities as centers for trade and commerce in Central and Western Europe, beginning in the 11th cent. The bourgeoisie, or merchants and craftsmen, began to organize themselves into corporations as a result of their conflict with the landed proprietors. Although trade and commerce existed in the ancient city-states of Greece and in the Roman Empire, it was primarily in the hands of those who were prevented from acquiring land. Thus, the bourgeoisie as a separate class preoccupied with material gain did not exist prior to the rise of the medieval cities. At the end of the Middle Ages, under the early national monarchies in Western Europe, the bourgeoisie found it in their interests to support the throne against the feudal disorder of competing local authorities. In England and the Netherlands, the bourgeoisie was the driving force in uprooting feudalism in the late 16th and early 17th cent. In the 17th and 18th cent., the bourgeoisie supported principles of constitutionality and natural right, against the claims of divine right and against the privileges held by nobles and prelates. The English, American, and French revolutions derived partly from the desire of the bourgeoisie to rid itself of feudal trammels and royal encroachments on personal liberty and on the rights of trade and property. In the 19th cent., the bourgeoisie, triumphantly propounding liberalism, gained political rights as well as religious and civil liberties. Thus modern Western society, in its political and also in its cultural aspects, owes much to bourgeois activities and philosophy. Subsequent to the Industrial Revolution, the class greatly expanded, and differences within it became more distinct, notably between the high bourgeois—industrialists and bankers—and the petty bourgeois—tradesmen and white-collar workers. By the end of the 19th cent., the capitalists (the original bourgeois) tended to be associated with a widened upper class, while the spread of technology and technical occupations was opening the bourgeoisie to entry from below. The term bourgeois has also long been used to imply an outlook associated with materialism, narrowness, and lack of culture—these characteristics were early satirized by Molière and have continued to be a subject of literary analysis. Within Karl Marx's the-

ory of class struggle, the bourgeoisie plays a significant role. By overthrowing the feudal system it is seen as an originally progressive force that later becomes a reactionary force as it tries to prevent the ascendancy of the proletariat (wage earners) in order to maintain its own position of predominance. Some writers argue that Marx's theory fails because he did not foresee the rise of a new, expanded middle class of professionals and managers, which, although wage earners, would not fit easily into his definition of the proletariat. See Nicholas Berdyaev, *The Bourgeois Mind and Other Essays* (1934, repr. 1966), Charles Moraze, *The Triumph of the Middle Classes* (1966), A. G. Frank, *Lumpenbourgeoisie* (1972).

Bourges (bōörzh), city (1968 pop. 73,998), capital of Cher dept., central France. It is a transportation center with foundries, arsenals, breweries, printing plants, and aeronautical and food industries. Known as Avaricum, Bourges was the Roman capital of Aquitania N. of the Garonne River (see GAUL). It early became an archiepiscopal see and the capital of BERRY. Charles VII resided there while most of France was in English hands. In 1438 he promulgated the PRAGMATIC SANCTION OF BOURGES, which was revoked in 1461 by his son Louis XI, who was born in Bourges. Louis XI founded (1463) the Univ. of Bourges, where Jacques Cujas later taught; it was abolished in the French Revolution. The Cathedral of St. Etienne (13th cent.), one of the glories of French Gothic, is remarkable in that it has no transept. Jacques Cœur, whose splendid house still stands, and Louis Bourdaloue were born in Bourges.

Bourget, Paul (pōl bōörzhā'), 1852-1935, French novelist. His early novels were naturalistic, but *Le Disciple* (1889, tr. 1901) marked a change. This work recounts the destruction of a pupil who applies his master's naturalistic literary theories to life. Bourget thereafter wrote in a Catholic and strongly moralistic tone. His psychological analysis and classic style won admiration, but the conservatism of his views restricted his popularity. Representative of his more than 60 novels are *Cruelle Énigme* (1885, tr. *Love's Cruel Enigma*, 1891), *Cosmopolis* (1893, tr. 1893), *Le Démon de midi* (1914), and *Le Sens de la mort* (1915, tr. *The Night Cometh*, 1916). He also wrote verse, plays, and critical essays.

Bourget, Le, town (1968 pop. 49,302), Seine-Saint-Denis dept., N. central France. One of the major airports of Paris is there. Charles Lindbergh landed at Le Bourget after his transatlantic flight of 1927.

Bourget, lake, 16 sq. mi. (41 sq. km), c. 11 mi. (18 km) long and 2 mi. (3.2 km) wide, NE Savoie dept., E France. It is famous for its scenic beauty. Aix-les-Bains and other resorts are located on its shores. The celebrated abbey of Haute-Combe (founded 12th cent., restored 19th cent.) is situated on the western shore.

Bourgmont, Étienne Venyard, steur de (ātyēn' vāNyār' syōr də bōörmōn'), fl. 1706-25, French explorer in what is now the United States. He came to America c. 1685. While he was acting commander of Detroit, he deserted his post in 1706 in the face of an Indian uprising caused by his intemperate actions in dealing with them. He fled to the wilderness and traveled over the region of the lower Missouri River. In 1719 the governor of New France sent Bourgmont back to France to report his discoveries, and in 1720 Bourgmont was made "commandant on the River Missouri" to block Spanish intrusion from the Southwest. In 1724 he went westward and made a treaty with the Comanche somewhere in present-day W. Kansas. In 1725 he returned to France.

Bourgogne, Hôtel de see HÔTEL DE BOURGOGNE.

Bourguiba, Habib (ha'bēb bōörgē'ba), 1903-, Tunisian statesman. Early active in the Destour party, he was an advocate of close cooperation with France. Later, however, he became a staunch nationalist and in 1934 formed the Neo-Destour party. Because of its anti-French agitation, the Neo-Destour was several times outlawed and Bourguiba was often imprisoned. In 1946 he escaped to Cairo and later went to the United States to promote Tunisian nationalism. He was imprisoned again from 1949 until he was released (1954) to negotiate an agreement that led to Tunisian autonomy (1954) and to independence in 1956. That year, he was elected premier. In 1957 he deposed the bey and was chosen president of the republic by the constituent assembly. A moderate, Bourguiba maintained close ties with the United States and favored negotiation with Israel. In Jan., 1974, he tentatively agreed to a plan for the eventual merger of Tunisia and Libya.

Bourignon, Antoinette (āntwānēt' bōörēnyōn'), 1616-80, Flemish Christian mystic, adherent of QUI-

ETISM In 1636 she fled from home to avoid a marriage urged by her father, spent a short time in a convent, and was in charge (1653-62) of an orphanage. Believing herself divinely directed to restore the pure spirit of the Gospel, she gathered (1667) at Amsterdam a fanatical following. Moving from place to place, she took her printing press with her and disseminated her quietistic teachings. According to her alleged revelations, religion was a matter of internal emotion, not of faith and practice. Her mystical ideas found particular favor in Scotland, where Bourignonism was declared a heresy (1711) and candidates for the ministry were required to renounce it before ordination. Her autobiography was translated into English as *The Light of the World* (1696). See A. R. Macewen, *Antoinette Bourignon, Quietist* (1910).

Bourinot, Sir John George (bōōr'īnō'), 1837-1902, Canadian historian and political scientist, b. Sydney, N.S. He is remembered as an authority on the Canadian constitution and government. His *Local Government in Canada* (1887), *Manual of the Constitutional History of Canada* (1888, rev. ed. 1901), *How Canada Is Governed* (1895, rev. ed. 1918), and other books are still authoritative.

Bourke-White, Margaret, 1904-71, American photo-journalist, b. New York City. One of the original staff photographers at *Fortune*, *Life*, and *Time* magazines, Bourke-White was noted for her coverage of World War II, particularly of the invasion of Russia and the liberation of Italy and of German concentration camps. Her series on the rural South during the depression, mining in South Africa, Korean guerrilla warfare, and American industry, and her portraits of world leaders are especially celebrated. Bourke-White's books include *Purple Heart Valley* (1944), *You Have Seen Their Faces* (1937, with her husband, Erskine CALDWELL), and *Portrait of Myself* (1963). She died after a 14-year battle with Parkinson's disease.

Bourmont, Louis Auguste, comte de Ghaisnes de (lwē ōgust' kōnt dā gān dā bōōrmōn'), 1773-1846, marshal of France. An emigre, he fought against the French Revolution under the prince de Condé, in the VENDEE, and as a leader of the CHOUANS. Imprisoned in 1800, he escaped (1804) to Portugal, but in 1807 he was reconciled to Napoleon, whom he served in several campaigns. In the Hundred Days he deserted to the Prussians on the eve of Waterloo and joined the Bourbon standard. King Charles X made him minister of war (1829) and marshal (1830). He was successfully leading an army to Algeria when the revolution of 1830 made him an exile. In 1832 he aided Caroline de BERRY in her feeble insurrection, in 1840 he returned to France under an amnesty.

Bourne, Francis (bōrn), 1861-1935, English prelate, cardinal of the Roman Catholic Church. He entered the priesthood in 1884 and later was made bishop coadjutor of Southwark (1896), bishop of Southwark (1897), archbishop of Westminster (1903), and cardinal (1911). He accomplished a great deal by his moderate policies in avoiding difficulties between the Catholic Church and the state in England.

Bourne, Hugh (bōōrn), 1772-1852, English founder of the sect of Primitive Methodists. In 1799 he joined the Wesleyan Methodists and became a preacher. In 1807 he began holding outdoor revival services, despite prohibitions by the Wesleyan Methodist Conference. His adherents gathered around him to establish a new community, whose first class was organized in 1810. In 1812 the name Primitive Methodists was adopted. Within the lifetime of the founder the sect gained over 110,000 members. From 1844 to 1846, Bourne visited the United States, where he gathered large congregations. See biography by J. T. Wilkinson (1952).

Bourne, Randolph Sillman (bōōrn), 1886-1918, American author, b. Bloomfield, N.J., grad. Columbia, 1912. His critical examination of the American way of life established him as a spokesman for his generation. The books he wrote on progressive education, *The Gary Schools* (1916) and *Education and Living* (1917), reflect the influence of John Dewey. Bourne opposed U.S. entry into World War I and wrote pacifist and nonintervention articles, which were collected posthumously in *Untimely Papers* (1919). See his *History of a Literary Radical* (ed. by Van Wyck Brooks, 1920), biography by J. A. Moreau (1966).

Bourne, summer resort town (1970 pop. 12,637), Barnstable co., SE Mass., crossed by Cape Cod Canal, settled 1627, inc. 1884. The canal was bridged in 1935. Tourism is the chief industry, followed closely by fishing. Points of interest in the town include the Massachusetts Maritime Academy, a replica (built

1926) of the Aptuxet Trading Post (1627), Indian Burial Hill, Sacrifice Rock, and Wishing Rock.

Bournemouth (bōrn'math), county borough (1971 pop. 153,425), Hampshire, 5 central England, on Poole Bay. It has grown since the middle of the 19th cent. from a small fishing village in the sheltered, pine-wooded valley of the Bourne to a popular resort and fine-arts center. It has an excellent sandy beach, a fine climate, and numerous parks. There is a municipal college. Mary Shelley, writer and wife of the poet, is buried in the parish churchyard. In 1974, Bournemouth became part of the new non-metropolitan county of Dorset.

Bournonville, Auguste (ōgust' bōōrnōnvēl'), 1805-79, Danish dancer, choreographer, and teacher. Bournonville studied in Copenhagen and in Paris with Auguste Vestris. He joined the Royal Danish Ballet in 1830. As soloist and, after 1848, as choreographer of more than 50 works, he developed a distinctive romantic style and precision of technique which made the company internationally famous. Bournonville fought with extraordinary energy for the recognition in Denmark of ballet as an art form. His surviving dance works include a version of *La Sylphide* and *The Dancing School*.

Bourrienne, Louis Antoine Fauvelot de (lwē aNtwan' fōvālā dā bōōrēēn'), 1769-1834, French political figure. He was a friend and for a time (1797-1802) private secretary to Napoleon, who made him a councillor of state. Bourrienne later supported the Bourbon restoration and was elected to the chamber of deputies, where he was a spokesman for the ultraroyalist followers of King Charles X. His memoirs (10 vol., 1829-31) are vivid but untrustworthy. **bourse** (bōōrs), term applied to a European STOCK EXCHANGE. The first international bourse was established in Antwerp in the 16th cent. The Paris bourse, dating from 1720, includes both the parquet, equivalent to the New York State Exchange and consisting of 70 members (who must be French citizens) ruled by a committee, and the coulisse, comparable to the lesser American exchanges and dealing in securities exchanged from the parquet.

Boussingault, Jean Baptiste Joseph Dieudonné (zhaN batēst' zhōzēf' dyodōnā' bōōsāNgō'), 1802-87, French agricultural chemist. He was professor of chemistry at Lyons and later professor of agriculture and analytical chemistry at the Paris Conservatoire des Arts et Metiers. He is known especially for his research on the nitrogen cycle. He also worked on the composition of plant tissues and on the nutritive value of forages. He is credited with the idea of agricultural field experiments. In about 1834 he laid out a series of trials on his farm in which he weighed and analyzed both the materials applied to the soil as well as the crops produced. His *Economie rurale* (1844) was later republished as *Agronomie, chimie agricole, et physiologie* (1887-91) and translated into English and German. Boussingault's experiments, however, were not limited to agriculture; his research also included work on atomic weights and the properties of steel alloys.

Bouteflika, Abdelaziz (abdēl'azēz' bōōtēflēka'), 1937-, Algerian political leader. He fought against the French in the National Liberation Army and was appointed minister of sports shortly after independence (1962). As Algeria's foreign minister (1963), Bouteflika became a major spokesman of the non-aligned nations. In 1974 he served as president of the 29th UN General Assembly.

Boutens, Pieter Cornelis (pē'tər kōrnā'lis bou'tans), 1870-1943, Dutch poet. His *Verzen* (1898) won him early praise. His impressionistic and mystical lyric verse was marked by rhythmic freedom. Boutens made extensive translations, particularly from Greek.

Boutet de Monvel, Louis Maurice (lwē mōrēs' bōōtā' dā mōNvēl'), 1851-1913, French painter and illustrator. His fame rests chiefly on his decorative illustrations for children's books and his charming watercolors, e.g., *Chansons et rondes pour les enfants*, *Chansons de France*, *La Vie de Jeanne d'Arc*, and *Nos Enfants*.

Bouts, Dierick, Dirk, or Thierry (dē'rik, dīrk, tyē'rē bouts), c. 1420-1475, early Netherlandish painter, b. Haarlem, active in Louvain. Bouts was influenced by Roger van der Weyden, the van Eycks, and Petrus Christus. His elongated, often stiffly posed figures occupy landscapes that reveal a loving care for detail. His luminous panels have a calm beauty, particularly in the landscape backgrounds, where his sensitive treatment of changing color and light is demonstrated. The *Last Supper* altarpiece (St Peter's, Louvain) is his major work. Two paintings of the Madonna and a portrait are in the Metropolitan Museum.

Boutwell, George Sewall, 1818-1905, American politician, b. Brookline, Mass. He served seven terms in the Massachusetts legislature between 1842 and 1851, was elected governor for the years 1851-52 by a coalition of Free-Soilers and Democrats, and was an organizer (1855) of the Republican party in Massachusetts. As U.S. Representative (1863-69), Boutwell, a leading radical Republican, was for a time chairman of the Committee on Reconstruction. He was one of the managers who handled the impeachment case against President Andrew Johnson, and he delivered one of the final arguments before the Senate. Although he had been (1862-63) the first commissioner of internal revenue, Boutwell knew little about finance. His selection as Secretary of the Treasury (1869-73) was representative of President Grant's many poor appointments. His one absorbing interest was the reduction of the national debt, and he neglected more important problems. His release of government gold defeated the famous attempt to corner the gold market on BLACK FRIDAY, Sept. 24, 1869, but the conspiracy need never have proceeded so far had he acted more promptly. He was a U.S. Senator from 1873 to 1877. See his *Reminiscences of Sixty Years in Public Affairs* (1902), Allan Nevins, *Hamilton Fish* (1936).

Bouvier, John (bōōvēr'), 1787-1851, American writer on law, b. France. He emigrated to Philadelphia in 1802 with his parents and later was a lawyer and journalist in Pennsylvania. His *Law Dictionary* (1839), compiled especially for American lawyers, a reference work for both the student and the practitioner, was revised and reprinted in the 19th and 20th cent.

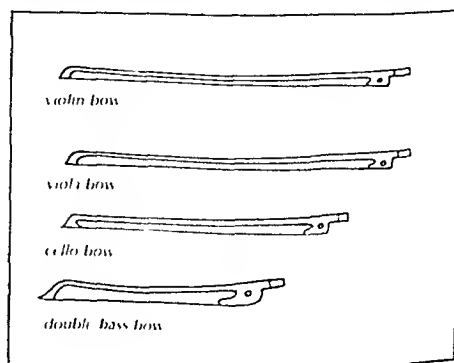
Bouvier des Flandres (bōōvyā' dā flāN'drā), breed of powerful WORKING DOG perfected in Belgium around the beginning of the 20th cent. It stands from 23 to 28 in. (58-71 cm) high at the shoulder and weighs from 60 to 70 lb (27-32 kg). It has a fine, soft undercoat and a harsh, wiry outercoat ranging in color from fawn to black. Its ears are cropped and stand erect, and its tail is docked to approximately 4 in. (10 cm). The Bouvier is primarily a herder of cattle, but it has also been trained successfully as a police and war dog. See DOG.

Bouvines (bōōvēn'), village (1968 pop. 560), Nord dept., N. France, in Flanders. In an epochal battle there in 1214, Philip II of France defeated the joint forces of King John of England, Emperor Otto IV, and the count of Flanders, establishing the power of the French monarchy.

Bovet, Daniele (bōvā'), 1907-, Italian pharmacologist, b. Switzerland, D. Sc. Univ. of Geneva, 1929. From 1929 to 1947 he was a researcher and then head of the laboratory of therapeutic chemistry at the Institut Pasteur in Paris. From 1947 he was associated with the Instituto Superiore de Sanita in Rome. He won the 1957 Nobel Prize in Physiology and Medicine for work in developing antihistamines, sulfa drugs, and curare derivatives and other muscle relaxants for use in surgery. He also became known for studies of the effects of mental illness on the chemistry of the brain. His writings include numerous works on microbiology, toxicology, and endocrinology.

Bow (bō), river, 315 mi (507 km) long, rising in the Rocky Mts., 5 Alta., Canada, and flowing SE through Banff National Park. It emerges from the mountains in the Bow River Pass and continues past Calgary southeastward across the plains to its junction with the Belly River to form the South Saskatchewan River. On the Bow is the Bassano or Horseshoe Bend Dam (built 1912).

bow (bō), implement used in playing stringed instruments. Its name originated from the fact that in its early form it resembled an archer's bow, but by the



Bows

17th cent the European bow had gradually become flat. The violin bow received its definitive form during the period from 1775 to 1781 at the hands of François Tourte (1747–1835). He made the bow of Pernambuco wood, gave it a slightly concave curvature, and invented the device by which the horsehairs are held in place and tightened. The violoncello and the double bass are played with a bow that is shorter and heavier than the violin bow.

bow and arrow, weapon consisting of two parts, the bow is made of a strip of flexible material, such as wood, with a cord linking the two ends of the strip to form a tension from which is propelled the arrow, the arrow is a straight shaft with a sharp point on one end and usually with feathers attached to the other end. The use of the bow and arrow for hunting and for war dates back to the Paleolithic period in Africa, Asia, and Europe. It was widely used in ancient Egypt, Mesopotamia, Persia, the Americas, and Europe until the introduction of gunpowder. Arrowheads were first made of burnt wood, then of flint and bone, later of bronze, and ultimately of steel. Greek and Roman armies employed heavy infantry rather than light infantry armed with bows and arrows, but the Romans made extensive use of mounted archers. With the rise of the armored knight in the Middle Ages, infantry was armed with bows and arrows. Archery continued to develop in the 14th cent with the rise of the foot soldier. The crossbow, although known in Roman times, was not widely used until the Middle Ages. It consisted of a bow set on a stock, and was more powerful than the ordinary bow, it could fire arrows, darts, or stones. It was, however, slower than the longbow and more difficult to wield, even the arbalest, a later crossbow, was clumsy and slow. By the end of the 13th cent use of the crossbow had declined, and at the battle of Crecy (1346) English longbowmen, firing from fixed positions, so thoroughly outclassed Genoese crossbowmen fighting for the French that the longbow replaced the crossbow as the dominant European projectile weapon. The longbow had originated in Wales, probably in the 12th cent, and became prominent in the Welsh Wars of Edward I in the late 13th cent. Also significant in the history of the bow and arrow is the Asiatic bow. It was made shorter and lighter for use on horseback, and though not so strong as the longbow it was more maneuverable and could be more rapidly fired. The Chinese also developed a longbow, which proved much less effective than the English variety. The rapid rate of fire attained by archers kept the bow and arrow in use in warfare long after gunpowder was introduced, for primitive firearms required much time to load. The North American Indians and the English were particularly noted as archers. See ARCHERY. See S. T. Pope, *Bows and Arrows* (2d ed 1930, repr 1962), D. F. Featherstone, *The Bowmen of England* (1967).

Bow Bells (bō), in the church of St Mary-le-Bow (Bow Church), Cheapside, London, England. The church is located in mid-London, and tradition says that only one who is born within sound of the Bow Bells is a true Londoner, or Cockney. According to legend the Bow Bells called Dick Whittington (see WHITTINGTON, RICHARD) back to London. The fine steeple, which is over 222 ft (68 m) high, was constructed by Christopher Wren when he rebuilt the church after the great fire of 1666, the crypt of the original Norman church, with the arches (bows) for which the church is named, still stands.

Bowditch, Nathaniel, 1773–1838, American navigator and mathematician, b. Salem, Mass. He had no formal schooling after the age of 10. In 1795 he went to sea, and on five long voyages he carried out his studies in navigation and as a result corrected some 8,000 errors in Moore's *Practical Navigator*, first published in America in 1799. A new edition appeared under Bowditch's name as *The American Practical Navigator* (1802–19), it has been published by the U.S. Hydrographic Office since 1867. Bowditch made a translation (4 vol., 1829–39) of Laplace's *Mécanique céleste*. See biographies by his son N. I. Bowditch (3d ed 1884) and Paul Rink (1969).

Bowdler, Thomas (boud'lar, bōd'-), 1754–1825, English editor. He is best known for his *Family Shakespeare* (10 vol., 1818), an expurgated edition for family reading that, although attacked for its prudery, was reprinted many times. Bowdler also edited (omitting passages of an irreligious or immoral tendency) selections from the Old Testament (1822) and Gibbon's *History of the Decline and Fall of the Roman Empire* (6 vol., 1826). His editorial activities gave rise to the term *bowdlerize*, which means to expurgate a book by deleting sections considered indelicate.

Bowdoin, James (bō'dan), 1726–90, American political leader, b. Boston. He was elected to the Massachusetts General Court in 1753 and served until 1774. Illness prevented him (1774) from taking his place as a delegate to the Continental Congress. Bowdoin was (1775–77) a leading figure in the council that governed Massachusetts during the Revolution, presided over the state constitutional convention in 1779, and served (1785–87) as governor of the state. A conservative, as governor he played an active role in suppressing SHAYS'S REBELLION and also forwarded the movement toward a centralized national government. Bowdoin College, in Maine, was named for him.

Bowdoin College, at Brunswick, Maine, coeducational, chartered 1794, opened 1802, named for James Bowdoin. One of the nation's older colleges, its alumni include Nathaniel Hawthorne, Henry Wadsworth Longfellow, and Franklin Pierce.

bowel: see INTESTINE.

Bowell, Sir Mackenzie (bō'āl), 1823–1917, Canadian prime minister, b. England. A leader of the Protestant and English interests in Canada, he served as a Conservative in the Canadian House of Commons (1867–92) and in the Senate (1892–1906). After the Conservative party took office in 1878, he held a number of cabinet posts. For two years (1894–96) he was prime minister, but in 1896 his cabinet was split by the resignation of half of the ministers, and he himself was obliged to resign. He was then chosen opposition leader in the Senate but did not play an active role in politics. He was knighted in 1895.

Bowen, Elizabeth (bō'in), 1899–1973, Anglo-Irish novelist, b. Dublin. In impeccable prose she treated love and frustration through studies of complex psychological relationships. Her novels include *The Hotel* (1927), *To the North* (1932), *The House in Paris* (1936), *The Death of the Heart* (1938), and *The Heat of the Day* (1949). In her last three novels—*A World of Love* (1955), *Two Little Girls* (1964), and *Eva Trout, or, Changing Scenes* (1968)—Bowen was less concerned with rendering reality than with exploring truths best expressed in myth or parable. *Look at All Those Roses* (1941), *Ivy Gripp'd the Steps* (1946), and *A Day in the Dark and Other Stories* (1965) are volumes of short stories. Nonfiction works include *Bowen's Court* (1942), on her ancestral home, *The Shelbourne Hotel* (1951), and *Seven Winters, and Afterthoughts* (1962), a collection of childhood memories and literary studies. *Pictures and Conversations* (1975) is a collection of miscellaneous writings, including portions of a novel and autobiography left unfinished at Bowen's death. See study by A. E. Austin (1971).

bowerbird, common name for any of several species of birds of the family Ptilonorhynchidae, native to Australia and New Guinea, which build, for courtship display, a bower of sticks or grasses. Usually the males construct the bowers, some of which are large (up to 9 ft/275 cm high), while others are like small cabins or runways. The crestless gardener bowerbird, *Amblyornis inornatus*, makes a lawn around its bower. Colored stones, shells, feathers, flowers, and other bright objects, which are replaced when they become withered or worn, are used to decorate the lawns and the bowers. The satin bowerbird, *Ptilonorhynchus violaceus*, prefers blue decorative articles. The bower is constructed by the male in his effort to attract a female and has no other function than for the courtship performance. After mating has taken place in the bower, a nest is built by the female away from the bower, and there the clutch of two eggs is laid. The birds are crowlike and lack the showy plumage of the related bird of paradise. The bowers may be high pyramids, such as those built by the five species of maypole builder bowerbirds, or lower, more intricate, and painted with blue and green paints made of saliva and pigments, such as those built by the satin bowerbird and regent bowerbird (*Sericulus chryscephalus*). The great gray bowerbird (genus *Chlamydera*) of Australia is the largest member of the family, being 15 in. (37.5 cm) long. Bowerbirds do not have very pleasant calls, but they are good mimics, sometimes other species' songs are included in their repertoires. Bowerbirds are classified in the phylum CHORDATA, subphylum Vertebrata, class Aves, order Passeriformes, family Ptilonorhynchidae.

Bowers, Claude Gernade (zhō'nād' bou'ərz), 1878–1958, American journalist, historian, and diplomat, b. Hamilton co., Ind. After serving as editor of the Fort Wayne *Journal Gazette* (1917–23), Bowers, as editorial writer on the New York *World* (1923–31) and political columnist on the New York *Journal* (1931–33), was an influential spokesman for the

Democratic party. Ambassador to Spain (1933–39), Bowers remained in Madrid throughout the Spanish civil war. He then served (1939–53) as ambassador to Chile. Though much of his historical writing is vigorous, well written, and deservedly popular, it is frankly partisan, further praising or reappraising favorably the characters and accomplishments of Democratic leaders in the past, e.g., *The Party Battles of the Jackson Period* (1922, repr 1965), *Jefferson and Hamilton* (1925), *The Tragic Era* (1929), *Jefferson in Power* (1936), and *The Young Jefferson, 1743–1789* (1945, repr 1969). See his autobiographical *My Mission to Spain* (1954) and *Chile through Embassy Windows* (1958) and his memoirs, *My Life* (1962).

Bowers, Eilley, c. 1827–1903, American frontier figure, b. Eilley Orrum in Scotland. She became a Mormon and moved (1855) to Nevada with her second husband. He returned (1857) to Salt Lake City, but she remained, earning her living by running a boarding house for miners. Her claim in the Comstock Lode was next to that of Lemuel Sanford Bowers, whom she later married. They were among the first to derive great wealth from the lode, and they erected a great mansion near Virginia City, Nev. Their mine soon gave out, and she died in poverty. See biography by Swift Paine (1929).

Bowery, the (bou'ərē, -rē) [Dutch *Bouwerie*=farm], section of lower Manhattan, New York City. The Bowery, the street that gives the area its name, was once a road to the farm of New Amsterdam Governor Peter Stuyvesant, who is buried at St Mark's-in-the-Bouwerie, an Episcopal church. The mail route (est. 1673) to Boston traveled this road. By the 1860s and 70s it had many fine theaters. Later the section became notorious for its saloons, dance halls, swindlers, petty criminals, and derelicts. In the 1960s a portion of the area was rehabilitated and several middle-income housing projects were built.

bowfin, primitive freshwater fish found in the Mississippi basin, the Great Lakes, and E. to Vermont. The bowfin has a light covering of rounded, overlapping scales, a large mouth, and sharp teeth. Its swim bladder is capable of functioning as a lung, and the bowfin can survive out of water for a day. It prefers sluggish water and surfaces occasionally to gulp air. The female, up to 2 ft (60 cm) long, lays eggs. The smaller male builds the nest and guards the young after they hatch. Bowfins are also called freshwater dogfish, they are voracious and destructive feeders on fish and invertebrates and are sometimes cannibalistic. As game fish they are good fighters, but they are not regarded as food fish in most parts of the United States. Bowfins are classified in the phylum CHORDATA, subphylum Vertebrata, class Osteichthyes, order Amiiformes, family Amiidae.

bowhead whale: see RIGHT WHALE.

Bowie, James (bō'ē, bō'ē), c. 1796–1836, hero of the Texas Revolution, b. Logan co., Ky. Before arriving in Texas in 1828, he and his brother, Rezin Bowie, were noted frontiersmen in the backwoods of Catahoula parish, La. In Texas, James became a leader of the American settlers who opposed the Mexican government and joined in the Nacogdoches disturbances of 1832. When the revolution began in 1835, he was appointed colonel; he died at the ALAMO. Legend attributes the Bowie knife to his invention, but there are many different accounts of its origin. See C. L. Douglas, *James Bowie* (1944), R. W. Thorp, *Bowie Knife* (1948).

Bowie (bō'ē), city (1970 pop. 35,028), Prince Georges co., W. central Md., inc. 1916. It is mainly a residential community. Points of interest include the Woodward Mansion (c. 1743), which now serves as the city hall, and Belair Stables, now a historical museum. Bowie State College is in the city, and a racetrack is nearby.

bowlegs (genu varum), outward curvature of the leg bone (tibia) or thigh bone (femur) causing the knees to separate when the feet are placed together. When the condition is severe enough to be considered a deformity, the cause is usually a disorder that occurs early in life such as RICKETS, flat feet, a congenital disease, or an injury. Bowlegs can be corrected mechanically by braces, shoe wedges, or other orthopedic devices. In some cases the bone is straightened surgically.

Bowles, Chester Bliss (bōlz), 1901–, U.S. public official, b. Springfield, Mass., grandson of Samuel Bowles (1851–1915). At first a journalist and an advertising man, Bowles was later (1942–43) head of the Connecticut Office of Price Administration (OPA) and then national OPA director (1943–46). He then served as director of the Office of Economic Stabilization. In 1948 he was elected governor of

Connecticut as a Democrat. Defeated for reelection in 1950, he was appointed (1951) ambassador to India, where he served until 1953. From 1959–61 he sat in the U.S. House of Representatives. Chosen chairman of the Democratic platform committee for the 1960 national elections, he led the fight for a strong civil rights plank and for a vigorous policy of foreign economic and technical aid. In 1961, he was Under Secretary of State. Again appointed (1963) ambassador to India, he served until 1969. Among his writings are *The Coming Political Breakthrough* (1959), *The Conscience of a Liberal* (1962), and *Promises to Keep: My Years in Public Life, 1941–1969* (1971).

Bowles, Paul, 1910–, American writer and composer, b. New York City. He studied in Paris with Virgil Thompson and Aaron Copeland and has composed many operas, ballets, and orchestral and chamber pieces. Since 1952 he has lived in Tangier, Morocco. His fiction often traces the psychic disintegration of civilized men when faced with a primitive environment. His works include the short-story collections *The Delicate Prey* (1950) and *The Time of Friendship* (1967), and the novels *The Sheltering Sky* (1949) and *Up Above the World* (1966). See his autobiography (1972). His wife was Jane Auer. **Bowles**, 1917–73, American writer, b. New York City. Original and idiosyncratic, her works often treat the conflict between the weak and the strong. They include *Two Serious Ladies* (1943), a novel, and *In the Summer House* (1954), a play. See her *Collected Works* (1964).

Bowles, Samuel, 1797–1851, American newspaper editor, b. Hartford, Conn. He founded (1824) the Springfield (Mass.) *Republican*, a weekly. In 1844 it became a daily under the influence of his son, Samuel Bowles, 1826–78, b. Springfield, Mass., who had joined the *Republican* at 17. At 25, when his father died, he took control. His vigor, discipline, practical policies, and general editorial competence, together with the aid of an exceptional but small staff, made the Springfield *Republican* one of the half-dozen most influential newspapers in the United States. Bowles, by urging the union of all antislavery groups into a single national party, opened the way for the establishment of the Republican party in New England and became one of its most ardent members. He gave complete support to Lincoln and in the Reconstruction period opposed the legislation of the radicals and the carpetbaggers, in favor of milder measures. His condemnation of the political and financial corruption of the period resembled that of the MUCKRAKERS, and he was once sued by James Fisk for libel. In later life he traveled a great deal and sent letters about his travels back to his paper. Those of his Western trip of 1865 were collected in *Across the Continent* (1865), and those of his sojourn in Colorado, 1868, in *The Switzerland of America* (1869). See G. S. Merriam, *Life and Times of Samuel Bowles* (1885). His son, Samuel Bowles, 1851–1915, b. Springfield, Mass., was the third of the family to edit the *Republican*. He maintained its high quality by close editorial direction, but did little writing himself.

Bowles, William Lisle, 1762–1850, English poet, cleric, and literary critic. In 1804 he became vicar of Bremhill, Wiltshire, in 1818 chaplain to the prince regent, and in 1828 canon residentiary of Salisbury Cathedral. He won the admiration of Coleridge with the melancholy, rather emotional verse included in *Fourteen Sonnets* (1789). Bowles's other poetry includes *The Battle of the Nile* (1799), *The Sorrows of Switzerland* (1801), and *The Spirit of Discovery* (1804). In 1806 Bowles published an edition of Pope that was highly critical of the poet and his work, this led to an acrimonious controversy in which Bowles was vigorously assailed by Byron.

bowling, indoor sport, also called tenpins, played on an alley by rolling a ball at 10 maple pins. It is the most popular indoor participation sport in the United States, with over 20 million active players. A regulation bowling alley is constructed of polished wood and measures 41 to 42 in. (104.1 to 106.7 cm) wide and 60 ft (18.3 m) from the foul line to the center of the head pin (63 ft or 19.2 m to the end of the alley). A ball with three or four finger holes, weighing from 10 to 16 lb (4.5 to 7.26 kg) is thrown by a bowler at the pins, each of which is 15 in. (38.1 cm) high, set up in a triangular array in rows of increasing length (one through four) at the opposite end of the alley. A bowling contest is divided into 10 frames, with two throws allowed a bowler in each frame, if necessary. Each pin knocked down counts one point. Toppling all pins with the first ball is a strike and scores 10 points plus the total of the next two throws. Clearing the alley with two balls is

a spare and scores 10 points plus the next throw. A perfect game, 300 points, requires 12 consecutive strikes. Bowling originated in ancient Germany, but the Dutch introduced the game in America, where it became popular in the 19th cent. Bowling, which was played with varying numbers of pins (e.g., in ninepins) throughout the ages, was standardized as a 10-pin game in the mid-19th cent. The popularity of bowling has been spurred by the invention of automatic pin-setting machines and the televising of contests. The American Bowling Congress (founded 1895) and the Women's International Bowling Congress (founded 1916) hold yearly championships. The Federation Internationale des Quilleurs serves as the world governing body for the bowling committees of some 40 nations, including the United States and Canada. The games of duck pins, candle pins, and barrel pins are similar to bowling but are played with much smaller balls and pins. See J. L. Martin, *Bowling* (2d ed. 1971).

Bowling Green. 1 City (1970 pop. 36,253), seat of Warren co., S Ky., on the Barren River, inc. 1812. It is a shipping and marketing center for an area producing tobacco, corn, livestock, and dairy items. Textiles, apparel, automobile parts, woodwork, and heavy equipment are manufactured in the city. Bowling Green was occupied by the Confederates at the beginning of the Civil War until the Federal advance forced them to retreat in 1862. The city is the seat of Western Kentucky Univ. Nearby is Lost River Cave, said to have been a hideaway for the James brothers and for Gen. John Hunt Morgan. To the southwest lie the ruins of a Shaker settlement established in 1800. 2 City (1970 pop. 21,760), seat of Wood co., NW Ohio, in a farm area, inc. 1855. Tomato products, hydraulic hoists, and plastics are the chief manufactures. Bowling Green State Univ. is there.

Bowling Green State University, at Bowling Green, Ohio, coeducational, chartered 1910 as a normal school, opened 1914. It became a college in 1929, a university in 1935. The school maintains two-year centers in Bryan, Fostoria, and Fremont as well as a branch near Sandusky.

bowls, ancient sport (the bocce of Caesar's Rome is still played by Italians), especially popular in Great Britain and Australia, known as lawn bowls or bowling on the green in the United States. It was played in America before the American Revolution (hence Bowling Green in numerous place names), but later declined in popularity. Christian Schepflin revived the game in 1879 by forming the Dunellen (N.J.) Bowling Club. The usual "bowling green" is about 120 ft (36.58 m) square and is divided into six alleys, or rinks, each of which is 20 ft (6.1 m) wide and 120 ft long. A small white ball, called a jack, is thrown on the alley by one of the players at some spot not less than 25 yd (22.86 m) from the bowling mat. The object of the game is to roll a ball—weighing 3.5 lb (1.6 kg) and made biased so as to swerve while rolling—as close to the jack as possible, and, if necessary, to dislodge balls previously thrown by opponents. The American Lawn Bowls Association (founded 1915) standardizes rules in the United States; it is one of 10 national groups affiliated with the International Bowling Board (founded 1905). The sport called CURLING, played on ice, is related to bowls.

Bowman, Isaiah, 1878–1950, American geographer, b. Waterloo, Ont., B.S. Harvard, 1905, Ph.D. Yale, 1909. He taught geography at Yale (1905–15) and then became director (1915–35) of the American Geographical Society. He led the first Yale South American expedition (1907), served as geographer-geologist on the Yale Peruvian expedition (1911), and led the American Geographical Society Expedition to the Central Andes (1913). He was chief territorial adviser to President Wilson at the Versailles conference and served the Dept. of State as territorial adviser in World War II. He was a member of the executive committee of the National Research Council from 1919 to 1929 and was its chairman from 1933 to 1935. He was president of Johns Hopkins Univ. from 1935 until his retirement in 1948. His work on many commissions and boards includes contributions as an active officer of the Explorers Club, the Association of American Geographers, and the Council of Foreign Relations and as president (1931–34) of the International Geographical Union, and as vice president (1940–45) of the National Academy of Sciences. He was considered one of the greatest modern authorities on political geography. His books include *The Andes of Southern Peru* (1916) and *Desert Trails of Atacama* (1924), a standard work, *Forest Physiography* (1911), *The Pro-*

neer Fringe (1931), first of a series on world frontier areas, *The New World: Problems in Political Geography* (1922), and *Design for Scholarship* (1936).

Bowne, Borden Parker (boun), 1847–1910, American philosopher, b. Monmouth co., N.J. In 1876 he became head of the department of philosophy at Boston Univ. and later served as dean of the graduate school. In his philosophy, which he called personalism, he stressed the reality and freedom of the self and insisted on the central importance of personality. His masterpiece, *Metaphysics*, appeared in 1882. Other works include *Principles of Ethics* (1892), *The Immanence of God* (1905), *Personalism* (1908), and *The Essence of Religion* (1910). See J. R. Shive, *The Meaning of Individuality: A Comparative Study of Alfred North Whitehead, Borden Parker Bowne, and Edgar Sheffield Brightman* (1961), F. K. Lazarus, *Rāmānuja and Bowne* (1962).

Bowra, C. M. (Sir Cecil Maurice Bowra), 1898–1971, English classical scholar, b. China. Associated with Oxford Univ. throughout his adult life, he was warden of Wadham College (1922–71) and also served as professor of poetry (1946–51) and vice chancellor (1951–54). He was knighted in 1951. Although he wrote and edited books in many areas of literature, Bowra is particularly known for his studies of ancient Greek poetry and culture, notably *Tradition and Design in the Iliad* (1930), *Greek Lyrical Poetry* (1936), *The Greek Experience* (1957), *Pindar* (1964), and *Homer* (1972). He also edited *The Oxford Book of Greek Verse in Translation* (1937).

Bowring, Sir John (bou'ring), 1792–1872, British diplomat, linguist, and writer. An extraordinarily versatile linguist, he is remembered for his anthologies and translations of poetry from many European and Oriental languages. He was a friend of Jeremy BENTHAM, whose works he later collected and edited, and became (1824) the first editor of Bentham's *Westminster Review*. He was a member of Parliament (1835–37, 1841–49) and went on numerous financial and commercial missions to Europe and the Middle and Far East. He served as consul at Canton and in 1854 was knighted and sent as governor to Hong Kong. There he precipitated a war with China by ordering (1856) the bombardment of Canton in a dispute over the right of the Chinese to remove a Chinese pirate from a Chinese ship when that ship was registered by the British (although, in this case, the registration had expired). His *Kingdom and People of Siam* (1857) was the result of a diplomatic mission in that country. See his *Autobiographical Recollections* (1877), G. L. Nesbitt, *Benthamite Reviewing* (1934).

Bow ware (bō), English porcelain, similar to CHELSEA WARE. It was made at Stratford-le-Bow from 1730 to 1776, when its factory was absorbed by the DERRY WARE pottery.

bowwood: see MULBERRY.

box, common name for the Buxaceae, a family of trees and shrubs with leathery evergreen leaves, native to the tropics and subtropics of the Old World and to Central America. The boxes (genus *Buxus*) have been widely introduced to other regions for use as hedge plants and for their wood. Boxwood is close-grained, strong and hard, and polishes well; it is valued for wood engraving, carving, and turning, and for making musical instruments. *Pachysandra procumbens*, a native American species of an otherwise Asiatic genus, is a low, creeping herb found in the S Appalachians and cultivated elsewhere as a ground cover. The box family is classified in the division MAGNOLIOPHYTES, class Magnoliopsida, order Euphorbiales.

box elder. see MAPLE.

boxer, breed of medium-sized, muscular WORKING DOG perfected in Germany in the 19th cent. but whose origins may be traced back in Europe to the 16th cent. It stands from 21 to 25 in. (53.3–63.5 cm) high at the shoulder and weighs from 60 to 75 lb (27.2–34 kg). It has a short, smooth, shiny coat of fawn or brindle, often with white markings on the head, chest, and feet, and a black muzzle. The ears are cropped to stand erect, and the tail is docked. A relative of numerous breeds of the bulldog type, the boxer was originally used in dogfighting and bull baiting. Today it is trained as a police dog and as a guide dog for the blind. The boxer is also kept as a pet. See DOG.

Boxer Uprising, 1898–1900, anticolonial movement in China, culminating in a desperate uprising against Westerners and Western influence. By the end of the 19th cent. the Western powers and Japan had established wide interests in China. The Opium War (1839–42), which Great Britain had provoked, forced China to grant commercial concessions (see

TREATY PORT) and to recognize the principle of EXTRA-TERRITORIALITY. The concessions to Great Britain were soon followed by similar ones to France, Germany, and Russia. The CH'ING regime, already weakened by European encroachments, was more enfeebled by Japan's success in the First Sino-Japanese War (1894-95) and the subsequent further partitioning of China into foreign spheres of influence. The CH'ing emperor, KUANG HSU, attempted to meet the imperialist threat by adopting modern educational and administrative reforms, but he stirred conservative opposition and was frustrated (1898) by the dowager empress, TZ'U HSI, who, favoring a last effort to expel foreign influence, supported armed resistance. She tacitly encouraged an antiforeign secret society called I Ho Ch'uan [Chinese, = righteous, harmonious fists] or, in English, the Boxers. The Boxers soon grew powerful, and late in 1899 the movement began to assume menacing proportions. Violent attacks on foreigners and on Chinese Christians occurred, particularly in the provinces of Chihli, Shansi, and Shantung, in Manchuria, and in Inner Mongolia. In those regions, railway building a visible symbol of the foreigner, was most active, and Chinese Christians, especially Roman Catholics, adherents to the foreigners' religion, were most numerous. Also located there were the majority of territorial leaseholds acquired by the European powers. In June, 1900, the Boxers (some 140,000 strong and now led by the war party at court), occupied Peking and for eight weeks besieged the foreigners and the Chinese Christians there. Provincial governors in SE China suppressed the court's declaration of war and assured the powers of protection for foreign interests, thus limiting the area of conflict to N China. The siege was lifted in August by an international force of British, French, Russian, American, German, and Japanese troops, which had fought its way through from Tientsin. The Boxer Uprising thus ended. The Western powers and Japan agreed—mainly because of U.S. pressure to “preserve Chinese territorial and administrative entity” and because of mutual jealousies among the powers—not to carry further the partition of China. Nevertheless China was compelled (1901) to pay an indemnity of \$333 million, to amend commercial treaties to the advantage of the foreign nations and to permit the stationing of foreign troops in Peking. The United States later (1908) used some of its share of the indemnity for scholarships for Chinese students. China emerged from the Boxer Uprising with a greatly increased debt and was, in effect, a subject nation. See A. H. Smith, *China in Convulsion* (1901), G. N. Steiger, *China and the Occident* (1927), C. C. Tan, *The Boxer Catastrophe* (1955), Peter Fleming, *The Siege at Peking* (1959), V. W. W. Purcell, *The Boxer Uprising* (1963), Richard O'Connor, *The Spirit Soldiers* (1973).

boxfish: see TRUNKFISH

boxing, sport of fighting with fists, also called pugilism and prizefighting. Mentioned by Homer and included in the ancient Olympian games, boxing is one of the oldest forms of competition known to man. It was popular with the Romans, who bound the fists with a knotted, and often metal-weighted, leather band, or cestus. The sport died out after the fall of Rome. It was revived in England in the early 18th cent., helped by royal patronage in the form of betting on or offering prizes to the contestants, as well as by the ring prowess of James Figg, the first British champion (1719-30), and the first set of rules, drawn up by Jack Broughton (1743). Its popularity soon spread to other countries. The use of bare fists declined after the marquis of QUEENSBERRY introduced (1865) his celebrated code of boxing rules, which became standard by 1889. The code called for boxing gloves, a limited number of 3-min rounds, the forbidding of gouging and wrestling, a count of 10 sec before a floored man is called the loser, and various other features of modern boxing. In the United States boxing was illegal for many years. New York was the first state to legalize it (1896), and others soon followed suit. Today, professional boxing is regulated in each state by athletic or boxing commissions, most of which are members of the World Boxing Association (WBA), founded in 1921. However, several states do not accept WBA rulings, and on occasion more than one champion reigns. Professional boxers, wearing gloves weighing at least 5 oz (141.75 grams) each, fight in a roped-off area, or ring, about 20 ft (6.1 m) square. Competitors are divided into classes according to maximum weight—flyweight (112 lb/50.81 kg), bantamweight (118 lb/53.53 kg), featherweight (126 lb/57.15 kg), lightweight (135 lb/61.24 kg), welterweight (147 lb/

66.68 kg), middleweight (160 lb/72.58 kg), light heavyweight (175 lb/79.38 kg), and heavyweight (over 175 lb). John L. Sullivan was the bareknuckle champion from 1882 to 1892. After the Queensberry rules were generally accepted, the recognized world's heavyweight champions were James J. Corbett (1892-97), Robert L. Fitzsimmons (1897-99), James J. Jeffries (1899-1905) [disputed 1905-10], Jack Johnson (1910-15), Jess Willard (1915-19), William H. (Jack) Dempsey (1919-26), Gene Tunney (1926-28) [disputed 1928-30], Max Schmeling (1930-32), Jack Sharkey (1932-33), Primo Carnera (1933-34), Max Baer (1934-35), James J. Braddock (1935-37), Joe Louis (Joseph Louis Barrow, 1937-49), Ezzard Charles (1949-51), Jersey Joe Walcott (Arnold Cream, 1951-52), Rocky Marciano (Rocco Marchegiano, 1952-56), Floyd Patterson (1956-59, 1960-62), Ingemar Johansson (1959-60), Charles (Sonny) Liston (1962-64), Muhammad Ali (Cassius Clay, 1964-67, 1974-) [disputed 1967-70 after Muhammad Ali's title was declared forfeit as a result of his refusal to enter the army], Joe Frazier (1970-73), George Foreman (1973-74). Other famous boxers include Henry Armstrong, Tony Canzoneri, Georges Carpentier, George Dixon, Johnny Dundee, Joe Gans, Harry Greb, Stanley Ketchel, Benny Leonard, Tommy Loughran, Kid McCoy, Jimmy McLarin, Terry McGovern, Archie Moore, Battling Nelson, “Philadelphia” Jack O'Brien, “Sugar” Ray Robinson, Barney Ross, Mickey Walker, and Jimmy Wilde. Boxing reached its peak of popularity in the 1920s and 30s. Since World War II boxing has declined in popularity, rising admission prices and the influence of television have been the main factors in the decline. Most major championship fights are now telecast only on closed-circuit networks in theaters. Other injurious influences have been scandals, ring injuries and deaths, and monopolistic practices by promoters. The largest purse in boxing history was the \$10 million split by George Foreman and Muhammad Ali in their 1974 bout in Zaire, in which Ali regained the championship. Largely drawn by Ali, one of boxing's most colorful and controversial figures, many millions of people throughout the world watched his victory on either satellite or cable television. Amateur boxing in the United States is regulated by the Amateur Athletic Union. The National Collegiate Athletic Association championships and the Golden Gloves competition are other important amateur bouts. Boxing became part of the modern Olympic games in 1904. Olympic weight divisions correspond closely to those used in professional boxing. See Pierce Egan *Boxiana* (1812, repr. 1971), N. S. Fleischer, *50 Years at Ringside* (1940, repr. 1969), John Durant, *The Heavyweight Champions* (4th ed., rev. and enl. 1971), Art Fischer et al., *Garden of Innocents* (1972), Rex Lardner, *The Legendary Champions* (1972).

box turtle, hard-shelled land TURTLE of the genus *Terrapene*, native to North America. Its lower shell, or plastron, has a hinge dividing it into front and rear sections, the animal can raise these sections to meet the upper shell, or CARAPACE, forming a secure box around its body. It is primarily a vegetarian, although it also eats insects, earthworms, and slugs. The box turtle hibernates during cold winters and mates in the spring. In summer the female buries from two to seven eggs, which hatch out in the early fall. The young often remain in the nest until the following spring. The Eastern box turtle, *Terrapene carolina*, is a woodland species found in the eastern and central United States. The Western species, *T. omata*, is found in the grasslands of the central United States and northern Mexico. There are also several rare Mexican species. Box turtles are classified in the phylum CHORDATA, subphylum Vertebrata, class Reptilia, order Chelonina, family Emydidae.

Boyacá (bōyākā'), town (1968 est. pop. 7,700), N central Colombia, near Tunja. At Boyacá on Aug. 7, 1819, revolutionary forces under Simón BOLÍVAR won the decisive engagement that assured the independence of present-day Colombia and Venezuela from Spain.

boyars (bōyärz'), upper nobility in Russia from the 10th through the 17th cent. The boyars originally obtained influence and government posts through their military support of the Kievan princes. Their power and prestige, however, soon came to depend almost completely on landownership. The boyars occupied the highest state offices and through a council advised the prince. When political power shifted to Moscow in the 14th and 15th cent., the boyars retained their influence. However, as the Moscow grand princes consolidated their power,

the influence of the boyars was gradually eroded, particularly under Ivan III and Ivan IV. Their ancient right to leave the service of one prince for another was curtailed, as was their right to hold land without giving obligatory service to the czar. The political turmoil of the so-called time of troubles further weakened the boyars, and in the 17th cent. the rank and title of boyar was abolished by Peter I.

Boyce, William, c. 1710-1779, English composer. After studying in London, he became a composer (1736) and later an organist (1758) of the Chapel Royal and Master of the King's Music in 1755. Although overshadowed by Handel, he was the foremost English-born composer of his day. He wrote symphonies, stage works, and much vocal music. His most important work is *Cathedral Music* (3 vol., 1760-78), a compilation of church music by many English composers.

boycott, concerted economic or social ostracism of an individual, group, or nation to express disapproval or coerce change. The practice was named (1880) after Capt. Charles Cunningham Boycott, an English land agent in Ireland whose ruthlessness in evicting tenants led his employees to refuse all cooperation with him and his family. In the United States the boycott is used chiefly in labor disputes, consumers' and businessmen's groups also resort to the method. Boycotts may be either primary or secondary. A typical example of a primary boycott is the refusal of aggrieved employees and their supporters to purchase the goods or services of an employer. A secondary boycott occurs when the aggrieved party attempts either to boycott a third party or to coerce it into joining an ongoing boycott. Thus, workers instituting a boycott may refuse to patronize firms that continue to deal with the initially boycotted party. Similarly, a secondary boycott would occur if workers struck an employer in order to force him to join the boycott of another firm. In the United States, such secondary actions are prohibited by both the Taft-Hartley Act (1947) and the Landrum-Griffin Act (1959), although little has been done to enforce the ban. During the late 1960s and early 70s the United Farm Workers union employed a series of boycotts in an attempt to gain recognition as the sole bargaining agent for grape and lettuce fieldworkers. The boycott has been used as a weapon in political and racial issues. Outstanding examples are the refusal of American colonials to buy British goods after the passage of the Stamp Act (1765), the Chinese boycott of U.S. goods (1905) because of the poor treatment of Chinese in America, the refusal of Gandhi's followers to buy British-made goods in India, and the Arab League boycott (1948) of all companies dealing with the state of Israel. The legal status of the boycott differs with various governments. See H. W. Laidler, *Boycotts and the Labor Struggle* (1914, repr. 1968).

Boyd, Alan Stephenson, 1922-, U.S. Secretary of Transportation (1967-69), b. Macclenny, Fla. A lawyer in Florida, he served as general counsel to the Florida Turnpike Authority (1955) and as a member (1955-59) and chairman (1957-58) of the Florida Railroad and Public Utilities Commission. He was named to membership on the Civil Aeronautics Board by President Eisenhower in 1959, becoming its chairman in 1961. In 1965, President Lyndon B. Johnson appointed him Undersecretary of Commerce for transportation, and in 1967 he became head of the newly created Dept. of Transportation.

Boyd, Belle, 1844-1900, Confederate spy in the Civil War, b. Martinsburg, Va. (now WV). Operating (probably unofficially) in Martinsburg and Front Royal, she provided Gen. T. J. (Stonewall) Jackson with valuable information on Union activities in the Shenandoah Valley in 1862. In 1864, after being twice imprisoned and released, she went to England, supposedly with secret dispatches from Jefferson Davis to Confederate agents there. The first of her three husbands, a Union officer who had been her captor, followed her to England to marry her. After his death she began a career on the English stage (1866) and on her subsequent return to the United States toured widely, especially in the Middle West, giving dramatic talks about herself and sundry episodes of the Civil War. She wrote *Belle Boyd in Camp and Prison* (1865). See biography by L. A. Sigaud (1945).

Boyd, Ernest, 1887-1946, American critic and author, b. Dublin, Ireland. In the British consular service, he resigned in 1920 and settled in New York City, where he became an important literary figure. He contributed editorials to periodicals, wrote criticism on European literature, and translated modern French and German authors. His works include

Contemporary Drama of Ireland (1917), *Portraits, Real and Imaginary* (1924), *H. L. Mencken* (1925), *Guy de Maupassant* (1926), and *Literary Blasphemies* (1927). He was editor and translator of the complete works of Guy de Maupassant.

Boyd, Louise Arner, 1887-1972, American arctic explorer, b. San Rafael, Calif. She led a series of scientific explorations on the east coast of Greenland. The expedition of 1933, sponsored by the American Geographical Society, was described in her *The Fiord Region of East Greenland* (1935), on those of 1937 and 1938 a submarine ridge between Bear Island and Jan Mayen was made known, that of 1941 was undertaken for the National Bureau of Standards. In World War II she was (1942-43) a technical expert in the War Dept. In 1955, Boyd flew over the North Pole, the first woman to do so successfully, she photographed the area around the North Pole and the Arctic Sea. She wrote *The Coast of North-east Greenland* (1948).

Boydell, John (boi'dəl), 1719-1804, English engraver and print publisher, originator and builder of the Boydell Shakespeare Gallery. He studied engraving in London and early began to amass his fortune with the publication of his engravings of views of England and Wales. It is as the publisher of works by other engravers, however, that he is better known. In 1786 he began the publication, by subscription, of prints illustrating Shakespeare's works. The leading English artists were commissioned and a gallery was built by Boydell to house the works. Because of financial reverses, the collection was sold by lottery in 1804.

Boyd Orr, John Boyd Orr, 1st Baron, 1880-1971, British nutritionist and agricultural scientist, b. Scotland, grad. Univ. of Glasgow. He served as professor of agriculture at the Univ. of Aberdeen (1942-45), as government consultant on nutrition and health, and as director general (1946-47) of the United Nations Food and Agriculture Organization. He made notable contributions to the science of nutrition and to the solution of world food problems, and he worked toward the establishment of a world government. Knighted in 1935, he was created baron in 1949. He was awarded the 1949 Nobel Peace Prize for advocating a world food policy based on human needs rather than trade interests. His writings include *The National Food Supply and Its Influence on Public Health* (1934), *Food and the People* (1943), *Food—The Foundation of World Unity* (1948), and *The White Man's Dilemma* (1953).

Boye, Karin (ka'rēn bö'yē), 1900-1941, Swedish novelist, poet, and short-story writer. Boye's volumes of poetry, including *Moln* [clouds] (1922) and *Glomdalen* [forgotten land] (1924), reveal an austere and ardent idealism as well as a seriousness and social awareness equal to that of her prose fiction. Her early novels, e.g., *Astarte* (1931) and *Kris* [Crisis] (1934), are stylized and expressionist in style. *Kallöcarin* (1941), her last novel, is a fierce protest against totalitarianism. Boye died an apparent suicide at 40.

Boyen, Hermann von (boi'ən), 1771-1848, Prussian field marshal. After the Prussian defeat by Emperor NAPOLEON I and the disastrous treaties of Tilsit in 1807 (see TILSIT, TREATIES OF), he assisted SCHARNHORST in the reorganization of the Prussian army. As chief of staff to F. W. von BÜLOW, he fought (1813-14) against the French in the War of Liberation, and as minister of war (1814-19) he completed the reforms that were initiated earlier. His measures, including the introduction of general conscription and the development of a national guard, formed the basis of Prussian military strength. He was again minister of war from 1841 to 1847.

Boyer, Jean Pierre (zhaN pyēr bwayā'), 1776-1850, president of Haiti (1818-43). A free mulatto, he fought under TOUSSAINT L'OUVERTURE and then joined André RIGAUD, also a mulatto, in the latter's abortive insurrection against Toussaint. He returned in 1802 with the French army of Charles CLÉBER but later joined the patriots under Alexandre PÉTION, who chose him as his successor. He united N and S Haiti after the suicide of Henri CHRISTOPHE (1820), and in 1822, taking advantage of the weakness of Spanish Santo Domingo, he took control of the whole island. Compulsory labor was instituted. In 1825 a French fleet forced Boyer to pay an exorbitant indemnity in return for French losses. France then recognized Haitian independence. Financial embarrassment, combined with the labor policy and the devastation of an earthquake in 1843, brought about Boyer's overthrow and permanent exile.

Boyesen, Hjalmar Hjorth (hya'l-mär hyört boi'-ēsen), 1848-95, American writer, b. Norway, educated at the universities of Leipzig and Christiania

(Ph.D., 1868). He came to the United States in 1869 and became editor of *Fremad*, a Norwegian weekly published in Chicago. Later he was a professor at Cornell and Columbia universities; his scholarly works include *Goethe and Schiller* (1879) and *Essays on Scandinavian Literature* (1895). Boyesen is best remembered for his fiction, including *Gunnar* (1874), a romance of Norwegian life, and realistic urban novels, such as *The Mammon of Unrighteousness* (1891) and *The Social Strugglers* (1893). See biography by C. A. Glasrud (1963).

Boyle, Charles, 4th earl of Orrery. see ORRERY, CHARLES BOYLE, 4TH EARL OF

Boyle, Kay, 1903-, American writer, b. St. Paul, Minn. She lived in Europe for 30 years and has taught English at San Francisco State College since 1963. Her novels and stories often illuminate a desperate moment when courageous action is demanded although tragedy will probably result. Among her works are the novel *Plagued by Nightingales* (1931), a short-story collection, *Nothing Ever Breaks Except the Heart* (1966), and an essay collection, *The Long Walk at San Francisco State and Other Essays* (1970).

Boyle, Richard, 1st earl of Cork, 1566-1643, English settler in Ireland. He first went to Ireland in 1588 and in 1602 purchased for a small sum Sir Walter Raleigh's large landholdings in Cork, Waterford, and Tipperary. His energy and success in improving the lands, building mills, establishing ironworks and other industries, founding towns, and creating trade were remarkable and won him rapid advancement. Created earl of Cork in 1620, he was appointed (1629) one of the lord justices of Ireland and in 1631 became lord high treasurer of the kingdom. In this position he came into conflict with Thomas Wentworth (later 1st earl of STRAFFORD), who arrived in Ireland as lord deputy in 1633. In their long struggle Strafford at first was successful in depriving Boyle of a large part of his privileges and income, but Boyle's patient marshaling of the forces of opposition to Strafford's Irish program was an important factor in the latter's downfall. He remained loyal to the crown, however, and helped put down the sudden Irish rebellion of 1641. Two of his seven sons became well known—Roger Boyle, 1st earl of Orrery, and Robert Boyle, the scientist. See Dorothea Townshend, *The Life and Letters of the Great Earl of Cork* (1904).

Boyle, Robert, 1627-91, Anglo-Irish physicist and chemist. The seventh son of the 1st earl of Cork, he was educated at Eton and on the Continent and conducted most of his researches at his own laboratories at Oxford (1654-68) and London (1668-91). He invented a vacuum pump and used it in the discovery (1662) of what is now known as Boyle's law (see GAS LAWS). Boyle is often referred to as the father of modern chemistry; he separated chemistry from alchemy and gave the first precise definitions of a chemical element, a chemical reaction, and chemical analysis. He also made studies of the calcination of metals, combustion, acids and bases, the nature of colors, and the propagation of sound. Although he was especially noted for his experimental work, Boyle also contributed to physical theory, supporting an early form of the atomic theory of matter, which he called the corpuscular philosophy, and using it to explain many of his experimental results. His extensive writings established him as the leading scientist of his time and contributed greatly to the dominance of the mechanistic theory following Newton's work. Boyle was one of the group at Oxford that later became the Royal Society, but he refused the presidency of the society in 1680, as well as many other honors. See his works, ed. by Thomas Birch (6 vol., 1772, repr. 1965-66), biography by R. E. W. Maddison (1969), study by Marie Boas Hall (1958, repr. 1968).

Boyle, Roger, Baron Broghill and 1st earl of Orrery: see ORRERY, ROGER BOYLE, 1ST EARL OF

Boyle's law: see GAS LAWS

Boylston, Zabdiel, 1679-1766, American physician, b. Brookline, Mass. He was privately educated in medicine and settled in Boston. In an epidemic of smallpox in 1721 he was persuaded by Cotton Mather to inoculate, thus introducing the practice to the United States. Beginning with his son and two slaves, he inoculated over 240 persons, all but six of whom survived. Public sentiment, however, was against the experiment, and the lives of both Boylston and Mather were threatened. In 1724, Boylston visited England, and his *Historical Account of the Small-Pox Inoculated in New England* was published there in 1726.

Boyne, river, c. 70 mi (110 km) long, rising in the Bo of Allen, Co. Kildare, E. Republic of Ireland, and flowing NE through Co. Meath, past Trim, to the Irish Sea near Drogheda. Salmon is caught in the river. In the battle of the Boyne (July, 1690) near Drogheda, the armies of King William III defeated the Catholic James II, who fled to France. The victory is commemorated annually by Irish Protestants.

Boynton Beach, city (1970 pop. 18,115), Palm Beach co., SE Fla., on the Atlantic coast, inc. 1920. It is a beach resort.

Boyron, Michel: see BARON, MICHEL

Boys' Clubs of America, federation of more than 900 clubs organized (1906) in Boston as the Federated Boys' Clubs. Its purpose is to fight delinquency by providing leisure-time activities.

Boy Scouts, organization of boys over 12 years old, founded (1908) in Great Britain by Sir Robert BADEN-POWELL. It was incorporated in 1910 in the United States, where its appearance was connected with earlier organizations—the Sons of Daniel Boone, organized by Daniel Carter BEARD, and the Woodcraft Indians, organized by Ernest Thompson SETON. In the United States, James E. West was chief scout from 1911 to 1943. From those beginnings the movement spread throughout most of the world, with the organization and program basically the same in every country. It is intended to be nonmilitary and without racial, religious, political, or class distinctions. The community-level unit is the troop, which is subdivided into patrols of about 10 boys each. An adult scoutmaster administers the troop's program. Scouts are divided into classes—tenderfoot and second-class and first-class scouts. The program of activities aims at a threefold development, mental, moral, and physical, it stresses outdoor knowledge and skills and embraces training in citizenship, nature lore, wood and camp craft, manual arts, lifesaving, and sports. Boy Scouts have performed useful service in many civic projects, sharing in nationwide safety-first and city-improvement campaigns, acting as assistant traffic patrols, and aiding in the prevention of forest fires. The first of several international gatherings of Boy Scouts, called jamborees, was held in London in 1920. See Edwin Nicholson, *Education and the Boy Scout Movement in America* (1941, repr. 1973). Two related organizations, the Cub Scouts and the Explorer Scouts, offer similar programs to 8- to 10-year-olds and older teenagers, respectively. See GIRL SCOUTS.

boysenberry: see BRAMBLE

Boys Town, village, Douglas co., E. Nebr., inc. 1936. The noted community was founded in 1917 by Father Edward J. Flanagan (1886-1948) for homeless or abandoned boys. The village is governed by the boys themselves and maintained by voluntary contributions.

Bozcaada (böz'ja'a'da) or **Tenedos** (tēn'ədōs), is land (1970 pop. 2,030), 15 sq. mi (39 sq. km), NW Turkey, in the Aegean Sea. The strategically located island was a station of the Greek fleet during the Trojan War. Xerxes used it (5th cent. B.C.) as a base for the Persian fleet. The Ottoman Turks captured it in 1657.

Bozeman, John M. (böz'mən), 1835-67, American pioneer. A Georgian, he went to the gold fields of Colorado (1861) and Montana (1862). In the winter of 1862-63 he traveled with a companion from Bannack, Mont., to Colorado by a route lying E of the Big Horn Mts. through lands reserved by treaty to the Indians. Since the only other approaches to Montana from the east were the long, circuitous Missouri River or a trail leading N from the Overland Trail in Idaho (which necessitated a double crossing of the Continental Divide), he was enthusiastic about his short cut, which became known as the **Bozeman Trail**. Several parties, including one guided by Bozeman himself, used the trail in 1864, and in 1865-66 the Federal government built forts Reno, Phil Kearney, and C. F. Smith to guard it. However, after the Fetterman Massacre, Dec. 1866 (see under FETTERMAN, WILLIAM JUDD), the trail S and E of Fort C. F. Smith was abandoned. In April, 1867, Bozeman was killed by Indians. Bozeman Pass, where the trail crossed the Belt Mts., and Bozeman, Mont., were named for him. See study by D. M. Johnson (1971).

Bozeman, city (1970 pop. 18,670), seat of Gallatin co., SW Mont., inc. 1883. The city is named after John M. Bozeman, a pioneer who led the first settlers there in 1864. Bozeman is the center of a farming and stock-raising area. Tourism is an important source of revenue; the city is the headquarters of Gallatin National Forest, and Yellowstone National Park is nearby. Montana State Univ. is in Bozeman.

Bozeman Trail: see under BOZEMAN, JOHN M

Bozen: see BOLZANO, Italy

Bozez (bō'zēz) and **Seneh** (sē'nē), two cliffs, at the entrance to the ravine of Michmah (now the Wadi Suveinet) 1 Sam 14 4,5

Bozkath (bōz'kāth), unidentified place, SW Palestine Joshua 15 39 Boscath 2 Kings 22 1

Bozrah (bōz'ra) 1 Important city of Edom, probably the modern Busayra (Jordan), SE of the Dead Sea The prophets often linked the name Bozrah with that of Edom Gen 36 33, 1 Chron 1 44, Isa 34 6, Jer 49 13,22, Amos 1 12, Micah 2 12 2 City of Moab, perhaps identical with Bezer Jer 48 24

Bozzaris, Marco or Markos (bōzār'is, -zār'is, Gr bōt'sarēs), c 1788-1823, Greek patriot Exiled from his native Epirus in 1803, he joined ALI PASHA in 1820 and later was prominent in the Greek War of Independence, notably in the defense of Mesolongion (1822-23) and at Karpenision, where he defeated the Turks with a handful of men but died in battle

Br, chemical symbol of the element BROMINE

Brabant (Fr brābān', Flemish brabant'), province (1970 pop 2,176,373), 1,268 sq mi (3,284 sq km), central Belgium BRUSSELS (the capital) and LOUVAIN are the chief cities The densely populated province is drained by the Dyle, Senne, and Demer rivers Much of its soil is fertile and is under cultivation, and there is much industry Except in Brussels, the population is mostly Flemish-speaking The province occupies the southern part of the former duchy of Brabant

Brabant, duchy of, former duchy, now divided between Belgium (Brabant and Antwerp provs) and the Netherlands (NORTH BRABANT prov) Louvain, Brussels, and Antwerp were its chief cities The duchy of Brabant emerged (1190) from the duchy of Lower Lorraine In 1430 it passed to Philip the Good of Burgundy, and in 1477 it was taken by the Hapsburgs (For the history of Brabant from 1477 to 1794 see NETHERLANDS, AUSTRIAN AND SPANISH) Like the rest of the S Low Countries, Brabant owed its extraordinary prosperity during the Middle Ages to its wool and other textile industries and to the commercial enterprise of the inhabitants of its cities and towns ANTWERP, its greatest city, was for a time the financial capital of Europe The dukes of Brabant, who relied on the towns for money to finance their wars and their luxurious life styles, granted the towns virtual self-government and an ever-increasing share in the management of the duchy In 1356 this trend culminated in the granting of a charter of liberties known as the *foyeuse Entree*, so called because each subsequent duke had to swear to it when entering Louvain after acceding According to the charter, the dukes could not declare war, conclude alliances, or coin money without the consent of delegates of the clergy, nobility, and towns, who together formed an assembly later known as the Estates of Brabant The charter was abolished (1789) by Emperor Joseph II In 1830, S Brabant led the revolt against Dutch rule that resulted in independence for Belgium Since 1840 the eldest son of the king of the Belgians has held the title duke of Brabant

Brač (brach), Ital Brazza, island (1971 pop 12,831), 152 sq mi (394 sq km), off the Dalmatian coast in the Adriatic Sea, W Yugoslavia It is a popular summer resort and tourist spot Supetar (Ital San Pietro), a small port, is the island's chief town

Bracara Augusta: see BRAGA, Portugal

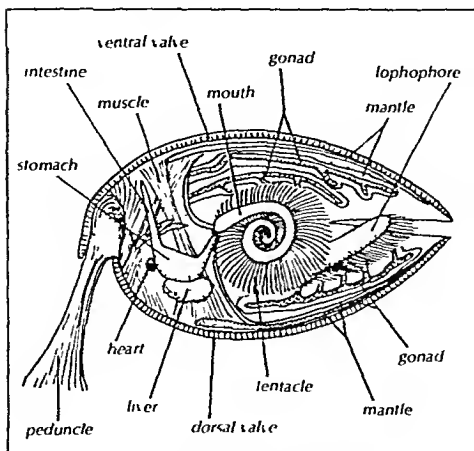
Brace, Charles Loring, 1826-90, American social reformer, b Litchfield, Conn He founded (1853) the Children's Aid Society of New York, a pioneer organization that established modern methods in child welfare Among his books are *Short Sermons to Newsboys* (1866) and *Gesta Christi* (1882) See biography by Emma Brace (1894), Gordon Trasler, *In Place of Parents* (1960)

brace: see DRILL

Bracegirdle, Anne, 1663?-1748, English actress A pupil of Betterton, she was the delight of Colley Cibber and the favorite of Congreve, achieving her greatest successes as the heroines of Congreve's comedies, which were written for her Eclipsed by Anne Oldfield, she retired in 1707, but in 1710 made a reappearance as Angelica in *Love for Love* together with Betterton and Mrs Barry

Brachiopoda (brākēōp'ōdā), phylum of shelled sessile or sedentary marine animals, commonly known as lamp shells, and characterized by a peculiar feeding organ, the lophophore The shell consists of two parts, called valves, that completely enclose the body, the external appearance of the animal is much like that of a bivalve mollusk, or pelecypod,

such as a clam However, the valves of a lamp shell cover the top and bottom of the animal, while those of a clam cover the right and left sides Furthermore,



Internal anatomy of a lamp shell, Magellania, representative of the phylum Brachiopoda

the internal anatomy of brachiopods does not resemble that of pelecypods, the two groups are not related There are two classes in the phylum the Inarticulata, members of which have the valves held together by muscles alone, and the Articulata, members of which have interlocking processes that form a hinge A complex set of muscles opens the shell for feeding and closes it for protection In most brachiopods a short stalk called a pedicel, or peduncle, emerges between the valves or through an opening in the lower valve Most sessile brachiopods attach to objects by means of the pedicel, but a few lack pedicels and attach directly by the ventral valve Burrowing lamp shells have long pedicels, which they contract to retreat into the burrow The lophophore consists of two tentacle-bearing arms, often spirally coiled, one on either side of the mouth The tentacles have cilia that create currents, drawing water-bearing food particles and oxygen into the shell Food particles are trapped in mucus on the tentacles and moved by the cilia to the mouth Oxygen is absorbed through the body wall Brachiopods have a simple digestive and nervous system, and are equipped with excretory organs called nephridia The open circulatory system includes a contractile vessel, or heart, and sinuses for the flow of the colorless circulatory fluid to various parts of the body Reproduction is sexual and the sexes are usually separate In most species the eggs and sperm are shed into the sea, where fertilization results in the development of free-living, ciliated larvae The larvae settle to the bottom after developing rudiments of the adult structures A few species brood their young Brachiopods are believed to be related to the shell-less bryozoans, or moss animals (phylum ECTOPROCTA), which also have a lophophore Abundant at the start of the Cambrian period, brachiopods were widespread and numerous in ancient seas About 30,000 extinct species are known, and members of the largest species were almost 1 ft (30 cm) in diameter Fewer than 300 species are extant today, and these are relatively small, usually 1 to 2 in (2.5-5 cm) across All are marine and most prefer shallow water, they are sporadically distributed, although some are very abundant locally Among the better known lamp shells are the burrowing *Lingula* (class Inarticulata) and the stalkless, sessile *Crania* (class Articulata)

Bracken, John, 1883-1969, Canadian political leader, b Ontario A noted agricultural expert, he was premier of Manitoba for 20 years (1922-42) In 1942 he was chosen to lead Canada's Conservative party, which he renamed Progressive Conservative Elected in 1945 to the Canadian House of Commons, he served as leader of the opposition until 1948, when he resigned

bracken or brake, common name for a tall fern (*Pteridium aquilinum*) with large triangular fronds, widespread throughout the world, often as a weed It is considered poisonous to livestock when eaten in quantity, but the rootstocks and the young shoots, cooked, have been used for food Bracken is also a source of tannin and is used for thatching and as bedding for livestock A beverage is made from the roots The names *bracken* and *brake* are some-

times also applied to other large, coarse ferns and, as general terms, to a thicket of such plants Bracken is classified in the division POLYPODIOPHYTES, class Polypodiopsida, order Filicales, family Polypodiaceae

Brackenridge, Henry Marie, 1786-1871, American writer, b Pittsburgh, son of Hugh Henry Brackenridge Admitted to the Pennsylvania bar in 1806, he moved to St Louis, where he was a lawyer and journalist Among his writings are *Views of Louisiana* (1814), part of which was one of the sources of Washington Irving's *Astoria*, and a pamphlet *South America* (1817), which puts forth a policy similar to the Monroe Doctrine Sent to South America to study political conditions, he recounted his experiences in *Voyage to South America* (1819) His *Recollections of Persons and Places in the West* (1834) is a valuable historical source See biography by W F Keller (1956)

Brackenridge, Hugh Henry, 1748-1816, American author and jurist, b Scotland, grad Princeton, 1771 He studied theology and served in the American Revolution as chaplain, but later turned to law His early writings include two patriotic plays and some verse In 1781 he moved to Pittsburgh, where he founded (1786) the *Pittsburgh Gazette*, the city's first newspaper, and helped to establish the Pittsburgh Academy (now the Univ of Pittsburgh) A leading Pennsylvania supporter of the Federal Constitution, Brackenridge later acted (1794) as a peacemaker in the Whiskey Rebellion He was also a justice of the Pennsylvania supreme court from 1799 to his death He is, however, best known as an author His satirical and picaresque novel, *Modern Chivalry* (6 vol, 1792-1805, rev ed, 4 vol, 1804-7), written in a vigorous style, pictures backwoods life in America In it, the moderate democrat Brackenridge ridicules the excesses of a raw democracy He also wrote an account of the Whiskey Rebellion and several political tracts See C M Newlin, *Life and Writings of Hugh Henry Brackenridge* (1932, repr 1971), biography by Daniel Marder (1967)

bracket fungi: see FUNGI

brackets: see PUNCTUATION

Brackley, Thomas Egerton, Viscount see ELLESMERE, THOMAS EGERTON, BARON

Bracknell, new town and civil parish (1971 pop 37,279), Easthamstead rural district, Berkshire, S England Bracknell was designated one of the NEW TOWNS in 1949 to alleviate overpopulation in London Its current population target is 60,000 In 1949, Bracknell was a market town of some 5,000 persons, with timber yards and a brickmaking industry Its new industries include the manufacture of boilers, gasoline pumps, tools, clothing, and sealing compounds There is a college of further education

Bracquemond, Félix (fālēks' brakmōN'), 1833-1914, French engraver, painter, and decorator of ceramics He is best known for his many etchings, both original and reproductions of famous paintings Bracquemond was a chief founder of the influential Society of Painter-Engravers, established in France in 1889

Bracton, Henry de, d 1268, English writer on law He was the author of *De legibus et consuetudinibus Angliae* [on the laws and customs of England], a broad, philosophic treatise that is often called the most important work on English law before that of Sir William BLACKSTONE Sir Edward COKE and others used the work in their legal arguments against the king in the English civil war See edition of *De legibus* by G E Woodbine (4 vol, 1915-42), edition of Bracton's notebook by F W Maitland (3 vol, 1887)

Bradbury, Ray, 1920-, American writer, b Waukegan, Ill A popular writer of SCIENCE FICTION, Bradbury skillfully combines social and technological criticism with delightful fantasy His best-known works include the short-story collections *The Martian Chronicles* (1950) and *Dandelion Wine* (1957), the novels *Fahrenheit 451* (1953), *Something Wicked This Way Comes* (1962), and *The Halloween Tree* (1972), and a volume of poetry, *When Elephants Last in the Dooryard Bloomed* (1972)

Bradbury, William Batchelder, 1816-68, American hymn composer and music editor, b York, Maine, pupil of Lowell Mason He organized the Juvenile Music Festivals in New York, and later, after studying in Germany, he started music conventions in New Jersey He compiled over 50 collections of Sunday-school songs, and his own tunes, such as those for *He Leadeth Me*, for *Just as I Am, without One Plea*, and for *Savior, like a Shepherd Lead Us*, are still popular

Braddock, Edward, 1695-1755, British general in the French and Indian Wars Although he had seen little

active campaigning before 1754, Braddock was reputed to have a good knowledge of European military tactics and was noted as a stern disciplinarian. He was promoted to major general in 1754 and early in 1755 arrived in Virginia as commander in chief of the British forces in North America against the French. His immediate objective was the French stronghold at the forks of the Ohio (see FORT DUQUESNE). With some 700 colonial militiamen, whom he regarded disdainfully, and over 1,400 British regulars, he moved across the Alleghenies from Fort Cumberland (now Cumberland, Md.), building a road (the foundation of the National Road) as he went. The march was so slow, however, that he feared the French would reinforce Duquesne before he could reach there. Adopting the suggestion of one of his aides-de-camp, George Washington, he left the wagons behind him with one of the two British regiments and pushed ahead with about two thirds of his total force. While crossing the Monongahela River, Braddock was met (July 9, 1755) by a force of not more than 900 men (a few French, some Canadians, and many Indians) under Daniel Beaujeu, who had already learned of the advance. The British regulars, as unfamiliar with Indian-style fighting as their commander (although both had been given fair warning by the colonials), bolted from their column formation under the steady fire from a ubiquitous enemy safely concealed in ravines and behind trees. The affair turned into a bloody rout. Since the Indians paused to collect scalps and other trophies of war, the demoralized troops were able to rejoin the rear guard and both retreated safely to Fort Cumberland. Of the 1,459 actively engaged, 977 were killed or wounded, including 63 of the 89 officers, who—unlike the soldiers—fought bravely. Braddock himself had four horses shot from under him before he was mortally wounded. He died four days later at Great Meadows and was buried there, near the site of Uniontown, Pa. See D. S. Freeman, *George Washington*, Vol. II (1948), biography by Lee McCardell (1958).

Braddock, borough (1970 pop. 8,795), Allegheny co., W. Pa., an industrial suburb of Pittsburgh, on the Monongahela River, settled 1742, inc. 1867. It is a steel-manufacturing center. On that site, in 1755, Gen. Edward Braddock was defeated by the French and the Indians.

Bradenton (bră'dəntən), city (1970 pop. 21,040), seat of Manatee co., SW Fla., on Tampa Bay at the mouths of the Braden and the Manatee rivers, inc. 1903. A popular winter resort with excellent fishing in the rivers, bay, and Gulf, it is also a shipping center for the citrus fruit and truck crops of the area. Travertine is quarried and refined there. Hernando DeSoto is believed to have landed near that site in 1539, the DeSoto National Memorial is to the west (see NATIONAL PARKS AND MONUMENTS, table). The area was settled (1850s) by Joseph Braden, whose castlelike home is a local landmark. An annual event (March) is the reenactment of the DeSoto landing.

Bradford, Andrew, 1686–1742, colonial printer of Pennsylvania, b. Philadelphia, son of William BRADFORD (1663–1752). Andrew learned the trade in his father's shop in New York City and in 1712 went to Philadelphia, where he established his own press and became a bookseller. In 1719 he began publication of the *American Weekly Mercury*, the first newspaper in Pennsylvania and the third in the colonies. He was imprisoned for publishing political criticism but defended his own case for freedom of the press, establishing a precedent for the defense of John Peter Zenger. In 1741 he began publication of the short-lived (three issues) *American Magazine*, the first colonial magazine.

Bradford, Augustus Williamson, 1806–61, Civil War governor of Maryland (1862–66), b. Bel Air, Md. As a delegate to the 1861 peace conference in Washington, he strongly pleaded for the Union and became the Union party candidate for governor of Maryland. Elected by a large majority, partially as a result of intimidation at the polls by Union soldiers, Bradford served from 1862 to 1866, assuring Federal control of the state. In 1862 and 1863 he appealed for volunteers in a state-equipped local militia that helped turn back Confederate invasions of state territory. Denying that the Federal government had the power to free the slaves in Maryland, he called a state convention in 1864 that framed a new constitution abolishing slavery. See W. B. Hesseltine, *Lincoln and the War Governors* (1948).

Bradford, Gamaliel, 1863–1932, American biographer, b. Boston. After many unsuccessful years as a writer, he achieved literary fame as a biographer with his *Lee*, the *American* (1912). He perfected the

method of writing "psychographs," or short portraits of historical figures. His works in this area include *Confederate Portraits* (1914), *Union Portraits* (1916), and *Damaged Souls* (1923). See his autobiographical *Life and I* (1928) and his journal (1933) and letters (1934), both edited by Van Wyck Brooks.

Bradford, John, 1510?–1555, English Protestant martyr, burned at Smithfield as a heretic in 1555. A complete collection of his writings, edited by Aubrey Townsend, was published in 1848–53.

Bradford, John, 1749–1830, pioneer printer of Kentucky, b. Virginia. He moved to Kentucky c. 1779. Although he had no previous practical experience, he issued at Lexington on Aug. 11, 1787, the first number of the *Kentucky Gazette*, the first newspaper in the territory, and succeeded, despite many handicaps, in making it a creditable sheet. In 1788 he printed the *Kentucke Almanac*, the first pamphlet in the W. United States. In 1792, Bradford published the acts of the initial session of the Kentucky legislature, the first book to be published in Kentucky. He aided in founding Transylvania Univ. and was the first chairman of the board (1799–1811). In 1826 he began to publish in the *Gazette* his "Notes of Kentucky," a valuable historical source, which continued until 1829.

Bradford, William, 1590–1657, governor of Plymouth Colony, b. Austerfield, Yorkshire, England. As a young man he joined the separatist congregation at Scrooby and in 1609 emigrated with others to Holland, where, at Leiden, he acquired a wide acquaintance with theological literature. Bradford came to New England on the *Mayflower* in 1620 and in 1621, on the death of John CARVER, was chosen leader of the Pilgrims. He remained governor for most of his life, being reelected 30 times, during the five years in which he chose not to serve, he was elected assistant. Bradford, though firm, used his large powers with discretion, and there were few complaints about his leadership. He maintained friendly relations with the Indians and struggled hard to establish fishing, trade, and agriculture. He stressed the obligations of the colonists to their London backers and was one of the eight colonial "undertakers" who in 1627 assumed Plymouth Colony's debt to the merchants adventurers. Given a monopoly of fishing and trading privileges, they finally discharged the debt in 1648. Bradford was more tolerant of other religious beliefs than were the Puritan leaders of Boston (although he was by no means consistent in this respect), and he was largely responsible for keeping Plymouth independent of the Massachusetts Bay colony. His famous *History of Plimoth Plantation*, not published in full until 1856, forms the basis for all accounts of the Plymouth Colony. The editions of W. T. Davis (1908), W. C. Ford (1912), and Samuel Eliot Morison (1952) are the best. See also G. F. Willison, *Saints and Strangers* (1945), biography by Bradford Smith (1951).

Bradford, William, 1663–1752, British pioneer printer in the American colonies. Born in Leicestershire, England, he served an apprenticeship under a London printer before emigrating in 1685 to Philadelphia, where he set up the first press. He added a bookstore in 1688 and was in 1690 one of the founders of the first paper mill in the colonies. He was arrested for printing a pamphlet critical of the Quaker government, his trial, at which no verdict was reached, was probably the first in the United States involving freedom of the press. Bradford moved (c. 1693) to New York City where he became royal printer and issued some 400 items in the next 50 years, including the first American Book of Common Prayer (1710), some of the earliest of American almanacs and many pamphlets and political writings. In 1725 he began publication of the royalist *New York Gazette*, the first New York newspaper. Many of his descendants, including Andrew BRADFORD and William BRADFORD, became printers.

Bradford, William, 1722–91, American Revolutionary printer and patriot, grandson of William Bradford (1663–1752). He learned printing from his uncle, Andrew Bradford, in Philadelphia, and in 1742 he set up his own shop. He established the successful anti-British *Weekly Advertiser*, which competed for many years with Benjamin Franklin's newspaper, the *Pennsylvania Gazette*. He also printed a number of books and published (1757–58) the *American Magazine* and *Monthly Chronicle*. In 1754 he established the London Coffee House in Philadelphia, this became the seat of the merchants' exchange. Bradford opposed the Stamp Act and took an active part in opposition to British measures, becoming a leader of the Sons of Liberty. He advocated and became official printer to the First Continental Con-

gress. Sacrificing his business, he became a major in the Continental Army and took part in the campaign in New Jersey. At Princeton he was badly wounded and his health shattered. His son, Thomas Bradford (1745–1838), carried on the business and published the *Merchants' Daily Advertiser*. See J. W. Wallace, *An Old Philadelphian* (1884).

Bradford, county borough (1971 pop. 293,756), West Riding of Yorkshire, N. central England, on a small tributary of the Aire River. It is a center of the worsted industry, which dates from the Middle Ages. There is an important wool exchange. Besides woollens, other fabrics (including synthetics) are made. Electroplating, electrical engineering, and the manufacture of machinery and automobiles are also important industries. There are stone quarries nearby. Bradford's landmarks include the memorial hall, dedicated to Edmund Cartwright, inventor of the power loom, St. Peter's Church (1458), now the cathedral of the diocese of Bradford, and the Conditioning House, a unique textile-testing establishment. The Univ. of Bradford, Bradford Technical College, Bradford Regional College of Art, and Margaret McMillan Memorial College of Education are in the borough. In 1974, Bradford became part of the new metropolitan county of West Yorkshire.

Bradford, city (1970 pop. 12,672), McKean co., NW Pa., in the Alleghenies, near the N.Y. line, settled c. 1823, inc. as a city 1879. The growth of the city was initiated by the discovery of oil (c. 1871), and oil refining is still a major industry. Other products include electronic components, steel couplings, cutlery, chemicals, and explosives. A two-year branch of the Univ. of Pittsburgh is in the city. Nearby are Allegheny National Forest (with its dam and reservoir) and Allegany State Park (N.Y.), the area is popular for hunting and fishing.

Bradlaugh, Charles (brăd'lô), 1833–91, British social reformer, a secularist. Editor of the free-thinking weekly *National Reformer* from 1860 and later associated with Annie BESANT, he was an early advocate of woman's suffrage, birth control, free speech, national education, trade unionism, and other controversial causes. In 1880, Bradlaugh was elected to Parliament after several unsuccessful attempts. Rather than take a Bible oath to be sworn in as a member of Parliament, Bradlaugh, an atheist, demanded the right to take an affirmation. This action provoked a great deal of controversy, and it was not until 1886 that the matter was settled in his favor. His numerous works include *Land for the People* (1877), *The True Story of My Parliamentary Struggle* (1882), and *Speeches* (1890). See H. Bradlaugh Bonner, *Charles Bradlaugh* (7th ed. 1908), J. P. Gilmour, ed., *Champion of Liberty* (1933), Walter L. Arnstein, *The Bradlaugh Case* (1965), David Tribe, *President Charles Bradlaugh*, M. P. (1971).

Bradley, Andrew Cecil, 1851–1935, English scholar and critic, b. Cheltenham, brother of Francis Herbert Bradley. He taught at Oxford for many years and was professor of poetry there (1901–6). Bradley is noted for his *Shakespearean Tragedy* (1904), a classic work of criticism noted for its exposition of Hamlet, Othello, and Macbeth as psychological beings and of Shakespeare as a consummate interpreter of the human soul. Bradley's other works include *Oxford Lectures on Poetry* (1909) and *Ideals of Religion* (1940).

Bradley, Francis Herbert, 1846–1924, English philosopher. He was educated at Oxford, where he became a fellow of Merton College in 1876. His works include *Ethical Studies* (1876), *Principles of Logic* (1883), and *Appearance and Reality* (1893). In logic Bradley attacked the psychological tendencies of empiricism by differentiating sharply between the mental act as a psychological event and its universal meaning, to him only the latter was the concern of logic. In metaphysics Bradley held that absolute idealism, in which the world of appearance is characterized by contradiction, is opposed to the absolute, in which all contradiction, including the gulf between subject and object, is transcended. Although greatly influenced by Hegel, Bradley's metaphysics is generally considered a highly original contribution to philosophical thought. See his collection of essays (2 vol., 1935), studies by Richard Wollheim (1959), A. K. Ganguly (1964), and G. L. Vander Veer (1970).

Bradley, James, 1693–1762, English astronomer, educated at Oxford. His discovery of the aberration of light, announced in 1729, placed him among the foremost contemporary astronomers. His second important discovery, the nutation, or "nodding," of the earth's axis, was not made known until 1748, when it had stood the test of careful observations.

over a period of nearly 19 years. In 1742, Bradley became astronomer royal. Under his direction the observatory at Greenwich was supplied with new instruments.

Bradley, Omar Nelson, 1893–, U.S. general, b. Clark, Mo. A graduate of West Point, he served in World War I and filled various army administrative and academic posts before assuming (1943) command of the 2d Corps in World War II. Bradley was active (1943) in the N. African and Sicilian campaigns and led (1944) the U.S. 1st Army in the invasion of Normandy. Later he commanded the U.S. 12th Army Group in the battle for Germany. Bradley acted (1945–47) as administrator of veterans' affairs, was appointed (1948) chief of staff of the U.S. army, and served (1949–53) as first permanent chairman of the joint chiefs of staff. Promoted to general of the army in 1950, he retired in 1953 to become a business executive. See his *Soldier's Story* (1951) and *Collected Writings* (4 vol., 1967).

Bradshaw, George, 1801–53, English map engraver and the originator of railway guides. *Bradshaw's Railway Time-Tables*, first published in 1839, became *Bradshaw's Monthly Railway Guide* (first issued 1841). He afterwards published *The Continental Railway Guide* and others.

Bradshaw, Henry, 1831–86, English librarian and antiquarian at Cambridge Univ. He discovered, organized, and made known the university's treasures of manuscripts and incunabula, especially those in Gaelic—the Book of Deer and old Celtic glossaries—and the early Waldensian records in the Piedmont MSS. He was dean of King's College from 1857 to 1865.

Bradshaw, John, 1602–59, English regicide judge. In 1649 he was made president of the parliamentary commission to try Charles I., other lawyers of greater prominence having refused the position. His conduct of the trial was arbitrary, he even refused the king the right to speak in his own defense. For a short time he was rewarded with honors and offices and acted (1649–53) as president of the council of state. He was forced to retire when Oliver Cromwell dissolved the council, and he became an opponent of the Protectorate.

Bradstreet, Anne (Dudley), c. 1612–1672, early American poet, b. Northampton, England, considered the first significant woman author in the American colonies. She came to Massachusetts in the Winthrop Puritan group in 1630 with her father, Thomas Dudley, and her husband, Simon Bradstreet, both later governors of the state. A dutiful Puritan wife who raised a large family, she nevertheless found time to write poetry. In 1650 her first volume of verse appeared in London as *The Tenth Muse Lately Sprung Up in America*. It was followed by *Several Poems* (Boston, 1678), which contains "Contemplations," probably her best work. Her verses are often derivative and formal, but some are graced by realistic simplicity and genuine feeling. See her works ed. by J. Hensley (1967), biography by E. W. White (1971).

Bradstreet, John, c. 1711–1774, British officer in the French and Indian Wars. A Nova Scotian, he was captured (1744) by the French and confined at LOUISBURG. After his exchange he described the weaknesses of the fortress, and in 1745 Sir William Pepperell captured the stronghold. For his services in the expedition, Bradstreet was promoted to the rank of captain and made lieutenant governor of St. John's, N.F., a post he held permanently. He led (1758) the successful expedition against Fort Frontenac, thereby cutting communications between the French forces in Canada and those on the Ohio River. Later he served (1759) under Lord AMHERST at Ticonderoga and Crown Point. In PONTIAC'S REBELLION, Bradstreet commanded the forces that garrisoned (1764) Detroit and other Western posts.

Bradstreet, Simon, 1603–97, colonial governor of Massachusetts, b. Lincolnshire, England. He emigrated to New England in 1630 and was assistant in the Massachusetts Bay Company for 49 years (1630–79) and for part of that time served as secretary (1630–36). In 1634, Bradstreet was sent with four others to the Plymouth, New Haven, and Connecticut colonies to negotiate concerning the formation of the New England Confederation, and on its organization became one of two Massachusetts representatives, a post he retained for 33 years. After the Restoration, John Norton and he went to England and succeeded in persuading Charles II to confirm the colony's charter. His first period as governor (1679–86) was followed by the unsuccessful royal administration of Sir Edmund ANDROS. He served as governor again, from 1689 to 1692. Anne BRADSTREET was his wife.

Bradwardine, Thomas (brād'wārdēn), c. 1295–1349, English mathematician, natural philosopher, and theologian. He was chaplain to Edward III (c. 1338) and later Archbishop of Canterbury. As a mathematician he is known for his *Tractatus de proportionibus velocitatum* (1328), which goes beyond the usual scholastic approach in attempting to derive novel quantitative relations between speed and force, as a natural philosopher he defended Aristotle's concept of the plenum against atomistic views, e.g., in his *Tractatus de continuo*. His major theological work, *De causa Dei contra Pelagium*, takes a determinist position on the problem of free will.

Brady, Diamond Jim (James Buchanan Brady), 1856–1917, American financier and philanthropist, b. New York City. He was a bellboy and messenger and then worked for the New York Central RR in various capacities. He later was employed by a railroad supply company, and his selling ability rapidly brought him a fortune. He began collecting diamonds and other jewels and amassed 30 complete sets of jewelry estimated as worth well over \$1 million. He was famous for his appetite and elaborate meals and was one of the best-known men in New York's Broadway night life. In 1912 he gave funds to Johns Hopkins Hospital, Baltimore (where he had received treatment) to found the James Buchanan Brady Urological Institute. See biography by Parker Morrell (1934, repr. 1970).

Brady, Mathew B., c. 1823–96, American pioneer photographer, b. Warren co., N.Y. Brady learned the daguerreotype process from S. F. B. Morse and in 1844 opened his own photographic studio in New York City, which brought him widespread fame. He published *Gallery of Illustrious Americans* in 1850 and five years later experimented successfully with the wet-plate process. He began photographing President Lincoln in 1860. When the Civil War began Brady was authorized to accompany and photograph the armies, through his efforts a vast visual record of the war was preserved. In 1875 the government purchased part of Brady's collection, but the rest passed into private hands after the photographer's financial failure. In 1954 the Library of Congress acquired the enormous Handy collection of Brady's work. See Roy Meredith, *Mr. Lincoln's Camera Man* (1946, repr. 1974), J. D. Horan, *Mathew Brady, Historian with a Camera* (1955), H. D. Milhollen and D. H. Mugridge, comp., *Civil War Photographs* (1961).

Brady, Samuel, 1758–95, American frontiersman. He fought in several battles of the American Revolution but earned his name as a scout in the Ohio country under Daniel Brodhead and Anthony Wayne. His exploits were the subject of much frontier legend.

bradycardia: see ARRHYTHMIA

Braga, Teófilo (tə'fəloō brā'ga), 1843–1924, Portuguese intellectual and political leader, b. Ponta Delgada in the Azores. At the Univ. of Coimbra he was a member of the positivist circle of Quental. In 1871 he began to teach at the Univ. of Lisbon, writing voluminously on many subjects. He tried to apply the positivist principles of Comte in his general history of Portuguese Literature (10 vol., 1870–81). A republican and an anticlerical in politics, he was chosen as first president of the new republic of Portugal (1910–11) and served again briefly in 1915. His teaching had a great effect on Portuguese intellectual life, and his writing stimulated interest in Portuguese history and literature. Several collections of his poetry were published during his lifetime.

Braga, city (1970 municipal pop. 101,877), capital of Braga dist., NW Portugal, in Minho. It is an agricultural trade center with minor industry. The ancient Bracara Augusta, it had considerable importance in Roman days, but was of much more importance in the Middle Ages as the see of the bishop of Braga, who rivaled the bishop of Toledo in power. As the seat of Portugal's titular primate, the city is still a religious center. In the old cathedral is the tomb of Henry of Burgundy. Nearby is a summer resort with the well-known Church of Bom Jesus do Monte.

Bragança (bragan'sə) or **Braganza** (–zə), town (1970 municipal pop. 33,928), capital of Bragança dist., NE Portugal, in Trás-os-Montes. It is of interest because of its castle, seat of the Braganza family, long the royal family of Portugal.

Braganza (brāgān'zā), royal house that ruled Portugal from 1640 to 1910 and Brazil from 1822 to 1889. It took its name from the castle of Braganza or Bragança. The line was descended from Alfonso, the natural son of John I of Portugal, who married the daughter of Nun'Alvares Pereira, the duke of Braganza. Although Alfonso's grandson, Ferdinand, was

executed for alleged treason by John II, the family steadily increased its possessions. John, 6th duke of Braganza, married a niece of King John III, and when the Portuguese threw off Spanish rule in 1640, their grandson became king as John IV. The house of Braganza ruled Portugal until the establishment of a republic in 1910. After Brazil declared (1822) its independence, it was ruled as an empire under Pedro I, son of John VI of Portugal, and Pedro II until a revolution made it a republic in 1889.

Bragg, Braxton, 1817–76, Confederate general in the U.S. Civil War, b. Warrenton, N.C. A graduate of West Point, he fought the Seminole and in the Mexican War was promoted to lieutenant colonel for distinguished service at Buena Vista. He resigned from the army in 1856 and lived on his Louisiana plantation until the outbreak of the Civil War, when he was appointed a Confederate brigadier general and assigned to command the coast from Pensacola, Fla., to Mobile, Ala. Shortly after being promoted to major general (Jan., 1862), he assumed command of Gen. A. S. Johnston's 2d Corps, leading it in the battle of Shiloh (April). With Johnston's death, Bragg was made a general, and he succeeded (June) General Beauregard in command of the Army of Tennessee. His invasion of Kentucky (Aug.–Oct., 1862) was unsuccessful, ending in retreat to Tennessee after Gen. D. C. BUELL caught up with him at PERRYVILLE. A reorganized Union army under Gen. W. S. ROSECRANS was then sent against him and at MURFREESBORO (Dec. 31, 1862–Jan. 2, 1863) forced him to withdraw again. In the CHATTANOOGA CAMPAIGN, Bragg, victorious in the battle of Chickamauga, laid siege to the Union army in Chattanooga, but in Nov., 1863, Gen. U. S. Grant thoroughly defeated him and forced him to retire into Georgia. Gen. J. E. JOHNSTON took over his command (December) and Bragg went to Richmond, where he became military adviser to Jefferson Davis, with nominal rank as commander in chief of Confederate armies. After the war he was chief engineer of Alabama and later lived in Texas, where he died. See biography by D. C. Seitz (1924, repr. 1971), study by Grady McWhiney (Vol. I, 1969).

Bragg, Sir William Henry, 1862–1942, English physicist, educated at King William's College, Isle of Man, and Trinity College, Cambridge. He served on the faculties of the Univ. of Adelaide in Australia (1886–1908), the Univ. of Leeds (1909–15), and the Univ. of London (1915–23). From 1923 he was Fullerian professor of chemistry in the Royal Institution and director of the Davy-Faraday research laboratory. He shared with his son W. L. Bragg the 1915 Nobel Prize in Physics for their studies, using the X-ray spectrometer, of X-ray spectra and of crystal structure. He became a Fellow of the Royal Society in 1906 and served as president of the society from 1935 to 1940. In 1920 he was knighted. Among his works are *The World of Sound* (1920), *Concerning the Nature of Things* (1925), *An Introduction to Crystal Analysis* (1929), and *The Universe of Light* (1933). With W. L. Bragg he wrote *X Rays and Crystal Structure* (1915, 5th ed. 1925). See biography by Sir Kerr Grant (1952).

Bragg, Sir William Lawrence, 1890–1971, English physicist, b. Adelaide, Australia, educated in Australia and at Trinity College, Cambridge, son of W. H. Bragg. He was professor of physics at Victoria Univ., Manchester, from 1919 to 1937. From 1938 to 1953 he was professor of experimental physics at Cambridge and director of the Cavendish Laboratory. In 1954 he was made head of the Royal Institution. He shared with his father the 1915 Nobel Prize in Physics for their studies, with the X-ray spectrometer, of X-ray spectra and of crystal structure. In 1941 he was knighted. Among his works are *The Structure of Silicates* (1930, 2d ed. 1932) and *Atomic Structure of Minerals* (1937). With his father he wrote *X Rays and Crystal Structure* (1915, 5th ed. 1925).

Brahe, Tycho (tī'kō brā), 1546–1601, Danish astronomer. The most prominent astronomer of the late 16th cent., he paved the way for future discoveries by improving instruments and by his precision in fixing the position of planets and stars. From Brahe's exact observations of the planets, Kepler devised his laws of planetary motions (see KEPLER'S LAWS). Brahe's achievements included the study of a supernova (first observed in 1572 and now known as Tycho's star) in the constellation Cassiopeia and the discoveries of a variation in the inclination of the lunar orbit and of the fourth inequality of the moon's motion. He never fully accepted the Copernican system but made a compromise between that and the Ptolemaic system. In the Tychonic system, the earth was the immobile body around which the

sun revolved, and the five planets then known revolved around the sun. Given funds by the Danish king Frederick II, Brahe built on the island of Ven a castle, Uraniborg, and an observatory, Stjerneborg. He was deprived of his revenues by Christian IV in 1596 and left Ven (1597) and in 1599 settled near Prague under the patronage of the German emperor Rudolf II. He published (1588) *De mundi aetherii recentioribus phaenomenis*, the second volume of a projected three-volume work on his astronomical observations, from an incomplete manuscript and notes Kepler edited. Volume I, *Astronomiae instauratae progymnasmatia* (1602). Brahe's *Astronomiae instauratae mechanica* (1598) contained his autobiography and a description of his instruments. See biographies by J. L. Dreyer (1890, repr. 1963) and J. A. Gade (1947).

Brahm, Otto (ô'tô bram), 1856-1912, German theatrical director, manager and critic. Inspired by the work of Antoine in Paris, he founded a theater, the Freie Bühne, in Berlin in 1889. There he devoted his efforts to eliminating from the German stage old-fashioned techniques by employing the theories and methods of the naturalists. In 1894 he became director of the larger DEUTSCHES THEATER and the acknowledged leader of the modern German theater movement.

Brahma (bra'mâ), one of the three supreme gods of HINDUISM, the others being VISHNU and SHIVA. In the late Vedic period he was called Prajapati, the primeval man, whose sacrifice permitted the original act of creation. Although worshiped until Gupta times, his popularity declined, and today only a single temple near modern Ajmer is devoted to him. He is regarded as the creator and is reborn periodically in a lotus that grows from the navel of the sleeping Vishnu. His consort is Sarasvati, patroness of art, music, and letters, and the traditional inventor of the Sanskrit language. A basic unit in the Hindu chronology is the *kalpa*, or "day of Brahma," which is equal to 4,320,000,000 earthly years. The neuter form of the masculine name Brahma is Brahman.

Brahmagupta (bra'măgôp'tă), c. 598-c. 660, Hindu mathematician and astronomer. He wrote in verse the *Brahma-sphuta-siddhanta* [improved system of Brahma], a standard work on astronomy containing two chapters on mathematics that were translated into English by H. T. Colebrooke in *Algebra from the Sanskrit of Brahmagupta* (1817). A shorter treatise, *The Khandakhadyaka* (tr. 1934), expounded the astronomical system of Aryabhata.

Brahman: see VEDANTA

Brahman or Brahmin (both bra'man), member of the highest, or priestly, caste of the Hindus. The Brahmins alone may interpret the VEDAS and perform the Vedic sacrifice. The vast majority of Brahmins today are in occupations unrelated to religion, but they retain their social prestige and many caste conventions. The Brahmins of India are divided into 10 territorial subcastes, 5 in the north and 5 in the south.

Brahman cattle, breed of beef cattle developed in the S United States in the early 1900s by combining several breeds or strains of ZEBU cattle of India. Brahman cattle have a very distinctive appearance with a hump over the shoulders, loose skin under the throat, and large drooping ears; they are generally light to medium gray in color. Much of the contribution of this breed to beef production has been through crossing with European cattle, e.g., Hereford and Angus. These hybrid cattle exhibit hybrid vigor, i.e., they generally exhibit growth and reproductive rates greater than either of the parental types. Several new breeds of cattle have been developed in the United States based on Brahman-European crosses, some important ones being the Beefmaster (Brahman combined with SHORTHORN CATTLE and HEREFORD CATTLE), Brangus (Brahman combined with ANGUS CATTLE), Charbray (Brahman combined with CHAROLAIS CATTLE), and Santa Gertrudis (Brahman combined with Shorthorn). Brahman cattle have been extensively exported.

Brahmanism: see HINDUISM

Brahmaputra (brâmăpô'tră) [Sanskrit, = son of Brahma], river, c. 1,800 mi (2,900 km) long, rising in the Kailas range of the Himalayas, SW Tibet (China), and flowing through NE India to join with the Ganges River in central Bangladesh to form a vast delta, navigable for large craft c. 800 mi (1,290 km) upstream. In Tibet, where it is called the Tsangpo, the river flows c. 700 mi (1,130 km) east in a wide navigable channel and forms an important east-west transport route. In SE Tibet the river turns south and flows swiftly through deep, narrow gorges into In-

dia. In Assam state it takes the name Brahmaputra and flows c. 450 mi (725 km) through the broad, fertile Assam valley. Entering Bangladesh, where it is called the Jamuna, the river continues south to the Bay of Bengal via the Ganges-Brahmaputra delta. The river's lower course is sacred to Hindus. Tea, rice, and sugarcane are the main crops of its fertile valley.

Brahmin: see BRAHMAN

Brahmo Samaj (bra'mô sâmaj') [Hindi, = society of God], Indian religious movement, founded in Calcutta in 1828 by Rammohun ROY. It promoted a monotheistic, reformed Hinduism with strong Islamic and Christian overtones, support for the rights of women, and opposition to such aspects of Hinduism as idolatry and animal sacrifice. Under Roy the organization attained considerable importance in E India until his death in 1833. After a decade of decline, it was revived by Debendranath Tagore in 1843. A schism divided the organization in 1865, when Keshub Chunder Sen split with Tagore and formed the Adi Brahmo Samaj, and in 1878 Sen's group itself divided. Sen's followers formed a new church, the Nava-Vidhana, while the dissidents founded the Sadharan Brahmo Samaj, which became dominant. The Brahmo Samaj movement had great influence in the 19th cent., but, although it still exists, it has had little impact on 20th-century Hinduism. See P. K. Sen, *Biography of a New Faith* (2 vol., 1950-54), K. C. Sen, *The Voice of Keshub* (1963), P. V. Kanai, *An Introduction to Dev-Samaj* (1965).

Brahms, Johannes (brâmz, Ger. yôhan'nēs brams), 1833-97, German composer, b. Hamburg. Brahms ranks among the greatest masters of the romantic period. The son of a musician, he early showed astonishing talent in many directions; he chose as a boy to become a pianist. As accompanist to the violinist Eduard Remenyi he attracted the notice of Johann Joachim, who introduced him to leading musical circles. Brahms became the devoted friend of Robert and Clara Schumann, both of whom admired his compositions. His later activities as pianist and as choral conductor were not very successful, but after he settled in Vienna his compositions brought him enough money to support himself in simple comfort. Brahms never married, although he had several love affairs and remained deeply attached to Clara Schumann for many years after her husband's death. His extreme self-criticism led him to destroy much of what he composed, thus limiting the number of his existing works but ensuring a uniformly high quality. In his music the romantic impulse is restrained by a reverence for the forms of the past. This blend of romantic feeling and classical spirit is exemplified in such works as his *Variations on a Theme by Handel* (1861), for piano, and the orchestral composition *Variations on a Theme by Haydn* (1873). In his day, Brahms's conservative romanticism was contrasted with Richard Wagner's dramatic romantic style, and a controversy raged between supporters of Brahms and the followers of the "neo-German" school led by Liszt and Wagner. Brahms wrote four symphonies, which are considered among the greatest in symphonic music. Major choral works include *Ein deutsches Requiem* [a German requiem] (1866) and *Schicksalslied* [song of destiny] (1868), both for chorus and orchestra. The Violin Concerto in D (1878), the Piano Concerto in B-flat (1878-81), and the Piano Quintet in F Minor (1864) are staples of the concert repertory. Brahms also composed sonatas, capriccios, intermezzos—works in almost every genre except opera. Throughout his life he devoted attention to chamber music and to songs, which vary from simple accompaniments for folk songs to solemn compositions such as *Vier ernste Gesänge* [four serious songs] (1896). Many of his exquisite romantic lieder, in which the words, melody, and piano accompaniment are inseparably blended, are favorites among professional and amateur singers alike, and his lullaby has long been a familiar melody throughout the world. See his letters, ed. by Max Kalbeck (1909), biographies by Karl Geiringer (rev. ed. 1947) and Hans Gal (tr. 1963), study by Burnett James (1972).

Brahui (brahō'ē), Dravidian language of Baluchistan. See DRAVIDIAN LANGUAGES

Braid, James, 1795?-1860, English surgeon and writer on hypnotism and magic. The first to use the term *hypnotism* instead of *mesmerism* or *animal magnetism*, he also demonstrated that it was achieved by suggestion. His writings prepared the way for investigations into what was later called the unconscious mind.

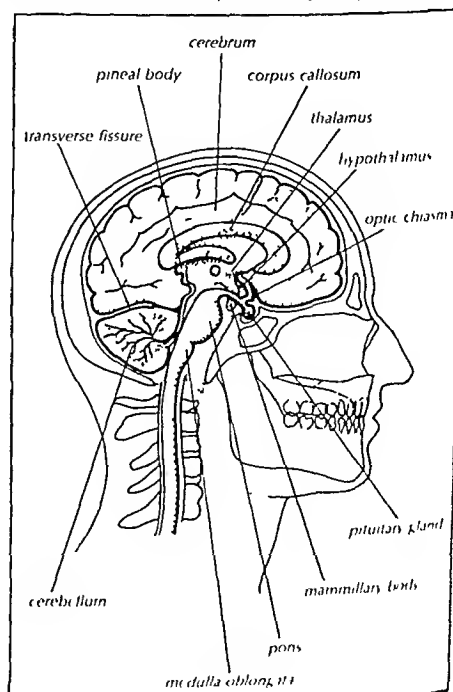
Braidwood, Thomas, 1715-1806, English educator; grad. Univ. of Edinburgh. He established (1760) a school in Edinburgh the first school in Great Britain for deaf mutes, moving it to London in 1783.

Brăila (brăē'la), city (1969 est. pop. 122,000), SE Rumania, in Walachia, on the Danube River. The chief grain-shipping port of Rumania, it is also a major industrial and commercial city. Machinery, metal foodstuffs, and textiles are the principal products. Brăila probably dates from Greek times. It was burned by the Turks in 1462 and by Stephen the Great of Moldavia in 1470. Taken by the Turk c. 1550, it played an important role in the Russo-Turkish Wars (18th cent.) and was captured several times by Russian forces. The Treaty of Adrianopol (1829) awarded the city to the Rumanian principality of Walachia. The Cathedral of St. Michael, a state theater, and an art museum are in Brăila.

Braille, Louis (brāl, Fr. lwē bri'ya), 1809?-1852, French inventor of the Braille system of printing and writing for the blind. Having become blind from an accident at the age of 3, he was admitted at 10 to the Institution nationale des Jeunes Aveugles in Paris. Later he taught there. In order to make his instruction easier, he chose Charles Barbier's system of writing with points, evolving a much simpler one from that system. He was interested in music as well and for a time played the organ in a church in Paris. The Braille system consists of six raised points or dots used in 63 possible combinations. It is in use, in modified form, for printing, writing, and musical notation for the blind. See also BLINDNESS.

Brain, Dennis, 1921-57, British horn player. Brain studied with his father, Aubrey, at the Royal Academy of Music in London. He played principal horn with the Royal Philharmonic and then the Philharmonia orchestras. He was killed in an automobile accident. Brain's extraordinary artistry has been preserved on many orchestral and solo recordings. Works were written for him by Hindemith, Britten, and other composers.

brain, the supervisory center of the NERVOUS SYSTEM in all vertebrates. It is also the site of emotions, memory, self-awareness, and thought. Occupying the SKULL cavity (cranium), the adult human brain normally weighs from 2¼ to 3¼ lb (1-1.5 kg). Differences in weight and size do not signify corresponding differences in mental ability. An elephant's brain weighs more than four times that of a human and a whale's brain, seven times, however, neither animal has the intelligence of the orangutan, whose brain weighs one third as much as man's. Sensory nerve cells feed information to the brain from every part of the body, external and internal. The brain evaluates the data, then sends directives through the motor nerve cells to muscles and glands, causing them to take suitable action. Alternatively, the brain may inhibit action, as when a person forces himself not to flinch from a blow, or it may simply store the



Bram

information for later use. Both incoming information and outgoing commands traverse the brain and the rest of the nervous system in the form of electrochemical impulses. By means of these impulses, the brain directly controls conscious or voluntary behavior, such as walking and thinking. It also controls, through feedback circuitry, most involuntary behavior, i.e., connections with the autonomic nervous system enable the brain to adjust heartbeat, blood pressure, fluid balance, and similar functions. The brain even influences apparently fully automatic activities such as those of the internal organs. Essentially the human brain consists of some 10 billion interconnected nerve cells with innumerable extensions. This interlacing of nerve fibers and their junctions allows a nerve impulse to follow any of a virtually unlimited number of pathways. The effect is to give man his seemingly infinite variety of responses to sensory input. What pathway a brain actually chooses for an impulse depends on many factors. Among them are (1) the particular brain's physical characteristics, (2) temporary physical conditions, such as fatigue or malnourishment, (3) information previously implanted by experience and learning, (4) intensity of the stimulus producing the impulse, and (5) emotional states such as anger or melancholy. The billions of nerve cells in the brain are structurally supported by the hairlike filaments of glial cells. Smaller than nerve cells and ten times as numerous, the glia account for an estimated half of the brain's weight. They are thought to constitute the blood-brain barrier, stopping waste products and other poisons from reaching nerve cells through the network of cranial blood vessels. Nerve fibers in the brain are sheathed in a near-white substance called myelin and form the white matter of the brain. Nerve cell bodies, which are not covered by myelin sheaths, form the gray matter. Anatomically the brain has three major parts, the hindbrain (including the CEREBELLUM and the BRAINSTEM), the midbrain, and the forebrain (including the diencephalon and the cerebrum). Every brain area has an associated function, although no one area is completely responsible for any single function. The cerebellum coordinates muscular movements and, along with the midbrain, monitors posture. The brainstem, which incorporates the medulla and the pons, monitors involuntary activities such as breathing and vomiting. The THALAMUS, which forms the major part of the diencephalon, receives incoming sensory impulses and routes them to the appropriate higher centers. The HYPOTHALAMUS, occupying the rest of the diencephalon, regulates heartbeat, body temperature, and fluid balance. Above the thalamus extends the corpus callosum, a neuron-rich membrane underlying the cerebrum. The cerebrum, occupying the topmost portion of the skull, is by far the largest sector of the brain. Split vertically into left and right hemispheres, it is deeply fissured and grooved. Its upper surface, the cerebral cortex, contains most of the master controls of the body. In the cortex ultimate analysis of sensory data occurs, and motor impulses originate that initiate, reinforce, or inhibit the entire spectrum of muscle and gland activity. The parts of the cerebrum intercommunicate through association tracts consisting of connector neurons. Found profusely in the corpus callosum, these tracts account for approximately half of the total number of nerve cells in the brain. The tracts are believed to be the seats of reasoning, learning, and perhaps memory. The left half of the cerebrum controls the right side of the body, the right half controls the left side. Other important parts of the brain are the PITUITARY gland, the basal ganglia, and the reticular activating system (RAS). The pituitary is involved in growth regulation. The basal ganglia, located just above the diencephalon in each cerebral hemisphere, are thought to handle coordination and habitual but acquired skills like chewing and playing the piano. The RAS is a special system of nerve cells linking the medulla, pons, midbrain, and cerebral cortex. There is evidence that the RAS functions as a sentry. In a noisy crowd, for example, the RAS alerts a person when a friend speaks and enables that person to ignore other sounds. During both sleep and consciousness, the ceaseless electrochemical activity in the brain generates brain waves that can be electronically detected and recorded (see ELECTROENCEPHALOGRAPHY). The entire brain is enveloped in three protective sheets known as the MENINGES, continuations of the membranes that wrap the SPINAL CORD. The two inner sheets enclose a shock-absorbing cushion of cerebrospinal fluid. Few if any pain receptors exist in brain tissue. A headache is felt because of sensory

impulses coming chiefly from the meninges or scalp. In invertebrates a group of ganglia or even a single ganglion may serve as a rudimentary brain. See Edwin Clarke and Kenneth Dewhurst, *An Illustrated History of Brain Function* (1973).

Braine, John, 1922-, English novelist, b. Bedford, Yorkshire. He was able to leave his job as a librarian after the success of his first novel, *Room at the Top* (1957). Ranked as one of the major works of England's ANGRY YOUNG MEN, this novel bitterly chronicles the rise of a young working-class man into the upper middle class of an English factory town. In its penetrating analysis of the English class structure and of psychological relationships, *Room at the Top* is representative of all Braine's novels. His other works include *Life at the Top* (1962), *The Jealous God* (1964), and *Writing a Novel* (1974).

Brainerd, David, 1718-47, missionary to the American Indians, b. Haddam, Conn. Licensed to preach in 1742, he spent his brief years among the Indians, first in New York and later in New Jersey and Pennsylvania. His diary was widely read and influenced many to enter the mission field. Parts of the diary were published during Brainerd's lifetime, and in 1749, Jonathan Edwards published the hitherto unpublished portion.

Brainerd, city (1970 pop. 11,667), seat of Crow Wing co., central Minn., on the Mississippi River, in a pine-forested and lake region, inc. 1881. Founded (1870) by the Northern Pacific RR, it is still a railroad center with repair shops. Lumbering and related enterprises (such as paper manufacturing) are its economic mainstays. A junior college is in the city.

brainstem, lower part of the BRAIN, adjoining and structurally continuous with the spinal cord. The upper segment of the human brainstem, the pons, contains nerve fibers that connect the two halves of the CEREBELLUM. It is vital in coordinating movements involving right and left sides of the body. Below the pons and continuous with the spinal cord is the medulla, which transmits ascending and descending nerve fibers between the spinal cord and the brain. The medulla also directly controls many involuntary muscular and glandular activities, including breathing, heart contraction, artery dilation, salivation, vomiting, and probably laughing. The nuclei of some of the nerves that originate in the brain are also located in the brainstem. Nerve fibers in the brainstem do not readily regenerate, hence injury may result in permanent loss of function. See also NERVOUS SYSTEM.

Braintree, town (1970 pop. 35,050), E. Mass., a suburb of Boston, inc. 1640. Abrasives and rubber goods are among its manufactures. Braintree included Quincy (birthplace of John Adams and John Quincy Adams) until 1792 and Randolph until 1793. John Hancock and Gen. Sylvanus Thayer, superintendent of West Point from 1817 to 1833, were born in Braintree. The Thayer Academy, founded by the general, is in the town.

Braintree and Bocking, urban district (1971 pop. 24,839), Essex, E. England, between the Pant (Blackwater) and Brain river valleys. There are textile, plastic, and metal-product industries. Bricks from ancient Roman roads (the district is on the line of the Roman Stone Street) were used in the church in Braintree.

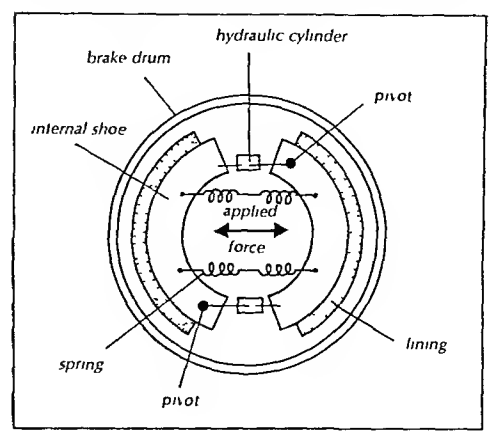
Brain Trust, the group of close advisers to Franklin Delano Roosevelt when he was governor of New York state and during his first years as President. The name was applied to them because the members of the group were drawn from academic life. This informal advisory group on the New Deal included Columbia University professors Raymond MOLEY, Adolf A. BERLE, Jr., and Rexford G. TUGWELL and expanded to include many more academicians. It soon disintegrated, but the term has remained in common usage for similar groups. See study by Rexford G. Tugwell (1968).

brain wave. see ELECTROENCEPHALOGRAPHY

brake, in botany see BRACKEN

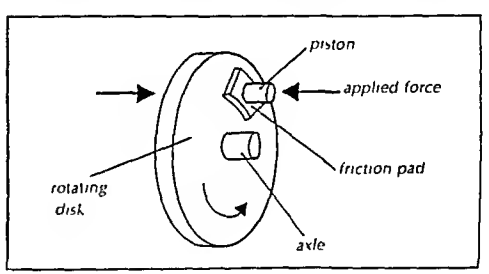
brake, in technology, device to slow or stop the motion of a mechanism or vehicle. Friction brakes, the most common kind, operate on the principle that friction can be used to convert the mechanical energy of a moving object into heat energy, which is absorbed by the brake. The essential components of a friction brake are a rotating part, such as a wheel, axle, disk, or brake drum, and a stationary part that is pressed against the rotating part to slow or stop it. The stationary part usually has a lining, called a brake lining, that can generate a great amount of friction yet give long wear, it most often contains asbestos. The principal types of friction brake are the block brake, the band brake, the internal-shoe

brake, and the disk brake. The block brake consists of a block, the stationary part, that is shaped to fit the contour of a wheel or drum. For example, a



Shoe brake

wooden block applied to the rim of a wheel has long been used to slow or stop horse-drawn vehicles. A simple band brake consists of a metal band, the stationary part, that can be tightened around a drum by means of a lever. It is found on hoists and excavating machinery. The internal-shoe brake has a drum that contains two stationary semicircular pieces, or shoes, which slow or stop the motion of the drum by pressing against its inner surface. This is the type of brake most often found on automobiles, with an internal-shoe brake drum located on the central part of each wheel. A disk brake of the type used on automobiles has a metal disk and pistons with friction pads that can close on the disk and slow it. A manually operated brake pedal or handle is used to activate a brake. With low-power machinery or vehicles the operator can usually apply sufficient force through a simple mechanical linkage from the pedal or handle to the stationary part of the brake. In many cases, however, this force must



Disk brake

be multiplied by using an elaborate braking system. One such system, called the air brake system, or air brake, was invented by American manufacturer George Westinghouse and was first used on passenger trains in 1868. It is now widely used on railroad trains. The fundamental principle involved is the use of compressed air acting through a piston in a cylinder to set block brakes on the wheels. The action is simultaneous on the wheels of all the cars in the train. The compressed air is carried through a strong hose from car to car with couplings between cars, its release to all the separate block brake units at the same time is controlled by the engineer. An automatic feature provides for the setting of all the block brakes in the event of damage to the brake hose, leakage, or damage to individual brake units. The air brake is used also on subway trains, trolley cars, buses, and trucks. The hydraulic brake system, or hydraulic brake, is used on almost all automobiles (see HYDRAULIC MACHINE). When the brake pedal of an automobile is depressed, a force is applied to a piston in a master cylinder. The piston forces hydraulic fluid through metal tubing into a cylinder in each wheel where the fluid's pressure moves two pistons that press the brake shoes against the drum. The vacuum brake system, or vacuum brake, depends upon the use of a vacuum to force a piston in a cylinder to hold a brake shoe off a drum, when the vacuum is destroyed, the shoe is released and presses on the drum. In an automotive power brake system, extra pressure can be exerted on the hydraulic master cylinder piston by a vacuum brake's piston. A machine that is driven by an electric motor can sometimes use its motor as a brake

Because inertia keeps the machine's shafts moving after the current to the electric motor has been shut off, the machine keeps the motor's armature turning. While this is happening, if the motor's action can be changed to that of a generator, the electric current produced will be drawing its energy from the machine, thus slowing it. However, since such a braking method is not suitable for bringing the machine to a quick stop, it is usually supplemented by friction brakes.

Brakelond, Jocelin de see JOCELIN DE BRAKELOND

Brakpan (brāk'pān), city (1970 pop 113,115), Transvaal prov., NE South Africa. It is a gold- and coal-mining center and has an ironworks. There is also a technical college in the city.

Bramah, Joseph (brām'ə, brā'-), 1748-1814, English inventor. In 1784 he took out his first patent on a safety lock, and in 1795 he patented his hydraulic press, known as the Bramah press (see under HYDRAULIC MACHINE). He devised a numerical printing machine for bank notes and was one of the first to suggest the practicability of screw propellers and of hydraulic transmission.

Bramante, Donato (dōnā'tō braman'tā), 1444-1514, Italian Renaissance architect and painter, b. near Urbino. His buildings in Rome are considered the most characteristic examples of High Renaissance style. In 1477 he painted frescoes in the municipal palace at Bergamo. In Milan and neighboring cities including Pavia and Vigevano, he executed paintings that recall works by Piero della Francesca and Mantegna. Bramante designed much of the Church of Santa Maria presso San Satiro in Milan, its famous choir, painted in perspective, gives an illusion of great depth, although it is extremely shallow. He may also have planned the east end of Santa Maria delle Grazie, a spacious domed appendage to an older Gothic church. After 1499 he left for Rome, where he designed the simple but graceful cloister for Santa Maria delle Pace and the exquisitely proportioned circular Tempietto in the courtyard of San Pietro in Montorio. His other works in Rome include the Belvedere courtyard at the Vatican, designs for a massive Palace of the Tribunals, the choir of Santa Maria del Popolo and other churches, and his own large house with Doric columns rhythmically disposed above a massive rusticated ground floor. His most important work, however, was his plan for St. Peter's, probably conceived as a centrally planned (Greek cross) and domed structure of enormous size and impressiveness. He favored central plans and a sense of noble severity especially in his Roman period. Although St. Peter's was later remodeled into a longitudinal structure, Bramante is responsible for the essential proportions of the east end, and his design influenced the appearance of many smaller churches. See study by G. Chierici (Am ed 1960).

Bramantino (bramantē'nō), c 1465-c 1535, Lombard painter and architect. His real name was Bartolomeo Suardi. He took the name of his master Bramante, whose style he followed closely. He became court painter to Francesco Maria Sforza. His works are noted for their fine architectural background. Examples of his art are the *Madonna and Angels* and *St. Martin* (both Brera, Milan), and several paintings in the Metropolitan Museum and the National Gallery of Art, Washington, D.C. As an architect, Bramantino designed the Trivulzio Chapel (San Nazzaro, Milan). He also wrote a treatise on perspective, parts of which have been preserved.

bramble, name for plants of the genus *Rubus* [Lat., =red, for the color of the juice]. This vast genus of the family Rosaceae (ROSE family), with representatives in many parts of the world, includes the blackberries, raspberries, loganberries, boysenberries, and dewberries. The plants are typically shrubs with prickly stems (called "canes") and edible fruits that botanically are not berries but aggregates of drupelets (see FRUIT). The underground parts of brambles are perennial and the canes biennial, only second-year canes bear flowers and fruits. Innumerable horticultural varieties have been bred. The native American black raspberry, or blackcap (*R. occidentalis*), and red raspberry (*R. strigosus*) as well as the European red raspberry (*R. idaeus*) are all cultivated in North America, chiefly in the Northeast. Numerous blackberry species and varieties are cultivated in many regions, particularly in the south-central states. Closely resembling the blackberries, except for a more trailing or prostrate habit and a larger fruit, are the dewberries, the most common North American species (*R. procumbens*) is sometimes called running blackberry. The loganberries and boysenberries, with tart purplish fruits, are

thought to be strains of either a variety of the Pacific dewberry (*R. ursinus*) or a hybrid between it and the red raspberry, the original plant appeared in the California orchard of Judge J. H. Logan in 1881. Bramble berries were eaten by the Indians. Berries are grown commercially in Europe and North America for sale as fresh, canned, and frozen fruit and for use in numerous types of preserves and fruit-flavored beverages and liqueurs. In England the name bramble is applied chiefly to the common wild blackberry. Other thorny shrubs are sometimes also called brambles. Brambles are classified in the division MAGNOLIOPHYTES, class Magnoliopsida, order Rosales, family Rosaceae.

Brameld, Theodore, 1904-, American educator, b. Neillsville, Wis., grad. Ripon College, 1926, Ph.D. Univ. of Chicago, 1931. After teaching philosophy at Long Island Univ. and Adelphi College, he was professor of the philosophy of education at the Univ. of Minnesota (1939-47), New York Univ. (1947-58), and Boston Univ. (1958-69). Brameld's theory of reconstructionism has received widespread attention in educational circles. This philosophy holds that a system of public education that is aware of the findings of the behavioral sciences can bring about fundamental changes in the social and economic structure of society. His writings include *Ends and Means in Education* (1950), *Philosophies of Education in Cultural Perspective* (1955), *Toward a Reconstructed Philosophy of Education* (1956), and *The Climactic Decades* (1970).

Brampton, town (1971 pop 41,211), S. Ont., Canada, NW of Toronto. It is noted for its greenhouses. Automobiles, optical goods, and other products are made.

bran, outer coat of a cereal grain—e.g., wheat, rye, and corn—mechanically removed from commercial flour and meal by bolting or sifting. Wheat bran is extensively used as feed for farm animals. Bran is used as food for humans (in cereals or mixed with flour in bread) to add roughage (i.e., cellulose) to the diet. It is also used in dyeing and calico printing.

Brancovan, Constantine (bran-kō'vān'), 1654-1714, prince of Walachia (1688-1714). A skillful politician who secured domestic peace, he furthered Walachia's economic and cultural development. Under his rule, the "Brancovan" artistic style was created, an example of which can be seen in the palace at Mogosoaia, near Bucharest. In 1709 he negotiated with Czar Peter I of Russia an alliance against his suzerain, Sultan Ahmad III, but he later withdrew. Accused of treason, he was deposed and, with his four sons, was beheaded at Constantinople.

Brancusi, Constantin (brankyōō'zē, Rum. bran-kōōsh), 1876-1957, Rumanian sculptor. Brancusi is considered one of the foremost of modern artists. In 1904 he went to Paris, where he worked under Mercie. He declined Rodin's invitation to work in his studio. Because of his radical, economic style, his abstract sculptures, *The Kiss* (1908), *Sleeping Muse* (1910), and the portrait of Mlle. Pogany (1923), Musée d'Art moderne, Paris, have been the subjects of much controversy. He altered his technique from modeling to carving. c 1910. In 1927 Brancusi won a lawsuit against the U.S. customs authorities who attempted to value his sculpture as raw metal. The suit led to legal changes permitting the importation of abstract art free of duty. Brancusi's work is notable for its extreme simplification of form, its organic and frequently symbolic character, and its consummate craftsmanship. He had a profound understanding of materials, working primarily in metal, stone, and wood. *Bird in Space* (1919, Mus. of Modern Art, New York City) is a characteristic work. Others are in the Solomon R. Guggenheim Museum, New York City, and in the museums of Chicago, Cleveland, and Philadelphia. See catalog by Sidney Geist (1969), biography by Ionel Jianu (1963), studies by Sidney Geist (1967) and A. T. Spear (1969).

Brand, Sir John Henry, or Jan Hendrik Brand (yan hēn' drak brant'), 1823-88, South African politician, president of the Orange Free State, b. Cape Town. He was called to the English bar in 1849 and practiced law in South Africa. In 1863 he was elected president of the struggling Orange Free State and immediately made war (1864-69) on the Basutos. Reelected in 1869 (and at each election until his death), Brand refused (1871) to become president of both the Orange Free State and the Transvaal because of the Transvaal's anti-British policy. He was knighted for his mediation services in the British-Transvaal disputes.

Brandeis, Louis Dembitz (brān'dīs), 1856-1941, Associate Justice of the U.S. Supreme Court (1916-39), b. Louisville, Ky., grad. Harvard law school, 1877. A

successful Boston lawyer (1879-1916), Brandeis distinguished himself by investigating insurance practices and by establishing (1907) Massachusetts savings-bank insurance. After defending (1900-1907) the public interest in Boston utility cases, he served (1907-14) as counsel for the people in proceedings involving the constitutionality of wages and hours laws in Oregon, Illinois, Ohio, and California. In *Muller vs. Oregon* (1908) he persuaded the U.S. Supreme Court that minimum-hours legislation for women was reasonable—and not unconstitutional—with a brief primarily consisting of statistical, sociological, economic, and physiological information. This "Brandeis brief," as it came to be called, revolutionized the practice of law. He opposed (1907-13) the monopoly of transportation in New England and successfully argued (1910-14) before the Interstate Commerce Commission against railroad-rate increases. In 1910 as one of the counsel in the congressional investigation of Richard A. Ballinger, he exposed the anticongressionalist views of President Taft's Secretary of the Interior. As an arbitrator (1910) of a strike of New York garment workers, (mostly Jewish), he became acutely aware of Jewish problems and afterward was a leader of the Zionist movement. An enemy of industrial and financial monopoly, he formulated the economic doctrine of the New Freedom that Woodrow Wilson adopted in his 1912 presidential campaign. Over the protests of the vested interests that Brandeis had alienated as "people's attorney," Wilson appointed (1916) him to the U.S. Supreme Court. Long an advocate of social and economic reforms, he maintained a position of judicial liberalism on the bench. With Oliver Wendell Holmes, he often dissented from the majority. After Franklin Delano Roosevelt became (1933) President, Brandeis was one of the few justices who voted to uphold most of Roosevelt's New Deal legislation. He retired from the bench in 1939. Brandeis Univ. is named after him. He wrote *Other People's Money* (1914) and *Business, a Profession* (1914). For selections of his writings, see Alfred Lief, ed., *The Social and Economic Views of Mr. Justice Brandeis* (1930), O. K. Fraenkel, ed., *The Curse of Bigness* (1935), Solomon Goldman, ed., *The Words of Justice Brandeis* (1953). See his letters, ed. by M. I. Urofsky and D. W. Levy (1971), biography by A. T. Mason (1946, repr. 1956), studies by S. J. Konefsky (1956, repr. 1974) and M. I. Urofsky (1971), A. M. Bickel, *The Unpublished Opinions of Mr. Justice Brandeis* (1957).

Brandeis University, at Waltham, Mass., coeducational, chartered and opened 1948. Although Brandeis was founded by members of the American Jewish community, the university operates as an independent, nonsectarian institution. Its graduate school of arts and sciences was established in 1953. The university's Florence Heller Graduate School for Advanced Studies in Social Welfare is well known, as is its Wien International Scholarship Program. Adjoining the campus is the American Jewish Historical Society.

Brandenburg (bran'dānbōōrk), former state, c 10,400 sq mi (26,940 sq km), central East Germany. Potsdam was the capital, other leading cities included Cottbus, Frankfurt-an-der-Oder, and Brandenburg. As constituted in 1947 under Soviet military occupation, Brandenburg consisted of the former Prussian province of Brandenburg minus those parts of the province lying E of the Oder and Neisse rivers (see GERMANY). It became (1949) one of the states of the German Democratic Republic, but it finally was abolished as an administrative unit in 1952. BERLIN was situated in, but was administratively separate from, Brandenburg. Drained by the Havel, Spree, and Oder rivers, the region encompassed by the former state has many lakes and pine forests. The Spree Forest, in Lower LUSATIA, is inhabited by Slavic-speaking WENDS, remnants of the population that inhabited Brandenburg at the time of its acquisition (12th cent.) by ALBERT THE BEAR. The Slavic principalities had been previously subdued by Charlemagne but had regained their independence. In the 10th cent. the German kings organized the North March, a small area on the Elbe, which was bestowed on Albert the Bear in 1134. Albert expanded his territory, and in 1150 he inherited the principality of Brandenburg from his last Wendish prince. The March of Brandenburg, as Albert's lands were called, were colonized by Germans and became Christianized. Albert's descendants, the Ascanians, ruled Brandenburg until their extinction in 1320. Emperor Louis IV, a Wittelsbach, gave (1323) the vacant fief to members of his own house, but Emperor CHARLES IV (who confirmed the margraves of Brandenburg as

ELECTORS of the Holy Roman Empire) forced the Wittelsbachs to surrender it and conferred (1373) it on his son Wenceslaus. When Wenceslaus became (1378) German king, Brandenburg went to his brother, later Emperor SIGISMUND, who in 1417 formally transferred it to FREDERICK I of the house of HOHENZOLLERN. Among Frederick's early successors were ALBERT ACHILLES (reigned 1470-86), who introduced primogeniture as the law of inheritance of the Hohenzollern family, and Joachim II (reigned 1535-71), who accepted the Reformation in 1539. In the 17th cent. the electors of Brandenburg acquired (1614) the duchy of CLEVELAND and other W. German territories and (1618) the duchy of Prussia (roughly, the later EAST PRUSSIA). Although it suffered heavily in the Thirty Years War (1618-48), Brandenburg emerged as a military power under FREDERICK WILLIAM, the Great Elector (reigned 1640-88), who acquired E. Pomerania and freed Prussia from Polish suzerainty. His son, Elector Frederick III, in 1701 took the title "king in Prussia" as FREDERICK I. The later history of Brandenburg is that of PRUSSIA.

Brandenburg, city (1970 pop. 93,660), Potsdam district, central East Germany, a port on the Havel River. It is an industrial center and rail junction. Manufactures include steel, textiles, machinery, and motor vehicles. Brandenburg was founded as a Slavic settlement called Brennabor or Brennaburg. It was conquered (12th cent.) by Albert the Bear and gave its name to the margraviate (later the province) of Brandenburg. Noteworthy buildings of the city include a 12th-century Romanesque church and the city hall (13th-14th cent.).

Brandes, Georg Morris Cohen (brän' das), 1842-1927, Danish literary critic. His invigorating influence brought the wide currents of contemporary European thought to Danish, Icelandic, and other Scandinavian literatures. He wrote and lectured in many languages and was conceded to be the greatest critic since Taine. Yet he was refused the chair in aesthetics at the University of Copenhagen in 1870 because he was a Jew, an atheist, and a radical. He was granted the same chair in 1902. After finishing *Critiques and Portraits* (1870), he traveled on the Continent, meeting, among others, Taine and Renan, who influenced his ideas and work. On his return he wrote *Main Currents in Nineteenth-Century Literature* (6 vol., 1872-90, tr. 1901-5), an attack on provincialism and reaction. An opponent of romanticism, Brandes helped direct the Scandinavian literatures toward realism and concern with social issues. He introduced feminism to Denmark. His review, the *Nittende Aarhundrede*, was discontinued after three years. Brandes spent some time in Berlin, where he came under the influence of Nietzsche. He was attacked during the war for maintaining total neutrality. Among his later works are *William Shakespeare* (1895-96, tr. 1898), *Goethe* (1915, tr. 1924), *Voltaire* (1916, tr. 1930), and *Jesus, a Myth* (1925, tr. 1926), a work which gained him many enemies.

Brando, Marlon, 1924-, American film actor, b. Omaha, Nebr. Noted for his mumbling delivery and understated naturalism, Brando has been acclaimed as both a great actor and an exciting Hollywood sex symbol. He starred on Broadway as the primitive, brutal Stanley Kowalski in Tennessee Williams's *A Streetcar Named Desire* (1947) and in the filmed version of the play (1952). His movies include *Viva Zapata!* (1952), *Julius Caesar* (1953), *On the Waterfront* (1954), *One-Eyed Jacks* (1960, also directed), *The Godfather* (1971), and *Last Tango in Paris* (1972). See Tony Thomas, *The Films of Marlon Brando* (1973).

Brandon, Saint, see BRENDAN, SAINT

Brandon, Charles, see SUFFOLK, CHARLES BRANDON, 1ST DUKE OF

Brandon, city (1971 pop. 31,150), SW Man., Canada, on the Assiniboine River. The business center of the wheat-raising area of SW Manitoba, Brandon has an extensive trade in farm products and machinery. It is the seat of the annual provincial exhibition and of the Manitoba Winter Fair. A dominion experimental farm adjoins the city. Brandon Univ. is in the city. Brandon is named for the old Hudson's Bay Company post, Brandon House, built in 1793.

Brandon, uninc. village (1970 pop. 12,749), Hillsborough co., W. Fla., a suburb just E. of Tampa. Chiefly residential, it is also a retail and service center. Citrus fruits and vegetables are grown in the area, and there are many cattle and dairy farms.

Brandon University, at Brandon, Manitoba, Canada, nondenominational, coeducational, founded 1899 as Brandon College. The school gained university status in 1967. It has faculties of arts, science, and education.

Brandt, Willy (vîl'ē brant), 1913-, German political leader. His name originally was Herbert Ernst Karl Frahm. He early became active in the Social Democratic party. Soon after Adolf Hitler came to power (1933), Brandt fled to Norway and began a journalistic career. He continued political activities there and became a Norwegian citizen. When Norway was invaded (1940), he was imprisoned briefly by the Germans but escaped to Sweden. Returning to Germany after World War II, he resumed (1947) German citizenship and served (1949-57) in the Bundestag. In 1957 he was elected mayor of West Berlin. In 1961 and 1965, he was the unsuccessful Social Democratic candidate for chancellor of the German Federal Republic. As chairman of the Social Democratic party, he was named (Dec., 1966) foreign minister in the Christian Democratic-Social Democratic coalition government headed by Kurt Kiesinger. After Brandt's party won the federal elections in Sept., 1969, he became (Oct.) chancellor with the support of the Free Democratic party. His government initiated peace talks with Eastern European countries and with East Germany. Nonaggression treaties were signed (1971) with the USSR and Poland, and a treaty with East Germany was signed in Dec., 1972. Brandt was awarded the 1971 Nobel Peace Prize for his efforts toward peace. He resigned on May 6, 1974, following the revelation that one of his close aides was an East German spy.

brandy [for brandywine, from Du. = burnt, i.e., distilled, wine], strong alcoholic spirit distilled from wine or from marc, the residue of the wine press. The most noted brandy is cognac, made from white grapes in the Charente district of France. The label *Cognac, fine champagne* denotes the finest type of cognac, which comes from a small area around Cognac. Brandy is manufactured commercially in other districts of France, notably Armagnac, and in Spain, Portugal, Australia, Italy, South Africa, and the United States. Most fine brandies are distilled in pot stills constructed to retain the volatile ingredients. The product is blended and flavored, then stored in casks (preferably oak), where it mellowes and takes on a yellow color; it acquires a deeper tint from long storage or the addition of caramel syrup. Brandy marketed in the United States must be matured in cask for at least four years. Brandy made from marc is very potent and is inferior to wine brandy. Liquor distilled from fermented beets, grains, or sugarcane is sometimes called brandy. The term, qualified by the name of a fruit, is applied to spirits distilled from the fermented juice of fruits other than the grape, e.g., peach brandy, cherry brandy, and plum brandy (slivovitz), which is extensively manufactured in the Balkans.

Brandy Station, small trading center, Culpeper co., Va. It was the scene of the greatest cavalry engagement of the Civil War (also called the battle of Fleetwood Hill), fought June 9, 1863. Gen. Alfred Pleasonton's Union cavalry surprised Confederate Gen. Jeb Stuart's cavalry and fought a hard battle before the approach of Confederate infantry forced a withdrawal across the Rappahannock. This engagement was followed by the GETTYSBURG CAMPAIGN.

Brandywine, battle of, in the American Revolution, fought Sept. 11, 1777, along Brandywine Creek. The creek, formed by two small branches in SE Pennsylvania, flows southeast to join, near Wilmington, Del., the Christina River, which empties into the Delaware. The British under Sir William Howe were advancing on Philadelphia from Elkton, Md., and General Washington, realizing that they would cross the stream, placed most of his army at Chadds Ford. Howe sent General Knyphausen to feint an attack at Chadds Ford, while he himself, with General Cornwallis, struck the American right flank, where Gen. John Sullivan could not check the attack. Washington ordered a retreat to Chester, Pa. The British continued their advance and took Philadelphia (Sept. 27, 1777). See H. S. Canby, *The Brandywine* (1941).

Branford, town (1970 pop. 20,444), New Haven co., S. Conn., on Long Island Sound, settled 1644, inc. as a town 1930. Formerly a shipping and fishing center, the town is now mainly residential and manufactures prestressed concrete forms, automotive parts, wire, and other products.

Brangus cattle: see BRAHMAN CATTLE

Brannan, Samuel, 1819-89, California pioneer, b. Saco, Maine. Converted to Mormonism, he edited a Mormon paper in New York City before leading a party of Mormons by sea from New York to California. In 1847 he founded the first newspaper in San Francisco, the *California Star*. Later he began a mer-

chandising business at Sutter's Fort and soon gained extensive landholdings. Returning to San Francisco, he was active in the move to bring order to the lawless city and was an organizer and the first president (1851) of the Committee of Vigilance. See biographies by P. D. Bailey (1943, rev. ed. 1953, repr. 1959) and L. J. Stellman (1953).

Branner, Hans Christian, 1903-66, Danish writer. Branner's early novels, often concerned with the irrational fears of childhood, include *The Child Playing on the Shore* (1937). With *The Riding Master* (1949, tr. 1951) he turned to more complex Freudian themes, expressed in an increasingly symbolic vein. Later works include the plays *Siblings* (1952, tr. *The Judge*, 1955) and *Nobody Knows the Night* (1955), and a volume of poems, *Arrel* (1963). See study by T. L. Markey (1973).

Brant, Joseph, 1742-1807, chief of the Mohawk Indians. His Indian name is usually rendered as Thayendanegea. He served under Sir William Johnson in the French and Indian War, and Johnson sent him (1761) to Eleazar Wheelock's Indian school in Lebanon, Conn. Brant served (1763) under Johnson again in Pontiac's Rebellion. In the American Revolution he did much to bind the Indians to the British and Loyalist side. He fought (1777) at Oriskany in the Saratoga campaign. In 1778, leading the Indian forces, he joined Walter Butler, and together they raided Cherry Valley, where they massacred the defenseless inhabitants. He was an able leader in other raids. After the Revolution, failing to get a settlement of the Indian land question in the United States, he got lands and subsidies for his people in Canada around the present Brantford, Ont. A zealous Christian, he preached Christianity, translating the Book of Common Prayer and the Gospel of Mark into the Mohawk language. See biographies by J. W. Jakes (1969) and H. C. Robinson (1971).

Brant, Sebastian (sābās'tyān brānt), 1457-1521, German humanist and moralist. He taught law at the Univ. of Basel and in 1503 became town clerk of Strasbourg. His verse allegory *Das Narrenschiff* [ship of fools] (1494) became world famous. Illustrated with woodcuts, it went through six editions in Brant's lifetime alone. The story tells of 112 fools—each representing a fashionable foible—who sail out to sea and die because of their folly. An English translation by Alexander Barclay appeared in 1509. See verse translation (with the woodcuts) by E. H. Zeydel (1944). The poem inspired the novel *Ship of Fools* (1962) by Katherine Anne Porter.

brant or brant goose, common name for a species of wild sea goose. The American brant, *Branta bar-nicla*, breeds in arctic regions and winters along the Atlantic coast. The head, neck, and tail are black, the back brownish gray, and the under parts grayish white. Hunters find the birds easy prey and their flesh palatable. Eelgrass (*zostera marina*) is their staple food, although of necessity they may seek other nourishment. The Old World barnacle goose, *B. leucopsis*, so named because it was thought to grow out of barnacles attached to driftwood, is very similar to the brant and is an occasional visitor to North America. The black brant migrates from its arctic breeding grounds to the Pacific coast. White brant is an alternate name for the snow goose, which belongs to the same family, and gray, or prairie, brant refers to the American white-fronted goose. Brants are classified in the phylum CHORDATA, subphylum Vertebrata, class Aves, order Anseriformes, family Anatidae.

Brantford, city (1971 pop. 64,421), S. Ont., Canada, on the Grand River. It is a leading manufacturing city, noted particularly for its large farm implement factories. The city was named for the Mohawk chieftain Joseph BRANT, who led the Six Nations of the Iroquois to the region after the American Revolution and who is buried in the old Mohawk Church near the city. The Mohawk Institute, an Indian residential school, is nearby. Alexander Graham Bell was living in Brantford in 1876 when he made his first successful experiment in the transmission of sound by electric wire. A museum, formerly his home, exhibits the first telephone.

Branting, Hjalmar (yāl'mār brānt'īng), 1860-1925, Swedish premier. A leader of the Social Democratic party, he was finance minister in 1917. As premier (1920, 1921-23, 1924-25) he was responsible for social reforms and for welfare legislation. Branting supported the League of Nations and shared the 1921 Nobel Peace Prize with Christian Louis Lange.

Brantôme, Pierre de Bourdeille, seigneur de (pyēr də bōōrdā'yā sānyōr' də brāntōm'), 1540?-1614, French courtier, soldier, and author of memoirs. He accompanied Mary Stuart to Scotland,

served in the Spanish army in Africa, and joined the expedition of the Knights of St John against the sultan. His *Vies des hommes illustres et des grands capitaines* and his *Livre des dames* (tr., *Lives of Fair and Gallant Ladies*, 1933) give a racy and vivid account of his time.

Braque, Georges (zhôrzh brak), 1882–1963, French painter. He joined the artists involved in developing FAUVISM in 1905, and at l'Estaque c 1909 he was profoundly influenced by Cézanne. He met Picasso, and the two simultaneously explored form and structure with results that led to the development of CUBISM. In works such as the monumental *Nude* (1907–8, Cuttoli Coll., Paris) Braque exemplified the analytical phase of the movement with his keen sense of structure and orderly method of decomposing an object. In 1911 he introduced typographical letters into his canvases, thus leading the way to COLLAGE. After World War I, in which he was badly wounded, Braque veered away from the angularity of early cubism and developed a more graceful, curvilinear style, predominantly painting still life. His works showed restraint and subtlety both in design and color (e.g., *The Table*, Pulitzer Coll., St. Louis). Braque is represented in leading galleries in Europe and the United States. See his notebooks (tr. 1971), studies by Werner Hofmann (1961), E. B. Mullins (1969), and Francis Ponge et al. (tr. 1971).

Bras d'Or Lake (bra dôr), arm of the Atlantic Ocean, c 360 sq mi (930 sq km), indenting deeply into Cape Breton Island, N S., SE Canada, and occupying much of the interior. A narrow channel links it with the sea. The region was the scene of important experiments in the early history of aviation. In 1907, Alexander Graham Bell founded at Baddeck the Aerial Experiment Association, and on Feb. 23, 1909, J. A. D. McCurdy piloted his airplane, the *Silver Dart*, a distance of half a mile.

Brasília (brazêl'ya), capital city and federal district (1970 pop. 538,351) of Brazil, 2,264 sq mi (5,864 sq km), an enclave in the southwestern portion of Goiás state. One of the newest cities of the world, it was inaugurated in 1960. It is situated in the highlands of central Brazil, and its ultramodern public buildings (designed by Oscar NIEMEYER) dominate the sparsely settled countryside. The removal of the capital from Rio de Janeiro to the interior, to encourage the development of central Brazil, was long advocated, but not until President Juscelino Kubitschek instituted such legislation (1956) was the project activated. The city was laid out (1957) in the unconventional shape of an airplane by the Brazilian architect Lucio Costa. Highways connecting the new capital with Belém, Belo Horizonte, Fortaleza, Porto Alegre, Rio de Janeiro, and São Paulo are completed or under construction.

Braşov (brashôv'), Hung. *Brassó*, Ger. *Kronstadt*, city (1969 est. pop. 175,000), central Rumania, in Transylvania, at the foot of the Transylvanian Alps. The administrative center of the Braşov region, the city is a road and rail junction and a major industrial center. Tractors, trucks, machinery, chemicals, and textiles are among the chief manufactures. The city is also a noted resort and winter sports center. Founded in the 13th cent. by the Teutonic Knights, Braşov was a major center of trade and industry in the Middle Ages. It enjoyed considerable autonomy under the Hapsburg empire. After World War I the city, along with Transylvania, was ceded by Hungary to Rumania. There are sizable German and Hungarian minorities. From 1950 to 1960, Braşov was called Stalin or Oraşul-Stalin (city of Stalin). It has a large 14th-century church (called the Black Church because of fire damage in 1689), the 13th-century St. Bartholomew Church, and the 14th-century St. Nicholas Church (rebuilt 1751). Parts of the medieval town wall and the 17th-century citadel remain intact. There is also a polytechnic institute.

brass, ALLOY having copper (55%–90%) and zinc (10%–45%) as its essential components. The properties of brass vary with the proportion of copper and zinc and with the addition of small amounts of other elements. In general brass can be forged or hammered into various shapes, rolled into thin sheets, drawn into wires, and machined and cast. Its ductility reaches a maximum with about 30% zinc and its tensile strength with 45%—although this property varies greatly with the mechanical and heat treatment of the alloy. Cartridge brass (70% copper, 30% zinc) is used for cartridge cases, plumbing and lighting fixtures, rivets, screws, and springs. Aluminum brass (not exceeding 3% aluminum) has greater resistance to corrosion than ordinary brass. Brass containing tin (not exceeding 2%) is less liable to corrosion in sea water, it is sometimes called naval brass

and is used in naval construction. Dutch metal (80%–85% copper, 15%–20% zinc) is used as a substitute for gold leaf. When iron is added to brass it produces hard, tough alloys. One of these is delta metal (55% copper, 41% zinc, 1%–3% iron, and fractional percentages of tin and manganese), which can be forged, rolled, or cast and is used for bearings, valves, and ship propellers.

brasses, monumental, or sepulchral brasses, memorials to the dead, in use in churches on the Continent and in England in the 13th cent. and for several centuries following. They are usually set in the pavement but occasionally are placed upright against a wall or stand free upon a plinth. Some, called palimpsests, are incised on brasses that have been used before on the opposite face. The engraving usually presents a figure of the deceased. Historical interest centers around the contemporary costumes, armor, heraldic designs, genealogy, and paleography revealed. Such brasses still exist in Belgium, especially in Bruges, in the Netherlands, and in Germany, where there are some exceptional 13th-century examples. In England the churches of Ipswich, Norwich, London, Bristol, and elsewhere disclose more than 7,000 examples covering the different periods of their use. Tens of thousands of brasses were destroyed during the Tudor dissolution of the monasteries. The majority of those that remain are of native design and craftsmanship and of the inset type, incised examples usually indicate Flemish origin. A few brasses are in Glasgow and Edinburgh churches. The image of the brass can be transferred to paper by rubbing with a black gum called cobbler's heel-ball or with crayon. Rubbing brasses has been a popular activity in England for many decades. See James Mann's *Monumental Brasses* (1957), A. C. Bouquet, *European Brasses* (1968), H. W. Macklin, *Monumental Brasses*, ed. John P. Phillips (repr. 1969).

brasses, ornamental. Brass, a copper-zinc alloy produced since imperial Roman times, is closely associated in art with bronze, a copper-tin alloy (see BRONZE SCULPTURE). Brass was generally fashioned into utilitarian objects such as bowls, pots, and jugs. In the Middle East, China, and Japan, brass was beaten and hollow-cast, and in India an excellent decorated brass known as Benares ware is still produced. In Europe, the Meuse valley became the center of ornamental work in copper and its alloys during the 11th cent. Although production spread to most of Western Europe, the work was known well into the 16th cent. as *dinanderie*, after Dinant, a Belgian town long the leader in this work. Early *dinanderie* included ecclesiastical objects such as fonts, tabernacles, and lecterns, and domestic articles such as the distinctive aquamanile, a vessel, often in the form of an animal, used for pouring water. The brass chandeliers of Norway, Sweden, and Holland were widely exported. In the 17th and 18th cent. small objects for domestic use, such as candlesticks, utensils, and hearth equipment were produced. Ormolu, a gilded or varnished brass or bronze, was often used in the fashioning of these objects and later for covering the wooden parts of furniture. Machine production killed the brass and bronze art industries in the late 19th cent.

Brassó, Rumania. see BRAŞOV

Brasstown Bald, peak, 4,784 ft (1,458 m) high, N. Ga., in the Blue Ridge of the Appalachian Mts., near the N. C. line, highest point in Georgia.

brass wind instrument: see WIND INSTRUMENT

Brathwaite, Richard, 1588?–1673, English poet. His *Bamabae luterarium*, a doggerel travelogue of provincial England, was written first in Latin (1636) and later published with an English translation (*Bamabee's Journal*, 1638). Because the book was published under the pseudonym Corymbaeus, its true authorship was not discovered until 1818. His other works include *The English Gentleman* (1630) and *The English Gentlewoman* (1631), books that emphasized the honorable and generous behavior of the landed gentry.

Brătianu (bratîa'nōō) or **Brătiano** (–nō), Rumanian family. **Ion Brătianu**, 1821–91, was prominent in the Revolution of 1848 and helped to secure (1866) the election of Prince Carol of Hohenzollern-Sigmaringen (Carol I of Rumania) to the throne. Brătianu headed (1876–88, except for April–June, 1881) a ministry that declared (1878) the full independence of Rumania from Turkey, which was secured in the treaty of San Stefano. His son, **Ion Brătianu**, 1864–1927, succeeded him as leader of the Liberals and was premier (1909–11, 1914–18). He resigned early in 1918 rather than accept the humiliating peace terms offered by the Central Powers but regained his posi-

tion in Dec., 1918, and represented Rumania at the Paris Peace Conference (1919). In 1920 he resigned in protest against the minority clauses of the Treaty of Trianon with Hungary and the division of the Banat with Yugoslavia. From 1922 until his death (except for an interlude in 1926–27) Brătianu was premier, ruling Rumania as a virtual dictator, he prevented the accession of Carol II in 1927. He was succeeded briefly as premier by his brother, Vintila Brătianu. **Constantin Brătianu**, also called **Dinu Brătianu**, 1889–1950?, another member of the family, led the National Liberal party from 1934 and opposed both the dictatorship of Ion Antonescu and the Communist regime. He was reported to have died in prison.

Bratislava (bra'tēsla'va'), Ger. *Pressburg*, Hung. *Pozsony*, city (1970 pop. 283,539), S. Czechoslovakia, on the Danube River and near the Austrian and Hungarian borders. It is Czechoslovakia's third largest city and the traditional capital of Slovakia. Bratislava is also an important road and rail center and a leading Danubian port. Industries include mechanical engineering, machine building, oil refining, food processing, and the manufacture of chemicals, textiles, electrical equipment, paper, wood products, and beer. Forests, vineyards, and large farms surround the city, which has an active trade in agricultural products. It is also a popular tourist center. A Roman outpost called *Posonium* by the 1st cent. A.D., Bratislava became a stronghold of the Great Moravian Empire in the 9th cent. After the death of Ottocar II (1278), Bratislava and much of S and E Slovakia fell under Hungarian rule. From 1541, when the Turks captured Buda, until 1784, Bratislava served as Hungary's capital and the residence of Hungarian kings and archbishops. The kings continued to be crowned there until 1835, and Bratislava was the meeting place of the Hungarian diet until 1848. Inhabited largely by German traders before the 19th cent., the city then became predominantly Magyar. In the 19th cent. it was the center of the emerging Slovak national revival, and after the union of the Czech and Slovak territories in 1918 it was incorporated into Czechoslovakia. From 1939 until 1945, Bratislava was the capital of a nominally independent Slovak republic that was governed by a pro-German regime. The Univ. of Jan Comenius (1919), the Slovak Academy of Sciences, a polytechnic university, a national theater, and several museums are in the city. The 9th-century castle, above the Danube, was rebuilt in the 13th cent. St. Martin's Cathedral, the Franciscan convent and church, and the old town hall are also 13th-century buildings. The new town hall occupies an 18th-century palace, formerly the residence of the primates of Hungary; the Treaty of PRESSBURG was signed there in 1805.

Brattleboro, town (1970 pop. 12,239), Windham co., SE Vt., on the Connecticut River, chartered 1753. The town grew near Fort Dummer, which was established in 1724 to protect the settlers from Indians. Once an artists' colony, Brattleboro is now a center for winter sports. Its manufactures include optical goods, paper and wood products, books, and purses. Rudyard Kipling married a native of Brattleboro, and they lived nearby. John Humphrey Noyes was born in Brattleboro. Mark Hopkins College is in the town.

Braun, Eva (ä'va), 1912–45, mistress and later wife of the German dictator Adolf Hitler. She was a shop assistant to a Nazi photographer, through whom she met Hitler. She entered his household in 1936, although their relationship was kept secret. She had no influence on the government. Hitler married her in the last days of his life, and she joined him in suicide.

Braunschweig: see BRUNSWICK, Germany

Brauer, Adriaen: see BROUWER ADRIAN

Brawley, city (1970 pop. 13,746), Imperial co., SE Calif., inc. 1908. It is situated in an agricultural area of the Imperial Valley, SE of the Salton Sea. Cattle feeding and the production of beet sugar are the major industries. Nearly half the population is Mexican-American. The Imperial Valley Rodeo and Brawley Cattle Call is an important event in the city.

Braxton, Carter, 1736–97, political leader in the American Revolution, signer of the Declaration of Independence, b. King and Queen co., Va. He lived (1757–60) in England, returned to America, and served in the house of burgesses (1761–71, 1775) and in the Continental Congress (1775–76, 1777–83, 1785).

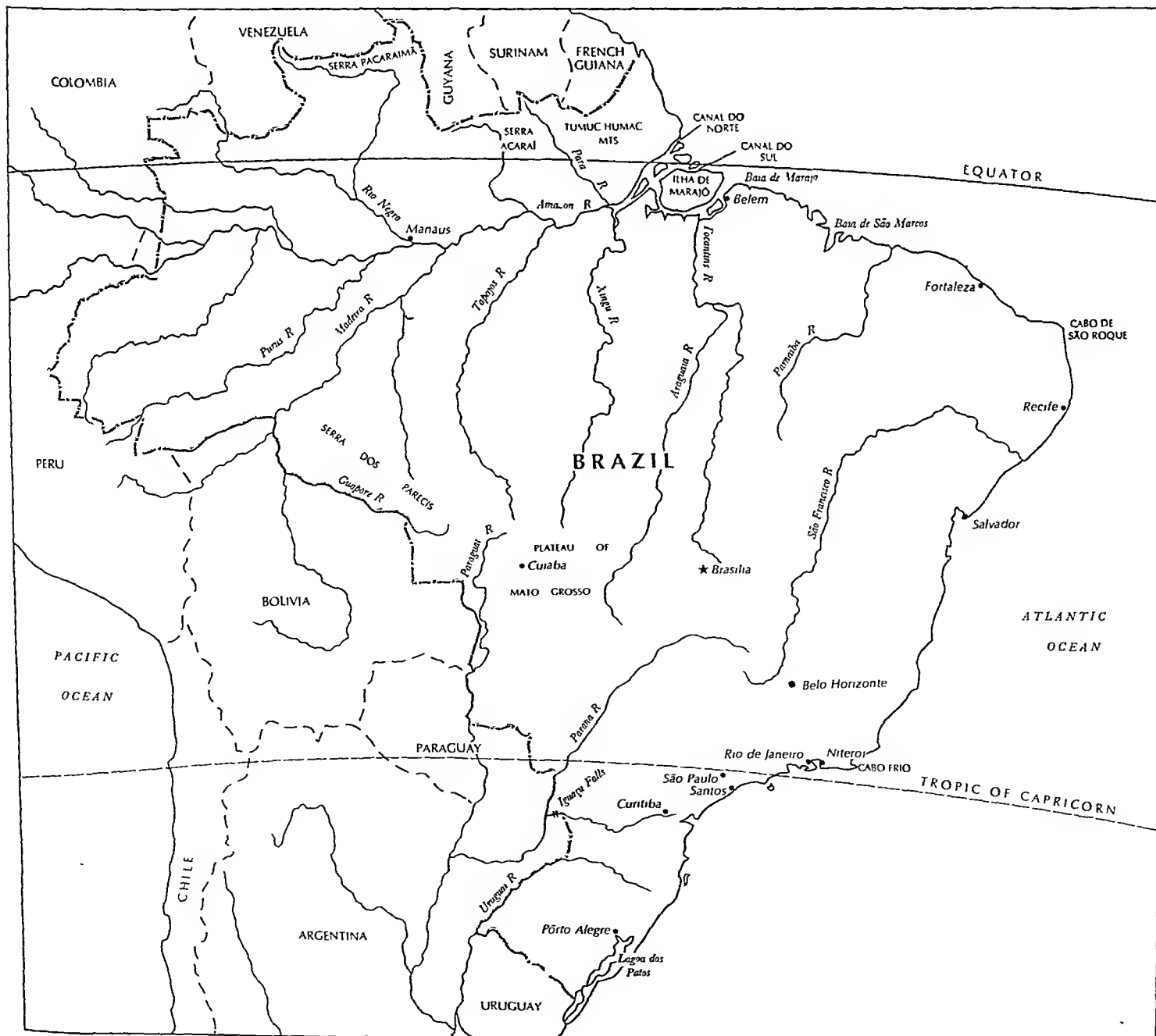
Bray, Thomas, 1656–1730, English clergyman and philanthropist. In 1696 he was selected by the bishop of London as his commissary to establish the Anglican church in Maryland. Bray recruited mis-

sionaries and assembled parochial libraries for North America. He sent out more than 30 parish libraries, which also served in many cases as circulating libraries. He established similar libraries in England and Wales. He founded (1699) the Society for Promoting Christian Knowledge to carry on his work. Bray visited Maryland in 1700 and was instrumental in the passage of a revised provincial Church Act (1702). He secured the charter (1701) for the noted Society for the Propagation of the Gospel in Foreign Parts. Rector of St Botolph Without, Aldgate, London, from 1706 until his death, he was interested in many religious and charitable enterprises, among them the relief of prisoners in England, with which James Oglethorpe was also concerned. In 1723 a charity society, "Dr Bray's Associates," was founded, which in 1730 was concerned in a petition for the charter of Georgia. His major written work was *A Course of Lectures Upon the Church Catechism* (9 vol, 1696). See biography by E. L. Pennington (1934), C. T. Laugher, *Thomas Bray's Grand Design* (1974).

Brazil (brázil'), Port *Brasil*, republic (1973 est pop 99,000,000), 3,286,470 sq mi (8,511,965 sq km), E South America. It is a federation of 22 states, four territories, and BRASÍLIA, the federal district and site of the capital city of the same name. By far the largest of the Latin American countries, Brazil occupies nearly half the continent of South America, stretching from the Guiana Highlands in the north to the plains of Uruguay and Paraguay in the south. In the west it spreads to the equatorial rain forest, border-

ing on Bolivia, Peru, and Colombia, in the east it juts far out into the Atlantic toward Africa. Its vast extent covers a great variety of land and climate, for although Brazil is mainly in the tropics (the equator crosses it in the north and the Tropic of Capricorn crosses it in the south), the southern part of the great central upland is cool and yields the produce of temperate lands. The people are also diverse in origin, and Brazil boasts that the new "race" of Brazilians is a successful amalgam of Indian, Negro, and European strains. Portuguese is the official language, and a large part of the population is at least nominally Roman Catholic. Most of the estimated 150,000 Indians (chiefly of Tupi or GUARANÍ linguistic stock) are found in the rain forests of the Amazon River basin, which occupies all the north and north central portions of Brazil. Most of Brazil's great cities are on the Atlantic coast or the banks of the great rivers. The chief city within the Amazon region is MANAUS. Wild rubber, once of great economic importance, and other forest products are gathered in the region, but the states of AMAZONAS, PARA, and ACRE, and the territories of AMAPÁ, RORAIMA, and RONDÔNIA are still largely of potential rather than actual economic value. At the mouth of the Amazon is the city of BELÉM, chief port of N Brazil. Southeast of the Amazon mouth is the great seaward outthrust of Brazil, the region known as the Northeast. The states of MARANHÃO and PIAUÍ form a transitional zone noted for its many babassu and carnauba palms. The Northeast proper—including the states of CEARÁ, RIO GRANDE DO NORTE, PARAÍBA, PERNAMBUCO,

ALAGOAS, SERGIPE, and the northern part of BAHIA—was the center of the great sugar culture that for centuries dominated Brazil. The Northeast has also contributed much to the literature and culture of Brazil. In these states the general pattern is a narrow coastal plain (formerly supporting the sugarcane plantations and now given over to diversified subtropical crops) and a semiarid interior, or SERTÃO, subject to recurrent droughts. This region has been the object of vigorous reclamation efforts by the government in recent years. The "bulge" of Brazil reaches its turning point at the Cape of São Roque. To the northeast lie the islands of FERNANDO DE NORONHA territory, and to the south is the important port and airport of NATAL. South of the "corner" of Brazil, the characteristic pattern of Brazilian geography becomes notable: the narrow and interrupted coastal lowlands are bordered on the west by an escarpment, in some places, however, the escarpment actually reaches the sea. Above the escarpment is the great Brazilian plateau, which tapers off in the southernmost state, Rio Grande do Sul, where it is succeeded by the plains of the Rio de la Plata country. The escarpment itself appears from the sea as a mountain range, generally called the Serra do Mar [coast range], and the plateau is interrupted by mountainous regions, such as that in Bahia, which separates E Bahia from the valley of the São Francisco River. The chief cities of the Northeast are the ports of RECIFE in Pernambuco and SALVADOR in Bahia. There are a number of excellent harbors farther south: VITÓRIA in Espírito Santo, RIO DE JANEIRO, the



former capital, one of the most beautiful and most capacious harbors in the world, SANTOS, the port of São Paulo and the greatest coffee port in the world, and PORTO ALEGRE in Rio Grande do Sul. In the east and southeast is the heavily populated region of Brazil—the states that in the 19th and 20th cent. received the bulk of European immigrants and took hegemony away from the old Northeast. The states of GUANABARA and RIO DE JANEIRO, with the great steel center of VOLTA REDONDA, are heavily industrialized. Neighboring SÃO PAULO state has even more industry (50% of all of Brazil's industry) and a well-developed agriculture. The city of SÃO PAULO on the plateau has continued the vigorous and aggressive development that marked the region in the 17th and 18th cent., when the paulistas went out in the famed bandeiras (raids), searching for Indian slaves and gold and opening the rugged interior. They were largely responsible for the development of the gold and diamond mines of MINAS GERAIS state, the second most populous state in Brazil, and for the building of its old mining center of Vila Rica (OURO PRÉTO), now succeeded by BELO HORIZONTE as capital. Minas has some of the finest iron reserves in the world, as well as other mineral wealth, and is becoming industrialized. Settlement also spread from São Paulo southward, particularly in the 19th and early 20th cent. when coffee from São Paulo's terra roxa [purple soil] had become the basis of Brazilian wealth, and coffee growing spread to PARANÁ. That state, in the west, runs out to the "corner" where Brazil, Argentina, and Paraguay meet at the natural marvel of the Iguazu Falls in the Parana River. The more southern states of SANTA CATARINA and RIO GRANDE DO SUL, developed to a large extent by German and Slavic immigrants, are primarily cattle-growing areas with increasing industrial importance. Frontier development is continuing in central Brazil. The state of MATO GROSSO is still largely devoted to stock raising. The transcontinental railroad from Bolivia spans the southern part of the state. The federal district of Brasília was carved out of the neighboring plateau state of GOIÁS, to the east. The national capital was transferred to the planned city of Brasília in 1960. Despite a high annual growth rate and recent industrialization Brazil is still an agricultural country. Agriculture employs about 60% of the labor force and accounts for 70% of the exports. The major commercial crops are coffee, cocoa, cotton, sugarcane, oranges, bananas, and beans. Cattle, pigs, and sheep are the most numerous livestock. Besides iron, Brazil is an important producer of coal, manganese, chrome, industrial diamonds, quartz crystal, and many other minerals. The leading manufacturing industries produce cotton textiles, paper, fertilizer, and asphalt. Motor vehicle production is increasing. Brazil is the world's leading coffee exporter. Other exports are iron, cotton, and sugar. Manufactured goods and raw materials head the imports. Most trade is with the United States, the European Common Market countries, and Argentina. Brazil is governed by the 1967 constitution, which has been amended frequently. Authority is vested in the president, who is elected for five years by an electoral college consisting of members of congress and the state legislatures. The bicameral congress is popularly elected. The 66 senators serve for eight years and are elected in rotation. The 310 deputies serve for four years. The president may unilaterally intervene in state affairs, although each state has its own governor and legislature. There are two legal parties, the pro-government National Renovating Alliance and the opposition Brazilian Democratic Movement. About 70% of the population is literate. There are more than 40 universities in the country. *History.* Whether or not Brazil was known to Portuguese navigators in the 15th cent. is still an unsolved problem, but the coast was visited by the Spanish mariner Vicente Yáñez Pinzón (see under PINZÓN, MARTÍN ALONSO) before the Portuguese under Pedro Álvares CABRAL in 1500 claimed the land, which came within the Portuguese sphere as defined in the Treaty of Tordesillas (1494). Little was done to support the claim, but the name Brazil is thought to derive from the Portuguese word for the red color of brazilwood [brasa=glowing coal], which the early visitors gathered. The first permanent settlement was not made until 1532, and that was at SÃO VICENTE in São Paulo. Development of the Northeast was begun about the same time under Martim Afonso de SOUSA as first royal governor. Salvador was founded in 1539, and 12 captaincies were established, stretching inland from the Brazilian coast. Portuguese claims, somewhat lackadaisically administered, did not go unchallenged. French Huguenots established themselves (1555) on an island in Rio de

Janeiro harbor and were routed in 1567 by a force under Mem de Sá, who then founded the city of Rio de Janeiro. The Dutch made their first attack on Salvador (Bahia) in 1624, and in 1633 the vigorous Dutch West India Company was able to capture and hold not only Salvador and Recife but the whole of the Northeast, the region was ably ruled by JOHN MAURICE OF NASSAU. No aid was forthcoming from Portugal, which had been united with Spain in 1580 and did not regain its independence until 1640. It was a naval expedition from Rio itself that drove out the Dutch in 1654. The success of the colonists helped to build up self-confidence among the settlers. Farther south, the bandeirantes from São Paulo had been trekking westward since the beginning of the 17th cent., thrusting far into Spanish territory and extending the western boundaries of Brazil, which were not delimited until the negotiations of the Brazilian diplomat RIO BRANCO in the late 19th and early 20th cent. The Portuguese also had ambitions to control the Banda Oriental (present Uruguay) and in the 18th cent. came into conflict with the Spanish there, the matter was not completely settled even by the independence of Uruguay in 1828. Meanwhile the sugar culture had come to full flower in the Northeast, where the plantations were furnishing most of the sugar demanded by Europe. The native Indians were not adaptable to the back-breaking labor of the cane fields, and Negro slaves were imported in large numbers. Dependence on a one-crop economy was lessened by the development of the mines in the interior, particularly those of Minas Gerais, where gold was discovered late in the 17th cent. Mining towns sprang up, and Ouro Preto became in the 18th cent. a major intellectual and artistic center boasting such artists as the sculptor ALFRED DINHO. The center of development began to swing south, and Rio de Janeiro, increasingly important as an export center, supplanted Salvador as the capital of Brazil in 1763. Ripples from intellectual stirrings in Europe that preceded the French Revolution and the successful American Revolution brought on an abortive plot for independence among a small group of intellectuals in Minas, the plot was discovered and the leader, TIRADENTES, was put to death. When Napoleon's forces invaded Portugal, the king of Portugal, JOHN VI, fled (1807) to Brazil, and on his arrival (1808) in Rio de Janeiro that city became the capital of the Portuguese Empire. The ports of the colony were freed of mercantilist restrictions, and Brazil became a kingdom, of equal status with Portugal. In 1821 the king returned to Portugal, leaving his son behind as regent of Brazil. New policies by Portugal toward Brazil, tightening colonial restrictions, stirred up wide unrest. The young prince eventually acceded to popular sentiment, and advised by the Brazilian JOSE BONIFÁCIO, on Sept. 7, 1822, on the banks of the little Ipiranga River, uttered the fateful cry of independence. He became PEDRO I, emperor of Brazil. Pedro's rule, however, gradually kindled increasing discontent in Brazil, and in 1831 he had to abdicate in favor of his son, PEDRO II. The reign of this popular emperor saw the foundation of modern Brazil. Ambitions directed toward the south were responsible for involving the country in the war (1851-52) against the Argentine dictator, Juan Manuel de Rosas, and again in the War of the Triple Alliance (1865-70) against Paraguay. Brazil drew little benefit from either, far more important were the beginnings of the large-scale European immigration that was to make SE Brazil the economic heart of the nation. Railroads and roads were constructed, and today the region has an excellent transportation system. The plantation culture of the Northeast was already crumbling by the 1870s, and the growth of the movement to abolish slavery, spurred by such men as Antônio de CASTRO ALVES and Joaquim NABUCO, threatened it even more. The slave trade had been abolished in 1850, and a law for gradual emancipation was passed in 1871. In 1888 while Pedro II was in Europe and his daughter ISABEL was governing Brazil, slavery was completely abolished. The planters thereupon withdrew their support of the empire, enabling republican forces, aided by a military at odds with the emperor, to triumph. By a bloodless revolution in 1889 the republic was established with Manuel Deodoro da FONSECA as first president. The rivalry of the states and the power of the army in government, especially under Fonseca's unpopular successor, Floriano PEIXOTO, caused the political situation to remain uneasy. The expanding market for Brazilian coffee and more particularly the wild-rubber boom brought considerable wealth as the 19th cent. ended, but the creation of rubber plantations in the Far East brought the wild-rubber boom to a halt and

hurt the economy of the Amazon region after 1912. Brazil sided with the Allies in World War I, declaring war in Oct., 1917, and shared in the peace settlement, but later (1926) it withdrew from the League of Nations. Measures to reverse the country's growing economic dependence on coffee were taken by Getúlio VARGAS, who came into power through a revolution in 1930. By changing the constitution (notably in 1937) and establishing a type of corporative state he centralized government (the *Estado Novo*—new state) and began the forced development of basic industries and diversification of agriculture. His dictatorial rule, although it aroused much opposition, reflected a new consciousness of nationality. The Brazilian spirit, which had been unconsciously represented in folk art and folk music, now was consciously expressed, particularly in the paintings of Cândido PORTINARI and the music of Heitor VILLA-LOBOS. World War II brought a new boom (chiefly in rubber and minerals) to Brazil, which joined the Allies on Aug. 22, 1942, and under foreign minister Oswaldo Aranha took a large part in inter-American affairs. In 1945 the army forced Vargas to resign, and Gen. Eurico Gaspar Dutra was elected president. Brazil's economic growth was plagued by inflation, and this issue enabled Vargas to be elected in 1950. His second administration was marred by economic problems and corruption, and in 1954 he resigned and committed suicide. He was succeeded by João Café Filho. Juscelino KUBITSCHKEK was elected president in 1955. Under Kubitschke the building of Brasília and an ambitious program of highway and dam construction were undertaken. The inflation problem persisted. In 1960 Jânio QUADROS was elected by the greatest popular margin in Brazilian history. But his autocratic manner and reform program aroused great opposition, and he resigned within seven months. Vice President João GOULART was the legal successor. Military leaders and conservatives opposed to him forced constitutional changes creating a parliamentary government and weakening the presidency (1961). In 1963, however, full presidential powers were restored by plebiscite. Weakened by political strife and seemingly insurmountable economic chaos, the leftist administration of Goulart demanded radical constitutional changes. In 1964 a military insurrection deposed Goulart. Congress elected General CASTELO BRANCO to fill out his term. Goulart's supporters and other leftists were removed from power and influence throughout Brazil, and the president was given far-reaching powers. In 1965, after anti-military forces won elections in two states, the president's extraordinary powers were extended, and all political parties were dissolved. A new constitution was adopted in 1967. Marshall COSTA E SILVA succeeded Castelo Branco in March. In 1968, in the face of student protests and criticism from the church against the military regime, Costa e Silva recessed Congress and assumed one-man rule. In 1969 Gen. Emílio GARRASTAZÚ MÉDICI succeeded Costa e Silva. Terrorism of the right and left (several diplomats were captured by leftist guerrillas) became a feature of Brazilian life but abated somewhat in the mid-1970s. Gen. Ernesto Geisel succeeded Garrastazu Médici as president in March, 1974. See Gilberto Freyre, *The Mansions and the Shanties* (tr. 1963) and *Order and Progress, Brazil from Monarchy to Republic* (tr. 1970), C. H. Haring, *Empire in Brazil* (1958, repr. 1968), R. M. Levine, *The Vargas Regime* (1970), R. M. Schneider, *The Political System of Brazil* (1971), Fernando de Azevedo, *Brazilian Culture* (tr. 1950, repr. 1971), E. B. Burns, *A History of Brazil* (1971), Charles Wagley, *An Introduction to Brazil* (rev. ed. 1971), T. E. Weil and others, *Area Handbook for Brazil* (1971), T. L. Smith, *Brazil People and Institutions* (4th ed. 1972) and with Alexander Marchant, ed., *Brazil, Portrait of Half a Continent* (1951, repr. 1972), Philip Raine, *Brazil, Awakening Giant* (1974).

Brazilian literature. Soon after the discovery of Brazil, the Portuguese began to describe the wonders of the new land. Brazilian literature began with the letter of Pedro Vaz de Caminha announcing the discovery to the king of Portugal. That descriptive trend was continued in the 16th and 17th cent. in the works of the missionaries José de ANCHIETA wrote in Portuguese about Brazil and is considered the first Brazilian writer. The dualism of European tradition and New World feeling continued. Many consider the 17th-century Jesuit priest Antônio VIRA (brought to Brazil as a child) the true master of the Portuguese prose in the classic style. In the late 17th cent. the first native Brazilian writer of note, Gregório de Matos Guerra, wrote poetry satirizing the society of his time. During the 18th cent. poetic

"academies" sprang up in various parts of Brazil. The most famous was in Minas Gerais, it included José Basilio da Gama, author of the epic poem *Uruguai*, and Tomas Antônio Gonzaga, best known for his pastoral love poem *Marília de Dirceu* (1792). This group had helped introduce revolutionary ideas from France into Brazil. Independence from Portugal in 1822 fostered national feeling and ushered in the romantic era, which is generally dated from the appearance in 1836 of volumes of poetry by Domingos José Gonçalves de Magalhães, visconde de Araguaia, and by Manuel de Araújo Porto-Alegre. The two major Brazilian romantic poets were Antônio Gonçalves Dias, who glorified the Indian and the native soil, and Antônio de Castro Alves, a leader in the fight for the abolition of slavery. His social awareness introduced a new dimension into the nascent "Brazilianism." A more introspective mood was created by Álvares de Azevedo. The romantic era also witnessed the birth of the novel in Brazil, notably *O Guarani* (1857) by José de Alencar and the later *Iracema*. A realist note was sounded by Alfredo d'Escagnolle Taunay in his novel *Inocência* (1872) and in *Memórias de um sargento de milícias* (2 vol., 1854-55) by Manuel Antônio de Almeida. The works of the man generally considered the greatest of Brazilian writers, Joaquim Maria Machado de Assis, were in the same realist vein. His novels and short stories are noted for their psychological depth and classic purity of style. Contemporary with Machado de Assis were the Parnassian poets, headed by Olavo Bilac, but theirs was an isolated trend. Seven years before the appearance of Bilac's *Poesias*, Aluizio de Azevedo had published *O Mulato* (1881), a novel that dealt in naturalistic fashion with the Brazilian scene and characters. In 1902, Euclides da Cunha wrote his masterly description of an uprising in the Brazilian northeast, *Os sertões* (tr. *Rebellion in the Backlands*, 1944). Concern with the native soil and with social problems was henceforth to predominate in Brazilian literature. Canaan, a pessimistic novel of ideas by José Pereira da Graça Aranha, appeared in the same year, and the stories of José Bento Monteiro Lobato also became popular. Even the Paris-born "art for art's sake" movement, called modernism, had a strong nativist and sociological bias. It began in Brazil as a poetic movement led by Mario de Andrade (whose prose work, *Macunaíma*, made pioneer use of the vernacular in 1928), and it was soon joined by other poets of stature, including Manuel Bandeira. The naturalistic novel came into its own in the 1930s with the works of Graciliano Ramos, José Lins do Rego, and Jorge Amado. Their concern with the Brazilian northeast has been continued by writers such as João Guimarães Rosa, whose poetic novel *Grande sertão veredas* appeared in 1958. The chief trend of the 20th cent., inspired by the writings of the great jurist Ruy Barbosa at the turn of the century and by the sociological works of Gilberto Freyre (begun in the 1930s), is toward critical and scholarly works. At the same time, the more subjective trend continues with, among others, novelists Rachel de Queiroz, José Américo de Almeida, and Érico Lopes Veríssimo, poets Jorge de Lima, Guilherme de Almeida, Vinícius de Moraes, Augusto Frederico Schmidt, and Cecília Meireles, dramatists Nelson Rodrigues and Aníbal Suassuna, and short-story writer Clarice Lispector. See Samuel Putnam, *Marvelous Journey* (1948), D. S. Loos, *The Naturalistic Novel of Brazil* (1963), Alfrânio Coutinho, *An Introduction to Literature in Brazil* (tr. 1969), Elizabeth Bishop, ed., *An Anthology of Twentieth-Century Brazilian Poetry* (1972).

Brazil nut, common name for the Lecythidaceae, a family of tropical trees. It includes the anchovy pear (*Gras cauliflora*), a West Indian species with edible fruit used for pickles, and several lumber trees of South America, e.g., the cannon-ball tree, some species of *Barringtonia*, and the Brazil nut trees (genus *Bertholletia*). The latter are found chiefly in Brazil along the Amazon and Orinoco rivers. The edible Brazil nuts grow clumped together in large, round, woody and extremely hard seed pods the size of a large apple. The meat of the seed (the "nut") is very rich in oil. The Brazil nut family is classified in the division MAGNOLIOPHYTA, class Magnoliopsida, order Lecythidales.

brazilwood, common name for several trees of the family Leguminosae (PULSE family) whose wood yields a red dye. The dye has largely been replaced by synthetic dyes for fabrics, but it is still used in high-quality red inks. The bright red wood, which takes a high polish, is used in cabinetwork and for making violin bows. The East Indian redwood, or

sapanwood (*Caesalpinia sappan*), was called "bresil wood" when it was first imported to Europe in the Middle Ages. Portuguese explorers used this name for a similar South American tree (*C. brasiliensis*), from which the name Brazil for its native country purportedly derives. Brazilwoods are classified in the division MAGNOLIOPHYTA, class Magnoliopsida, order Rosales, family Leguminosae.

brazing, method of joining metal parts. The parts are cleaned and then heated above the melting point of the brazing metal, which is then applied, on cooling, it solidifies and serves to bond the parts together. Brazing metal is generally harder and has a higher melting point than common SOLDER.

Brazos (bráz'as), river, 870 mi (1,410 km) long (1,210 mi/1,947 km long with its main tributary), rising in E N Mex. From its source it flows SE across Texas to enter the Gulf of Mexico at Freeport. The Brazos flows through the fertile farming area of N Texas, where it is used for irrigation. The river supplies water to nearby cities, several dams provide flood control and hydroelectric power. The river is navigable upstream.

Brazza, Pierre Paul François Camille Savorgnan de (pyër pöl frānswä' kamé'ya sävörnän' də bráz'ä'), 1852-1905, Franco-Italian empire builder. He was born Pietro Paolo Savorgnan di Brazza but adopted the French form of his name in 1874, when he became a French citizen. After visiting (1874) Gabon he returned (1875) on the orders of the French government to explore West Africa. In 1879, in an attempt to forestall the efforts of Henry M. Stanley to annex the Congo basin for Belgium, Brazza explored the upper Congo. He founded (1880) Franceville (now in Gabon) and Brazzaville (now in the Congo Republic) and established a protectorate over the kingdom of Makoko. Although he failed to deter Stanley, he added c. 193,000 sq mi (499,900 sq km) to the French empire in central Africa. He served as a French colonial official from 1883 and was commissioner general of the French Congo (1886-98). See Richard West, *Brazza of the Congo* (1972).

Brazza: see BRAČ, Yugoslavia

Brazzaville (bráz'avil, Fr. brázavêl'), city (1972 est. pop. 184,000), capital of the People's Republic of the Congo, on Stanley (Malebo) Pool of the Congo River. It is the nation's largest city and its administrative, communications, and economic center. The chief industries are beverage processing, tanning, and the manufacture of construction materials, matches, and textiles. There are also machine shops. An important port on the Congo River, Brazzaville receives wood, rubber, agricultural products, and other items and sends them by railroad to POINTE NOIRE, a port on the Atlantic Ocean. Motorboats connect Brazzaville with KINSHASA, Zaire, across Stanley Pool. The city was founded in 1880 by Savorgnan de BRAZZA, the French explorer. It was the capital of FRENCH EQUATORIAL AFRICA from 1910 to 1958 and was the center of Free French forces in Africa during World War II. The city's main growth began after 1945. It houses a Center for Higher Studies (1961), a teachers college, and an art school. At a conference in Brazzaville in 1944, African leaders from French West and Equatorial Africa for the first time publicly called for reforms in French colonial rule, thus starting the colonies on the road to independence. In late 1960 leaders of newly independent French-speaking African nations met in the city, the "Brazzaville group" of states, which adopted a moderate political stance on most African and international issues of the time, took its name from this meeting.

Brea (brä'a), city (1970 pop. 18,447), Orange co., S Calif., inc. 1917. It is an industrial, commercial, and residential community in an oil and citrus-fruit area. Most industries are related to the production and processing of oil. Other manufactures include rubber products, tools, and chemicals. The city developed during an oil boom in the early 1900s. Points of interest include the campsite of the Spanish explorer Don Gaspar de Portola, the first European to visit the area.

Breadalbane, John Campbell, 1st earl of (brädöl'-bîn, bräd-), 1635?-1717, Scottish nobleman. He took part in the royalist rising of 1654 and helped George Monck to further the restoration (1660) of Charles II. In 1688 he privately supported James II, but he did not commit himself openly and took advantage of the Act of Indemnity to swear allegiance to William III (1689). His strong position among the highland clans made him a useful intermediary in negotiating the submission of the chiefs in 1691. He has been blamed for instigating the massacre of the MacDon-

alds of Glencoe (1692), allegedly using their failure to submit on time as a pretext for settling old scores with that clan. However, there is no evidence that he was personally involved in that episode. He took no active part in negotiating the Act of Union (1707), but he was a representative peer in the united Parliament (1713-15). He gave nominal support only to the Jacobite rebellion of 1715.

Breadalbane (brädöl'bîn), mountainous district, Perthshire, central Scotland. The district, picturesque and little cultivated, is the site of Breadalbane power scheme (118,000-kw capacity).

breadfruit: see MULBERRY

breadroot or Indian breadroot, perennial plant (*Psoralea esculenta*) of the family Leguminosae (PULSE family), native to the American prairies and valued by the Indians for the starchy tuberous root that was much used for food, eaten raw or roasted or dried for winter use. The breadroot has bluish pealike blossoms and in general resembles the lupine. The plant was the prairie turnip or *pomme de prairie* of Western pioneers. Other species of *Psoralea* have also supplied food. Breadroot is classified in the division MAGNOLIOPHYTA, class Magnoliopsida, order Rosales, family Leguminosae.

breaker. see WAVE, in oceanography

Breakspear, Nicholas: see ADRIAN IV

breakwater, offshore structure to protect a harbor from waves. When it also serves as a pier, it is called a quay, when covered by a roadway it is called a mole. In the United States a breakwater commonly consists of a long mound of stone rubble. The flow of waves up its slope and the formation of swirls by its rough surface dissipate wave energy. In Europe the typical breakwater is a vertical wall, usually of concrete, built on a rock base, it reflects the waves without dissipating their energy. A pneumatic breakwater consists of perforated pipes discharging air bubbles. A similar hydraulic breakwater has underwater pipes that direct streams of water against approaching waves. Under the right conditions both types cause waves to break. The Chesapeake breakwater was the first built in the United States. See COAST PROTECTION.

Bréal, Michel Jules Alfred (mëshêl' zhul älf'rêd' brääl'), 1832-1915, French philologist. He is best known for his *Essai de sémantique* (1897), which gave great impetus to scientific interest in the field of semantics.

Bream, Julian (Alexander), 1933-, English guitarist and lutenist. Bream was first taught guitar by his father and studied piano and cello at the Royal College of Music. He made his debut at the age of 12. An outstanding performer, Bream has a repertory ranging from Dowland to Henze. Many compositions have been written for him.

bream: see SUNFISH

breast: see MAMMARY GLAND

Breasted, James Henry (brës'tîd), 1865-1935, American Egyptologist, b. Rockford, Ill., grad. North Central College, 1888, M.A. Yale, 1891, Ph.D. Univ. of Berlin, 1894. He began teaching at the Univ. of Chicago in 1894 and was (1905-33) professor of Egyptology and Oriental history there. Breasted was also director of the Haskell Oriental Museum (1895-1901) and after 1919 director of the Oriental Institute of the Univ. of Chicago. He made archaeological discoveries of great importance in Egypt and directed researches in Mesopotamia. Besides many reports and monographs, he wrote some general works, including *The Development of Religion and Thought in Ancient Egypt* (1912) and *The Dawn of Conscience* (1933). Two of his textbooks were *History of Egypt from the Earliest Times to the Persian Conquest* (rev. ed. 1928) and *Ancient Times* (rev. ed. 1944). Breasted translated and edited Egyptian historical sources in *Ancient Records of Egypt* (5 vol., 1906-27). His son, Charles Breasted, wrote a memoir of him, *Pioneer to the Past* (1943).

breathing: see RESPIRATION

Brébeuf, Jean de (zhāN də bräbōf'), 1593-1649, French Roman Catholic missionary, one of the Jesuit Martyrs of North America. A Norman, he was sent (1625) to Quebec and did missionary work among the Huron Indians. The warfare of the Huron and Iroquois caused the abandonment of his mission in 1628, and in 1629 on the surrender of Quebec to the English he went back to France. In 1633 he returned to Canada and carried on his work among the Indians, enduring great hardships. In 1649 the Iroquois took the Huron village and the mission. Father Brébeuf and his colleague, Gabriel Lalemant, were tortured to death. He was canonized in 1930. Feast Sept. 26 or (among the Jesuits) March 16. See his

Travels and Sufferings of Father Jean de Brébeuf among the Hurons of Canada, ed by Theodore Besterman (tr 1938), biography by F X Talbot (1949)

breccia: see CONGLOMERATE

Brèche de Roland (brësh də rôlân'), narrow gorge (alt 9,200 ft/2,804 m), Hautes-Pyrenees dept., SW France, in the Pyrenees. It leads into the Cirque de Gavarnie, a natural amphitheater. According to legend Roland, one of Charlemagne's knights, created the breach with his sword

Brecht, Bertolt (originally 8erthold) (both bër'tôlt brëkht), 1898-1956, German dramatist and poet. His brilliant wit, his outspoken Marxism, and his revolutionary experiments in the theater have made Brecht a vital and controversial force in modern drama. His early plays were realistic, in them the downtrodden struggled for survival in a disorganized world, and violence and disaster were recurrent. In the later 1920s Brecht turned to expressionism, as in *Mann ist Mann* [man is man] (1926), and began to develop his so-called epic theater, in which narrative, montage, self-contained scenes, and rational argument were used to create a shock of realization in the spectator. Sets and lighting were designed to prevent the illusion of the theater from gaining sway, and Brecht revealed elements of the staging process itself. Songs played an important part—for these Brecht wrote the lyrics for music by Hindemith, Kurt Weill, Hanns Eisler, and others. *Die Dreigroschenoper* [the threepenny opera] (1928), with music by Kurt Weill, is based on John Gay's *Beggar's Opera*; it reveals Brecht's continued hostility toward the capitalist social structure as well as his bittersweet compassion for humanity. Under National Socialism Brecht went into exile (1933), settling in Denmark and later in the United States. Works written in his most mature phase include *Mutter Courage und ihre Kinder* [Mother Courage and her children] (1941) and *Der gute Mensch von Sezuan* (tr *The Good Woman of Setzuan*, 1943), both concerned with ethical conduct. An outstanding example of epic theater is *Der kaukasische Kreidekreis* [the Caucasian chalk circle] (1955). From 1948, Brecht lived in East Berlin, where he directed the state-supported Berliner Ensemble. Notable English translations of Brecht's plays are those by Eric Bentley, which include *Seven Plays by Bertolt Brecht* (1961). See his collected plays ed by Ralph Manheim and John Willett (tr 1970), biographies by F Ewen (1967) and M Esslin (rev ed 1971), studies by J Willett (rev ed 1968), W Haas (tr 1970), and John Fugeri (1972).

Breck, James Lloyd, 1818-76, American Episcopal clergyman and missionary, b Philadelphia. In 1841 he established a seminary at Nashotah, Wis., with which he was connected until 1850, when he turned to missionary work among the Ojibwa Indians in Minnesota. In 1858, with Bishop Henry B Whipple, he founded at Faribault, Minn., the Seabury Divinity School and church schools for boys and girls. See T I Holcombe, *An Apostle of the Wilderness* (1903).

Breckinridge, John, 1760-1806, American statesman, b Augusta co., Va., grandfather of John Cabell Breckinridge. After he was admitted (1785) to the bar, he practiced law in Charlottesville, Va. Elected (1792) to the U.S. Congress, he soon resigned and moved to Lexington, Ky. He was (1795-97) attorney general of the new state, and as a member (1798-1801) of the state legislature he secured (1798) the enactment of the Kentucky Resolutions (see KENTUCKY AND VIRGINIA RESOLUTIONS). Breckinridge also prepared the stronger resolutions passed in the Kentucky legislature the next year in answer to criticisms of the earlier resolutions. In the U.S. Senate (1801-5) he was a leading spokesman of Western interests and played an important role in the passage of legislation bringing about the Louisiana Purchase. He was appointed U.S. Attorney General by President Jefferson in 1805 and died in office.

Breckinridge, John Cabell, 1821-75, Vice President of the United States (1857-61) and Confederate general, b Lexington, Ky. A lawyer, Breckinridge served in the Kentucky legislature (1849-51) and in the House of Representatives (1851-55). He was chosen by the Democrats in 1856 as a Southern running mate for Buchanan. As Vice President in a difficult period he distinguished himself by dignified and impartial presiding over the Senate. When a division within the Democratic ranks occurred in 1860, he became the presidential candidate of the Southern faction. Breckinridge claimed that no power existed in the Federal or local government to restrict slavery in any area while it was in territorial status. Believing in secession as a right, he nevertheless disapproved of such a course at that time. He received 72 elec-

toral votes in the November election. During the remainder of his term as Vice President, he attempted to secure the adoption of some compromise. As Senator (elected 1859) in the special session that began in July, 1861, he consistently opposed the administration's war measures. He failed in efforts to have Kentucky call a convention to act on secession. When the state declared for the Union in Sept., 1861, Breckinridge offered his services to the Confederacy. Appointed brigadier general in Oct., 1861, he served with distinction throughout the war, mostly in the West. On Feb. 4, 1865, he was made secretary of war for the Confederacy. When the South surrendered, Breckinridge fled to Europe via Cuba but was permitted to return (1869) by an amnesty proclamation issued in 1868. See biography by Lucille Stillwell (1936).

Breckinridge, Sophonisba Preston, 1866-1948, American pioneer social worker, educator, and author, b Lexington, Ky., grad Wellesley, 1888, Ph.D. Univ. of Chicago, 1901. She was the first woman to be admitted (1897) to the bar in Kentucky, but abandoned the practice of law to enter social work at Hull House, Chicago. After 1902 she taught at the Univ. of Chicago, where later she was professor of social economy (1925-29) and then professor of public welfare (1929-33). In 1934 she was president of the American Association of Schools of Social Work. As a delegate to the Pan-American Conference at Montevideo, Uruguay, in 1933, she was the first woman to represent the United States at an international conference. Her published works include *The Delinquent Child and the Home* (with Edith Abbott, 1912), *Family Welfare in a Metropolitan Community* (1924), *Public Welfare Administration in a Metropolitan Community* (1927), and *Women in the Twentieth Century* (1933).

Brecknock (brëk'nök, -nak) or **Brecon** (brëk'an), municipal borough (1971 pop 6,283), county town of Breconshire, S Wales, at the junction of the Honddu and Usk rivers. It is a market for the surrounding agricultural and cattle-raising area. Brecknock was founded by the Normans c 1091. In the town are fragments of an 11th-century castle, Christ College, founded by Henry VIII in 1542, and the 11th-century priory church of St. John, which became a cathedral in 1923. In 1974, Brecknock became part of the new nonmetropolitan county of Powys.

Brecknockshire, Wales. See BRECONSHIRE.

Brecon: see BRECONSHIRE, BRECKNOCK.

Breconshire (brëk'an-shîr), or **Brecon**, county (1971 pop 53,234), S Wales. The region is mountainous, rising to its greatest height in the Brecon Beacons (2,907 ft/886 m). In the Usk and Wye river valleys sheep (for mutton and wool) and beef cattle are grazed. Oats, barley, and wheat are Breconshire's major crops. Forestry is also important. Some coal is mined in the south, and limestone is quarried. Brecon Beacons National Park, in the southern part of the county, consists of 519 sq mi (1,344 sq km) of scenic land. Breconshire, in a region that may have been inhabited during the Stone and Bronze ages, gets its name from Brychan, a native prince who ruled after the Romans left c 400 A.D. The county was seized from the Welsh princes by the Normans in 1092. In 1974, Breconshire became part of the new nonmetropolitan counties of Gwent, Mid Glamorgan, and Powys.

Breda (brä'dä'), city (1971 pop 122,068), North Brabant prov., S Netherlands, at the confluence of the Mark and Aa rivers. It is an industrial and transportation center; its manufactures include machinery, textiles, and canned foods. Breda was founded by the 11th cent. The city was successfully besieged (1624-25) by the Spaniards under Ambrogio Spinola; the surrender of its heroic garrison is the subject of a famous painting by Velazquez. Points of interest in the city include a 13th-century Gothic church (Groote Kerk) and a castle (now a military academy).

Breda, Compromise of, 1566. See GUEUX.

Breda, Declaration of, 1660. See RESTORATION, in English history.

Breda, Treaty of, 1667. See DUTCH WARS.

Bredero, Gerbrand Adriaenszoon (hër'bränt adreän'zôn brä'dërō), 1585-1618, Dutch dramatist and poet. He is considered the major Dutch poet of his generation, particularly for his spontaneous love sonnets. The first Dutch master of comedy, Bredero was an important innovator; he drew upon classical elements as well as Renaissance models. His masterpiece, *De Spaansche Brabander* [the Spaniard from Brabant] (1617), is a realistic comedy of Amsterdam

life and reveals the influence of Spanish romanticism. Bredero's work was collected in three volumes in 1890.

breeder reactor. See NUCLEAR REACTOR.

breeding of plants and animals refers to the purposeful selection of certain parent organisms for propagation in order to improve the breed, variety, or strain. Selective breeding has been carried on by man to some extent since the domestication of plants and animals in the Neolithic period. In early Chinese civilizations rice crops were improved by selection, and in the early Indian civilizations of North and South America corn was thus improved. Cattle, horses, dogs, and other useful animals were long bred by selection. Breeding began to be established on a more scientific basis after the rediscovery of the laws of inheritance of Gregor Mendel. Among plants, pure lines are established by self-pollinating a plant and planting the seed it produces. The choice plants are then self-pollinated, and the process is repeated through a number of generations until a strain is developed that shows little variation. In recent years it has been found that by making crosses between such established pure lines, pure-line hybrids can be developed that have greater vigor than the pure lines and still retain uniformity of characteristics. In the United States much of the corn is produced from pure-line hybrid seed. Animals are said to be pure bred if in the breeding strain desirable characteristics are transmitted through generations with a uniformity approaching that shown by pure-line plants. The strains result from a series of crosses that involve considerable inbreeding. To prevent loss of vigor and reproductivity it is necessary to avoid too many crosses between very closely related animals. Crosses are therefore made between strains within a breed and sometimes between certain breeds. New breeds and varieties of established breeds are developed chiefly by hybridization and by breeding individuals in which mutations occur by chance. ARTIFICIAL INSEMINATION also plays an important role in the breeding of livestock. See GENETICS, HEREDITY, HYBRID.

Breed's Hill. See BUNKER HILL, BATTLE OF.

Bregenz (brä'gents), city (1971 pop 22,800), capital of Vorarlberg province, extreme W Austria, on the Lake of Constance (Bodensee). It is a lake port and a winter sports center and has industries that manufacture cotton and silk textiles, food products, and machinery. There is a large hydroelectric plant located on a site settled in the Bronze Age. Bregenz was chartered c 1200 and in 1726 became the administrative center of Vorarlberg. Nearby is the Bregenz Forest, a densely wooded highland noted for its scenic beauty.

Breidafjörður (brä'thafyör'thur), large inlet of the Denmark Strait, c 75 mi (120 km) long and 45 mi (70 km) wide, W Iceland, between the Vestfjörða and Snaefellsnes peninsulas. Hvammsfjörður and Gilsfjörður are eastern arms.

Breisach (brî'zakh), town (1970 est. pop 5,000), Baden-Württemberg, SW West Germany, on the Rhine River. Its manufactures include wine and paper. An old town, it has long been coveted because of its strategic location. It was fortified by the Romans, who called it *Mons Brisacius*. It became an imperial town in 1275. BERNHARD OF SAXE-WEIMAR took the town in 1638. Louis XIV secured it for France in the Peace of Westphalia (1648) and ceded it back to the emperor in the Treaty of Ryswick (1697), but built a new fort, Neuf-Breisach (Ger. Neu Breisach), on the opposite side of the Rhine. The French repeatedly captured Breisach during the 18th cent. but gave it to Baden in 1805.

Breisgau (brîs'gau), region, Baden-Württemberg, SW West Germany, including the Rhine plain and the western slopes of the Black Forest. Freiburg is the chief city. Fruit and wine are the main products. After the extinction (1218) of the first house of Zähringen, it was divided among various heirs. Most of it passed to the Hapsburgs in 1368. France held the region at various times in the 17th-18th cent. In 1805 the Breisgau was divided between Baden and Württemberg, the latter gave its share to Baden in 1810.

Breitenfeld (brî'tänfêl'), village, Leipzig dist., S central East Germany. It gave its name to two battles of the Thirty Years War. Gustavus Adolphus of Sweden there defeated the imperial forces under Count Johannes Tilly and Marshal Gottfried Pappenheim in 1631, and the Swedes under General Lennart Torstensson there routed the imperial troops under Archduke Leopold William in 1642.

Bremen (brä'man), city (1970 pop 582,277), capital of the state of Bremen, N West Germany, on the Weser River. Known as the Free Hanse City of Bremen.

men (Ger. *Freie Hansestadt Bremen*), it is West Germany's largest port after Hamburg and is a commercial and industrial center trading in cotton, wool, tobacco, and copper. Manufactures include ships, steel, machinery, electrical equipment, textiles, beer, and foodstuffs, including roasted coffee. Bremen is Germany's oldest port city. It was made an archbishopric in 845, and under Archbishop Adalbert (1043–72) it included all of Scandinavia, Iceland, and Greenland. The archbishops held temporal sway over a large area between the Weser and Elber rivers, but the city of Bremen itself remained virtually independent as its importance grew. In 1358 it became one of the leading members of the HANSEATIC LEAGUE. It accepted the Reformation in 1522, and in 1646 it was made a free imperial city. It stubbornly fought to preserve this status after the archbishopric had been assigned to Sweden by the Peace of Westphalia and later was ceded (1719) by Sweden to the elector of Hanover (George I of England). Bremen was occupied by France from 1810 to 1813. The city's overseas trade—from the late 18th cent. particularly with the United States—grew in the 19th cent., partly because of the founding (1827) of nearby Bremerhaven and the establishment (1857) of Norddeutscher Lloyd (North German Lloyd), a large shipping company. The city joined the German Empire in 1871. After World War I there was a short-lived (1918–19) socialist republic of Bremen. The city was badly damaged by bombs during World War II, but numerous historic monuments remain, including the Gothic city hall (1405–9), the statue of Roland, the medieval hero, which was erected in 1404 as a symbol of the city's freedom, the cathedral (begun 1043), a blend of Romanesque and Gothic styles, and two noted churches—the Liebfrauenkirche (13th cent.) and the Johanneskirche (14th cent.). The city has a major art museum and a museum of overseas ethnology. The state of Bremen (1970 pop. 723,000, 156 sq mi (404 sq km), was formed in 1947 by combining Bremen and Bremerhaven.

Bremer, Fredrika (frēdrē'kə brāmər), 1801–65, Swedish writer and feminist, b. Finland. Her novels of everyday life include *The H Family* (1829), *The President's Daughters* (1834), and *The Home* (1839). She recorded impressions of travel in America (1849–51) in *Homes in the New World* (1853), letters from this book were translated as *America of the Fifties* (1924). Her later novels advocate the emancipation of woman. See study by S. A. Rooth (1955).

Bremerhaven (brāmər'hā'fən), city (1970 pop. 140,455), in the state of Bremen, N. West Germany, at the mouth of the Weser River, near the North Sea. It is one of the largest fishing ports in Europe and is a major passenger and freight port. Founded in 1827, Bremerhaven in 1939 was absorbed by Wesermünde, which had been formed in 1924 as the result of the merger of the cities of Geestemünde and Lehe. In 1947 the combined municipality was renamed Bremerhaven and returned to the state of Bremen. The first regular ship service between continental Europe and the United States was started in Bremerhaven in 1847.

Bremersdorp, Swaziland. See MANZINI.

Bremerton (brēm'ər-tən), city (1970 pop. 35,307), Kitsap co., NW Wash., an excellent harbor on an arm of Puget Sound, inc. 1901. The city was platted (1891) when the area was selected as the site for the U.S. Puget Sound Naval Shipyard, and today Bremerton's economy is centered around that great installation. All types of U.S. naval vessels (including Polaris submarines) are built and repaired in the six drydocks there. Auxiliary facilities include a naval torpedo station and a naval ammunition depot. Although the great majority of residents are employed by the U.S. government, there are some logging and wood-product enterprises, and tourism is important. Bremerton is the gateway to the Olympic peninsula, with easy access to the Cascade and Olympic mts. It is surrounded on three sides by water, and numerous ferries ply the inland seas of Puget Sound, linking the city to nearby resort islands. The U.S.S. *Missouri*, docked there, is a national shrine; it was the scene of the official Japanese surrender at the end of World War II. Bremerton has a junior college. Three state parks are nearby.

bremstrahlung (brēm'sht'ra'lang) see X RAY.

Brendan, Saint, d. 577?, Irish abbot of Clonfert, Co. Galway. A popular medieval story told how he traveled westward to wonderful islands—an Irish version of a widespread legend. His feast is May 16. A perhaps different St. Brendan (d. 573) was a friend of Columba and founder of the monastery at Birr. The name is often written Brandon.

Brennan, William Joseph, Jr., 1906–, Associate Justice of the U.S. Supreme Court (1956–), b. Newark, N.J. After receiving his law degree from Harvard, he was admitted (1931) to the bar and practiced law in Newark. During World War II he did legal work in the U.S. army. In New Jersey after the war he served as a superior court judge (1949–50), appellate division judge (1950–52), and justice of the state supreme court (1952–56). President Eisenhower appointed him to succeed Sherman Minton on the Supreme Court. A liberal on the bench, he supported individual liberties and a greater guarantee of justice to the poor.

Brenner Pass (brē'nər), Ital. *Brennero*, Alpine pass, 4,495 ft (1,370 m) high, connecting Innsbruck, Austria, with Bolzano, Italy. The lowest of the principal Alpine passes, it was an important Roman route through which many invasions of Italy were made. A long carriage road was built c. 1772, and the railroad was completed in 1867. The pass became the border between Italy and Austria after World War I. During World War II, Hitler and Mussolini held meetings there.

Brennus, fl. c. 389 B.C., legendary Gallic leader. He occupied Rome but failed to take the Capitol from MANLIUS (Marcus Manlius Capitolinus). According to legend, when the tribute that the Romans had agreed to pay was being weighed, a Roman complained, whereupon Brennus threw his sword on the scale, crying, "Vae victis!" [woe to the vanquished]. His historical existence is dubious.

Brennus, d. 279 B.C., Gallic leader. He was in command of the band of Gauls (or Galatians) who invaded Greece in 279 B.C. At first halted at Thermopylae, he later turned and took the pass into Doris. He was wounded in an unsuccessful attack on Delphi and is supposed to have committed suicide on the northward retreat after the Gauls were attacked by the Thessalians.

Brent, Margaret, 1600?–1671?, early American feminist, b. Gloucester, England. With her two brothers and a sister, she left England to settle (1638) in St. Marys City, Md., where she acquired an extensive estate, she was the first woman in Maryland to hold land in her own right. Under the will of Gov. Leonard Calvert, Margaret Brent was made executor of his estates. She also acted as attorney (i.e., agent) for Lord Baltimore. As an important woman of affairs in the colony, she demanded (1648) a place in the colonial assembly. Her claim was refused while the heirs contested her handling of the Calvert estates. Shortly thereafter she moved to Virginia but kept her Maryland property. See M. E. W. Ramey, *Chronicles of Mistress Margaret Brent* (1915), E. A. Dexter, *Colonial Women of Affairs* (1924, repr. 1972).

Brent, borough (1971 pop. 278,541) of Greater London, SE England. Brent was created in 1965 by the merger of the municipal boroughs of Wembley and Willesden. The area is a rail and industrial center. Its manufactures include automobile parts, clocks and watches, and electrical equipment. At Wembley is a large sports stadium that was originally built for the British Empire Exposition of 1924–25.

Brentano, Clemens (brēntā'nō), 1778–1842, German poet of the romantic school, brother of Bettina von Arnim. While studying at Halle and Jena he met Wieland, Herder, and Goethe, but his sympathies were with the younger German romantics. With Achim von Arnim he collaborated on *Des Knaben Wunderhorn* [the boy's magic horn] (1806–8), a folk-song collection that influenced Eichendorff, Heine, and the brothers Grimm. Brentano wrote plays, lyric poems, fairy tales, and such *Novellen* as *Geschichte vom braven Kasperl und dem schönen Annerl* (1817, tr. *Honor*, 1847). See study by J. F. Fetzer (1974).

Brentano, Franz (frānts), 1838–1917, German philosopher and psychologist. He was a teacher (1866–73) at Würzburg, and in 1874 he became professor of philosophy at Vienna. In 1880 he retired to write and study. His best-known book, *Psychologie vom empirischen Standpunkte* (1874), attempts to establish psychology as an independent science. Brentano believed that mental processes were the data of psychology and were to be regarded as acts rather than as passive processes. He influenced Edmund HUSSERL and Alexius MEINONG. See studies by Gustav Bergmann (1967) and A. C. Rancurello (1968).

Brentwood, urban district (1971 pop. 57,976), Essex, SE England. It is mainly residential but produces some agricultural equipment, film, and prefabricated concrete. Brentwood was on an important coach road from London to Colchester, the 15th-century White Hart Inn remains standing.

Brentwood. 1 City (1970 pop. 11,248), St. Louis co., E Mo., a residential suburb W of St. Louis, inc. 1919. Its manufactures include pencils, leather goods, women's apparel, hospital and pharmaceutical supplies, and plastic products. 2 Uninc. town (1970 pop. 27,868), Suffolk co., SE N.Y., on central Long Island, in the town of Islip. It is mainly residential, with some light industry. Josiah Warren led (1851) an experiment in communal living in Brentwood. 3 Borough (1970 pop. 13,732), Allegheny co., W Pa., a residential suburb of Pittsburgh, inc. 1915. There is some light industry.

Brescia (brā'shā), city (1971 pop. 210,067), capital of Brescia prov., Lombardy, N. Italy. It is a commercial and industrial center and a railroad junction. Manufactures include machinery, firearms, textiles, and processed food. A Gallic town, it later became a Roman stronghold (1st cent. B.C.) and then the seat of a Lombard duchy. In the 12th cent. it was made an independent commune. It subsequently fell under the domination of a long series of outside powers (including Verona, Milan, Venice, and Austria), until it united with Italy in 1860. In the 18th and 19th cent. Brescia was a revolutionary center, and in 1849 the city heroically resisted the Austrians for 10 days before it capitulated. Of note in Brescia are Roman remains, the Romanesque Old Cathedral (11th cent.), the baroque New Cathedral (17th cent.), the Lombard-Romanesque Church of San Francesco, and a Renaissance-style city hall. In the 16th cent. Brescia was the seat of a flourishing school of painting headed by G. B. Moroni and his pupil Moretto.

Breshkovsky, Catherine (brēshkōf'skē), 1844–1934, Russian revolutionary, called "the little grandmother" (*babushka*) of the Russian Revolution. Of a noble family, she began on her father's estates the education of the peasants and other social reforms. These, carried into a larger field, brought her over 30 years of imprisonment and exile in Siberia. Released from exile by Kerensky after the Revolution of 1917, she returned to Russia, but found herself out of sympathy with the Bolshevik regime and left the country. Her letters and memoirs were edited by Alice Stone Blackwell with the title *Little Grandmother* (1917). See her autobiographical *Hidden Springs of the Russian Revolution* (1931).

Breslau: see WROCLAW, Poland.

Bressanone (brās-sānō'nā), Ger. *Brixen*, town (1971 pop. 16,025), Trentino-Alto Adige, N. Italy, on the Brenner Road, and at the confluence of the Isarco and Rienza rivers. Bressanone and its surrounding territory were ruled by prince-bishops from the 11th cent. In 1803 the bishopric was secularized and passed to Austria as a part of the TYROL. The town passed to Italy with the S. Tyrol in 1919, it retains a mixed German and Italian population. Of note are the cathedral (13th cent., with a baroque interior) and the Palazzo Vescovile (17th cent.).

Bresse (brēs), region, in Burgundy, E. France, between the Ain and Saône rivers. Bourg-en-Bresse is the historic capital. A fertile farm area, it is famous for its chickens and wines. To the south is the Dombes, a region dotted with thousands of ponds, partially drained and reclaimed. Bresse was part of the duchy of SAVOY until 1601, when it was ceded to France along with Bugey (a district between the Ain and the Rhône) and the Territory of Gex. All three were added to Burgundy prov.

Bresson, Robert (rōbēr' brēsōn'), 1907–, French film director and scriptwriter, b. Bromont-Lamotte, France. Bresson's films tend to be austere and unadorned, concerned more with intellectual and spiritual values than plot or character. He prefers to use nonprofessional actors. His works include *Les Dames du Bois de Bologne* (1944), *Le Journal d'un cure de campagne* (1950), *Un condamné à mort s'est échappé* (1956), *Pickpocket* (1959), *Procès de Jeanne d'Arc* (1961), *Au Hazard*, *Balthazar* (1966), *Mouchette* (1966), *Une Femme douce* (1969), and *Lancelot of the Lake* (1974). See *The Films of Robert Bresson* (ed. by Ian Cameron, 1970).

Brest (brēs'), city (1968 pop. 159,857), Finistère dept., NW France, on an inlet of the Atlantic Ocean. It is a commercial port and an important naval station. There is a national engineering school in Brest. Electronics equipment and clothing are the chief manufactures. The city dates from Gallo-Roman times. The spacious, landlocked harbor was created in 1631 by Cardinal Richelieu as a military base and arsenal. In 1683, during the reign of Louis XIV, Marshal Vauban built the ramparts and a castle. The French repulsed the English in 1694 off Brest, in 1794 the English, under Lord Howe, defeated the French fleet. During World War II the Germans had a huge submarine base at Brest. Their heavily fortified subma-

rine pens showed few cracks under Allied air raids, but the city itself was almost completely destroyed. The German garrison capitulated to U.S. troops in 1944.

Brest (brĕst'), formerly **Brest-Litovsk** (-lĭtōfsk'), Pol *Brześć nad Bugiem*, city (1970 pop. 122,000), capital of Brest oblast, W European USSR, in Belorussia, at the confluence of the Western Bug and Mukhavets rivers near the Polish border. It is a major industrial, commercial, and transportation center. Industries include shipbuilding, food processing, and the production of metals, textiles, and electrical machinery. Founded by Slavs in 1017 as Bereste, the city was conquered by the Mongols in 1241 and by Lithuania in 1319. During the 14th cent. it was renamed Brest-Litovsk. In 1569 it became capital of the newly merged Polish and Lithuanian state. Brest passed to Russia in the third partition of Poland (1795). German forces took the city in 1915 and three years later signed the Treaty of Brest-Litovsk with Soviet Russia there. Held by Poland between the world wars, Brest was regained by the USSR in 1939, occupied by Germany from 1941-44, and finally liberated by the Soviet army.

Brest-Litovsk, Treaty of (brĕst-lĭtōfsk'), separate peace treaty in World War I, signed by Soviet Russia and the Central Powers, March 3, 1918, at Brest-Litovsk (now BREST, Belorussia). After the separate armistice of Dec. 5, 1917, long, bitter negotiations were conducted by Leon Trotsky for Russia, Richard von Kuhlmann for Germany, and Count Ottokar Czernin for Austria-Hungary (Turkey and Bulgaria were also represented). Trotsky at one point suspended negotiations, but Germany resumed warfare and the Soviets—on the insistence of Lenin—accepted the German ultimatum, which set conditions even harsher than at first. Russia recognized the independence of Ukraine and Georgia, confirmed the independence of Finland, gave up Poland, the Baltic states, and part of Belorussia to Germany and Austria-Hungary, and ceded Kars, Ardahan, and Batum to Turkey. Later, Germany demanded a large indemnity. The general armistice of Nov. 11, 1918, forced Germany to renounce the treaty, and Russia also declared it null and void. The western frontiers of Russia were later agreed upon by a series of separate treaties. See J. W. Wheeler-Bennett, *The Forgotten Peace* (1938, repr. 1966).

Brethren, German Baptist sect. They are popularly known as Dunkards, Dunkers, or Tunkers, from the German for "to dip," referring to their method of baptizing. The Brethren evolved from the Pietist movement in Germany. The first congregation was organized there in 1708 by Alexander Mack. Persecution drove them to America where, under Peter Becker, they settled (1719) in Germantown, Pa. From that and other settlements in Pennsylvania they spread westward and into Canada. The Brethren oppose war and advocate temperance, the simple life, plain dress, and "obedience to Christ rather than obedience to creeds and cults." The original group, at present the largest in the United States, is the Church of the Brethren (Conservative Dunkers), the local churches are united by an annual conference that elects a general board to supervise the national church program. From the Church of the Brethren there have been separations into the Seventh-Day Baptists, German (1728, see BEISSEL, JOHANN CONRAD), Church of God (New Dunkards, 1848), Old German Baptist Brethren (1881), and the Brethren Church (Progressive Dunkers, 1882). The Brethren baptize by trine immersion, the candidate being immersed once for each member of the Trinity. They practice foot washing and the love feast. See M. G. Brumbaugh, *A History of the German Baptist Brethren in Europe and America* (1899, repr. 1961), V. S. Fisher, *The Story of the Brethren* (1957). See RIVER BRETHREN (for Brethren in Christ, River Brethren, and Yorker Brethren), CHRISTADELPHIANS (for Brethren of Christ), HUTTERIAN BRETHREN, MORAVIAN CHURCH.

Brethren in Christ: see RIVER BRETHREN.

Bretigny, Treaty of (brĕtĭnyĕ'), 1360, concluded by England and France at Bretigny, a village near Chartres, France. It marked a low point in French fortunes in the HUNDRED YEARS WAR. After John II of France, who had been captured (1356), was set free by the English at the price of 3 million gold crowns, he ceded to Edward III (without exacting feudal homage) Poitou, Aunis, Saintonge, Angoumois, Guienne, Gascony, Calais, and other territories. Edward then abandoned his claim to the French throne. The peace did not last, however, and by 1373 all but the Bordeaux district had been reconquered by Bertrand DU GUESCLIN.

Breton, André (aNdṛā' brĕtōN'), 1896-1966, French writer, founder and theorist of the surrealist movement. He studied neuropsychology and was one of the first in France to publicize the work of Freud. At first a Dadaist, he collaborated with Philippe Soupault in automatic writing in *Les Champs magnétiques* (1921). He then turned to SURREALISM, writing three manifestos (1924, 1930, 1934) and opening a studio for "surrealist research." Breton helped to found several reviews: *Littérature* (1919), *Minotaure* (1933), and *VVV* (1944). His other works include *Nadja* (1928, tr. 1960), a semiautobiographical novel, *What is Surrealism?* (1934, tr. 1936), *Ode to Charles Fourier* (1946), and *L'Art Magique* (1957). See study by A. E. Balakian (1971).

Breton, Jules Adolphe Aimé Louis (zhul adōlf' āmā' lwe'), 1827-1906, French painter of rustic scenes and peasant life. Breton's *Peasant Girl Knitting* (Metropolitan Mus.) is well known. His works frequently reflect a social and humanitarian concern. Breton was the author of two autobiographies.

Breton, Nicholas (brĕt'ən), 1551?-c. 1623, English author, a prolific and versatile writer of verse and prose. His best work, written in a lyrical and pastoral vein, appeared in *The Arbor of Amorous Devices* (1597), *England's Helicon* (1600), and *The Passionate Shepherd* (1604). See his poems (ed. with biography by Jane Robertson, 1952), *A Mad World My Masters and Other Prose Works* (ed. by Ursula Kentish-Wright, 1929).

Breton literature (brĕt'ən), in the Celtic language of Brittany. Although there are numerous allusions in other literatures of the 12th to 14th cent. to the "matter of Brittany," which includes the stories of Tristan and King Arthur, no Breton texts remain from this period. The earliest ones date from the 15th cent. Until the 19th cent., texts included songs, stories, and plays, all popular and mostly of unknown authorship. The plays were imitations of late medieval French miracles. As elsewhere in Europe, serious collecting of Breton folk literature began in the 19th cent. Jean François Le Gonidec (1775-1838) pioneered with a dictionary of the language in 1821. Theodore Hersart de La Villemarqué assembled an anthology of folk poems but was attacked for his dubious scholarship. A more sophisticated collector was François Marie Luzel (1821-95). The mid-19th cent. saw the birth of a cultivated literature, mainly in stories and verse. Auguste Brizeux (1803-58) was the best known of the poets who wrote in their native Breton. Others were J. Guillome and Prosper Proux (1811-73). In the late 19th cent. an intensification of the campaign to revive local literary traditions resulted in the establishment of several folk theaters and in the expansion and modification of the vocabulary by writers. Among the leading writers of the late 19th and the 20th cent. are the poets Emil Ernault (b. 1852), Jean Pierre CALLOC'H, and Robert Le Masson, the storytellers Louis and Louise Hermeu, Louis Heno, and Jakez Riou, and the playwright Tanguy Malemanche. During the 19th and 20th cent. a large number of Breton folk tales and songs have been collected. The diversity and richness of this collection make it unique in world literature.

Bretonneau, Pierre (pyĕr brĕtōnō'), 1778-1862, French physician. He performed (1825) the first successful tracheotomy for laryngeal diphtheria, wrote a treatise (1826) distinguishing between scarlet fever and diphtheria (which he named), described typhoid fever, and stated (1855) the germ theory of disease (which later became established largely through Pasteur's work).

Breton Succession, War of the, 1341-65, an important episode of the HUNDRED YEARS WAR. Duke John III of Brittany died in 1341 without heirs. The succession was contested by his half brother, John de Montfort, who was backed by Edward III of England, and by CHARLES OF BLOIS, who had married Jeanne de Penthièvre, a niece of the late duke Charles and Jeanne were supported by Philip VI, John II, and Charles V of France. The resulting war continued through several truces. In the battle of Auray (1364), Charles of Blois was defeated and killed, despite the support of his faithful follower, Bertrand DU GUESCLIN. The issue was settled by the Treaty of Guérande in 1365, when the Montfort heir was recognized by France as ruler of Brittany. An attempt (1378-79) by Charles V to confiscate Brittany for the French crown met the resistance of the Bretons and of Jeanne de Penthièvre. Du Guesclin, who commanded the royal army, made no serious effort to subdue the Bretons, and the attempt failed.

Brett, Reginald Baliol, 2d Viscount Esher: see ESHER, REGINALD BALIOL BRETT, 2d VISCOUNT.

Bretton Woods Conference, name commonly given to the United Nations Monetary and Financial Conference, held (July 1-22, 1944) at Bretton Woods, N.H. The conference resulted in the creation of the International Monetary Fund, to promote international monetary cooperation, and of the International Bank for Reconstruction and Development. By Dec., 1945, the required number of governments had ratified the treaties creating the two organizations, and by the summer of 1946 they had begun operation.

Breuer, Josef (yō'zēf broi'ər), 1842-1925, Austrian physician. He was the first to use (1880-82) the cathartic method to cure hysteria. His therapy and theory, when developed by FREUD, became psychoanalysis. Together they wrote *Studies in Hysteria* (1895).

Breuer, Marcel Lajos (broi'ər), 1902-, American architect and furniture designer, b. Hungary. During the 1920s he was associated, both as student and as teacher, with the BAUHAUS in Germany. In 1925, Breuer won renown with his design of the first tubular steel and laminated plywood chair. He built only one private house (Wiesbaden, 1932) before leaving Germany to work in Switzerland and England. Breuer became associate professor of architecture at Harvard Univ. in 1937 and from 1937 to 1941 was a partner of Walter GROPIUS, with whom he designed several outstanding houses. He developed exterior sun shielding and made bold sculptural use of poured concrete. With Nervi and S. H. Zehruss he planned the Paris headquarters of the UN Educational, Scientific, and Cultural Organization (1958). Among Breuer's major later designs are St. John's Abbey, Collegeville, Minn. (1953-61), the U.S. embassy at The Hague, the Whitney Museum of American Art, New York City (1966), and the New York Univ. Technology I and II buildings (1969), New York City. See his *Sun and Shadow*, ed. by Peter Blake (1955), *Buildings and Projects*, ed. by Cranston Jones (1962), and *New Buildings and Projects*, ed. by Tician Papachristou (1970).

Brueghel, family of painters: see BRUEGEL.

Breuil, Henri (aNdṛē' bro'ya), known as **Abbé Breuil**, 1877-1961, French archaeologist, paleontologist, and cleric. He taught at the Institut de Paléontologie Humaine, Paris, after 1910. He was one of the first to record and interpret Paleolithic art and the rock carvings and paintings in Europe and Africa. His principal work is *Four Hundred Centuries of Cave Art* (tr. 1952). See biography by A. H. Brodrick (1963).

Breviary of Alaric (ā'lārĭk), Visigothic code of Roman law issued (506) by King Alaric II for his Roman subjects in Spain and S. Gaul. It is also known as the *Lex Romana Visigothorum*. Based largely on the THEODOSIAN CODE and accompanied by valuable commentaries, it was a compilation of contemporary Roman law for the Roman element of the population, the Germanic element was under the authority of the earlier code issued by EURIC. Although both codes were later superseded by the *Forum judicum* of King RECCESWINTH, the Breviary remained influential in preserving Roman law in the S and E of France. See GERMANIC LAWS.

brevium: see PROTACTINIUM.

brewer's yeast: see YEAST.

brewing: see BEER.

Brewster, Sir David, 1781-1868, Scottish physicist and natural philosopher. He is noted especially for his research into the polarization of light (the invention of the kaleidoscope was one result of his studies). He improved the spectroscope and persuaded the British government to adopt his dioptric system of lighthouse illumination. For 21 years Brewster was principal of the United College of St. Salvador and St. Leonard, in St. Andrews, Scotland, and in 1859 he became principal of the Univ. of Edinburgh. He was a steady contributor to scientific publications. Included in his numerous writings are *A Treatise on Optics* (1831) and *Memoirs of the Life, Writings, and Discoveries of Sir Isaac Newton* (1855).

Brewster, Kingman, Jr., 1919-, American educator, b. Longmeadow, Mass., grad. Yale (A.B., 1941) and Harvard (LL.B., 1948). He was a professor of law at Harvard from 1950 to 1960. From 1961 to 1963 he was provost of Yale. In 1963 he became president of Yale. Among his writings are *Antitrust and American Business Abroad* (with M. Katz, 1959) and *Law of International Transactions and Relations* (1960).

Brewster, William, 1567-1644, English separatist and Plymouth colonist. After studying briefly at Cambridge he became the chief member of the congregation at Scrooby that broke away, or "sepa-

rated, from the Anglican Church in 1606, the members, after their migration to Holland in 1608, were known as Pilgrims. On his press at Leiden, Brewster printed a number of religious books and tracts that were distributed throughout England. Returning to England in 1617, he helped make arrangements for the Pilgrim migration to America and in 1620 embarked on the *Mayflower* with his wife, two sons, and two indentured boys. Brewster, an elder of the church from the time he lived in Leiden, was the sole religious leader of the Plymouth Colony until 1629, but because he was not ordained, he confined his ministry to services of prayer and praise only. Although he held no lay offices, he was very influential, being one of the eight who undertook (1627) to discharge the debt to the colony's backers. See biographies by Ashbel Steele (1857, repr 1970) and Dorothy Brewster (1970).

Brezhnev, Leonid Ilyich (lāyō'nēd īlyēch' brēzh'-nēf), 1906-, Soviet leader. He joined the Communist party in 1931 and rose steadily in the party hierarchy. In 1952 he became a secretary of the Communist party central committee. After suffering a slight political setback following Joseph Stalin's death in 1953, Brezhnev filled a number of party posts. In 1957, as protégé of Nikita Khrushchev, he became a member of the presidium (later politburo) of the central committee. From 1960 to 1964, he was chairman of the presidium of the Supreme Soviet, or titular head of state. Following Nikita Khrushchev's fall from power in Oct., 1964, which Brezhnev helped to engineer, he was named first secretary (later general secretary) of the Communist party. Although sharing power with Alexei KOSYGIN, Brezhnev emerged as the chief figure in Soviet politics. In 1968, in support of the Soviet invasion of Czechoslovakia, he enunciated the "Brezhnev doctrine," which asserted that the USSR could intervene in the domestic affairs of any Soviet bloc nation if Communist rule were threatened. While maintaining a tight rein in Eastern Europe, he favored closer relations with the Western powers, and he helped (1972-74) bring about a détente with the United States.

Březina, Otakar (ō'tōkar brēzh'-zīnā), 1868-1929, Czech lyric poet, leader of the Czech SYMBOLISTS, whose original name was Václav Jěbavý. The first collection of his poetry, *Tajemné dálky* [mysterious distances], appeared in 1895. It was followed by four more volumes of mystic, highly imaginative verse, and by one of essays, *Hudba pramenů* (the music of the springs) (1903). Březina is considered one of the greatest of Czech poets.

Brian Boru or Brian Boroimhe (both brī'an, brēn, bārōō', bārō'), 940?-1014, king of Ireland. A clan prince, he succeeded his brother Mathghamhain, who had seized the throne of Munster from the Eogharcht rulers (963). Brian subjugated all Munster, then extended his power over all S. Ireland, and in 1002 became high king of Ireland by right of conquest. As his power increased, relations with the Norse rulers on the Irish coast grew steadily worse. Sitric, king of the Dublin Norse, formed against Brian a coalition of Norse of Ireland, the Hebrides, the Orkneys, and Iceland as well as Brian's Irish enemies. On Good Friday (April 23), 1014, Brian's forces met and annihilated the allies at Clontarf, near Dublin. Soon afterward he was murdered in his tent. Brian's victory broke the Norse power in Ireland forever, but Ireland fell into anarchy.

Briand, Aristide (ārēstēd' brēā'n'), 1862-1932, French statesman. A lawyer and a Socialist, he entered (1902) the chamber of deputies and helped to draft and pass the law (1905) for separation of church and state. Made (1906) minister of education and minister of religion to execute the law, he was ejected from the Socialist party for participating in the bourgeois cabinet of premier Jean Sarrien. In 1909 he became premier for the first of 10 times. In World War I, Briand headed (1915-17) two successive coalition cabinets and made the decision to hold VERDUN at any cost. His government fell in March, 1917, attacked by Georges Clemenceau for attempting to negotiate a peace with Germany in 1917. Briand retired. After the war he emerged as a leading advocate of international peace and cooperation, and he is best remembered for his devotion to this cause. The cabinet he headed in 1921 fell because of his unpopular criticism of the Treaty of Versailles and his moderate demands at international conferences, where he worked for a reconciliation with Germany without the sacrifice of French security. As foreign minister from 1925 to 1932 he was the chief architect of the LOCARNO PACT (1925) and the KELLOGG-BRIAND PACT (1928), and he

shared the 1926 Nobel Peace Prize with Gustav Stresemann. An impressive orator, Briand was a prominent figure in the League of Nations. He advocated a plan for a United States of Europe.

briar: see SPIER.

Briard (brēārd'), breed of muscular, wiry WORKING DOG whose origins may be traced back to 12th-century France. It stands from 22 to 27 in (55.9-68.6 cm) high at the shoulder and weighs between 70 and 80 lb (31.8-36.3 kg). Its moderately long, stiff, slightly wavy coat is usually black, tawny, or gray, although any solid color except white is acceptable. Raised for centuries to herd and protect sheep, the Briard has more recently been trained as a police and war dog. It is also kept as a pet. See DOG.

Brice, Fanny, 1891-1951, American comedienne, b. New York City as Fanny Borach. Brice appeared in burlesque and vaudeville from 1906. She starred in the Ziegfeld "Follies" from 1910 onward, and in Broadway shows, emphasizing her plainness by means of a comic awkwardness. In 1937 she created for radio the popular role of Baby Snooks. She appeared in the films *My Man* (1928), *The Great Ziegfeld* (1936), and *Ziegfeld Follies* (1944). Three films have been based on her life, including *Funny Girl* (1968). See biography by Norman Katkov (1953).

Brices Cross Roads National Battlefield Site: see NATIONAL PARKS AND MONUMENTS, table.

brick, ceramic structural material that, in modern times, is made by pressing clay into blocks and firing them to the requisite hardness in a kiln. Bricks in their most primitive form were not fired but were hardened by being dried in the sun. Sun-dried bricks were utilized for many centuries and are used even today in regions with the proper climate. Examples from approximately 5,000 years ago have been discovered in the Tigris-Euphrates basin, and the ancient races occupying this region may have been the first users of brick. In Babylonia there was a lack of both timber and stone, and the thick clay deposited by the overflowing rivers was the only material adaptable to building. The Persians and the Assyrians used sun-dried blocks of clay for walls of great thickness, facing them with a protective coating of fired bricks. The Egyptians and the Greeks used bricks only to a limited extent, as they had access to plentiful supplies of stone and marble. The Romans manufactured fired bricks in enormous quantities and gave them an important role as a basic structural material in buildings throughout the Roman Empire. Bricks played an important part in

early Christian architecture until the decline of the empire. Whereas the Romans had usually concealed their brickwork beneath a decorative facing of stone or marble, the Byzantines devised a technique for exposing the bricks and giving them a full decorative expression. This technique influenced the Romanesque style and brought especially good results in Lombardy and in Germany, where bricks came to be arranged in immensely varied patterns. Since the Middle Ages, brickwork has been in constant use everywhere, adapting itself to every sort of construction and to every change of architectural style. At the beginning of the 19th cent. mechanical brick-making processes began to be patented and by the latter half of the century had almost entirely replaced the ancient hand-fashioning methods. Contemporary American building bricks are rectangular blocks with the standard dimensions of about 2¼ by 3¼ by 8 in (5.7 by 9.5 by 20.3 cm). Good bricks are resistant to atmospheric action and high temperatures and are more durable than stone. Where heat resistance is especially important, fire bricks are used; these are made of special refractory clays called fire clays and are fired at very high temperatures.

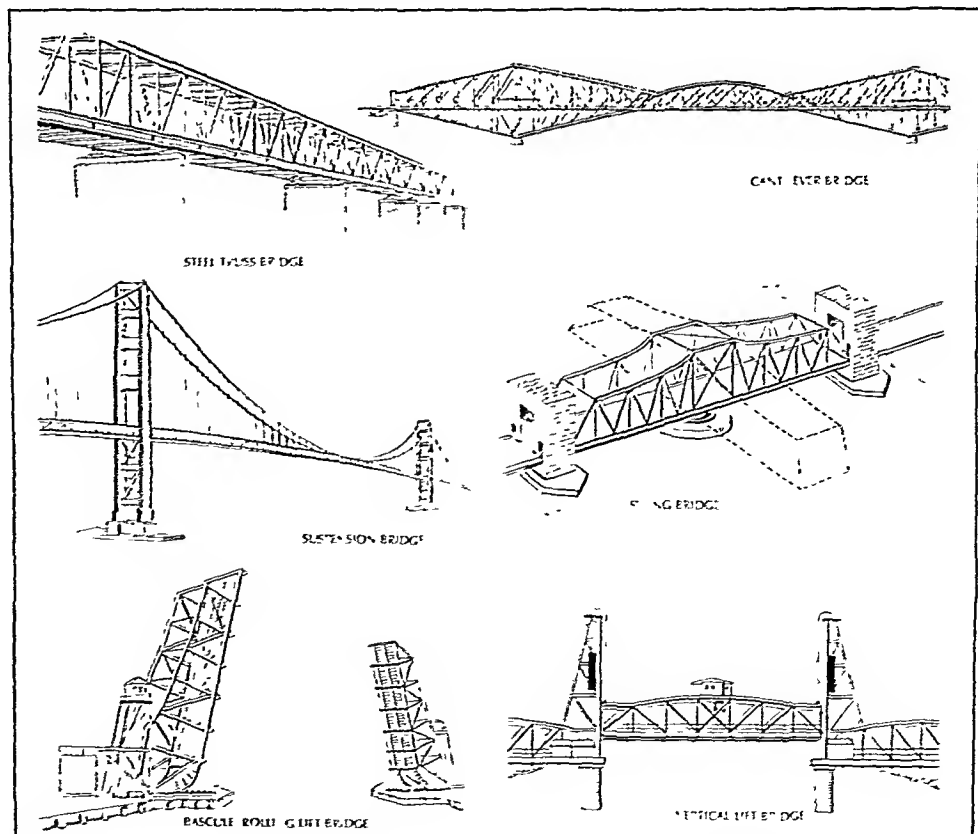
bridal wreath: see SPIRAEA.

Bride, Saint: see BRIDGET, SAINT.

bride price: see MARRIAGE.

Bridewell (brīd wəl), district in London, England, between Fleet St. and the Thames River. The Bridewell house of correction, demolished in 1863, was on the site of a palace built by Henry VIII and given by Edward VI to the City of London in 1553 for use as a training school for homeless apprentices. The building later became a prison as well. *Bridewell* thus came to be used as a general term for a prison or house of correction.

bridge, structure built over water or any obstacle or depression to allow the passage of pedestrians or vehicles. In ancient times and among primitive peoples a log was thrown across a stream, or two vines or woven fibrous ropes (the upper for a handhold and the lower for a footwalk) were thrown across, to serve as a bridge. Later, arched structures of stone or brick were used, traces of these, built from 4000 to 2000 B.C., have been found in Palestine. The Romans built long, arched spans, many of which are still standing. In England the rather crude arched stone bridges had heavy piers (intermediate supports) that were a great obstruction to river traffic, and the roadway was often lined with small shops. In the early days in the United States, since wood



Bridges

was abundant and cheap, the arched type of bridge did not develop. Wood is now seldom used, since a wooden bridge may be destroyed by rot or fire. In the middle part of the 19th cent. many bridges were built of cast and wrought iron. Robert Stephenson, an English engineer, designed and built a bridge of this type across Menai Strait in North Wales (1850). Another is Victoria Bridge across the St. Lawrence at Montreal. The disadvantage of cast iron for bridges is its low tensile strength. The development of the Bessemer process for converting cast iron into steel revolutionized bridgebuilding. It became possible to design framed structures with greater ease and flexibility. Single-piece, rolled steel beams can support spans of 50 to 100 ft (15.2–30.5 m), depending on the load. Larger, built-up beams are made for longer spans. The truss can span even greater distances and carry heavy loads, it is therefore commonly used for railroad bridges. A large truss span may have a length of about 300 ft (90 m). Longer spans are those of arch bridges, the Bayonne Bridge between New York and New Jersey and the Sydney Harbor Bridge in Australia are the longest, at 1,652 ft (504 m) and 1,650 ft (503 m), respectively. The CANTILEVER, however, is more common for spans of such lengths. The cantilevered Forth Bridge (1890) in Scotland was the first major structure built entirely of steel, the material that made possible its two record-setting spans of 1,710 ft (521 m) each. They remained the longest in existence until 1917, when the Quebec Bridge was built, it has an 1,800-ft (549-m) span. Today, however, the suspension bridge is used for the longest spans. It has a roadway suspended by vertical cables that are attached to two or more main cables. The main cables are hung on two towers and have their ends anchored in bedrock or concrete. The earliest suspension bridges built in America were those constructed by the American builder James Finley. The design of suspension bridges advanced when J. A. Roebling, a German-born engineer who emigrated to the United States, developed the use of wire cables and stiffening trusses. He completed a suspension bridge over the Niagara River in 1854. He also designed the Brooklyn Bridge across the East River (completed 1883), which was the world's longest suspension bridge at the time of its construction, having a main span of 1,595.5 ft (487 m). Today the 20 longest spans in the world are suspended. Eleven of them are in the United States. Ten of the 20 have been built since 1960. The eight longest main spans are the VERRAZANO-NARROWS BRIDGE, New York City, 4,260 ft (1,298 m), GOLDEN GATE BRIDGE, San Francisco, 4,200 ft (1,280 m), Mackinac Straits Bridge, Mich., 3,800 ft (1,158 m), Bosphorus Bridge, Istanbul, Turkey, 3,524 ft (1,074 m), GEORGE WASHINGTON BRIDGE, New York City, 3,500 ft (1,067 m), SALAZAR BRIDGE, Lisbon, Portugal, 3,323 ft (1,013 m), the Forth Road Bridge, Queensferry, Scotland, 3,300 ft (1,006 m), and the Severn Bridge, Bristol, England, 3,240 ft (988 m). The SAN FRANCISCO-OAKLAND BAY BRIDGE is noted for its three long spans, of which two are suspension spans and the third a cantilever. The CHESAPEAKE BAY BRIDGE-TUNNEL has two 1-mi (1.6-km) tunnels along its 18-mi (28-km) length. Movable bridges are generally constructed over waterways where it is impossible to build a fixed bridge high enough for water traffic to pass under it. The most common types of movable bridge are the lifting, bascule, and swing bridges. The lifting bridge, or lift bridge, consists of a rigid frame carrying the road and resting abutments, over each of which rises a steel frame tower. There is no center pier. The bridge is hoisted vertically. The bascule bridge follows the principle of the ancient drawbridge. It may be in one span or in two halves meeting at the center. It consists of a rigid structure mounted at the abutment on a horizontal shaft, about which it swings in a vertical arc. The lower center span of the famous Tower Bridge in London is of the double-leaf bascule type. Bascule bridges are sometimes built to swing back on a heavy steel quadrant frame, there being suitable tracks on which it rolls. There are several forms of the swing bridge, generally it is mounted on a pier in mid-stream and is swung into a position parallel to the stream. In the transportation of men and equipment during wartime, where the means of crossing a stream or river is lacking or has been destroyed by the enemy, military bridges play a vital role. Standard types of military bridge include the trestle, built on the spot by the engineering corps from any available material, and the floating bridge made with portable PONTOONS. See VIADUCT, PIER. See D. B. Steinman and S. R. Watson, *Bridges and Their Builders* (rev. ed. 1957), D. B. Steinman, *Famous Bridges*

of the World (rev. ed. 1961), H. Shirley-Smith, *The World's Great Bridges* (rev. ed. 1965), Robert Silverberg, *Bridges* (1966), H. J. Hopkins, *A Span of Bridges: An Illustrated History* (1970).

bridge, card game derived from WHIST, played with 52 cards by four players in two partnerships. The game probably originated in the Middle East in the 19th cent. Auction bridge, one form of the game, was developed by the British in India and later was popular in England and the United States. It is still played but has largely been supplanted by contract bridge, which achieved popularity after important innovations were made in 1925 by Harold S. Vanderbilt. Its phenomenal popularity owed much to the activities of Ely CULBERTSON. The craze subsided but was later revived, books, tournaments, and newspaper columns on bridge abound. The cards in contract bridge rank from ace down to two, in bidding, suits rank spades, hearts, diamonds, and clubs. After all cards are dealt, so that each player holds 13 cards, the dealer begins the auction, which proceeds in rotation to the left. Each player must bid, pass, double (increase the value of the previously stated contract), or redouble (only after a double, further increasing the point value of the contract). A bid is an offer to win a stated number of tricks over six with a named suit as trump or with no-trump. The lowest bid is one, the highest seven. Each bid, i.e., "one diamond," "one no-trump," "four hearts," must be higher than the preceding bid, with no-trump ranking above spades. Artificial bids are those that convey certain information to a partner and are not meant to be taken literally. The highest bid of the auction becomes the contract after three consecutive passes end the bidding. The player who first named the suit (or no-trump) specified in the winning bid becomes the declarer. The player to the left of the declarer leads any card face up, and the next hand, that of the declarer's partner, is placed face up on the table, grouped in suits. This is known as the dummy, and the declarer selects the cards to be played from this hand. The object of the game for both partnerships is to win as many tricks as possible, a trick being the three cards played in rotation after the lead. Suits must be followed, if a player has no cards in the suit led, he may play any card. Highest trump or, if no trump card is played, highest card of the suit led wins. Points are awarded for the number of tricks won. Culbertson devised the honor count system to evaluate a hand for bidding. The point count (or standard American) system introduced by Charles H. Goren in the 1940s has generally replaced honor count. Numerous conventions are used in bridge, but the four standard ones are Blackwood, Gerber, Stayman, and grand-slam force. Duplicate bridge, in which the same prearranged hands are played by individuals, pairs, or teams of four, is the main form of competitive bridge. The laws of contract bridge are promulgated in the Western Hemisphere by the American Contract Bridge League, which holds various bridge tournaments. In international contract bridge matches the Bermuda bowl, the trophy for victory, is the emblem of the world championship. In Olympic years an olympiad championship is held by the World Bridge Federation and replaces the team tournament for the Bermuda bowl. See Charles H. Goren, *Bridge Complete* (rev. ed. 1971), Terence Reese and Albert Dormer, *The Complete Book of Bridge* (1974).

Bridge of Sighs, covered stone bridge in Venice, Italy, built in the 16th cent. to connect the ducal palace with the state prison. The prisoners were led over the bridge directly to prison after trial in the ducal palace.

Bridgeport, city (1970 pop. 156,542), Fairfield co., SW Conn., on Long Island Sound, inc. 1836. It is a port of entry and the chief industrial city in the state. Its manufactures include electrical appliances and equipment, firearms, ammunition, helicopters, gas turbine engines, metal products, trucks, building materials, and aerosol products. Bridgeport was settled in 1639 and grew as a fishing community. The Barnum Institute of Science and History commemorates the showman P. T. Barnum, who lived in Bridgeport and whose circus wintered there. "General Tom Thumb" (Charles S. Stratton) was born in the city. *The Univ. of Bridgeport*, Sacred Heart Univ., and Housatonic Community College are in Bridgeport.

Bridger, James, 1804–81, American fur trader, one of the most celebrated of the MOUNTAIN MEN, b. Virginia. He was working as a blacksmith in St. Louis when he joined the Missouri River expedition of William H. Ashley in 1822. From that time until the fur trade declined in the 1840s he was a trader and

trapper in the mountains, becoming familiar with most of the country N. of Spanish New Mexico and E. of California. He was associated with Thomas Fitzpatrick and Jedediah Smith in many of their journeys, and he is generally credited with being the first white man to see (1825) Great Salt Lake. He was the guide for the party of Marcus Whitman, and in 1843 he and a partner, Louis Vasquez, opened Fort Bridger on the OREGON TRAIL. They later were forced by the Mormons to give up the post. Bridger was a guide, notably to Gen. A. S. Johnston on the Mormon campaign in 1857, to an expedition to the present Yellowstone Park (a region he did much to publicize), and to the surveying party of Gen. G. M. Dodge for the Union Pacific RR. He came to be famous for his talk, was a fine spinner of "tall tales," and was one of the most picturesque figures of the frontier. See biographies by J. C. Alter (1925, rev. ed. 1962, repr. 1967), Stanley Vestal (pseud. of W. S. Campbell, 1946, repr. 1970), and Gene Caesar (1961), Bernard De Voto, *Across the Wide Missouri* (1947).

Bridger, Fort, see FORT BRIDGER STATE PARK.

Bridges, Calvin Blackman, 1889–1938, American geneticist, b. Schuylers Falls, N.Y., grad. Columbia (B.S., 1912, Ph.D., 1916). In his research he collaborated with T. H. Morgan, A. H. Sturtevant, and H. J. Muller, the group that developed many of the concepts of modern genetics through their study of the fruit fly, *Drosophila*. He continued with the Morgan group as a research associate of the Carnegie Institution in Washington from 1919. His contributions to modern genetics include the proof of the chromosome theory of heredity, formulation of the theory of genic balance, and the detailed study of giant salivary chromosomes in relation to the positions of genes. He was co-author of *The Mechanism of Mendelian Heredity* (1915).

Bridges, Charles, fl. 1683–1740, English portrait painter, active (c. 1735–c. 1740) in Virginia. He was the most skillful practitioner of aristocratic portrait painting in the South at that time. Among the works attributed to him are *Mann Page the Second* (Col. lege of William and Mary) and *Maria Taylor Byrd* (Metropolitan Mus.).

Bridges, Harry (Alfred Renton Bridges), 1901–, American labor leader, b. Melbourne, Australia. Arriving (1920) as an immigrant seaman in San Francisco, he became a longshoreman and militant labor organizer. Bridges led (1934) the West Coast maritime workers' strike, which expanded into an abortive general strike, and in 1937 he set up the International Longshoremen's and Warehousemen's Union (ILWU), and became West Coast director of the Congress of Industrial Organizations (CIO). Proceedings in 1939 to deport him as a Communist alien ended when he was officially absolved of Communist affiliation. The U.S. House of Representatives passed (1940) a bill to deport him, but it was ruled (1945) illegal by the Supreme Court. He became a citizen in 1945. His support of Henry A. Wallace for President in 1948 resulted in his ouster as CIO regional head. He was convicted and sentenced (1950) to a five-year prison term for swearing falsely at his 1945 naturalization hearing that he had never been a member of the Communist party. In 1953, the U.S. Supreme Court dismissed the indictment for perjury against Bridges, thus voiding his prison sentence. He was reindicted on similar charges, but in 1955, a Federal district judge ruled that the government had failed to prove that he was a Communist or that he had concealed that fact when he was naturalized. Shortly thereafter the U.S. Justice Dept. announced it had given up its long fight to deport Bridges. In 1958 he was granted a U.S. passport. In 1971 and 1972 Bridges led the ILWU in a strike that tied up the West Coast waterfront for several weeks. See study by C. P. Larrowe (1972).

Bridges, Robert Seymour, 1844–1930, English poet. In 1882 he abandoned medical practice to devote himself to writing. An excellent metrist, he wrote many beautiful lyrics and longer poems, noted for their refined simplicity and perfection of form. Although not a well-known poet, in 1913 he was made poet laureate. In 1929, when Bridges was 85, he published *The Testament of Beauty*, a philosophical poem on the evolution of the human soul. It achieved immediate popularity and is considered his greatest work. Long interested in prosody, Bridges published two important works on the subject, *Milton's Prosody* (1893) and *John Keats* (1895). He also published the poems of his friend Gerard Manley Hopkins. See studies by Albert Guerard, Jr. (1942) and E. C. Wright (1951).

Bridget, Saint, 453?–523?, Irish holy woman. She is often called St. Brigid, St. Bride, or St. Bridget of

Kildare Little is known of her, but she did found a great monastery at Kildare. She is buried at Downpatrick with St. Patrick and St. Columba, and with them she is patron of Ireland, hence her nickname Mary of the Gael. St. Bridget is associated notably with charity and justice. Devotion to her was widespread in Great Britain before the Reformation, as witness many names, e.g., Bridewell, Kilbride, Kirkbride, and McBride. Feast Feb. 1. See study by Alice Curtayne (1954).

Bridget of Sweden, Saint, c. 1300–1373, Swedish nun, one of the great saints of Scandinavia. She was a noblewoman at court and the mother of eight children. After her husband's death she founded the Order of the Most Holy Savior (the Bridgettines). In 1349 she went to Rome and became famous for her holy life. She labored for the reform of religious life in Italy and for the return of the pope from Avignon to Rome. Her account of her numerous visions was widely read during the Middle Ages. St. Bridget is patron of Sweden. She is also called Birgitta. Feast Oct. 8. See biography by Johannes Jorgensen (2 vol., tr. 1954).

Bridgeton, 1. City (1970 pop. 19,992), St. Louis co., E Mo., on the Missouri River, settled c. 1765, inc. 1843. Refrigerators are among its manufactures. 2. City (1970 pop. 20,435), seat of Cumberland co., S N J., on the Cohansey River, settled 1686, inc. 1865. Once a rural farm center, it is now highly industrialized, with glassworks, fertilizer plants, and food-processing, textile, and garment industries. Bridgeton's downtown is highly Victorian in appearance, but the city has several 18th-century buildings, including Potter's Tavern (recently restored), a revolutionary center in colonial days, and a Presbyterian church (1792). The city's liberty bell, now in the county courthouse lobby, rang on July 7, 1776, for the reading of the Declaration of Independence. Bridgeton's zoo, the largest municipal zoo in the state, draws many visitors.

Bridgetown, city (1970 pop. 8,868), capital, commercial center, and chief port of BARBADOS, West Indies. It is, in addition, a tourist and health resort. Sugar, rum, and molasses are the leading exports, and Bridgetown also serves as an important transshipment point. The city, which was founded by the British in 1628, is the site of a college of the Univ. of the West Indies.

Bridge View, village (1970 pop. 12,522), Cook co., NE Ill., a residential suburb of Chicago, inc. 1947.

Bridgewater, town (1970 pop. 11,829), Plymouth co., E Mass., inc. 1656. Its iron foundry industry dates from colonial times. Bridgewater State College and a state prison are there.

Bridgman, Elijah Coleman, 1801–61, first American Protestant missionary to China, b. Belchertown, Mass. He served as a missionary in China from 1830 until his death. His *Chinese Chrestomathy* appeared in 1841, his Chinese translation of the Bible (in collaboration with M. S. Culbertson) was published posthumously in 1862.

Bridgman, Frederic Arthur, 1847–1927, American painter of genre and of scenes of Near Eastern antiquity, b. Tuskegee, Ala. He studied under Gérôme in Paris, where he remained as an important figure in the large American colony. Among his romantic, academic paintings are *The Procession of the Bull Apis* (Corcoran Gall.) and *Awaiting his Master* (Art Inst., Chicago). He also wrote several books, including *Winters in Algeria* (1890).

Bridgman, Laura, 1829–89, first blind deaf-mute to be successfully educated, b. Hanover, N.H. Under the guidance of Dr. S. G. Howe, of the Perkins Institution (now in Watertown, Mass.), she learned to read and write and to sew so well that she eventually became a sewing teacher at the school, where she remained until her death. See biography by L. E. Richards (1928).

Bridgman, Percy Williams, 1882–1961, American physicist, b. Cambridge, Mass., grad. Harvard (B.A., 1904, Ph.D., 1908). From 1910 he taught at Harvard, as professor from 1919. He won the 1946 Nobel Prize in Physics for his work in high pressures. He is known also for his studies of electrical conduction in metals and properties of crystals and for his writings on the philosophy of modern science. His works include *The Logic of Modern Physics* (1927), *The Nature of Physical Theory* (1936), and *Nature of Thermodynamics* (1941).

Bridgwater, municipal borough (1971 pop. 26,598), Somerset, SW England, on the Parrett River estuary. It is a port for seaborne traffic and a market town. Bridgwater is the only place in England that produces bathbricks, which are made from clay and

sand deposited by the river and are used for scouring metals. Other manufactures are bricks, tiles, furniture, and preserves. Admiral Robert Blake was born in Bridgwater.

Bridlington (brīd'lingtən, būr'-), municipal borough (1971 pop. 26,729), East Riding of Yorkshire, NE England. It has a well-protected harbor on Bridlington Bay, and its beaches and pavilions make it a popular holiday resort. The Royal Yorkshire Yacht Club has its headquarters there. The borough administers Flamborough Head and most of the intervening coast line. Bridlington is an ancient market town and port. An Augustinian priory founded during the reign of Henry I has been restored. Of interest are Roman and early British remains and Bayle Gate (14th cent.). In 1974, Bridlington became part of the new nonmetropolitan county of Humberside.

Brie (brē), region, Marne and Seine-et-Marne depts., N France, E of Paris. Rich in wheat and cattle, it is famous for Brie cheese. The smaller section of the region (*Brie française*) forms part of the Île-de-France and is very fertile. There, many of the huge farms are fortresslike in their imposing architecture. Meaux, the former capital and major commercial center, Melun, and Château-Thierry are the chief towns. The former county of Meaux (E Brie) was combined (11th cent.) with that of the Troyes to form the county (later province) of Champagne and Brie.

Brienne, Étienne Charles Loménie de: see LOMÉNIE DE BRIENNE, ÉTIENNE CHARLES

Brienze (brēnts'), town (1970 pop. 2,796), Bern canton, central Switzerland, on the northeast shore of the Lake of Brienz. A center of the Swiss woodcarving industry, it is also a resort. The Lake of Brienz (11 sq mi/28 sq km), traversed by the Aare River, is highly scenic.

brier or **brirar**, name sometimes given any thorny plant, more specifically the SWEETBRIER, and the greenbrier. French brier, or brierroot, is a name for the root of the European white HEATH so widely used in the manufacture of smoking pipes.

Briey (brēā'), town (1968 pop. 5,012), Meurthe-et-Moselle dept., in Lorraine, NE France. It is at the center of the huge Brie iron-ore basin (see LORRAINE) and has a chemical industry.

Brig (brēk), Fr. *Brigue*, town (1970 pop. 5,191), Valais canton, S Switzerland, on the Rhône River, at the north entrance of the Simplon Tunnel. Although it has a noted 17th-century palace, Brig is primarily known as the junction of the Simplon, Lötschberg, and Furka rail lines.

brig, two-masted sailing vessel, square-rigged on both masts. Brigs have been used as cargo ships and also, in the past, as small warships carrying about 10 guns. They vary in length between 75 and 130 ft (23–40 m), with tonnages up to 350. A brigantine is a somewhat smaller two-masted vessel, square-rigged on the foremast but with a fore-and-aft mainsail. In earlier times it carried a square topsail on the mainmast. A hermaphrodite brig is identical with the brigantine except that it carries no topsail on its mainmast, most U.S. brigs since 1860 have actually been of this type.

Briga: see BRIGUE AND TENDE

brigandage (brīg'əndij), robbery, blackmail, kidnapping, and plundering committed by armed bands. Laxity in administration, social and political demoralization, economic or political oppression, and racial or religious antagonisms may give rise to brigandage, especially if the terrain of the area provides suitable hiding places for the brigands. Inhabitants of an invaded state sometimes resort to brigandage, and those held under intolerable economic subjection adopt it as a means of retaliation. In such conditions, the bandit is often protected by a sympathetic public opinion, and, like the legendary Robin Hood, may become a popular hero, the symbol of resistance to tyranny. Brigandage then becomes a mixture of violent spoliation and patriotism or altruism. Brigandage more frequently flourishes during the disintegration of a state (as the decline of the Roman Empire), at a time of major economic and social change (as among the robber barons at the end of the feudal ages), after a great war, in the early stages of frontier settlement (as in early California and in the Australian bush), or in national borderlands (as on the Scottish border). When a strong centralized authority develops, when a disciplined constabulary is organized, or when public disapproval of brigandage becomes manifest, it disappears. The brigand leader, in a chaotic society, may extend his jurisdiction over a wide area, and although his ends may be selfish, he can contribute to

the social order by establishing a recognized authority. The lawless lives of brigands and highwaymen have often become legends. Stories of gallantry and heroism have gathered about many brigands, especially those who were the victims of social or political oppression, who were rebels rather than bandits. Ballads and folk tales have grown about many leaders, and the names of brigands are known to all. Dick Turpin, the highwayman, Hereward the Wake, Robin Hood, Stenka Razin, the Cossack, Fra Diavolo of Italy, and Jesse James of the United States. See C. J. Finger, *Highwaymen* (1925, rep. 1970), Danilo Dolci, *Outlaws* (1961), Christopher Hibbert, *Highwaymen* (1968), Eric Hobsbawm, *Bandits* (1969).

Briggs, Charles Augustus, 1841–1913, American clergyman, theologian, and educator, b. New York City, studied at the Univ. of Virginia, Union Theological Seminary, and the Univ. of Berlin. From 1875 until his death he was a member of the faculty of Union Theological Seminary, serving as professor of Hebrew and the cognate languages. In 1890 he was appointed to the chair of biblical theology. The address on the authority of Holy Scripture that he gave at that time caused his trial for heresy (1892) before the New York presbytery. Although acquitted, Dr. Briggs was suspended (1893) from the Presbyterian ministry by the General Assembly, thereupon Union Theological Seminary severed its relations with the Assembly. He later (1900) entered the Episcopal ministry. Among his many books are *A Critical and Exegetical Commentary on the Book of Psalms* (2 vol., 1906) and *Hebrew and English Lexicon of the Old Testament* (with Francis Brown and S. R. Driver, completed 1906). See his *Inaugural Address and Defense* (first printed in 1891 and 1893, repr. 1972), C. E. Hatch, *The Charles A. Briggs Heresy Trial* (1969).

Briggs, Clare A., 1875–1930, American cartoonist, b. Reedsburg, Wis. He won a national reputation with the contributions he made to the *Chicago Tribune* from 1907 to 1914. From 1914 until his death his cartoons appeared in the New York *Tribune* syndicate. Among his best-known creations are "Mr. and Mrs." and "In the Days of Real Sport." The droll simplicity of his drawings was characteristic of American graphic humor of the 1920s.

Briggs, Henry, 1561–1630, English mathematician. He was the first professor of geometry at Gresham College, London (1596–1619), and Savilian professor of astronomy at Oxford (from 1619). After publication of Napier's work on logarithms in 1614, Briggs suggested that the logarithms be tabulated to the base 10, and Napier agreed to the alteration. Briggs wrote *Arithmetica logarithmica* (1624), a work containing logarithmic tables for 30,000 natural numbers to 14 places. His logarithms are known today as common logarithms.

Briggs, Le Baron Russell, 1855–1934, American educator, b. Salem, Mass., grad. Harvard (B.A., 1875, M.A., 1882). As a teacher at Harvard he developed, with Barrett Wendell, a prescribed and widely imitated freshman English course. A number of able contemporary writers were influenced by his graduate course in creative writing. He became professor of English in 1890 and of rhetoric and oratory in 1904. In 1891 he was appointed dean of the college and from 1903 to 1923 served as president of Radcliffe. His works include *School, College, and Character* (1901), *Routine and Ideals* (1904), *Girls and Education* (1911), and *Men, Women, and Colleges* (1925). See R. W. Brown, *Dean Briggs* (1926).

Brigham, Albert Perry, 1855–1932, American geographer, b. Perry, N.Y., grad. Colgate Univ., 1879, M.A. Harvard, 1892. After nine years in the Baptist ministry (1882–91) he became professor of geology at Colgate, where he taught for 30 years. A founder of human geography, Brigham helped to shape the development of geographic thought in the United States by recognizing and expounding upon the influence of the earth on man. He published many articles and textbooks including *Geographic Influences in American History* (1903), a book that widely influenced history students and scholars.

Brigham City, city (1970 pop. 14,007), seat of Box Elder co., N Utah, inc. 1869. It is the center of a large farm area served by the Ogden River project. Sheep, cattle, wheat, sugar beets, garden crops, and orchard fruit are raised. The city has woolen mills, granaries, and food-processing plants, and a sugar refinery is nearby. It was founded as Box Elder in 1851, and its name was changed to honor Brigham Young in 1856. A U.S. Indian school is in the city, and just west is the Golden Spike National Historic Site, which marks the spot in which the last railroad spike was driven in 1869. A bird refuge is nearby.

Brigham Young University, at Provo, Utah, Latter-Day Saints, coeducational, opened as an academy in 1875 and became a university in 1903

Brighouse, municipal borough (1971 pop 34,111), West Riding of Yorkshire, N central England, on the Calder River. It is a center of woolen, cotton, and silk milling and produces carpets, leather goods, machinery, radio and television equipment, dyes, and soap. Stone quarries are nearby. Also in the vicinity is the traditional grave of Robin Hood. In 1974, Brighouse became part of the new metropolitan county of West Yorkshire.

Bright, John, 1811–89, British statesman and orator. He was the son of a Quaker cotton manufacturer in Lancashire. A founder (1839) of the Anti-Corn Law League, he rose to prominence on the strength of his formidable oratory against the CORN LAWS. A staunch laissez-faire capitalist, and, with RICHARD COBDEN, a bastion of the MANCHESTER SCHOOL of economics, he resented the protection given to landholders by these laws at the expense of manufacturing interests. After the repeal (1846) of the corn laws, Bright's principal concern was parliamentary reform, which he pursued relentlessly until passage of the third Reform Bill in 1884. A member of Parliament for Manchester (1847–57), he lost his seat because of his opposition to British involvement in the Crimean War, which he considered un-Christian and against Britain's economic interests. He represented Birmingham (1858–89) and served in William Gladstone's cabinets as president of the Board of Trade (1868–70) and chancellor of the duchy of Lancaster (1873–74, 1880–82). He supported Gladstone on the issues of disestablishment of the Church of Ireland (1869) and Irish land reforms, but he opposed Home Rule for Ireland. His laissez-faire views also made him oppose direct government intervention to improve the conditions of the poor. He resigned (1882) in protest against intervention in Egypt for the same reasons that had led him to oppose the Crimean War. See his speeches (ed by J. E. T. Rogers, 1868) and public addresses (also ed by J. E. T. Rogers, 1879), biographies by G. M. Trevelyan (2d ed 1925) and A. S. Turberville (1945).

Bright, Richard, 1789–1858, English physician. In London he was the leading consultant of his time, and he contributed many important clinical observations. He was the author of the significant *Reports of Medical Cases* (Vol. I, 1827). This contained his description of certain forms of NEPHRITIS, or kidney disease, known generally as Bright's disease and of dropsy resulting from kidney disease, as distinct from cardiac dropsy. Bright was a physician at Guy's Hospital.

bright-line spectrum: see SPECTRUM

Brighton, county borough (1971 pop 166,081), East Sussex, SE England. The largest and most popular resort in S England, Brighton also has engineering works and factories that manufacture office machinery, machine tools, electrical apparatus, vacuum cleaners, shoes, and paint. Formerly a small fishing village, it became a fashionable resort and was patronized, starting in 1783, by the Prince of Wales (later George IV), who built the Royal Pavilion. Entertainment is provided on the West Pier and the Palace Pier and in the Dome, formerly the royal stables and now a hall, these, together with the seaside promenade and the aquarium, are notable features. The Univ. of Sussex is in Brighton. In 1974 the borough became part of the new nonmetropolitan county of East Sussex.

Brighton, city (1971 pop 39,103), Victoria, SE Australia, part of the Melbourne urban agglomeration, on Port Phillip Bay. It is a residential area and resort.

Bright's disease: see NEPHRITIS

Brigid, Saint: see BRIDGET, SAINT

Brigue and Tende (brēg, tānd), Ital. *Briga e Tenda*, two small districts (1968 pop 2,726), Alpes-Maritimes dept., SE France, on the French-Italian border. With several smaller frontier areas in the Mont Cenis and Mont Blanc regions, they were ceded to France by Italy in 1947 after a referendum. Brigue and Tende are largely French-speaking. Before 1947 the strategic Col de Tende, a pass now situated on the border, was entirely within Italy.

Brill or Bril, Flemish painters, brothers. **Mattsy Brill** (ma'tis), 1550–83, went to Rome early in his career and executed frescoes for Gregory XIII in the Vatican. **Paul Brill**, 1554–1626, probably studied in Rome with his brother and succeeded him at the Vatican. His calm, well-observed landscapes exercised a great influence on Italian art. His works after 1600 show his mature style, the landscape elements are arranged like stage-set wings receding diagonally

into depth, his brushwork is broader, and his atmospheric effects refined. His frescoes and oils are found in many Roman churches. *Martyrdom of St. Clement* (Vatican), against a seascape, is perhaps his best-known work. He often painted small landscapes on copper.

Brill, Abraham Arden, 1874–1948, American psychiatrist, b. Austria, grad. New York Univ., 1901, M.D. Columbia, 1903. He came to the United States alone at the age of 13. After studies with C. G. Jung in Switzerland, he returned to the United States in 1908 to become one of the earliest and most active exponents of psychoanalysis, being the first to translate into English most of the major works of Freud as well as books by Jung. He taught at New York Univ. and Columbia, was a practicing psychoanalyst, and wrote *Psychoanalysis: Its Theories and Practical Application* (1912) and *Fundamental Conceptions of Psychoanalysis* (1921).

Brillat-Savarin, Anthelme (aŋtēlm' brēya'-sava-rān'), 1755–1826, French lawyer, economist, and gastronome, famous for his witty treatise on the art of dining, *La Physiologie du goût* (1825). It has been frequently republished and was translated into English as *The Physiology of Taste* (1925, rev. ed. 1971). An emigre during the Reign of Terror, Brillat-Savarin spent some time in the United States.

Brill's disease: see TYPHUS

brimstone: see SULFUR

Brindaban, India: see VRINDABAN

Brindisi (brēn'dēzē), Latin *Brundisium*, city (1971 pop 79,784), capital of Brindisi prov., in Apulia, S Italy. A modern port on the Adriatic Sea, it has been noted since ancient times for its traffic with the E Mediterranean. Manufactures include petrochemicals, plastics, and food products. Its excellent harbor was a Roman naval station, a chief embarkation point for the Crusaders (12th–13th cent.), and an important Italian naval base in World War I. One of the two columns marking the terminus of the Appian Way still stands. Brindisi also has Romanesque churches, a fine cloister, and a castle built (13th cent.) by Emperor Frederick II.

brine shrimp, common name for a primitive CRUSTACEAN that seldom reaches more than 1/2 in. (1.3 cm) in length and is commonly used for fish food in aquariums. Brine shrimp, which are not closely related to true shrimp, can be found almost everywhere in the world in inland salt waters, although they are completely absent from oceans. They can live in water having several times the salinity of sea water, but they can also tolerate water having only one tenth the marine salt concentration. Brine shrimp usually occur in huge numbers and can be seen in vast windblown lines in the Great Salt Lake. Their absence from the sea has been explained by their vulnerability to attack by predators and the absence of the latter in their inland saline habitat. Although brine shrimp are considered to be members of a single genus, *Artemis*, and possibly a single species, there are several varieties. Generally, they have stalked, compound eyes and tapered bodies with a trunk that bears 11 pairs of leaflike legs. Females have a brood pouch from which active young are liberated under favorable conditions. Otherwise eggs are laid parthenogenetically (unfertilized by sperm) or fertilized and can either hatch immediately or be dried and remain viable for many years. These eggs are remarkably resistant to adverse environmental conditions, which is why they can be hatched so easily in salt water and used for fish food, adult brine shrimp are also used as food in aquariums and are generally sold frozen. Brine shrimp are classified in the phylum ARTHROPODA, class Crustacea, subclass Branchiopoda, order Anostraca.

Brinker, Maureen Connolly: see CONNOLLY, MAUREEN

Brinkley, David, 1920–, American news broadcaster, b. Wilmington, N.C. He joined the National Broadcasting Company in 1943. Brinkley and Chef HUNTLEY developed documentary techniques for televised analyses of public affairs. Their *Huntley-Brinkley Report* series (1956–71) won several awards, including the Peabody, Sylvania, and "Emmy" awards. As a news analyst Brinkley is noted for his terse, biting comments and his dry wit.

Brinton, Crane (Clarence Crane Brinton), 1898–1968, American historian, b. Winsted, Conn. He received his Ph.D. from Oxford in 1923 and began teaching at Harvard the same year, becoming full professor in 1942. He wrote extensively on the history of Western political and moral philosophy and is considered an expert on the dynamics of revolutionary movements. His many books include *A Dec-*

ade of Revolution (1934), *The Anatomy of Revolution* (1938, rev. ed. 1965), *Ideas and Men* (1950, 2d ed. 1963), *A History of Western Morals* (1959), *The Shaping of Modern Thought* (1963), and *The Americans and the French* (1968).

Brinvilliers, Marie Madeleine d'Aubray, marquise de: see POISON AFFAIR

Brion, Amiral de: see CHABOT, PHILIPPE DE

Briosco, Andrea (andrē'a brēōs'kō), 1470?–1532, Italian architect and sculptor, known also as Andrea Riccio [curly-headed], b. Padua. As an architect, he created models for the church of Santa Giustina and for a chapel in Sant' Antonio in Padua. His fame rests chiefly on his bronze sculpture. In close contact with Paduan humanists, he carried out involved allegorical programs in his Paschal candlestick (Sant' Antonio) and the Della Torre monument (Verona). Drawing upon mythological themes, he combined delightful fantasy with a first-rate knowledge of antiquity.

briquette (brīkēt'), a block of compressed coal dust, peat, or charcoal used for FUEL.

Brisbane, Albert (brīz'bān), 1809–90, American social theorist, b. Batavia, N.Y. After studying with Charles FOURIER in Paris, he returned to the United States as an enthusiastic advocate of Fourierism. His *Social Destiny of Man* (1840) aroused widespread interest, especially that of Horace Greeley, who gave him a column in the *Tribune*. Brisbane was instrumental in the founding of the phalanxes at BROOK FARM and Red Bank, N.J. The failure of most of the other communal experiments was disastrous for the Fourierist cause, but Brisbane reaffirmed his convictions in his *General Introduction to Social Science* (1876). His wife, Redelia Brisbane, edited and wrote an introduction to his autobiography, published posthumously as *Albert Brisbane: A Mental Biography* (1893, repr. 1969). His son, Arthur Brisbane (1864–1936), was editor of the *New York Evening Journal* and other Hearst papers. See biography by O. Carlson (1937).

Brisbane, Sir Thomas Makdougall (brīz'bān, -bān), 1773–1860, British soldier, astronomer, and colonial administrator in Australia, b. Scotland. From 1793 to 1814 he served in the army in Flanders, in the West Indies, in Spain, and in Canada, rising to the rank of brigadier general. In 1821 he was appointed governor of New South Wales, where he encouraged agriculture, land reclamation, exploration, and, most important, immigration, thus stimulating the transformation of New South Wales from a dependent convict outpost into a free, self-supporting colony. He had poor financial sense, however, and was recalled in 1825. Brisbane had an observatory built (1822) at Paramatta, near Sydney, where work was done (1822–26) resulting in the "Brisbane Catalogue" of 7,385 stars. After his return to Scotland, he founded an observatory at Makers-toun, where valuable observations on magnetism were started (1841); these were incorporated into three volumes in the transactions of the Royal Society of Edinburgh. He was made president of the society in 1833. The city of Brisbane and the Brisbane River in Australia were named for him.

Brisbane (brīz'bān), city (1971 pop 699,371, urban agglomeration pop 816,987), capital of Queensland, E Australia, on the Brisbane River above its mouth on Moreton Bay. It has shipyards, oil refineries, food-processing plants, textile mills, automobile plants, and railroad workshops. Principal exports are wool, meat, fruit, sugar, and coal and other minerals. The area was settled in 1824 as a penal colony, and the city was named in 1834 for Sir Thomas Brisbane, governor of New South Wales. In 1925 the Greater Brisbane Act unified the administration of 19 formerly separate localities. Brisbane is the seat of the Univ. of Queensland (1909), a national art gallery (1895), and a museum (1871). There are Anglican and Roman Catholic cathedrals.

Briseis: see ACHILLES, AGAMEMNON

Brissot de Warville, Jacques Pierre (zhāk pē'r brēsō' də varvē'l'), 1754–93, French revolutionary and journalist. A lawyer of humble origin, he began his career by writing numerous pamphlets and books. His *Théorie des lois criminelles* (1781) was a plea for penal reform. He was imprisoned briefly in the Bastille for writing a seditious pamphlet. Brissot visited the Netherlands, Switzerland, England, and the United States. He was interested in humanitarian schemes and founded the abolitionist Société des Amis des Noirs. After his return to France in 1789 he began to edit the *Patriote français*, which later became the organ of the GIRONDIS (at first called Brissotins). Brissot, feeling that war would

silver mine at Kimberley is the largest in the world, copper is mined principally at Princeton and Britannia, gold chiefly along the Bridge River and in Cariboo and Osoyoos dists., iron ore primarily on Vancouver and Texada islands. Lead and zinc are mined in many places, the world's largest deposits being at Kimberley. Other minerals found in the province include coal, crude petroleum, asbestos, natural gas, and sand and gravel. British Columbia ranks first among the provinces in fishing, the most important catches are salmon, halibut, and herring. Beef is also an important product. Cattle are raised along the Fraser River, the Texas longhorn, introduced there c 1870, is still thriving, and the area is known for its sprawling ranches. Other industries include food processing and the manufacture of chemicals, furniture, transportation equipment, and electrical items. British Columbia attracts millions of visitors annually, and the land is a hunting and fishing paradise. There are four national parks—Glacier, Mt. Revelstoke, Yoho, and Kootenay—and hundreds of provincial parks and camping grounds. The climate along the west coast, tempered by the warm Japan Current, has made that area, especially Vancouver and Victoria, very attractive to tourists. The area was originally inhabited by Indians of the Pacific Northwest (known especially for their totem poles and POTLACHES). Juan Perez was probably the first white man to sail (1774) along the coast, but he did not make a landing. In 1778, Capt. James Cook, on his last voyage, explored the coast in his search for the Pacific entrance to the elusive Northwest Passage and claimed the area for Great Britain. John Meeres established (1788) a fur-trading post on Nootka Sound and built a schooner, but he was driven out (1789) by a Spaniard, Estevan Jose Martinez. Rival British and Spanish claims for the area were resolved by the Nootka Convention in 1790 (see NOOTKA SOUND). The British sent George Vancouver to take possession of the land, and from 1792 to 1794 he explored and mapped the coast. In 1793, Sir Alexander Mackenzie reached the Pacific overland, he was followed early in the 19th cent. by fur traders and explorers of the NORTH WEST COMPANY who crossed the mountains to establish posts in New Caledonia, as the region was then called. After the HUDSON'S BAY COMPANY absorbed the North West Company in 1821, the region became a preserve of the new company. In 1843, Fort Victoria was established by James Douglas as a trading post for the company. Three years later rival British and American claims to the area were settled when the boundary was set at the 49th parallel (see OREGON, state). Further controversy resulted in the SAN JUAN BOUNDARY DISPUTE. Partly as protection against further American expansion, Vancouver Island was ceded (1849) by the Hudson's Bay Company and became a crown colony, of which Sir James Douglas was made governor in 1851. In 1858 gold was discovered in the sand bars of the Fraser River and additional deposits were found on many of its tributaries. The great gold rushes that resulted brought profound changes. Fort Victoria boomed as a supply base for the miners, and a town quickly sprang up around it. Officials of the crown came to keep order, and to supervise government projects and the building of roads. Some 30,000 miners moved into what was then unorganized territory, this led to the creation (1858) of a new colony on the mainland, called British Columbia, and the end of the Hudson's Bay Company's supremacy. In 1863 the newly settled territory about the Stikine River was added to British Columbia. In 1866, Vancouver Island and British Columbia were combined, and in 1871 this united British Columbia, lured by the promise of financial aid and a transcontinental railroad that would link it to the rest of Canada, voted to join the new Canadian confederation. The Canadian Pacific Railway finally reached Vancouver in 1885, and a new era began. By providing access to new markets, the railroads furthered agriculture, mining, and lumbering, steamship service with the Orient was inaugurated, and Vancouver grew as a busy port, serving many provinces. The opening (1914) of the Panama Canal was a further boost to trade and commerce. A long dispute with the United States over the Alaska boundary was finally settled by the Alaska Boundary Commission in 1903. Politically, the Conservatives and Liberals alternated in power from 1903 (when the national parties were first introduced into British Columbian politics) until 1941, when a wartime coalition was formed. The SOCIAL CREDIT party came into power in 1952, under the leadership of W. A. C. Bennett, and retained control until 1972, when the New Democratic party, led by David Barrett, won a

majority. British Columbia sends 6 senators (appointed) and 23 representatives (elected) to the national Parliament. The Univ. of British Columbia is at Vancouver. See F. H. Goodchild, *British Columbia* (1951); J. H. S. Reid, *Mountains, Men, and Rivers* (1954); R. E. Watters, ed., *British Columbia* (1958); M. A. Ormsby, *British Columbia* (1958, repr. 1971); J. L. Robinson, ed., *British Columbia* (1972).

British Columbia, University of, at Vancouver, British Columbia, Canada, provincially supported, coeducational, chartered 1908, opened 1915. It has faculties of arts, science, graduate studies, applied science, agricultural sciences, dentistry, commerce and business administration, education, law, forestry, medicine, and pharmaceutical sciences, as well as schools of architecture, home economics, librarianship, nursing, physical education and recreation, rehabilitation medicine, social work, and community and regional planning.

British Commonwealth of Nations: see COMMONWEALTH OF NATIONS.

British East Africa, inclusive term for several former British dependencies, especially Kenya, Uganda, Tanganyika, and Zanzibar.

British East India Company: see EAST INDIA COMPANY, BRITISH.

British Empire, overseas territories linked to Great Britain in a variety of constitutional relationships, established over a period of three centuries. The establishment of the empire resulted primarily from commercial and political motives and emigration movements, its long endurance resulted from British command of the seas and preeminence in international commerce, and from the flexibility of British rule. At its height in the late 19th and early 20th cent., the empire included territories on all continents, comprising about one quarter of the world's population and area. The origins of the empire date from the late 16th cent. with the private commercial ventures, chartered and encouraged by the crown, of CHARTERED COMPANIES. These companies sometimes had certain powers of political control as well as commercial monopolies over designated geographical areas. Usually they began by setting up fortified trading posts, but where no strong indigenous government existed the English gradually extended their powers over the surrounding area. In this way scattered posts were established in India and the East Indies (for spices, coffee, and tea), defying Portuguese and later Dutch hegemony, and in Newfoundland (for fish) and Hudson Bay (for furs), where the main adversaries were the French.

The First Empire. In the 17th cent. European demand for sugar and tobacco led to the growth of plantations on the islands of the Caribbean and in SE North America. These colonies, together with those established by Roman Catholics and Protestant dissenters in NE North America, attracted a considerable and diversified influx of European settlers. Organized by chartered companies, the colonies soon developed representative institutions, evolving from the company governing body and modeled on English lines. The need for cheap labor to work the plantations fostered the growth of the African slave trade. New chartered companies secured posts on the African coasts as markets for captured slaves from the interior. An integrated imperial trade arose, involving the exchange of African slaves for West Indian molasses and sugar, English cloth and manufactured goods, and American fish and timber. To achieve the imperial self-sufficiency required by prevailing theories of MERCANTILISM, and, more immediately, to increase British wealth and naval strength, the NAVIGATION ACTS were passed, restricting colonial trade exclusively to British ships and making England the sole market for important colonial products. Developments in the late 17th and early 18th cent. were characterized by a weakening of the Spanish and Dutch empires, exposing their territories to British encroachment, and by growing Anglo-French rivalry in India, Canada, and Africa. At this time the British government attempted to assert greater direct control over the expanding empire. In the 1680s the revision of certain colonial charters to bring the North American and West Indian colonies under the supervision of royal governors resulted in chronic friction between the governors and elected colonial assemblies. The early 18th cent. saw a reorganization and revitalization of many of the old chartered companies. In India, from the 1740s to 1763, the British EAST INDIA COMPANY and its French counterpart were engaged in a military and commercial rivalry in which the British were ultimately victorious. The political fragmentation of the Mogul empire permitted the absorption of one area after

another by the British. The Treaty of Paris (1763, see under PARIS, TREATY OF) firmly established the British in India and Canada, but the financial burdens of war involved the government in difficulties with the American colonies. The success of the AMERICAN REVOLUTION marked the end of the first British Empire.

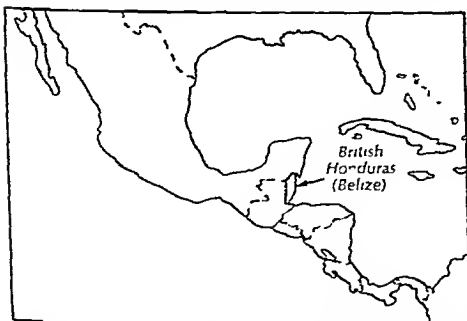
The Second Empire. The voyages of Capt. James Cook to Australia and New Zealand in the 1770s and new conquests in India after 1763 opened a second phase of territorial expansion. The victories of the Napoleonic Wars added further possessions to the empire, among them Cape Colony, Mauritius, Ceylon, Trinidad and Tobago, St. Lucia, British Guiana, and Malta. During the second empire mercantilist ideals and regulations were gradually abandoned in response to economic and political developments in Great Britain early in the 19th cent. Britain's new industrial supremacy lent greater force to doctrines of FREE TRADE, which, as part of their critique of mercantilism, questioned the economic value of political ties between the colonies and the mother country. The plight of large nonwhite populations within the empire became a matter of concern to humanitarians. Abolition of the slave trade (1807) and of slavery (1833) was accompanied in the colonies by efforts to improve the lot of indigenous groups. Better communications and the establishment of a regular civil service facilitated the development of a more efficient colonial administration. But the growth, notably in the English-speaking colonies, of national identity and of relative national self-sufficiency, as well as a trend of opinion in Britain favoring colonial self-government, made the British, now engaged in liberalizing their own governing institutions, willing to concede certain powers of self-government to the white colonies. In 1839, Lord Durham, in response to unrest in Canada, issued his "Report on the Affairs of British North America." Durham stated that to retain its colonies Britain should grant them a large measure of internal self-government. The BRITISH NORTH AMERICA ACT of 1867 inaugurated a pattern of devolution followed in most of the European-settled colonies by which Parliament gradually surrendered its direct governing powers, thus Australia and New Zealand followed Canada in becoming self-governing dominions. On the other hand, the British assumed greater responsibility in Africa and in India, where the INDIAN MUTINY had resulted (1858) in the final transfer of power from the East India Company to the British government. To govern territories with large indigenous populations, the crown colony system had been developed. Such colonies, of which one of the most enduring has been Hong Kong, were ruled by a British governor and consultative councils composed primarily of his nominees; these, in turn, of ten delegated considerable powers of local government to local rulers. In the later decades of the 19th cent. there occurred a revival of European competition for empire in which the British acquired or consolidated vast holdings in Africa—such as Nigeria, the Gold Coast (later Ghana), Rhodesia, South Africa, and Egypt—and in Asia—such as Burma and Malaya. The size and wealth of the empire and the anxieties produced by European colonial competition stimulated a desire for imperial solidarity. The IMPERIAL CONFERENCE, begun in 1887, represented an attempt to strengthen Britain's ties with those colonies that had become self-governing territories.

From Empire to Commonwealth. World War I brought the British Empire to the peak of its expansion, but in the years that followed came its decline. Victory added, under the system of MANDATES, new territories, including Palestine, Trans-Jordan, Iraq, and several former German territories in Africa and Asia. Imperial contributions had considerably strengthened the British war effort (more than 200,000 men from the overseas empire died in the war, the dominions and India signed the Versailles Treaty and joined the League of Nations), but at the same time expectations were raised among advanced colonial populations that an increased measure of self-government would be granted. Nationalist agitation against economic disparities, often stimulated by acts of racial discrimination by British settlers, was particularly strong in India (see INDIAN NATIONAL CONGRESS) and in parts of Africa. Although loath to lessen its hold over countries it had done much to develop, and thereby to incur great economic and political loss, Britain gradually capitulated to the pressures of nationalist sentiment. Iraq gained full sovereignty in 1932, British privileges in Egypt were modified by treaty in 1936, and concessions were made toward self-government in India.

and later in the African colonies. In 1931 the Statute of Westminster (see WESTMINSTER, STATUTE OF) officially recognized the independent and equal status under the crown of the former dominions within a British COMMONWEALTH OF NATIONS, thus marking the advent of free cooperation among equal partners. After World War II self-government advanced rapidly in all parts of the empire. In 1947, India was partitioned and independence granted to the new states of India and Pakistan. In 1948 the mandate over Palestine was relinquished, and Burma gained independence as a republic. Other parts of the empire, notably in Africa, gained independence and subsequently joined the British Commonwealth. Probably the outstanding impact of the British Empire has been the dissemination of European ideas, and particularly of British political institutions and of English as a lingua franca throughout a large part of the world. At the start of 1975 Great Britain still administered, as colonies, protectorates, or trust territories, many dependencies throughout the world. They included Brunei and Hong Kong in E Asia, the Seychelles in the Indian Ocean, Gibraltar in the Mediterranean, the Falkland Islands, Bermuda, and St. Helena in the Atlantic, the Cayman Islands, British Virgin Islands, Turks and Caicos Islands, and several of the Leeward and Windward Islands in the West Indies, British Honduras (Belize) in Central America, and Pitcairn Island, the Solomon Islands, the New Hebrides Islands (jointly with France), and the Gilbert and Ellice Islands in the Pacific. These dependencies have varying degrees of self-government. Great Britain claims authority over the state of Rhodesia, which, however, unilaterally declared its independence in 1965. See IMPERIALISM. See Paul Knaplund, *The British Empire, 1815-1939* (1941, repr. 1969) and *Britain, Commonwealth and Empire, 1901-1955* (1956), A. L. Burt, *The Evolution of the British Empire and Commonwealth from the American Revolution* (1956), *The Cambridge History of the British Empire* (8 vol., 1929-59, 2d ed. 1963-), R. A. Huttenback, *The British Imperial Experience* (1966), J. A. Williamson, *A Short History of British Expansion* (2 vol., 6th ed. 1967), C. E. Carrington, *The British Overseas* (2d ed. 1968), Colin Cross, *The Fall of the British Empire* (1968, repr. 1970), Max Beloff, *Imperial Sunset* (1969), Nicholas Mansergh, *The Commonwealth Experience* (1969), G. S. Graham, *A Concise History of the British Empire* (1970) and *Tides of Empire* (1972).

British Guiana: see GUYANA

British Honduras (hōndōō'as,-dyōō'-), British crown colony (1970 pop. 119,645), 8,867 sq mi (22,965 sq km), Central America, on the Caribbean Sea. It is also known as Belize. The capital is Belmopan, BELIZE, the capital until 1970, is the main port



British Honduras is bounded on the N by Mexico, on the S and W by Guatemala, and on the E by the Caribbean. The land is generally low, with mangrove swamps and cays along the coast, but in the south rises to Victoria Peak (c.3,700 ft/1,128 m high). The climate is subtropical. Although most of the area is heavily forested, yielding mahogany, cedar, and logwood, there are regions of fertile savannas and barren pine ridges. Only a small fraction of the land is cultivated. In addition to woods, the chief products are sugarcane, chicle, citrus fruits, and timber. The people are predominantly of black African ancestry, but there are large minorities of Mayan Indian descendants (in the interior) and Spanish-Americans. English is the official language, but Spanish is widely spoken. Once part of the Mayan civilization, the region was probably traversed by Cortes on his way to Honduras, but the Spanish made no attempt at colonization. British buccaneers, who used the cays to prey on Spanish shipping, founded Belize (early 17th cent.). British settlers from Jamaica began the exploitation of timber. Spain contested British pos-

session several times until defeated at the last battle of St. George's Cay (1798). From 1862 to 1884 the colony was administered by the governor of Jamaica. Since 1821, Guatemala has claimed the territory as part of its inheritance from Spain. As British Honduras has progressed toward independence, the tension between Britain and Guatemala over the issue has increased. In 1964 the colony gained complete internal self-government. It has a bicameral legislature, the main political organization is the People's United Party. The capital was moved to the new city of Belmopan in 1970 after a hurricane devastated Belize. See S. L. Cazier, *British Honduras, Past and Present* (1952), D. A. G. Wadell, *British Honduras* (1961), Norman Ashcraft, *Colonialism and Underdevelopment: Process of Political Economic Change in British Honduras* (1973).

British Imperial System of weights and measures: see ENGLISH UNITS OF MEASUREMENT.

British Isles: see GREAT BRITAIN, IRELAND

British Museum, the national repository in London for treasures in literature, science, and art. It has departments of manuscripts, of printed books, of antiquities, of prints and drawings, of coins and medals, and of ethnography. The museum was established by act of Parliament in 1753 when the collection of Sir Hans Sloane, begun in the previous century and called the Cabinet of Curiosities, was purchased by the government and was joined with the Cotton collection (see COTTON, SIR ROBERT BRUCE) and the Harleian Library (see HARLEY, ROBERT). In 1757 the royal library was given to the museum by George II. The institution was opened in 1759 under its present name in Montague House, but the acquisition of the library of George III in 1823 necessitated larger quarters. The first wing of the new building was completed in 1829, the quadrangle in 1852, and the great domed reading room in 1857. Later other additions were built. Sir Anthony Panizzi began the printing of the library's catalog. The library is vast and splendid, among its rarest manuscripts are included *Beowulf*, *Magna Carta*, the 4th-century Greek bible known as the Codex Sinaiticus, Froissart's *Chronicles*, and a unique papyrus of Aristotle. The library is increased partly by the copyright law requiring the deposit of each book printed in the United Kingdom. The museum's collection of prints and drawings is one of the finest in the world. The natural history collection was transferred (1881-83) to buildings in South Kensington and called the Natural History Museum. One of the major exhibits of the Egyptian department is the basalt slab known as the Rosetta Stone (see under ROSETTA). The Greek treasures include the Elgin Marbles and the Caryatid from the Erechtheum. The museum's special collections include a vast number of clocks and timepieces, ivories, and the Sutton Hoo treasure. See J. M. Crook, *The British Museum* (1972), *Treasures of the British Museum* (1972), Edward Miller, *That Noble Cabinet* (1974).

British North America Act, law passed by the British Parliament in 1867 that provided for the unification of the Canadian provinces into the dominion of Canada. The act also functions as the constitution of Canada, providing for a government similar to that of the United Kingdom. The act enumerates the powers of the provincial legislatures and gives the residual powers to the dominion, its interpretation by the privy council has somewhat nullified this design by giving a very extended scope to the provincial power of "property and civil rights," and a doctrine of "emergency powers" has been developed in order to give the dominion the authority needed by a national government in time of war. The power of amendment is still nominally vested in the British Parliament, which in practice, however, acts only on the request of the Canadian Parliament. Numerous attempts to make wide-ranging changes in the act have failed because of a lack of unanimity among Canada's provinces. See Edward Porritt, *Evolution of the Dominion of Canada* (1918, repr. 1972).

British North Borneo: see SABAH, Malaysia

British Somaliland: see SOMALI DEMOCRATIC REPUBLIC.

British South Africa Company: see RHODESIA.

British thermal unit, abbr. Btu, unit for measuring heat quantity in the customary system of ENGLISH UNITS OF MEASUREMENT, equal to the amount of heat required to raise the temperature of one pound of water at its maximum density [which occurs at a temperature of 39.1 degrees Fahrenheit (°F)] by 1°F. The Btu may also be defined for the temperature difference between 59°F and 60°F. One Btu is approximately equivalent to the following: 251.9 calo-

ries, 778.26 foot-pounds, 1055 joules, 107.5 kilogram-meters, 0.0002928 kilowatt-hours. A pound (0.454 kilogram) of good coal when burned should yield 14,000 to 15,000 Btu, a pound of gasoline or other fuel oil, approximately 19,000 Btu.

British Togoland: see TOGOLAND

British West Africa, former inclusive term for the British colonies of Camerouns, Gambia, Gold Coast, Nigeria, Sierra Leone, and Togoland.

British West Indies: see WEST INDIES

Britomartis (brīt'ōmār'tis), in ancient mythology, Cretan goddess, sometimes identified with Artemis. To escape the amorous pursuit of Minos, she jumped into the sea, but fishermen caught her in their nets and transported her to Aegina, where she was worshiped as Aphaea. According to another legend, she vanished in a grove sacred to Artemis and was deified as Dictynna.

Brittany (brīt'anē), Breton Breiz, Fr. Bretagne, region and former province, NW France. It is a peninsula between the English Channel on the north and the Bay of Biscay on the south and comprises five departments, Ille-et-Vilaine, Côtes-du-Nord, Finistère, Morbihan, and Loire-Maritime. The economy of the region is based on agriculture, fishing, and tourism. Apples, from which the distinctive Breton cider is made, are grown extensively inland. Industry includes shipbuilding at ST NAZAIRE and NANTES, food processing, and automobile manufacturing. There is a nuclear power plant in the Arree Mts. The coast, particularly at the western tip, is irregular and rocky, with natural harbors (particularly at BREST, LORIENT, and SAINT-MALO) and numerous islands. Important rivers include the Loire, the Odet, the Vilaine, and the Sèvre Nantaise. A part of ancient Armorica, the area was conquered by Julius Caesar in the GALIC WARS and became part of the province of Lugdunensis (see GAUL). It received its modern name when it was settled (c.500) by Britons whom the Anglo-Saxons had driven from Britain. Breton history is a long struggle for independence—first from the Franks (5th-9th cent.), then from the dukes of Normandy and the counts of Anjou (10th-12th cent.), and finally from England and France. In 1196, Arthur I, an ANGEVIN, was acknowledged as duke. King John of England, who presumably murdered him (1203), failed to obtain the duchy, which passed to Arthur's brother-in-law, Peter I (Peter Mauclerc). The extinction of his direct line led to the War of the BRETON SUCCESSION (1341-65), a part of the HUNDRED YEARS WAR (1337-1453). With the end of the Breton war, the dukedom was won by the house of Montfort. The dukes of Montfort tried to secure Brittany's neutrality between France and Britain during the remainder of the Hundred Years War. The unsuccessful rebellion of Duke Francis II against the French crown led to the absorption of Brittany into France after the accession of his daughter, Anne of Brittany, in 1488. King Francis I formally incorporated the duchy into France in 1532. Brittany's provincial PARLIAMENT met at Rennes, and its provincial assembly remained powerful until the French Revolution. The 16th and 17th cent. were generally peaceful in Brittany, but the region, never reconciled to centralized rule, became one of the early centers of revolt in 1789. However, its staunch Catholicism and conservatism soon transformed it into an anti-Revolutionary stronghold, the CHOUEANS (anti-Revolutionary peasants) were never fully subdued, and in S Brittany and the neighboring VENDEE the Revolutionary government resorted to ruthless reprisals. Breton nationalism grew in the 19th cent. and was fueled by the anticlericalism of the Third Republic. The Breton autonomists, long successfully repressed by the French government, nevertheless resisted German bids for collaboration in World War II. In more recent years the emigration of the young has resulted in a serious decline in the region's population. Brittany and the Breton people have retained many old customs and traditions. Breton, their Celtic language (akin to Welsh), is spoken in traditionalist Lower (i.e., western) Brittany outside the cities (see BRETON LITERATURE). Costumes featuring high lace head-dresses are distinctive in every community and are worn widely on Sundays and holidays. Religious festivals, at which ships, birds, and houses are blessed, are characteristic of Breton fetes, and there are formal religious processions and pilgrimages. Brittany has remarkable stone calvaries, some built at the close of the 16th cent. to ward off the plague. Many megalithic monuments, formerly ascribed to the DRUIDS, dot the Breton landscape, notably at CARNAC. See P. R. Giot et al., *Brittany* (1960), Nora K. Chadwick, *Early Brittany* (1969).

Brittany spaniel, breed of medium-sized SPORTING DOG whose origins may be traced back hundreds of years to France and Spain. It stands about 19 in (48.3 cm) high at the shoulder and weighs between 30 and 40 lb (13.6–18.1 kg). Its dense, flat or wavy coat is dark orange and white or liver and white. Many Brittany spaniels are born tailless or very short-tailed, and a tail that is more than 4 in (10.2 cm) long is docked to that length. Although it is a "leggy" spaniel, it has a compact body—its height at its shoulder often equals its body length. The Brittany is a first-rate hunter and may easily be trained to retrieve, both on land and water. It is the only spaniel that points its quarry. See DOG.

Britten, Benjamin, 1913–, English composer. Britten is considered the most significant British composer since Purcell. As a youth he showed facility in the composition of instrumental works, displaying technical brilliance and colorful orchestration. One example, *A Young Person's Guide to the Orchestra* (1945), written for a film, is based on a theme by Purcell. His most characteristic expression is achieved in vocal music. His many song cycles and choral works include *A Boy Was Born* (1933) and *A Ceremony of Carols* (1942). Britten's great *War Requiem* (1962), based on the bitter war poems of Wilfred Owen, was sung at the dedication in England of the reconstructed Coventry Cathedral, destroyed during World War II. In his operas, which include *Paul Bunyan* (1941), *Peter Grimes* (1945), *The Rape of Lucretia* (1946), *The Turn of the Screw* (1954), *A Midsummer Night's Dream* (1960), and *Death in Venice* (1973), he evinced a sensitivity to text and a fondness for variation technique, dynamic dissonance, and the use of ground basses. See biographies by P. M. Young (1968), Imogen Holst (2d ed. 1970), and E. W. White (new ed. 1970).

brittle star, common name for echinoderms belonging to the class Ophiuroidea. The name is derived from their habit of breaking off arms as a means of defense. New arms are easily regenerated. They are also called serpent stars because of the snakelike movements of the five mobile, slender arms. Brittle stars can be distinguished from SEA STARS, or starfish, by their rounded central disk, sharply set off from the arms. They have the water-vascular system and tube feet common to all echinoderms, unlike sea stars, brittle stars lack open grooves (ambulacral grooves) on the lower surface of the arms, and the tube feet serve as tactile organs. Also unlike sea stars, brittle stars walk with their arms, only some species use the tube feet for locomotion. Each arm contains a series of jointed bonelike plates, or ossicles, which determine the freedom of arm movements. Brittle stars can move quickly and in any direction. They are relatively small, usually less than 1 in (2.5 cm) across the central disk, although the arms may be quite long. They are inconspicuous and often nocturnal, living under rocks, among seaweed, or buried in the sand. All are marine species, feeding on detritus and small living or dead animals. The arms move the larger food masses to the mouth, where they are fragmented by a complex jaw apparatus. Tube feet move smaller particles to the mouth, and some species, like *Ophiocoma nigris* of the Pacific coast, can take tiny food particles like a filter-feeder, trapping them in mucus and using ciliary currents to deliver them to the mouth. As a rule, sexes are separate, and fertilization occurs in the open sea after gametes have been discharged. A characteristic armed larval stage, the ophiopluteus, undergoes a profound metamorphosis to produce the rayed adult form. About 2,000 species of ophiuroids are known, and a number are common along American coasts. Brittle stars are classified in the phylum ECHINODERMATA, class Ophiuroidea.

Britton, John, 1771–1857, English antiquary and topographer. The long list of his writings includes biographies, critical works on art and literature, and the descriptions of landscapes and buildings for which he is famous. *The Beauties of Wiltshire* (3 vol., 1801–25) was written with E. W. Brayley. The two friends wrote part of *Beauties of England and Wales* (18 vol., in 25, 1801–15), but because of difficulties with the publishers, they did not complete the series. Britton was influential in the movement to preserve ancient monuments. See his autobiography (3 parts, 1849–50).

Britton, Nathaniel Lord, 1859–1934, American botanist, grad. Columbia School of Mines, 1879. He taught geology and botany at Columbia, 1879–96. He was the New York Botanical Garden's first director and until his retirement in 1929 had a major part in its growth. His own contributions, chiefly in the field of tropical botany, include hundreds of thou-

sands of specimens, many of great rarity, gathered on his trips to the tropics. His chief works include *An Illustrated Flora of the Northern United States, Canada, and the British Possessions* (with Addison Brown, 1896–98), *The Bahama Flora* (with C. F. Millspaugh, 1920), and four volumes on cacti (with J. N. Rose, 1919–23).

Brixen: see BRESSANONE, Italy

Brixham: see TORBAY

Brno (bŭr'nŏ), Ger. *Brunn*, city (1970 pop. 335,918), central Czechoslovakia, at the confluence of the Svatka and Svitava rivers. It is the second largest city of Czechoslovakia and the chief city of Moravia. Brno is an industrial center, known particularly for its woolen industry and for its manufacture of textiles, machinery (notably tractors), machine tools, and armaments. The famous Bren gun, later made in Enfield, England, was developed in Brno. Tourism is also economically important, and the city holds a large annual international trade fair. Originally the site of a Celtic settlement, Brno grew between two hills, one of which, the Spielberg (Czech *Špilberk*), had a castle known in the 11th cent. The city became part of the kingdom of Bohemia, whose king, Ottocar I, confirmed Brno's ancient charter, a model of liberal town government, in 1229. King Wenceslaus I made it a free city by royal decree in 1243, and Brno flourished in the 13th and 14th cent. In the Hussite Wars it sided with the Roman Catholic Church. The city was besieged in 1645 by the Swedes and served as headquarters for Napoleon I during the battle of Austerlitz in 1805. The Spielberg castle, which was captured by Hapsburg forces during the Thirty Years War, became (1740–1855) their most notorious political prison. Franz von der Trenck and Silvio Pellico (who described it in *Le mie prigioni*) were its most celebrated inmates. In the 19th cent. Brno became one of the foremost manufacturing towns of the Austrian empire. Most Germans were expelled from the city after World War II. Brno's landmarks include the cathedral (15th cent.), the old and new town halls, and several fine Gothic and baroque churches. Masaryk Univ. (founded 1919), Beneš Technical College, a music conservatory, and several fine museums are also located in the city.

Broach (brŏch) or **Baroach** (bārŏch'), town (1971 pop. 92,263), Gujarat state, W India, on the Gulf of Cambay. A port at the mouth of the Namada River, Broach ships cotton and timber. Textiles are manufactured there. Broach was an important Buddhist center in the 7th cent. Under the Rajput dynasty (750–1300), it was the chief port of W India.

broaching: see QUARRYING

broadcasting, transmission of sound or images to a large number of receivers by radio or television. In the United States the first regularly scheduled radio broadcasts began in 1920 with the transmission of the Harding-Cox election returns by Frank Conrad over 8XK (later KDKA) in Pittsburgh. The sale of ADVERTISING was started in 1922, establishing commercial broadcasting as an industry. Radio became increasingly attractive as an advertising medium with the coming of network operation. A coast-to-coast hookup was tentatively effected early in 1924, and expansion of both audience and transmission facilities continued rapidly. By 1927 there were two major networks, and the number of stations had so increased that it caused serious overlapping in transmission channels. Legislation (see FEDERAL COMMUNICATIONS COMMISSION) designed to meet this problem was enacted, and the government has since maintained some control over the technical and business activities of the industry. By 1970 over 4,200 commercial radio stations were operating in the standard broadcasting (amplitude modulation, or AM) band. There were also over 2,000 frequency modulation (FM) stations on the air. Experiments in broadcasting television began in the 1920s, but were interrupted by World War II. After the war the number of commercial TV stations grew from 9 in 1947 to 672 by 1970. To offset the dominance of commercial broadcasting, the Corporation for Public Broadcasting was established in 1968 as a non-profit, non-governmental agency to finance the growth of non-commercial radio and television, by 1972 the network served over 200 stations. See RADIO, TELEVISION. See Eric Barnouw, *A History of Broadcasting in the United States* (3 vol., 1966, 1968, and 1971).

Broad Church: see ENGLAND, CHURCH OF

Broads, the, region, c. 5,000 acres (2,020 hectares), mainly in Norfolk, E England, extending inland to Norwich from the coast. It is composed of wide, interlocking shallow lakes, connected by the Wav-

eney, Yare, and Bure rivers, there are more than 200 mi (320 km) of navigable waterways. The Broads is a vacation center and wildlife sanctuary.

Broadstairs and Saint Peter's, urban district (1971 pop. 19,996), Kent, SE England. The district is in the region known as the Isle of Thanet. It is a residential area and resort and was once a retreat of Charles Dickens, whose residence there is now called Bleak House.

Broadview Heights, village (1970 pop. 11,463), Cuyahoga co., NE Ohio, a suburb of Cleveland, inc. 1926.

Broadway, famous thoroughfare of New York City. The longest street in the world, it extends 150 mi (241 km), from Bowling Green near the foot of Manhattan island N to Albany. Throughout its length within New York City, Broadway is chiefly a commercial street. At WALL ST. it runs through the financial center of the country, N of Union Square (14th St.) it passes a clothing and merchandising section with large department stores, entering the theater district at TIMES SQUARE (42d St.). There it becomes the noted "Great White Way," illuminated at night by a profusion of electric signs and lights. Points of interest along Broadway include Trinity Church (Wall St.), St. Paul's Chapel, built 1766 (near City Hall), the Woolworth Building (at Barclay St.), the Lincoln Center for the Performing Arts (64th–67th streets), COLUMBIA UNIV. (113th–121st streets), the Columbia-Presbyterian Medical Center (168th St.), and Van Cortlandt Park (at the north end of the city). Broadway was laid out by the Dutch and was the principal street of NEW AMSTERDAM, it was extended north as the colony grew.

Broca, Paul (pŏl brŏka'), 1824–80, French pathologist, anthropologist, and pioneer in neurosurgery. A professor in Paris at the Faculty of Medicine and at the Anthropological Institute, he was a founder of the Anthropological Society of Paris (1859) and of the *Revue d'anthropologie* (1872). An authority on aphasia, he localized the brain center for articulate speech in the convolution of Broca, or Broca's area (the third convolution of the left frontal lobe). He originated methods of classifying hair and skin color and of establishing brain and skull ratios.

brocade, fabric, originally silk, generally reputed to have been developed to a high state of perfection in the 16th and 17th cent. in France, Italy, and Spain. The fabric is characterized by a compact warp-effect background with one or more fillings used in the construction to make the motif or figure. The filling threads, often of gold or silver in the original fabrics of this name, float in embossed or embroidered effects in the figures. Motifs may be of flowers, foliage, scrollwork, pastoral scenes, or other design. Its uses include curtaining, hangings, pillows, portieres, evening wraps, and church vestments. Similar techniques are used in the manufacture of brocades made of cotton and synthetic fibers.

broccoli (brŏk'ŏlē) [Ital. = sprouts], variety of CABBAGE grown for the edible immature flower panicles. It is the same variety (*Brassica oleracea botrytis*) as the cauliflower and is similarly cultivated. Although known to the Romans, it has become generally popular in the United States only in this century. Broccoli is classified in the division MAGNOLIOPHYTES, class Magnoliopsida, order Capparales, family Cruciferae.

Brocéliande, Forest of (brŏsālēāNd'), Ille-et-Vilaine dept., NW France, in Brittany. In Arthurian legend it was the home of Merlin. It is known today as the Forest of Paimpont.

Broch, Hermann (hĕr'man brŏkh), 1886–1951, Austrian novelist. His powerful trilogy *Die Schlafwandler* (1931–32, tr. *The Sleepwalkers*, 1932) is written in a complex style reminiscent of James Joyce. Dealing with three different classes and periods, it describes the disintegration of social values and of organic coherence in the modern world. Broch, also a successful mathematician and businessman, lived in the United States after 1938. See his *The Guiltless* (1950, tr. 1973).

Brock, Sir Isaac, 1769–1812, British general, Canadian hero of the War of 1812. A British army officer, he was sent to Canada in 1802 and was given command (1806) of Upper and Lower Canada. He strengthened defenses and made plans for a navy. In 1811 he was made major general and was appointed administrator of Upper Canada. At the outbreak of war, Brock joined forces with Tecumseh on the Western frontier and moved against Detroit. He captured Gen. William Hull's army (1812) and gained control of the upper lakes. For this he received a knighthood and the title "hero of Upper

Canada" After Detroit he successfully defended Queenston Heights on the Niagara frontier, but was killed while leading a charge See study by S H Adams (1957)

Brock, Sir Thomas, 1847-1922, English sculptor One of the leading sculptors under the reign of Victoria, he enjoyed a long and successful career He became an Academician in 1891 and was knighted in 1911 His work shows dignity and restraint His bust of Longfellow (Westminster Abbey), his colossal Victoria Memorial, in front of Buckingham Palace, and his equestrian statue, *Black Prince* (Leeds) are notable examples of his work

Brocken (bröck'an), granite peak, 3,747 ft (1,142 m) high, W East Germany, highest peak of the Harz mts Popular legend makes it the meeting place of the Walpurgis Night or Witches' Sabbath The "Brocken scene" in Goethe's *Faust* is set there

Brockton, industrial city (1970 pop 89,040), Plymouth co., E Mass., settled c 1700, set off from Bridge-water 1821, inc as a city 1881 It has a large shoe and leather products industry Textiles and clothing, machinery and machine tools, plastics, and electrical and electronic equipment are also produced A junior college, an art center, and a historic museum are in the city Brockton has an annual fair, which has been held since 1874 A state park is nearby

Brock University, at St Catharines, Ont., Canada, coeducational, founded 1964 It has a faculty of arts and science and a college of education The university has developed a special interest in administration and in urban and Asian studies

Brockville, city (1971 pop 19,765), SE Ont., Canada, on the St Lawrence River It is in a rich dairy region The city's manufactures include telecommunications equipment, power tools, and baby foods In summer it is a tourist resort

Brockway, Zebulon Reed, 1827-1920, American penologist, b Lyme, Conn As superintendent of the House of Correction in Detroit, he tried to introduce in 1869 the indeterminate sentence for first offenders His ideas were incorporated in a Michigan statute but were nullified by the courts He aided New York state legislation by organizing the first state reformatory for adult males, built at Elmira, and was its first superintendent (1876-1900) He introduced a system of military training, physical training, education, and trade instruction, with merits as incentives to good behavior The success of his Elmira experiments led to the introduction of the indeterminate sentence in other states He wrote *Fifty Years of Prison Service* (1912)

Brod, Max (max bröd), 1884-1968, Israeli writer and composer, b Prague Brod is best known for his historical novels, notably *The Redemption of Tycho Brahe* (1916, tr 1928) and *Reuben, Prince of the Jews* (1925, tr 1928) A lifelong friend of Franz Kafka, he wrote an excellent biography of Kafka (1937, tr 1947) and also edited Kafka's writings Brod's numerous other works include a biography of Heine (1934, tr 1956), an autobiography (1960), and plays, poems, novels, and essays His musical compositions include works for orchestra, notably Requiem Hebraicum, and for voice and piano Long an active Zionist, Brod left Prague for Palestine in 1939 where he directed the Habima Theater

Broderick, David Colbreth (brö'darik), 1820-59, American politician, b Washington, D C Brought up in New York City, he was active in Tammany Hall before moving to California in 1849 He became equally active in politics there, being a member of the state constitutional convention of 1849 He was elected to the state senate in 1850 and was chosen to preside over it in 1851 Broderick, who drew his support chiefly from Northerners, fought bitterly for control of the Democratic party in the state against US Senator William M GWIN, leader of the proslavery element Both were sent to the US Senate in 1857 under a compromise by which Broderick was to have control of the Federal patronage However, President Buchanan and Gwin ignored the understanding, and Broderick fiercely attacked them both He was killed by Chief Justice David S Terry of the California supreme court, a supporter of Gwin, in a famous duel near San Francisco An eloquent eulogy at his elaborate funeral and editorial reverberations throughout the land made him the martyr of the Union cause in California See biographies by Jeremiah Lynch (1911) and D A Williams (1969)

Brodhead, Daniel, 1736-1809, American Revolutionary officer and Indian fighter, b probably near Albany, N Y He was taken as an infant to Pennsylvania, where he later served as deputy surveyor general (1773-75) In the Revolution he commanded a

detachment of militia in the battle of Long Island, was sent (1778) to Pittsburgh, and became commandant there in 1779 In that year he led an expedition up the Allegheny River against the Indians, this was linked with the expedition of John Sullivan in New York When in 1781, the Delawares broke their treaty, he invaded their territory He was removed from his command but later was brevetted brigadier general For 11 years (1798-1809) he was surveyor general of Pennsylvania

Brodie, Steve, 1863-1901, Brooklyn bookmaker who gained immediate fame and a measure of immortality by allegedly jumping off the Brooklyn Bridge and surviving the fall, on July 23, 1886 It was claimed that Brodie had not, in fact, jumped from the bridge but that a dummy was used as he hid under a pier In any case he gained the publicity he was seeking, and a tavern he opened shortly after in the Bowery became a mecca for sightseers

brodiaea or **brodiaea** (both bräd'ë'a), any plant of the genus *Brodiaea*, herbs of the family Liliaceae (LILY family) with narrow leaves and blue or purple star-shaped flowers The many North American species include the golden brodiaea (*B. ixoides*) and the common, or white, brodiaea (*B. hyacinthina*), called also wild hyacinth Both are found in hilly regions of the Pacific states Temperate South American species include the spring starflower (*B. uniflora*), which is commonly cultivated The small onionlike bulbs of brodiaeas were eaten by American Indians and called "grass nuts" Brodiaea is classified in the division MAGNOLIOPHYTES, class Liliatae, order Liliales, family Liliaceae

Broederlam, Melchior (mël'khëôr brö'darlam), active c 1381-1409, Franco-Flemish painter Broederlam was among the first practitioners of the International Gothic style (see GOTHIC ARCHITECTURE AND ART) He was court painter after 1387 to Philip the Bold, duke of Burgundy Influenced by Italian painting, Broederlam attempted to place figures in perspective, as in his panels for *Baerze's Retable* (Musée de la Ville, Dijon)

Brogan, Denis William, 1900-1974, British historian and political scientist, b Glasgow, Scotland He was educated at the Univ of Glasgow, Oxford, and Harvard and was professor of political science at Cambridge from 1939 to 1968, in addition, he lectured at various American universities Brogan was best known as an interpreter of American history and politics for British readers, he also wrote widely on modern France His writings include *The American Political System* (1933), *France under the Republic* (1940), *Politics and Law in the United States* (1941), *The American Character* (1944), *The Era of Franklin D Roosevelt* (1950), *Politics in America* (1954), *America in the Modern World* (1960), *American Aspects* (1964), and *Worlds in Conflict* (1967) He was knighted in 1963

Broglie (brôglië'), French noble family of Piedmontese origin, who settled in France in the 17th cent Victor Maurice, comte de Broglie, 1647-1727, was marshal of France and fought in the wars of King Louis XIV His son François Marie, duc de Broglie, 1671-1745, marshal of France, fought at Malplaquet (1709), in the War of the Polish Succession, and in the War of the Austrian Succession King Louis XV conferred on him the ducal title inherited by his son Victor François, duc de Broglie, 1718-1804, marshal of France, who distinguished himself in the War of the Austrian Succession and the Seven Years War Holy Roman Emperor Francis I made him prince of the Holy Roman Empire (1757), a title that remained in the family In the French Revolution he emigrated and commanded (1792) the army of the princes against the revolutionary forces Charles François, comte de Broglie, 1719-81, brother of Victor François, was ambassador to Poland (1752) and later headed the so-called "secret cabinet" of Louis XV, the king's secret organization of political advisers and spies Achilles Charles Leon Victor, duc de Broglie, 1785-1870, grandson of Victor François, was a statesman and diplomat under Emperor Napoleon I and a leader of the moderate liberals after the Restoration He occupied several cabinet posts, including that of premier (1835-36), under King Louis Philippe, and was (1847-48) ambassador to London After the February Revolution (1848) he was elected (1849) to the assembly He opposed Emperor Napoleon III He married a daughter of Mme de Staël His son, Jacques Victor Albert, duc de Broglie, 1821-1901, was a historian and politician He was a member of the national assembly (1871), ambassador to London (1871-72), premier (1873-74, 1877), and a liberal monarchist leader in the senate He wrote *Histoire de l'église et de l'empire romain au IVe*

siècle (6 vol., 1856-66), an apologia for the Church as preserver of civilization in the late Roman period, *The King's Secret* (tr 1879), based on the career of his great-granduncle, Charles François de Broglie, *An Ambassador of the Vanquished* (tr 1896), and *Frederick the Great and Maria Theresa* (tr 1883) He also edited the memoirs of his father (tr 1887) He was the grandfather of the scientists Maurice, duc de Broglie, and Louis Victor, prince de Broglie (see separate articles)

Broglie, Louis Victor, prince de, 1892-, French physicist In 1932 he became professor in the faculty of sciences, Univ of Paris It was known from the earlier QUANTUM THEORY that waves sometimes exhibited a particlelike behavior De Broglie hypothesized (1924) that particles should also exhibit certain wavelike properties, a prediction that led to the development of wave mechanics, a form of quantum mechanics The existence of these matter waves was confirmed experimentally in 1927, and de Broglie received the 1929 Nobel Prize in Physics for his theory He was elected permanent secretary of the Academy of Sciences in 1942 and has been a member of the French Academy since 1944 His many works on physics and the philosophy of science include *An Introduction to the Study of Wave Mechanics* (1930, tr 1930), *Revolution in Physics* (tr 1953), and *Non-Linear Wave Mechanics* (1956, tr 1960)

Broglie, Maurice, duc de, 1875-1960, French physicist, brother of Louis Victor, prince de Broglie His contributions include notable work on X rays and in atomic physics, radioactivity, and electricity He became a member of the Academy of Sciences in 1924 and of the French Academy in 1934

Broken Arrow, city (1970 pop 11,787), Tulsa co., NE Okla., a suburb of Tulsa

Broken Hill, city (1971 pop 29,743), New South Wales, SE Australia, near the South Australia border Since 1884 it has been a principal center of zinc and silver mining in Australia

broker, one who acts as an intermediary in a sale or other business transaction between two parties Such a person conducts individual transactions only, is given no general authority by his employers, discloses the names of the principals in the transaction to each other, and leaves to them the conclusion of the deal He neither possesses the goods sold nor receives the goods procured, he takes no market risks and transfers no title to goods or to anything else He earns his commission, or brokerage, when the contract of sale has been made, regardless of whether the contract is satisfactorily executed He is paid by the party with whom he first negotiates In practice, merchants and other salesmen act as brokers at times Brokers are most useful in establishing trade connections in those large industries where a great many relatively small producers (e.g., farmers) compete for a wide market They operate in strategic cities and keep in active touch with the trade needs of their localities and with one another They are important in determining prices, routing goods, and guiding production, and in those functions play a part similar to the highly organized exchanges Brokers also negotiate trades in property not directly affecting production Such are stockbrokers and real estate brokers Employment agents are really brokers, as they bring together the buyers and sellers of labor Merchandise brokers arrange sales between manufacturers and wholesalers or retailers, between producers and users of raw materials, and sometimes between two manufacturers Small concerns use retail brokers instead of maintaining their own sales forces Insurance brokers bring together insurance companies and those who want insurance They are most useful to those needing several types of insurance protection and to those whose large risks must be divided among many companies Real estate brokers negotiate sales and leases of farms, dwellings, and business property and are often also insurance brokers Ship brokers keep informed of the movement of vessels, of cargo space available, and of rates for shipment and sell this information to shippers They serve tramp carriers in the main, inasmuch as the larger ship lines have their own agents Such brokers also serve as post agents, in which capacity they settle bills for stores and supplies, pay the wages of the crew, and negotiate insurance for the vessel and cargo They also arrange the sale of ships In the organized markets, such as grain and stock exchanges, commission merchants and straight selling displace brokerage in large part, but between cities and where there is no active exchange, brokers in grain and other commodities are active Members of organized ex-

changes usually act as commission merchants or trade on their own account. However, in the New York Stock Exchange a group of members called "floor brokers" perform the actual trading on the exchange floor for representatives of commission houses, taking no responsibility and receiving a small fee. In the United States, note brokers buy promissory notes from businessmen and sell them to banks. Traders in acceptances and foreign bills of exchange are known in the United States as acceptance dealers. Customs brokers are not actually brokers; they act as agents for importers in estimating duties and clearing goods. The PAWNBROKER is a private money lender. See Margaret Hall, *Distributive Trading* (1950); R. L. Kohls, *Marketing of Agricultural Products* (1961).

Bromberg; see BYDGOSZCZ, Poland

Brome, Richard (brōm, brōm), c. 1590–1652, English dramatist. He was the friend, servant, and disciple of Ben Jonson. Primarily a writer of realistic satiric comedy, picturing the life and manners of Caroline bourgeois London, he also produced several tragicomedies, but with much less success. The main features of his plays are the humour characters (see HUMOR), complicated comic intrigue, and an abundance of action. The majority of his comedies were performed between 1629 and 1642, the most noteworthy being *The Northern Lass*, *The City Wit*, and *The Jovial Crew*. See study by R. J. Kaufmann (1961).

brome grass, common name for any plant of the genus *Bromus*, chiefly large, coarse grasses of a weedy nature, some, however, are useful as forage, and others are cultivated for decoration. Some of the better-known bromes are the smooth brome (*B. inermis*, sometimes called awnless, or Hungarian brome), often cultivated for pasture or for holding banks, rescue grass (*B. catharticus*), a forage in the Southern states, and chess, or cheat (*B. secalinus*), a pest of grainfields, formerly believed by some to be degenerate wheat. Many species of brome grasses develop sharp-barbed fruits at maturity that are injurious to stock (whence the name ripgut grass for some), before maturity these are often used for forage. Brome grasses are classified in the division MAGNOLIOPHYTES, class Liliatae, order Cyperales, family Gramineae.

bromeliad, common name for plants of the family Bromeliaceae (PINEAPPLE family).

bromide, any of a group of compounds that contain BROMINE and a more electropositive element or radical. Bromides are formed by the reaction of bromine or a bromide with another substance; they are widely distributed in nature. Most metal bromides are water soluble, exceptions are bromides of copper, lead, mercury, and silver that are very slightly soluble in water. Potassium bromide, KBr, and sodium bromide, NaBr, are the familiar bromides used in medicine as sedatives; they should be used under a doctor's direction since they are habit-forming. Magnesium bromide, found in seawater, is a source of pure bromine. Silver bromide is one of the light-sensitive silver salts used in films, plates, and printing papers for photography. Hydrobromic acid is a water solution of hydrogen bromide, a gas. The presence of a bromide in a water solution can be detected by adding chlorine and carbon disulfide, CS₂, the bromine is displaced from its compound and dissolves in the CS₂, giving it a characteristic orange color.

bromine (brō'mēn, -in) [Gr. =stench], volatile, liquid chemical element, symbol Br, at no 35, at wt. 79.904, m p -7.2°C, b p 58.78°C, sp gr of liquid 3.12 at 20°C, density of vapor 7.14 grams per liter at STP (see separate article), valence -1, +1, +3, +5, or +7. At ordinary temperatures bromine is a brownish-red liquid that gives off a similarly colored vapor with an offensive, suffocating odor. It is a member of the HALOGEN family in group VIIA of the PERIODIC TABLE. It is the only nonmetallic element that is liquid under ordinary conditions. It is soluble in water to some extent, the aqueous solution, called bromine water, acts as an oxidizing agent. It is also soluble in alcohol, ether, and carbon disulfide. Bromine is less active chemically than CHLORINE or FLUORINE but is more active than IODINE. It forms compounds similar to those of the other halogens (see BROMIDE). Oxides of bromine are unstable, but two acids, hypobromous acid, HBrO, and bromic acid, HBrO₃, are known with their salts. Hydrobromic acid is the aqueous solution of hydrogen bromide, HBr. Bromine does not occur uncombined in nature but is found in combination with other elements, notably sodium, potassium, magnesium, and silver. In compounds it is present in seawater, in

mineral springs, and in common salt deposits, e.g., those at Stassfurt, Germany. It occurs in the United States, principally in Michigan, Ohio, and West Virginia. Bromine for commercial purposes is obtained by treating brines (from salt wells or seawater) with chlorine, which displaces the bromine. It is important in the preparation of organic compounds, such as ethylene dibromide, which is used in conjunction with an antiknock compound in gasoline. Bromine has a powerful corrosive action on the skin, destroying the tissue, and the vapor is strongly irritating to the eyes and the membranes of the nose and throat. The element was discovered in seawater by Antoine Jérôme Balard in 1826.

Bromley, borough (1971 pop. 304,357) of Greater London, SE England. The borough was created in 1965 by the merger of the former municipal boroughs of Bromley and Beckenham, the urban districts of Orpington and Penge, and part of the urban district of Chislehurst and Sidcup. It is the largest of the 32 Greater London boroughs. Bromley is mainly residential. The Crystal Palace, site of the 1951 Great Exhibition, was within the borough until fire destroyed it in 1936. William Pitt the younger, the statesman, and H. G. Wells, the writer, were born in what is now Bromley.

Bromsgrove, urban district (1971 pop. 40,669), Worcestershire, central England. Bromsgrove is an ancient market town and road junction. It is predominantly residential but has some industry, including a large forging works. In 1974, Bromsgrove became part of the new nonmetropolitan county of Hereford and Worcester.

bronchitis, inflammation of the mucous membrane of the bronchial tubes. It can be caused by viral or bacterial infections or by allergic reactions to irritants such as tobacco smoke. The disease is characterized by low-grade fever, chest pains, hoarseness, and productive cough. Acute bronchitis is rarely serious in otherwise healthy adults, but it can be dangerous in infants, children, or adults who suffer from underlying respiratory disease, especially emphysema. It may subside or, particularly with continued exposure to irritants, may persist and progress to chronic bronchitis or pneumonia. The more prolonged chronic bronchitis is frequently secondary to a serious underlying disorder. Bronchial inflammation can be severe, cough and bronchial spasms are treated with antihistamines, cough suppressants, and bronchodilators. Antibiotics are used if there is evidence of bacterial invasion.

bronchopneumonia; see PNEUMONIA

bronchoscope, long, tubular instrument with a light at the tip that is inserted through the windpipe and bronchial tubes to examine these structures. By passing other instruments through it, foreign bodies and obstructions can be removed and tissue or secretions may be removed for microscopic observation. Gustav Killian, German laryngologist, in Freiburg, Germany, was the first to experiment with such a device in 1895. Chevalier Jackson adapted the bronchoscope to serve as an aid to the breathing of a patient during surgery in 1903, and he improved the system of illumination in the instrument; he is regarded as the father of bronchoscopy.

bronchus; see LUNGS

bronco; see MUSTANG

Brongniart, Adolphe Theodore (adōlf' tādōr' brōn'yar'), 1801–76, French botanist, son of Alexandre Brongniart. He was a pioneer in the study of vegetable physiology and was author of an important work on vegetable fossils (1828–37) and of a valuable first account of pollen. His classification of plants in the natural history museum at Paris was the basis of the system now used in Germany. He helped establish the *Annales des sciences naturelles* and founded the Société botanique de France.

Brongniart, Alexandre (älēksān'drā), 1770–1847, French geologist, mineralogist, and chemist. As director of the Sevres porcelain factory from 1800, he was responsible for its international fame. Brongniart established basic principles of ceramic chemistry that are incorporated in his *Traité des arts céramiques et des poteries* (1844). With Georges Cuvier he wrote *Essai sur la géographie minéralogique des environs de Paris* (1811), in which a system of stratigraphy was developed that relied on the use of fossils for the precise dating of strata. He also devised a system for the classification of reptiles.

Bronk, Delfev Wulf, 1897–, American biologist and administrator, b. New York City, grad. Swarthmore College (B.A., 1920), Ph.D. Univ. of Michigan, 1926. He was professor of medical physics at the Univ. of Pennsylvania from 1929 to 1949 and also director of

the Institute of Neurology (1936–40, 1942–49). From 1949 to 1953 he was president of Johns Hopkins. In 1953 he became president of the Rockefeller Institute for Medical Research (now Rockefeller Univ.), New York City. Bronk has also served as president and chairman of many important scientific societies. In his lectures he has asked for an understanding of science in terms of human values.

Bronte, Charlotte (brōn'tē), 1816–55, English novelist, Emily Jane Bronte, 1818–48, English novelist and poet, and Anne Bronte, 1820–49, English novelist. They were daughters of Patrick Bronte (1777–1861), an Anglican clergyman of Irish birth, educated at Cambridge. In 1820 he became incumbent of Haworth, West Riding of Yorkshire. The next year his wife died, and her sister, Elizabeth Branwell, came to the parsonage to care for the six Bronte children, five girls and one boy, Branwell. Maria and Elizabeth, the two oldest girls, were sent to the Cowan Bridge school for the daughters of poor clergymen. In spite of the harsh conditions there, Charlotte and Emily were also sent in 1824, but were brought home after Maria and Elizabeth contracted tuberculosis and died. At home for the next five years, the children were left much to themselves, and they began to write about an imaginary world they had created. This escapist writing, transcribed in tiny script on small pieces of paper, continued into adulthood and is a remarkable key to the development of genius in Charlotte and Emily. In 1831, Charlotte was sent to Miss Wooler's school at Roe Head. She became a teacher there in 1835, but in 1838 she returned to Haworth. At home she found the family finances in wretched condition. Branwell—talented as a writer and painter, on whom his sisters' hopes for money and success rested—had lost three jobs and was declining into alcoholism and opium addiction. To increase their income Charlotte and her sisters laid ill-considered plans to establish a school. In order to study languages Emily and Charlotte spent 1842 at the Pensionnat Heger in Brussels, but returned home at the death of their aunt, who had willed them her small fortune. Both girls were offered positions at the pensionnat, but only Charlotte returned in 1843. She went home the following year, because, it is thought, she was in love with M. Heger and had aroused the jealousy of Mme. Heger. Mr. Bronte's failing eyesight and the rapid degeneration of Branwell made this an unhappy period at home. When Charlotte discovered Emily's poetry in 1845, Anne revealed hers, and the next year the collected poems of the three sisters, published at their own expense, appeared under the pseudonyms Currer, Ellis, and Acton Bell. In 1847, Emily's novel *Wuthering Heights* and Anne's *Agnes Grey* were published as a set, and although *The Professor* by Charlotte was rejected, her *Jane Eyre* (1847) was accepted and published with great success. The identity of the sisters as authors was at first unknown even to their publishers. It was not until after the publication of Charlotte's *Shirley* in 1849 that the truth was made public. By then tragedy had all but destroyed the Brontë family. In September, 1848, Branwell died, Emily caught cold at his funeral and, refusing all medical aid, died of tuberculosis the following December. Anne, whose Tenant of Wildfell Hall appeared in 1848, also died of tuberculosis in May, 1849. Now that the people who had occupied most of her life were gone, Charlotte began to make trips to London where she was lionized. Her *Villette* appeared in 1853. In 1854 she married her father's curate, Arthur Bell Nichols, with whom she seems to have been happy. She died, however, of pregnancy toxemia complicated by the Bronte susceptibility to tuberculosis, after only a year of marriage. *The Professor* was published posthumously in 1857. Of the three Bronte sisters Anne was the least talented. Still her novels have been praised for their realism, integrity, and moral force. *Agnes Grey* is the unadorned story of a governess's life and *The Tenant of Wildfell Hall* tells of a young girl's marriage to a rake. Charlotte Bronte was the most professional of the sisters, consciously trying to achieve financial success from the family's literary efforts. Her novel *Jane Eyre*, the story of a governess and her passionate love for her Byronic employer, Mr. Rochester, is ranked among the great English novels. Strong, violently emotional, somewhat melodramatic, *Jane Eyre* brilliantly articulates the theme found in all Charlotte's work—the need of women for both love and independence. The undisputed genius of the family was Emily Brontë. An unyielding and enigmatic personality, she produced only one novel and a few poems, yet she is ranked among the giants of English literature. Her masterpiece, *Wuthering Heights* is the wild, passionate story of the intense, almost

demonic, love between Catherine Earnshaw and the gypsy founding Heathcliff. The action of the story is chaotic and unremotely violent, its characters are less people than forces. Indeed, the novel would be extraordinarily difficult to read were it not for the power of Emily Brontë's vision and the beauty and energy of her prose. Some of her powerful lyrics are counted with the best of English poetry. The early (1857) biography of Charlotte by Mrs. Gaskell is still valuable, as are the books on the Brontës by Clement K. Shorter. The poems of Emily have been edited by C. W. Hatfield (1941), the Brontë letters by Muriel Spark (1954). See the reconsideration of Mrs. Gaskell's *Life* by Margaret Lane (1953, repr. 1973), biographies of each of the Brontës by Winifred Gerin Anne (1959), Charlotte (1967), Branwell (1961, repr. 1972), and Emily (1972), biographies of the family by Lawrence and Elizabeth Hanson (4th ed. 1967) and Phyllis Bentley (1947, repr. 1973). See also F. E. Ratchford, *The Brontës' Web of Childhood* (1941, repr. 1964), *Emily Brontë: Her Life and Work*, Part 1 (biographical), by Muriel Spark, Part 2 (critical), by Derek Sanford, *Charlotte Brontë: Style in the Novel*, by Margot Peters (1973), *The Brontës and Their Background*, by Tom Winnifrid (1973).

Brontosaurus (brōntəsōr'əs) [Gr., =thunder lizard], formerly the genus name of a quadruped herbivorous DINOSAUR, probably over 70 ft (21 m) long and over 30 tons in weight, with a long neck and tail and a brain weighing about one pound. The genus name of this semiaquatic group has been officially changed to *Apatosaurus*. The eyes and nostrils of these amphibious dinosaurs were located toward the top of the skull, permitting them to see and breathe with only the top of the head above water. Bones of the brontosaurus and other sauropods have been found in the Morrison formation of the late Jurassic and early Cretaceous strata in Colorado, Wyoming, and other Western states. The brontosaurus is classified in the phylum CHORDATA, subphylum Vertebrata, class Reptilia, order Saurischia.

Bronx, the, borough of New York City, coextensive with Bronx co. (1970 pop. 1,472,216), land area 41 sq mi (106 sq km), SE N.Y., settled 1641 by Jonas Bronck (a Dane acting for the Dutch West India Company), chartered as a part of Greater New York City 1898. The only mainland borough of New York City, it comprises the southern part of a peninsula bordered on the W by the Hudson River, on the SW by the Harlem River (which separates it from Manhattan), on the S by the East River, and on the E by Long Island Sound. To the north is Westchester co., of which the Bronx was a part until its southern portion was annexed by New York City in 1875 and the remainder in 1898. Among the many bridges linking the borough to Manhattan and Queens are the Henry Hudson across Spuyten Duyvil (where the Harlem River joins the Hudson) to Manhattan, the Triborough to Manhattan and Queens, and the Bronx-Whitestone and the Throgs Neck to Queens. It is also connected to Manhattan by subway lines. Although chiefly a crowded, residential borough, some of the more than 80 mi (129 km) of waterfront is given over to shipping, warehouses, factories, and an enormous wholesale produce market. Large areas of the borough are set aside for parks, notably Bronx Park, with the outstanding New York Zoological Park (Bronx Zoo) and the New York Botanical Garden, Van Cortlandt Park, containing the Van Cortlandt House (1748), and Pelham Bay Park, with Orchard Beach on Long Island Sound. Among the institutions of higher learning in the Bronx are Fordham Univ., Manhattan College, Albert Einstein College of Medicine (of Yeshiva Univ.), the New York State Maritime College, Herbert H. Lehman College, and Bronx Community College. Other points of interest are Yankee Stadium and the Edgar Allan Poe cottage (1812) City Island, in Long Island Sound, is a boating center.

Bronx, river, c. 20 mi (30 km) long, issuing from Kensico Reservoir, SE N.Y., and flowing SW through the Bronx into the East River. The Bronx River Parkway, one of the first landscaped superhighways in the New York City area, parallels a portion of the river.

bronze, in art. see BRONZE SCULPTURE

bronze, in metallurgy, alloy of copper, tin, zinc, phosphorus, and sometimes small amounts of other elements. Bronzes are harder than brasses. Most are produced by melting the copper and adding the desired amounts of tin, zinc, and other substances. The properties of the alloy depend on the proportions of its components. Bronzes with different properties have different uses. Aluminum bronze has high strength and resists corrosion, it is used for bearings, valve seats, and machine parts. Lead-

bronze, containing from 10% to 29% lead, is cast into heavy duty bushings and bearings. Silicon bronze is used for telegraph wires and chemical containers. Phosphor bronze is used for springs. Bronze is used for coins, medals, steam fittings, and GUNMETAL and was formerly employed for cannon. Because of its particularly sonorous quality, bell metal, containing from 20% to 24% tin, is used for casting bells. Bronze has long been used in art, e.g., for castings, engravings, and forgings.

Bronze Age, period in the development of technology when metals were first used regularly in the manufacture of tools and weapons. Pure copper and bronze, an alloy of copper and tin, were used indiscriminately at first; this early period is sometimes called the Copper Age. The earliest use of cast metal can be deduced from clay models of weapons. CASTING was certainly established in the Middle East by 3500 B.C. Following the NEOLITHIC PERIOD, the development of a metallurgical industry coincided with the rise of urbanization. The organized operations of mining, smelting, and casting undoubtedly required the specialization of labor and the production of surplus food to support a class of artisans, while the search for raw materials stimulated the exploration and colonization of new territories. This process culminated in the civilizations of MESOPOTAMIA and SUMER. Later, the MINOAN CIVILIZATION and the MYCENAEAN CIVILIZATION opened extensive trade routes in central Europe, where tin and copper were mined. This activity fostered native industries and political unification, especially in Hungary, Austria, and the Alpine region. It laid the foundations of the IRON AGE civilization, which was to follow under Greek, Etruscan, and Scythian influences. In the New World the earliest bronze was cast in Bolivia A.D. c. 1100. The INCA civilization used bronze tools and weapons but never mastered iron. See V. G. Childe, *The Prehistory of European Society* (1958, repr. 1962), J. W. Alsop, *From the Silent Earth* (1964), Grahame Clark, *World Prehistory: An Outline* (2d ed. 1969).

bronze sculpture. Bronze is ideal for casting art works; it flows into all crevices of a mold, thus perfectly reproducing every detail of the most delicately modeled sculpture. It is most susceptible to the graver's tool and admirable for REPOUSSÉ work. Bronze, used in early times for objects later made of other materials, constitutes a record of ancient arts and life. The Egyptians used bronze, cast and hammered, for utensils, armor, and statuary far in advance of the BRONZE AGE in Europe. The Greeks were unexcelled in bronze sculpture. Among the few surviving examples of their work are two masterpieces: *The Zeus of Artemisium* (National Mus., Athens) and *The Delphic Charioteer* (Delphi Mus.). Examples of Etruscan artisans' work include a bronze chariot found at Monteleone (Metropolitan Mus.) and the celebrated Capitoline Wolf (Palazzo dei Conservatori, Rome). The Romans took quantities of bronze statues from Greece and made thousands themselves. They employed bronze for doors and for furniture, utensils, and candelabra, of which some were recovered at Pompeii and Herculaneum. Early medieval bronzes consisted mainly of utensils and domestic and ecclesiastical ornaments. During the Renaissance, Italian sculptors wrought magnificent bronzes of many sorts, outstanding among which are Ghiberti's doors to the baptistry of Florence and the sculptures of Donatello, Verrocchio, Giovanni Bologna, Pollaiuolo, and Cellini. The work of Peter Vischer was influential in Germany. A series of monumental effigies of the monarchs are among the finest English bronzes. France was known in the 18th cent. for gilded bronze furniture mounts. In the Orient bronzes of superb quality have been produced since ancient times. Major modern sculptors who have worked in bronze include Rodin, Epstein, Brancusi, and Lipchitz. The classic description of Renaissance bronze casting is given in Cellini's *Autobiography* (1558-62). See D. G. Mitten and S. F. Doeringer, *Master Bronzes from the Classical World* (1968), George Savage, *A Concise History of Bronzes* (1968).

Bronzino, Il (ēl brōntse'nō), 1503-72, Florentine painter, an important mannerist, whose real name was Agnolo di Cosimo di Mariano Bronzino was a pupil and adopted son of Jacopo da Pontormo. Continuing the tradition of his master, he specialized and excelled in portraiture. He depicted many elegant and celebrated men and women of the time; his portraits included *Cosimo I de' Medici* and his wife *Eleanor of Toledo* (both Uffizi), *Lodovico Capponi* (Frick Coll., New York City), and *Portrait of a Boy* (Metropolitan Mus.). In 1540 he became court

painter to Cosimo I. Bronzino's sophisticated portraits are cold, unemotionally analytical and painted in a superbly controlled technique. The long, chilly faces and postures of his aristocratic subjects express an undisguised arrogance popular in the mannerist period. Bronzino's work had an influence on court portraiture throughout Europe and extended even to Elizabethan England. His *Venus, Cupid, Folly, and Time* (Uffizi) conveys a covert eroticism beneath a moralizing allegory. Of his religious works, *The Descent of Christ into Limbo* (Uffizi) is the most famous. See study by C. H. Smyth (1972).

Brook, Alexander, 1898-, American painter, b. Brooklyn, N.Y. Brook's paintings, which are consistently realistic, include portraits, still-life subjects, landscapes, and figures. His color is subtle and reserved. A deep respect for human personality characterizes much of his work, often with overtones of wry humor or irony. Among his major works are *Amalia* (Toledo Mus. of Art), *Peggy Bacon and Metaphysics* (Univ. of Nebraska), and *The Sentinel* (Whitney Mus., New York City). Brook was married (1920-40) to the artist Peggy BACON and later to the painter Gina Klee.

Brook, Peter, 1925-, English theatrical director. An innovative and controversial figure, Brook mounts energetic productions in which the stage is utilized totally; he often has his actors singing, playing musical instruments, and performing acrobatics. His first production was *Dr. Faustus* in 1943, which was followed by such productions as *The Infernal Machine*, *The Respectful Prostitute*, *The Beggar's Opera*, *Marat/Sade*, *A Midsummer Night's Dream*, and *King Lear*. He has also directed films, such as *Moderato Cantabile* (1960) and *Lord of the Flies* (1963), and operas, including *Faust* and *Eugene Onegin*. See his *The Empty Space* (1969), biography by J. C. Trewin (1971).

Brooke, Alan Francis: see ALAN BROOKE, ALAN FRANCIS BROOKE, 1ST VISCOUNT

Brooke, Sir Charles Anthony Johnson: see BROOKE, SIR JAMES

Brooke, Sir Charles Vyner: see BROOKE, SIR JAMES

Brooke, Edward William, 1919-, U.S. Senator (1967-), b. Washington, D.C. Admitted to the bar in 1948, he served (1963-66) as attorney general of Massachusetts, where he gained a reputation as a vigorous prosecutor of organized crime. Elected (1966) as a Republican to the U.S. Senate, he became the first black Senator since Reconstruction. Brooke served (1967) on the President's Commission on Civil Disorders, which investigated the causes of race riots in American cities, and played (1970) a major role in the successful fight against confirmation of the nomination of G. Harrold Carswell to the U.S. Supreme Court. He is the author of *The Challenge of Change* (1966). See biography by J. H. Cutler (1972).

Brooke, Fulke Greville, 1st Baron, 1554-1628, English author and statesman. A favorite of Queen Elizabeth I, he held many official positions during his lifetime. His *Life of Sir Philip Sidney* (1652) was more a historical and personal commentary than a biography. The bulk of his work (published posthumously) reflects his concern with the degeneration of the monarchy, foreshadowed by the death of Elizabeth. Many young poets of the time were indebted to him for his patronage. See his *Poems and Dramas* ed. by Geoffrey Bullough (1939) and selected writings ed. by Joan Rees (1973), biographies by Joan Rees (1971) and R. A. Rebholz (1971).

Brooke, Henry, c. 1703-1783, Irish author. Educated at Trinity College, Dublin, he studied law in London before returning to Ireland permanently. In 1735 he published his long philosophical poem, *Universal Beauty*. His discursive novel, *The Fool of Quality* (5 vol., 1767-70), which was inspired by the theories of Rousseau, reveals Brooke's acute awareness of the political and social situation of his day.

Brooke, Sir James, 1803-68, rajah of Sarawak on Borneo, b. India, of English parents. After active service in Burma (1825-26), he retired (1830) from the army of the East India Company and, during a voyage to the East Indies, conceived a plan to suppress piracy. He sailed (1838) for Borneo, and on the west coast there he assisted (1840) Muda Hassim, uncle of the reigning sultan, to suppress rebel Dyak tribes. For his services he was made (1841) rajah by the sultan of Brunei and proceeded to create a government and to put down head-hunting and piracy. He revised the tax system and administered justice personally. He was given a baronetcy by the British government and entrusted with the governorship (1847-57) of Labuan. Chinese traders in opium pre-

capitated an uprising (1867), in which Kuching, the capital of Sarawak, was burned. Brooke was engaged sporadically in suppressing many tribal rebellions. He was succeeded by his nephew, Sir Charles Anthony Johnson Brooke, 1829-1917. Sir Charles extended the authority of the government to all parts of the country, and by the abolition of slavery and other reforms he made the country productive and the people prosperous. He was succeeded by his son, Sir Charles Vyner Brooke, 1874-1963. Sir Charles was forced out of Sarawak in 1942 by the Japanese invasion. In spite of the fact that his nephew, Anthony W. D. Brooke, acted as his heir apparent and head of the provisional government during the war, Sir Charles ceded Sarawak to the British government as a crown colony in 1946. See Sir Steven Runciman, *The White Rajahs* (1960), Robert Pringle, *Rajahs and Rebels* (1970), Nicholas Tarling, *Britain, the Brookes and Brunei* (1972).

Brooke, Rupert, 1887-1915, English poet. At the outbreak of World War I he joined the Royal Naval Division, served at Antwerp, and was in the Dardanelles expedition when he died of blood poisoning at the island of Skiros. Handsome and athletic, Brooke was also charming, intellectual, and witty, and was universally sought in society. His early fame and tragic death have made him an almost legendary figure. He wrote two small volumes of poetry, *Poems* (1911) and *1914 and Other Poems* (1915). His verse is exuberant and charming, the romantic patriotism of his war sonnets contrasting sharply with the bitter, disillusioned poetry of Owen and Sassoon. See his letters, ed. by Geoffrey Keynes (1968), biographies by Arthur Stringer (1948, repr. 1972) and Christopher Hassall (1964, repr. 1972), bibliography by Geoffrey Keynes (1954).

Brookeborough, Basil Stanlake Brooke, 1st Viscount, 1888-1973, Northern Irish politician. After serving in the cavalry in World War I he was elected to the Senate of the first Northern Ireland Parliament (1921). He resigned the following year to lead the Ulster special constabulary against the Irish Republican Army's border raids in Fermanagh. Reelected (1929) as a Unionist member of Stormont, he served as minister of agriculture (1933-41), minister of commerce (1941-45), and prime minister (1943-63). A staunch advocate of Protestant dominance in Ulster, he remained opposed to any reconciliation with the Republic of Ireland. Created Viscount Brookeborough in 1952, he continued to sit at Stormont until 1968.

Brook Farm, 1841-47, an experimental farm at West Roxbury, Mass., based on cooperative living. Founded by George Ripley, a Unitarian minister, the farm was initially financed by a joint-stock company with 24 shares of stock at \$500 per share. Each member was to take part in the manual labor in an attempt to make the group self-sufficient. Intellectual life was stimulating, with such members as Nathaniel Hawthorne, John S. Dwight, Charles A. Dana, and Isaac Hecker, and such visitors as Ralph Waldo Emerson, W. H. Channing, Margaret Fuller, Horace Greeley, and Orestes Brownson. Brook Farm was mainly an outgrowth of UNITARIANISM, although most of the members had left that church and were advocates of the literary and philosophical movement known as TRANSCENDENTALISM. Economically, the community's excellent school was the most successful part of the venture (anticipating John Dewey's progressive-education ideas of learning from experience), agriculture showed little profit because of the sandy soil and the inexperience of the farmers. The popularity of the doctrines of Charles FOURIER led, especially through the efforts of Albert Brisbane, to Brook Farm's conversion to a phalanx in 1844. The group, however, did not long survive the financial disaster of the burning (1846) of the uncompleted central building. *The Harbinger* (1845-49), printed at Brook Farm and edited by Ripley, was rather a Fourierist weekly newspaper than the organ of Brook Farm and was continued in New York City with Parke Godwin as editor after 1847. See E. R. Curtis, *A Season in Utopia* (1961, repr. 1971).

Brookfield, 1 Village (1970 pop. 20,284), Cook co., NE Ill., a residential suburb of Chicago, inc. 1893. The noted Chicago Zoological Park (Brookfield Zoo) is there. 2 City (1970 pop. 32,140), Waukesha co., SE Wis., a suburb of Milwaukee, inc. 1954. It has iron foundries and light manufacturing.

Brookhaven, city (1970 pop. 10,700), seat of Lincoln co., SW Miss., inc. 1859. It is situated in a dairy, timber, and farm area, nearby are oil and gas fields. The city's manufactures include textiles, mobile homes, electronic equipment, lawnmowers, and thermometers.

Brookhaven National Laboratory, scientific research center, Upton, Long Island, N.Y. It was founded in 1947 by Associated Universities Inc., which is a management corporation sponsored by nine eastern U.S. universities. This corporation runs the laboratory under a contract with the U.S. Atomic Energy Commission. At Brookhaven an international staff conducts multidisciplinary scientific work, e.g., fundamental studies of atomic nuclei, investigations of the effects and uses of nuclear radiation, and research and development in nuclear technology. Among the laboratory's equipment are a number of highly sophisticated nuclear reactors, particle accelerators, and electronic computers. The facilities also include a medical research center for work in nuclear medicine. Science students are drawn from universities throughout the world to work at the laboratory as part of their training.

Brookings, Robert Somers, 1850-1932, American businessman and philanthropist, b. Cecil co., Md. He earned a fortune in business in St. Louis, Mo., and retired in 1897 to devote himself to philanthropy. As chairman of the corporation of Washington Univ. from 1897 to 1914 he was primarily responsible for the rebuilding of that institution. He founded the Brookings Institution in Washington, D.C. See biography by Hermann Hagedorn (1936).

Brookings, city (1970 pop. 13,717), seat of Brookings co., S.D., on the Big Sioux River, inc. 1883. A trade center in a livestock and grain region, the city is an important seed-processing point. Other industries produce medical and dental equipment, aluminum windows, doors, and awnings, concrete products, and fabricated structural steel. In the city is South Dakota State Univ., whose campus houses an agricultural experiment station. The South Dakota Memorial Art Center is in Brookings.

Brookings Institution, at Washington, D.C., chartered 1927 as a consolidation of the Institute for Government Research (est. 1916), the Institute of Economics (est. 1922), and the Robert S. Brookings Graduate School of Economics and Government (est. 1924). It provides statistics, general information, and personnel for research to the U.S. government. The institution also helps trained scholars to study contemporary economic, governmental, and international problems by financing research projects and publishing their findings.

Brookline (brōōk'lin), town (1970 pop. 58,886), Norfolk co., E. Mass., a residential suburb adjacent to Boston, settled 1630s, set off from Boston and inc. 1705. It was known as "Muddy River" when part of Boston. The birthplace of President John F. Kennedy in Brookline is a national historic site. Other points of interest are Amy Lowell's home and an antique auto museum. Brookline is the site of Hebrew College.

Brooklyn, 1 Uninc. city (1970 pop. 13,896), Anne Arundel co., central Md. 2 Borough of New York City (1970 pop. 2,601,852), 71 sq. mi. (184 sq. km), co-extensive with Kings co., SE N.Y., at the southwestern extremity of Long Island, settled 1636, chartered as a part of Greater New York 1898. Brooklyn is a residential and industrial region, with the largest population of the city's five boroughs, among its manufactures are machinery, textiles, paper products, and chemicals. The borough is the center of an important foreign and domestic commerce and has extensive waterfront facilities. The Brooklyn, Manhattan, and Williamsburg bridges span the East River, connecting Brooklyn with Manhattan, beneath the river are the Brooklyn-Battery Tunnel (for vehicular traffic) and subway tunnels. The Verrazano-Narrows Bridge (completed 1964) connects the borough with Staten Island. Hollanders and Walloons settled about Gowanus and Wallabout bays in 1636 and 1637, about nine years later Dutch farmers established the hamlet of Breuckelen, near the present borough hall. Becoming Brooklyn under the English, it was incorporated as a village (Brooklyn Ferry) in 1816 and was chartered as a city in 1834. As it grew, Brooklyn absorbed many settlements and villages, such as Flatbush, New Utrecht, and Gravesend (all settled in the 17th cent.). Williamsburg was absorbed in 1855, and Brooklyn became the third largest city in the United States. In 1898, when it became a borough of New York City, its population was about one million. Among the numerous educational institutions in the borough are Brooklyn College, Polytechnic Institute of New York, Pratt Institute, St. Joseph's College, Packer Collegiate Institute, and Long Island Univ. The New York Naval Shipyard (popularly known as the Brooklyn Navy Yard) was located on the East River from 1801 until its closing in the late 1960s, at which time the instal-

lation was turned over to private enterprise. Fort Hamilton (built 1831 as a harbor defense) overlooks the Narrows of New York Bay. Near beautiful Prospect Park, the scene of fierce fighting in the Revolution (see LONG ISLAND, BATTLE OF) is the main building of the Brooklyn Public Library. Also in that area are the Brooklyn Museum, with noted collections of Egyptian, Oriental, and primitive art, the Brooklyn Botanic Garden, and the Brooklyn Children's Museum—these, along with the Brooklyn Academy of Music, are under the direction of the Brooklyn Institute of Arts and Sciences. Among the many structures that give the borough its appellation "City of Churches" are the Reformed Protestant Dutch Church of Flatbush (first built 1654, rebuilt 1796), St. Ann's Episcopal Church (est. 1784), and Plymouth Church of the Pilgrims, where Henry Ward Beecher preached. Other points of interest in the borough include CONEY ISLAND, with its beach and amusement park, Sheephead Bay, a fishing and boating center, the invaluable historical library of the Long Island Historical Society, the New York Aquarium (at Coney Island), Brooklyn Heights Historic District, and the Lefferts Homestead (1777). Manne Park and parts of Jamaica Bay are included in Gateway National Recreation Area. The *Daily Eagle*, a noted newspaper published in Brooklyn from 1841 until 1959, had Walt Whitman as one of its editors. See H. C. Syrett, *The City of Brooklyn, 1865-1898* (1944, repr. 1968), R. F. Weld, *Brooklyn is America* (1950, repr. 1967) and *Brooklyn Village, 1816-1834* (1932, repr. 1970), Walt Whitman, *Walt Whitman's New York* (1861, repr. 1972). 3 City (1970 pop. 13,142), Cuyahoga co., NE Ohio, a residential suburb of Cleveland, inc. 1867.

Brooklyn Bridge, vehicular suspension bridge, New York City, southernmost of the bridges across the East River, between lower Manhattan and Brooklyn, built 1869-83. The achievement of J. A. Roebling and his son W. A. Roebling, it has a span of 1,595 ft (486 m). It was the first steel-wire suspension bridge in the world and was the world's longest suspension bridge at the time of its completion. See David McCullough, *The Great Bridge* (1972).

Brooklyn Center, city (1970 pop. 35,173), Hennepin co., SE Minn., a residential suburb of Minneapolis, inc. 1911. It has some light industry.

Brooklyn College of the City University of New York, coeducational, opened 1930 by merging the Brooklyn branches of City and Hunter colleges. The baccalaureate program is tuition-free to New York City residents. See NEW YORK, CITY UNIVERSITY OF.

Brooklyn Institute of Arts and Sciences, cultural institution founded in 1823 as the Brooklyn Apprentices Library Association. The scope was broadened in 1843 and the name changed to The Brooklyn Institute. In 1890 the institution was reorganized and reincorporated under its present name. It includes the Brooklyn Museum (designed by McKim, Mead, and White and begun in 1895), a Children's Museum, the Brooklyn Academy of Music, and a botanical garden, opened in 1911. The Brooklyn Museum is famous for its large collection of Egyptian art and its Egyptological library. Other important features are the collections of primitive arts, Oriental art, American and European costumes, American decorative arts, including 25 completely furnished rooms, a comprehensive collection of American painting and sculpture of the 18th to 20th cent., and the print collection. The Children's Museum, opened in 1899, was the first in the country, it contains natural history and ethnological collections. The Brooklyn Academy of Music, in operation since 1859, presents concerts, plays, ballets, and lectures.

Brooklyn Park, city (1970 pop. 26,230), Hennepin co., SE Minn., a suburb of Minneapolis, chartered as a city 1969. Potatoes are grown and wood products are made in Brooklyn Park. North Hennepin State Junior College is there.

Brook Park, city (1970 pop. 30,774), Cuyahoga co., NE Ohio, a suburb of Cleveland, inc. 1914. The Cleveland municipal airport is there.

Brooks, Gwendolyn, 1917-, American poet, b. Topeka, Kansas. She grew up in the slums of Chicago. Brooks's poems deal with the experience of being black in America. She won the 1950 Pulitzer Prize for poetry for *Annie Allen* (1949), becoming the first black woman to win this award. Her verse was collected in *The World of Gwendolyn Brooks* (1970), which also includes an earlier novelette, *Maud Martha* (1953). The poems in *Riot* (1970) are written in street dialects. See her autobiography (1972).

Brooks, Maria Gowen, 1795?-1845, American poet, b. Medford, Mass. Her first collection of verse, *Jubith, Esther, and Other Poems* (1820), was praised by Southey, who named her "Maria del Occidente."

which she later used as a pseudonym. While living in Cuba she wrote the epic *Zophiel, or, The Bride of Seven* (1833) and *Idomen, or, The Vale of Yumuri* (1843). Her poetry, especially the *Ode to the Departed* (1843), was esteemed both in America and abroad.

Brooks, Phillips, 1835–93, American Episcopal bishop, b. Boston. After rectorships (1859–69) in Philadelphia, he began (1869) his memorable ministry at Trinity Church, Boston, where he became one of the most influential ministers of his time. In 1891 he was consecrated bishop of Massachusetts. His lectures at Yale were published as *Lectures on Preaching* (1877), and his Bohlen lectures in Philadelphia as *The Influence of Jesus* (1879). The Christmas hymn "O Little Town of Bethlehem" was included in his *Christmas Songs and Easter Carols* (1903). See *Life and Letters* (ed. by A. V. Allen, 2 vol., 1900), biographies by William Lawrence (1930) and R. W. Albright (1961).

Brooks, Preston Smith, 1819–57, U.S. Congressman (1852–57), b. Edgefield District, S.C. A lawyer and the nephew of Senator Andrew Pickens Butler, he is remembered as the man who in 1856 caned Charles Sumner after Sumner had bitterly criticized Senator Butler. The slander in Sumner's speech and the brutality in Brooks's action showed how the rift was widening between North and South. Resigning, Brooks was promptly reelected.

Brooks, Van Wyck, 1886–1963, American critic, b. Plainfield, N.J., grad. Harvard, 1908. His first book, *The Wine of the Puritans* (1909), presented the thesis that American culture has been so pervaded by puritanism with its materialistic emphasis that the artistic side of the nation's life has been profoundly neglected. Although this theme was developed in such subsequent books as *America's Coming-of-Age* (1915), *The Ordeal of Mark Twain* (1920), and *The Pilgrimage of Henry James* (1925), later works, including *Emerson and Others* (1927), indicate his growing respect for American literature. In 1937 he won the Pulitzer Prize in history for *The Flowering of New England* (1936). Other volumes followed in the series he called *Makers and Finders*: *New England*, *Indian Summer* (1940), *The World of Washington Irving* (1944), and *The Times of Melville and Whitman* (1947). In this series, his masterwork, Brooks interprets American literary history, it is a vivid, varied chronicle, rich in anecdote and infused with the author's humanism. Among Brooks's innumerable other books are such autobiographical works as *Days of Phoenix* (1957), *From a Writer's Notebook* (1958) and *An Autobiography* (1965). See *The Van Wyck Brooks-Lewis Mumford Letters*, ed. by R. E. Spiller (1970).

Brooks Range, mountain chain, northernmost part of the Rocky Mts., extending about 600 mi (970 km) from east to west across N. Alaska. Mt. Chamberlin 9,020 ft (2,749 m) high, near the Canadian border, is the highest peak. Rugged, barren, snow-covered, and uninhabited, Brooks Range separates the oil-rich Arctic Ocean coastal plain from the Yukon River basin.

broom, common name for plants of two closely related and similar Old World genera, *Cytisus* and *Genista*, of the family Leguminosae (PULSE family). They are mostly twiggily leguminous shrubs with abundant yellow or white (in *Cytisus*, purple also) pea-like blossoms. The common, or Scotch, broom (*Cytisus scoparius*) is naturalized in parts of North America; the tops have been much used as a diuretic. The Canary broom, or so-called genista of florists, is *Cytisus canariensis*, a yellow-flowered evergreen shrub. Species of the genus *Genista* include *Genista tinctoria*, called also dyer's-greenweed, which yields yellow-to-green dyes. Other plants are also called broom. Broom is classified in the division MAGNOLIOPHYTA, class Magnoliopsida, order Rosales, family Leguminosae.

broomcorn: see SORGHUM

broom rape, common name for plants of the Orobanchaceae, the broom rape family. The broom rapes are parasitic on the roots of other plants; they have small leaves and little or no green color. In some species the leaves are absent entirely. Most species are found in dry sandy areas of the Old World. Broom rapes are classified in the division MAGNOLIOPHYTA, class Magnoliopsida, order Scrophulariales.

Brosamer, Hans (häns brō'zämər), c. 1500–1554, German painter and engraver. His work shows the influence of Cranach, Dürer, and Holbein. Recent scholarship has attempted to reattribute a large body of works bearing the signature HB which are

no longer thought to be by Brosamer. Among works accepted as his are many portraits.

Broschi, Carlo: see FARINELLI, CARLO BROSCHI

Brosse, Salomon de (sälōmōn' də brōs), 1571–1626, French architect, trained by his grandfather, Jacques du Cerceau, the elder. Designing in terms of mass, rather than surface decoration, he paved the way for the next generation in the use of classicism as the style which denoted royalty. In Paris his works include the Luxembourg Palace (1615–20) built for Marie de' Medici and the facade of Saint-Gervais (1616). At Rennes he built the Parliament House (1618), now the Palais de Justice. Also attributed to him are the château of Blérancourt and the hunting château erected for Louis XIII at Versailles.

Brotherhood of the New Life: see HARRIS, THOMAS LAKE

Brothers, Richard, 1757–1824, English religious fanatic, b. Newfoundland. A naval officer, he traveled widely and moved to London in 1787. Shortly afterward he proclaimed himself a descendant of David, prince of the Hebrews, and ruler of the world. He gained a small following. After demanding that King George III turn over his crown to him, Brothers was confined as a criminal lunatic. Later moved to a private asylum, he was released in 1806. He wrote *A Revealed Knowledge of the Prophecies and Times* (2 vol., 1794).

Brothers of the Sword: see LIVONIAN BROTHERS OF THE SWORD

Brough, John (brūf), 1811–65, Civil War governor of Ohio (1864–65), b. Marietta, Ohio. In 1844, after publishing newspapers in Marietta and Lancaster, he became owner and editor of the Cincinnati *Enquirer*, which he made one of the leading Democratic organs in the West. Brough served in the state legislature, and as state auditor (1839–45) he thoroughly reorganized Ohio's financial system. Although a Democrat, Brough so vigorously supported the Union during the Civil War that the Republicans nominated him for governor in 1863, and he soundly defeated the Copperhead leader, Clement L. Vallandigham. He was one of the most effective state leaders of the period. See W. B. Hesseltine, *Lincoln and the War Governors* (1948).

Brougham, Henry Peter, 1st Baron Brougham and Vaux (brōm, vōz, vōks), 1778–1868, British statesman, b. Edinburgh. As a young lawyer in Scotland he helped to found (1802) the *Edinburgh Review* and contributed many articles to it. He went to London, was called (1808) to the English bar, and entered (1810) Parliament as a Whig. Brougham took up the fight against the slave trade and opposed the restrictions on trade with the Continent. In 1820 he won popular renown as chief attorney to Queen Caroline (see CAROLINE OF BRUNSWICK), and in the next decade he became a liberal leader in the House of Commons. He not only proposed educational reforms in Parliament, but also was one of the founders of the Society for the Diffusion of Useful Knowledge (1825) and of the Univ. of London (1828). As lord chancellor (1830–34) he effected many legal reforms to speed procedure and established the central criminal court. In later years he spent much of his time in Cannes, which he established as a popular resort. See Arthur Aspinall, *Lord Brougham and the Whig Party* (1927, repr. 1972), biography by F. R. Hawes (1957).

Brown, Heywood Campbell (brōn), 1888–1939, American newspaper columnist and critic, b. Brooklyn, N.Y. He worked on the *New York Tribune* (1912–21) and the *New York World* (1921–28), where his syndicated column, "It Seems to Me," began. In 1928 he transferred it to the Scripps-Howard newspapers, including the *New York World-Telegram*, where it appeared until he moved it to the *New York Post* just before his death. In his column Brown constantly championed the underdog, criticized social injustice, and backed emerging labor unions. A founder of the American Newspaper Guild, he was its first president from 1933 until his death. In 1930, Brown ran unsuccessfully for congress as a Socialist. His books include *The A. E. F.* (1918), *The Boy Grew Older* (1922) and *Gandle Follows His Nose* (1926), novels, and a biography of Anthony Comstock (with Margaret Leech, 1927). *It Seems to Me* (1935) and *Collected Edition* (ed. by H. H. Brown, 1941) give the best of his column.

Broussel, Pierre (pyèr brōsēsē'), c. 1575–1654, councillor of the Parlement of Paris under Louis XIII and Louis XIV. His opposition to the tax program proposed by Cardinal MAZARIN made him popular. The uprising after his arrest in 1648 caused his early release and was the start of the first FRONDE. In July,

1652, the Parisians chose him provost of the merchants, i.e., virtual mayor. He resigned in September in order to facilitate the reconciliation between the rebels and the court, and he died in obscurity.

Brouwer or Brauwer, Adriaen (both adrēän' brōu'wər), c. 1606–1638, Flemish painter who worked in Haarlem. He studied with Hals at the same time as did the young Ostade, and the influence of their two styles, as well as that of Rubens, is apparent in his paintings. Brouwer is noted for his depictions of peasant life, particularly of drinking scenes and humorously treated single figures sleeping or smoking. Brouwer's early canvases were richly colored, in the Flemish style, while his later works (1631–38) were often monochromatic, a characteristic of the contemporary Dutch fashion. His lively canvases were popular in his own time. Brouwer was also an important master of landscape and a superb draftsman. His *Drinkers at a Table* (Brussels) and *The Smokers* (Metropolitan Mus.) are characteristic. See study by G. Knuttel (tr. 1962).

Browder, Earl Russell, 1891–1973, American Communist, b. Wichita, Kansas. He became converted to socialism as a boy, and after imprisonment (1917–18, 1919–20) for opposing the draft he joined the Communist party. Following his return from a trip to China for the party, he was secretary-general of the party (1930–44) and president of the Communist political association (1944–45), which briefly replaced the party. He was the Communist party's candidate for President (1936, 1940) and editor in chief of the *Daily Worker* (1944–45). In 1940 he was convicted of passport fraud, and he was imprisoned in 1941, but he was freed by President Franklin D. Roosevelt in 1942. During World War II he advocated greater cooperation between the Soviet Union and the West. When the war ended, this policy was repudiated by the leaders of the USSR and resulted in his removal from all party offices (1945) and from the party (1946). Among his works are *Communism in the United States* (1935), *What Is Communism?* (1936), *The People's Front* (1938), *War or Peace with Russia?* (1947), and *Marx and America* (1958).

Browere, John Henri Isaac, 1792–1834, American sculptor, b. New York City, studied painting in New York under Archibald Robertson and sculpture in Europe. He is known for his life masks, many of famous Americans, which he produced in hopes of establishing a national gallery of bronze busts. Among his subjects were John Adams, John Quincy Adams, Thomas Jefferson, De Witt Clinton, and James and Dolley Madison (N.Y. State Historical Assoc., Cooperstown). The artistry of Browere's work lies in the choice of expression and the manipulation of facial details and hair, all his portraits are singularly strong in effect. See C. H. Hart, *Browere's Life Masks of Great Americans* (1899).

Brown, Benjamin Gratz, 1826–85, U.S. Senator (1863–67) and governor of Missouri (1871–73), b. Lexington, Ky. An able lawyer in St. Louis, Brown was a leader in the Free-Soil movement in Missouri and later helped form the Republican party there. In the memorable Missouri election of 1870, Brown and his supporters defeated the radical Republicans, and he thus became prominent in the rise of the national LIBERAL REPUBLICAN PARTY. He was the party's candidate for Vice President on the unsuccessful ticket headed by Horace GREELEY in 1872. He later became a Democrat. See biography by Norma L. Peterson (1965).

Brown, Charles Brockden, 1771–1810, American novelist and editor, b. Philadelphia, considered the first professional American novelist. After the publication of *Alcuin A Dialogue* (1798), he wrote such novels as *Edgar Huntly* (1799), *Arthur Mervyn* (2 vol., 1799–1800), and *Ormond* (1799), in which he presented arguments for social reform. *Wieland* (1799) was by far his most popular work and foreshadowed the psychological novel. To support himself after 1800 he became a merchant but also edited successively three periodicals, wrote political pamphlets, and projected a compendium on geography. See critical biographies by L. R. Wiley (1950) and D. L. Clark (1952), study by D. A. Ringe (1966).

Brown, Elmer Ellsworth, 1861–1934, American educator, b. Chautauque co., N.Y., grad. Illinois State Normal Univ., 1881, and studied at the Univ. of Michigan and in Germany. He taught education at the Univ. of Michigan (1891–93) and at the Univ. of California (1893–1906). After directing the reorganization of the Bureau of Education as U.S. commissioner of education (1906–11), he became chancellor of New York Univ., retiring in 1933. He wrote *The Making of Our Middle Schools* (1903) and *A Few Remarks* (1933).

Brown, Ford Madox, 1821-93, English historical painter, b Calais, France. Although closely affiliated with the Pre-Raphaelites in London, he never joined the brotherhood. Examples of his paintings are *Work* (1852-63, Manchester Art Gall), *The Last of England* (1855, Birmingham Gall), and his series of 12 frescoes in the town hall of Manchester, depicting the history of that city. He was the grandfather of Ford Madox Ford.

Brown, George, 1818-80, Canadian statesman and journalist, b Scotland. In 1837 he emigrated to the United States, but after five years in New York City, he settled in Toronto, Ont. There he founded (1844) the *Toronto Globe*, which under his editorship became the most powerful political journal in Upper Canada. He wholeheartedly supported Robert Baldwin and the movement for responsible government. Elected in 1851 as a Reform member of the Canadian legislative assembly, Brown in time became leader of the "Clear Grits" faction, which opposed the influence of the French Canadians in the assembly. He urged the secularization of the Clergy Reserves (lands reserved for the Protestant churches), a national school system, the purchase of the Northwest Territories, and representation by population instead of the equal representation for Quebec and Ontario as established by the Act of Union (1840). Brown played an important role in the movement for confederation. Despite his personal and political hatred for Sir John A. Macdonald, he joined (1864) "the great coalition" ministry and with Macdonald and others went to England in 1865 to urge Canadian confederation. He resigned that year from the government because of his inability to work with Macdonald and left Parliament in 1867. He later (1873) accepted appointment to the Canadian Senate, serving until he was shot to death by an insane employee. See biography by J. M. S. Careless (2 vol., 1959-1963).

Brown, George Alfred, 1914-, British politician. The son of a prominent trade union official, he worked as a salesman (1931-36) and an organizer for the Transport and General Workers Union (1936-42). The union sponsored his parliamentary candidacy for Belper, Derbyshire, which he represented from 1945 to 1970. A member of the right wing of the Labour party and a supporter of Hugh Gaitskell, Brown succeeded (1960) Aneurin Bevan as deputy leader of the party. Harold Wilson defeated him in the 1963 election for Gaitskell's successor as party leader, but Brown remained deputy leader until 1970. In Wilson's Labour government he was secretary of state for economic affairs (1964-66) and foreign secretary (1966-68). He was not reelected in 1970 and was made a life peer taking the title Baron George-Brown. See his memoirs, *In My Way* (1971), biography by W. N. Connor (1964).

Brown, George Douglas: see DOUGLAS, GEORGE

Brown, Helen Gurley, 1922-, American writer and editor, b Green Forest, Ark. The Depression taught her to develop competitive attributes, and she rose from secretarial jobs to advertising copywriter and account executive. In 1962 she published the best-selling *Sex and the Single Girl*—sequel *Sex and the New Single Girl* (1970)—which advised unmarried women on ways to maximize their potential. In 1966 she became editor of *Cosmopolitan*, reviving the faltering magazine by directing it toward single young career women.

Brown, Henry Kirke, 1814-86, American sculptor, b Leyden, Mass. He studied portrait painting with Chester Harding and later turned to sculpture, which he studied in Italy. Returning to America in 1846, he settled in New York City. His early sculptures show the influence of Italian neoclassicism. Several works reflect his interest in American Indians. His finest achievement is the bronze equestrian statue of Washington in Union Square, New York City (1856). Among his later works are four statues in the Capitol, Washington, D.C.

Brown, Jacob Jennings, 1775-1828, American general, b Bucks co., Pa. In the War of 1812 he defeated (May, 1813) a British attempt to take Sacket's Harbor, N.Y., and the next year became commander of the Niagara frontier. Brown crossed the Niagara, took Fort Erie, and drove the British back toward York (now Toronto). On July 25, 1814, he fought the battle of Lundy's Lane, in which he was wounded. From 1821 to 1828 he was general-in-chief of the U.S. army.

Brown, Jimmy, 1936-, American football player, b St. Simon Island, Ga. A high school and college star in all sports, but particularly in football, he joined the Cleveland Browns of the National Football League in 1957. Considered one of the greatest full-

backs in the history of the sport, Brown, who retired from the game in 1965 to pursue a career as a film actor, holds the lifetime records for most touchdowns (126), most yards gained rushing (12,312), and highest rushing average (5.22). He was elected to the Professional Football Hall of Fame in 1971.

Brown, John, 1800-1859, American abolitionist, b Torrington, Conn. He spent his boyhood in Ohio. His life was a succession of business failures, in Ohio, Pennsylvania, Massachusetts, and New York, before he became prominent in the 1850s. An ardent abolitionist (he once kept a station on the UNDERGROUND RAILROAD at Richmond, Pa.), Brown in 1855 settled with five of his sons in Kansas to help win the state for freedom. He became "captain" of the colony on the Osawatimie River. The success of the proslavery forces, particularly their sack of LAWRENCE, aroused Brown, and in order "to cause a restraining fear" he, with four of his sons and two other men, deliberately murdered five proslavery men living on the banks of the Pottawatomie River. In this he asserted he was an instrument in the hand of God. His exploits as a leader of an antislavery band received wide publicity, especially in abolitionist journals, and as Old Brown of Osawatimie he became nationally known. Late in 1857 he began to enlist men for a project that he apparently had had in mind for some time and that took definite form at a convention of his followers held at Chatham, Ont., the next spring. He planned to liberate the slaves through armed intervention by establishing a stronghold in the Southern mountains to which the slaves and free Negroes could flee and from where further insurrections could be stirred up. Early in 1859, Brown rented a farm near Harpers Ferry, Va. (now W. Va.), and there collected his followers and arms. On the night of Oct. 16, with 21 followers, he crossed the Potomac and without much resistance captured the U.S. arsenal at Harpers Ferry, made the inhabitants prisoners, and took general possession of the town. Strangely enough, he then merely settled down, while the aroused local militia blocked his escape. That night a company of U.S. marines, commanded by Col. Robert E. Lee, arrived, and in the morning they assaulted the engine house of the armory into which Brown's force had retired. In the resulting battle, 10 of Brown's men were killed, and Brown himself was wounded. News of the raid aroused wild fears in the South, and to the North it came as a great shock. On Dec. 2, 1859, Brown was hanged at Charles Town. His dignified conduct and the sincerity of his calm defense during the trial won him sympathy in the North and led him to be regarded as a martyr. The standard contemporary account is contained in *The Life, Trial and Execution of Captain John Brown* (1859, repr. 1969). See biographies by O. G. Villard (rev. ed. 1965), S. H. Oakes (1970), and J. Abels (1971), Allan Keller, *Thunder at Harper's Ferry* (1958), J. C. Malin, *John Brown and the Legend of Fifty-Six* (1942, repr. 1970), R. O. Boyer, *The Legend of John Brown* (1973).

Brown, John, 1810-82, Scottish essayist. He was a physician. His writing was collected in *Horae Subsecivae* (3 vol., 1858-82), which included his unique picture of a dog, *Rab and His Friends* (1859), and a memoir of that gifted child known to Walter Scott's circle as "Pet Marjorie," *Marjorie Fleming* (1863). See his letters (ed. by his son and D. W. Forrest, 1907).

Brown, John Carter, 1797-1874, American book collector and philanthropist, b Providence, R.I., son of Nicholas Brown. In about 1840 he began collecting books printed before 1800 relating to America, and the result was a remarkable library of 5,600 volumes. These were catalogued by John Bartlett (4 vol., 1865-71). Several thousand volumes were added to the library before Brown's death. After his son, John N. Brown, died, the library was donated to Brown Univ. (named for Nicholas Brown) with funds and endowment for a special building on the campus to house it. It is known as the John Carter Brown Library.

Brown, Joseph Emerson, 1821-94, U.S. public official, b Pickens District, S.C. As governor of Georgia during the Civil War, Brown quarreled with Jefferson Davis over conscription and the suspension of the writ of habeas corpus despite their common secessionist stand. After the war Brown briefly became a Republican but returned to the Democratic fold, and in 1880 he was appointed to the U.S. Senate seat of John B. Gordon, which he retained until his retirement in 1891. Along with Gordon and Alfred H. Colquitt, Brown controlled Georgia politics for many years. See studies by L. B. Hill (1939, repr. 1972) and D. C. Roberts (1973).

Brown, Moses, 1738-1836, American manufacturer and philanthropist, b Providence, R.I. He was associated with his brothers John, Joseph, and Nicholas in the family's mercantile activities before establishing (1790), with Samuel Slater, the first water-powered cotton mill in the United States. Largely because of Brown's influence, Rhode Island College (later renamed Brown Univ. in honor of his brother Nicholas) was moved in 1770 from Warren to Providence. Brown contributed generously to the college. Moses Brown School in Providence, a leading preparatory institution for boys, was established (1819) by Quakers on land donated by him. See biography by Mack Thompson (1962).

Brown, Nicholas, 1769-1841, American manufacturer and philanthropist, b Providence, R.I., grad Rhode Island College (renamed Brown Univ. in 1804 for him), 1786. He extended the internationally known mercantile business of his father, Nicholas Brown. Later his own firm, Brown and Ives, came to control most of the waterpower on the Blackstone River, where his uncle, Moses Brown, and Samuel Slater had pioneered in the cotton textile industry. He was the treasurer (1796-1825) and, for a long period of time, the benefactor of his alma mater Butler Hospital was founded (1847), in Providence, by his bequest for the care of the mentally ill. See J. B. Hedges, *Browns of Providence Plantations* (2 vol., 1952, repr. 1968).

Brown, Norman O., 1913-, American scholar and social critic, b El Oro, Mexico, grad Oxford, 1936. A classicist influenced by Freud, Brown thinks that the degree to which sexuality has been inhibited in America has led, not only to the stifling of instincts, but also to a perversion of human drives from life and art to money and death. His works include *Life Against Death: The Psychoanalytical Meaning of History* (1959), *Love's Body* (1966), *Hermes the Thief* (1969), and *Closing Time* (1973).

Brown, Olympia, 1835-1926, American Universalist minister and woman-suffrage leader, b Prairie Ronde, Mich., grad Antioch College, 1860, and the theological school of St. Lawrence Univ., 1863. She was one of the first women in America to be ordained (1863) to the ministry. For 30 years she was president of the Wisconsin Woman's Suffrage Association. In 1873 she married Henry Willis, but retained her own name.

Brown, Robert, 1773-1858, Scottish botanist and botanical explorer. In 1801 he went as naturalist on one of Matthew Flinders's expeditions to Australia, returning (1805) to England with valuable collections. In his *Prodromus florae Novae Hollandiae et Insulae Van Diemen* (1810) he described Australian flora. A leading botanist of his day, he served as librarian to the Linnaean Society and to Sir Joseph Banks and later as curator at the British Museum. He observed BROWNIAN MOVEMENT in 1827 and discovered the cell nucleus in 1831. His studies of several plant families and of pollen were also notable.

Brown, Samuel Robbins, 1810-80, American missionary and educator, b East Windsor, Conn. As missionary (1839-47) to China, he took charge of a school founded by the Morrison Educational Association. When he returned (1847) to the United States, three students accompanied him, the first Chinese to come to America to be educated. Brown had an important part in the founding of Elmira College. From 1859 to 1879 he worked as a missionary in Japan.

Brown, Walter Folger, 1869-1961, American cabinet officer, b Massillon, Ohio. A lawyer of Toledo, Ohio, he became prominent in Republican politics and was (1927-29) Assistant Secretary of Commerce. As Postmaster General (1929-33) under President Hoover, Brown secured a reduction of air mail rates and a consolidation of air mail routes—policies that aided the development of commercial aviation.

brown algae: see PHAEOPHYTA

brown coal: see LIGNITE

Brown Deer, village (1970 pop. 12,582), Milwaukee co., SE Wis., on the Milwaukee River, inc. 1955. It is a residential suburb N of Milwaukee. The major industry is the manufacture of meters.

Browne, Charles Farrar: see WARD, ARTEMUS

Browne, Hablot Knight, pseud. **Phiz**, 1815-82, English illustrator. At 21 he was chosen by Charles Dickens to illustrate *Pickwick Papers*. His success was immediate, and in due course he illustrated many of Dickens's novels as well as works of Harrison Ainsworth and Charles Lever. Browne also contributed popular cartoons to *Punch* and painted numerous watercolors and several oils.

Browne, Robert, c. 1550-1633, English clergyman and leader of a group of early separatists popularly

known as Brownists Browne conceived of the church as a self-governing local body of experiential believers in Christ Preaching without a license, Browne attacked the forms of government and the discipline of the Established Church, he gathered a congregation at Norwich c 1580 In 1581 he and his followers sought refuge in Holland There he published (1582) several treatises that are generally regarded as the first expression of the principles of CONGREGATIONALISM Circulation in England of these tracts was punishable by death Upon his return to England in 1584, Browne was imprisoned and later excommunicated But by 1586 he was sufficiently reconciled with the Church of England to be made master of the Stamford grammar school, and in 1591 he submitted to episcopal ordination and became rector of Adchurch, Northamptonshire See biographies by Champlin Burrage (1906) and F J Powicke (1910)

Browne, Sir Thomas, 1605-82, English author and physician, b London, educated at Oxford and abroad, knighted (1671) by Charles II His *Religio Medici*, in which Browne attempted to reconcile science and religion, was written about 1635 After circulating in manuscript, it was first published in a pirated edition (1642), an authorized edition followed (1643) Inspired by the discovery of funeral urns near Norwich, he wrote *Hydriotaphia, Urn Burial* (1658), a solemn reflection on death and immortality, in which he expressed a belief in the futility of things here on earth Published with *Urn Burial* was the more optimistic *The Garden of Cyrus*, a work devoted to the mystic symbolism of the number five Browne's philosophy is now primarily of historical interest It is the quality of his faith and, particularly, his mode of expression that make him one of the outstanding figures in the history of English literature His other notable works are *Pseudodoxia Epidemica* (1646), commonly known as *Vulgar Errors*, and *Christian Morals* (1716) See edition of his works (ed by Geoffrey Keynes, 6 vol., 1928-31), biographies by Edmund Gosse (1905) and J S Finch (1950), studies by W P Dunn (1950), Joan Bennett (1962), and Leonard Nathanson (1967)

Browne, Thomas, d 1825, Loyalist commander in the American Revolution A resident of Augusta, Ga, he was the victim of colonist violence in 1775, when he was tarred and feathered for ridiculing the Continental Congress Later he organized (1778) a Loyalist troop in Florida and raided settlements in S Georgia In 1780 he captured Augusta, in 1781 he was forced to surrender to Andrew Pickens and Henry Lee After his exchange he was a colonel in the Queen's Rangers in South Carolina and was defeated (May, 1782) by Anthony Wayne Browne, who was fiercely hated by the colonists, escaped and lived out his life in the British West Indies

Browne, Thomas Alexander, pseud **Rolf Boldrewood**, 1826-1915, Australian author A squatter, a magistrate, and a commissioner in the gold fields, he wrote many books of life in Australia, such as *Robbery under Arms* (1888) and *Ghost Camp* (1902)

Browne, William (William Browne of Tavistock) (tāv'istōk), 1591?-1645?, English poet An imitator of Spenser, he did his finest work in pastoral poetry, of which *Britannia's Pastorals* (1613, 1616, 1825) and *The Shepherd's Pipe* (with George Wither and others, 1614) are the best examples

Brownell, Herbert, Jr., 1904-, U S Attorney General (1953-57), b Peru, Nebr Admitted to the bar in 1927, he practiced law in New York City and served in the New York state legislature (1933-37) He managed Thomas E Dewey's campaigns for the governorship of New York in 1942 and for the presidency in 1944 and 1948 From 1944 to 1946 he was chairman of the Republican national committee In 1952, Brownell helped bring about the nomination and election of Dwight D Eisenhower as President As Eisenhower's Attorney General, Brownell figured prominently in the administration's controversial loyalty-security program

brown hematite: see LIMONITE

Brownian movement or motion, zigzag, irregular motion exhibited by minute particles of matter when suspended in a fluid The effect has been observed in all types of colloidal suspensions (see COLLOID)—solid-in-liquid, liquid-in-liquid, gas-in-liquid, solid-in-gas, and liquid-in-gas It is named for the botanist Robert Brown who observed (1827) the movement of plant spores floating in water The effect, being independent of all external factors, is ascribed to the thermal motion of the molecules of the fluid These molecules are in constant irregular motion with a velocity proportional to the temperature Small particles of matter suspended in the fluid

are buffeted about by the molecules of the fluid Brownian motion occurs for particles about 0.001 mm in diameter, these are small enough to share in the thermal motion, yet large enough to be seen with a microscope or ultramicroscope The first satisfactory theoretical treatment of Brownian motion was made by Albert Einstein in 1905 Jean Perrin made a quantitative experimental study of the dependence of Brownian motion on temperature and particle size that provided verification for Einstein's mathematical formulation Perrin's work is regarded as one of the most direct verifications of the KINETIC-MOLECULAR THEORY OF GASES

brownie, in Celtic folklore, household spirit associated with farmsteads Brownies help with chores, but, if criticized, they will make mischief, such as spoiling crops If payment other than food is offered a brownie, he vanishes from a farm forever

Browning, Elizabeth Barrett, 1806-61, English poet, b Durham A delicate and precocious child, she spent a great part of her early life in a state of semi-invalidism She read voraciously—philosophy, history, literature—and she wrote verse In 1838 the Barrett family moved to 50 Wimpole St, London Six years later Elizabeth published *Poems*, which brought her immediate fame The volume was a favorite of the poet Robert Browning, and he began to correspond with her The two fell in love, but their courtship was secret because of the opposition of Elizabeth's tyrannical father They married in 1846 and traveled to Italy, where most of their married life was spent and where their one son was born Mrs Browning threw herself into the cause of Italian liberation from Austria "Casa Guidi," their home in Florence, is preserved as a memorial Happiness in her marriage, Mrs Browning recovered her health in Italy, and her work as a poet gained in strength and significance Her greatest poetry, *Sonnets from the Portuguese* (1850), was inspired by her own love story *Casa Guidi Windows* (1851), on Italian liberty, and *Aurora Leigh* (1857), a novel in verse, followed During her lifetime Mrs Browning was considered a better poet than her husband Today her life and personality excite more interest than her work Although as a poet she has been criticized for diffuseness, pedantry, and sentimentality, she reveals in such poems as "The Cry of the Children" and some of the *Sonnets from the Portuguese* a highly individual gift for lyric poetry See *The Letters of Robert Browning and Elizabeth Barrett Browning, 1845-46* (1899, new ed 1930), Rudolph Besier, *The Barretts of Wimpole Street* (1930), the most popular dramatization of the Brownings's love story, biographies by F Winwar (1950), G B Taplin (1957), and Isabel C Clarke (1929, repr 1970), study by Alethea Hayter (1963), bibliography by Warner Barnes (1967)

Browning, Orville Hickman, 1806-81, U S Secretary of the Interior (1866-69), b Harrison co, Ky One of the organizers of the Republican party in Illinois, Browning helped secure his friend Lincoln's nomination (1860) for President, but later, as U S Senator from Illinois (1861-63), he opposed Lincoln on the emancipation question After Lincoln's death Browning supported Andrew Johnson's Reconstruction policy in opposition to the radical Republicans He joined Johnson's cabinet in Sept, 1866, and was one of the President's closest friends and advisers during the impeachment struggle His diary, edited by T C Pease and J G Randall (2 vol., 1927-33), is an important and detailed source for the Lincoln and Johnson administrations See biography by M G Baxter (1957)

Browning, Robert, 1812-89, English poet His remarkably broad and sound education was primarily the work of his artistic and scholarly parents—in particular his father, a London bank clerk of independent means *Pauline*, his first poem, was published anonymously in 1833 In 1834 he visited Italy, which eventually became his second homeland He won some recognition with *Paracelsus* (1835) and *Sordello* (1840) In 1837, urged by William Macready, the Shakespearean actor, Browning began writing for the stage Although not especially successful, he wrote eight verse plays during the next nine years, two of which were produced—*Strafford* in 1837 and *A Blot in the 'Scutcheon* in 1843 The narrative poem *Pippa Passes* appeared in 1841, it and subsequent poems were later published collectively as *Bells and Pomegranates* (1846) Included were "My Last Duchess" and "Soliloquy of the Spanish Cloister," both dramatic monologues, this form proved to be the ideal medium for Browning's poetic genius Other notable poems of this kind are "Fra Lippo Lippi," "Andrea del Sarto," and "The

Bishop Orders His Tomb" In 1846, after a romantic courtship, Browning secretly married the poet Elizabeth Barrett and took her to Italy, where they lived for 15 happy years There he wrote *Christmas Eve and Easter Day* (1850) and *Men and Women* (1855) In 1861, after the death of his wife, he returned to England, where he wrote *Dramatis Personae* (1864) This was followed by what is considered his masterpiece, the murder story *The Ring and the Book* (4 vol., 1868-69) Set in 17th-century Italy, the poem reveals, through a series of dramatic dialogues, how a single event—a murder—is perceived by different people Browning gained recognition slowly, but after the publication of this work he was acclaimed a great poet Societies were instituted for the study of his work in England and America His later works include *Dramatic Idyls* (2 vol., 1879-80) and *Asolando* (1889) Browning's thought is persistently optimistic He believed in commitment to life His psychological portraits in verse, ironic and indirect in presentation, and his experiments in diction and rhythm have made him an important influence on 20th-century poetry He was buried in Westminster Abbey See variously published volumes of his letters, biographies by Maisie Ward (vol 1, 1967, vol II, 1969), Betty Miller (1952, repr 1973), and William Irvine and Park Honan (1974), studies by Robert Langbaum (1963), Philip Drew (1966 and 1970), R E Gridley (1972), and Thomas Blackburn (1967, repr 1973), W C DeVane, *A Browning Handbook* (2d ed 1955)

Brownists: see BROWNE, ROBERT

Brownlow, William Gannaway (broun'lō), 1805-77, U S politician, governor of Tennessee (1865-69), known as the "Fighting Parson," b Wythe co, Va Brownlow won a large following in E Tennessee as an itinerant preacher, editor of the Jonesboro *Whig*, and, after 1849, editor of the influential Knoxville *Whig* Along with Andrew Johnson, whom Brownlow despised, he shared the Unionist leadership in E Tennessee, although he did not oppose slavery In Oct, 1861, his paper was suppressed by the Confederates, and Brownlow was imprisoned until March, 1862 Early in 1865 he became governor of Tennessee and instituted a destructive Reconstruction regime that proclaimed martial law and persecuted Confederate elements in the state He was reelected in 1867 and served as U S Senator from 1869 to 1873 See the narrative of his experiences during the Civil War, *Rise, Progress, and Decline of Secession* (1862), biography by E M Coulter (1937, repr 1971)

Brown-Séguard, Charles Edouard (broun-sākār', -sākwār'), 1817-94, physiologist, b Mauritius, of French and American parents He taught at Harvard (1864-68), practiced medicine in New York City (1873-78), and succeeded (1878) Claude Bernard at the Collège de France He was known for his research on the functions of the sympathetic nervous system and the spinal cord, he also studied the physiological effects of the injection of genital gland extracts and of the application of heat to the cortex His most important work was on internal secretions He is considered a founder of endocrinology, especially organotherapy

Brownson, Orestes Augustus, 1803-76, American author and clergyman, b Stockbridge, Vt Largely self-taught, he became a vigorous and influential writer on social and religious questions He was a Presbyterian, but left that church to become first a Universalist and then a sort of free-lance minister, working for such socialistic schemes as the short-lived Workingmen's party Later he was a Unitarian minister until in 1836 he started his own church, the Society for Christian Union and Progress As founder and editor of the *Boston Quarterly Review* (1838-42) and as editor of the *Democratic Review* (1842-44), he condemned social inequalities At this time he was one of the transcendentalists and was so interested in BROOK FARM as to send his son there He entered the Roman Catholic Church in 1844, and later, as editor of the new *Brownson's Quarterly Review*, he attacked non-Catholic beliefs Among his books are *New Views of Christianity, Society, and the Church* (1836), two autobiographical novels, *Charles Elwood, or, The Infidel Converted* (1840) and *The Convert* (1857), and *The American Republic* (1865) See biography by his son, Henry F Brownson (3 vol., 1898-1900), who also edited his works (20 vol., 1882-87, repr 1966), biographies by Arthur Schlesinger, Jr (1939, repr 1966), Theodore Maynard (1943, repr 1971), and A D Lapati (1965), studies by Lawrence Roemer (1953) and Leonard Gilhooly (1972)

brownstone, red to brown variety of SANDSTONE Its unusual color is caused in some instances by the

presence of red iron oxide which acts as a cement, binding the sand grains together. Vast thicknesses (up to 20,000 ft/6,096 m) of brownstone were deposited in the present-day Connecticut River valley region of Massachusetts and Connecticut and in central New Jersey during the latter part of the TRIASSIC PERIOD. Quarries in these regions were the source for much of the building stone used in the late 19th and early 20th cent. in the construction of the many brownstone houses in New York City. Similar, but more brightly colored, sandstones also were deposited in the Rocky Mt. region during the Triassic period and JURASSIC PERIOD. These deposits are called "redbeds" and make up the colorful landscapes of the Painted Desert of Arizona.

Brownsville, city (1970 pop. 52,522), seat of Cameron co., extreme S Texas, on the Rio Grande c. 17 mi (30 km) from its mouth at the Gulf of Mexico, inc. 1850. It is an important port of entry across the river from Matamoros, Mexico, a deepwater channel (completed 1936) accommodates ocean vessels. Brownsville is a trade, processing, and distributing point for the rich, irrigated lower Rio Grande valley, and has many industries, especially those connected with oil and natural gas. Other products include shrimp, electronic equipment, and aircraft parts. The establishment of Fort Texas there by Gen. Zachary Taylor in 1846 invited a Mexican attack that precipitated the Mexican War. Taylor later fought the battles of Palo Alto and Resaca de la Palma in coming to the fort's relief. The fort was renamed (1846) for Major Jacob Brown, killed while commanding its defense. Active until 1944, Fort Brown was held briefly by Union forces in the Civil War, the last battle of that war was fought 14 mi (23 km) east of the fort at Palmito Hill on May 13, 1865. The town of Brownsville grew around the fort and was a cattle-shipping point in the late 19th cent. In 1906 a group of black soldiers stationed at Fort Brown were blamed for a night gun raid on the town that resulted in the death of an innocent citizen, although interrogations of the soldiers produced no evidence, President Theodore Roosevelt, in a highly controversial directive, ordered the dishonorable discharge of 167 of the black soldiers. In 1972 the Secretary of the Army reversed the order, changing the discharges to honorable. Brownsville has a junior college, an international airport, and a notable zoo. Nearby recreational areas include Padre Island National Seashore.

Brown Swiss cattle, one of the oldest breeds of cattle, originating in Switzerland where the cows were used as triple-purpose animals (dairy, beef, and draft). They are large, fleshy, and slow-maturing, with body color ranging from gray or light brown to dark brown. Introduced in the United States in 1869, they have been used mainly as a dairy breed.

browntail moth, common name for a moth, *Nygmia phaeorrhoea*, of the tussock moth family. It is a serious pest of forest and shade trees, especially oak. It was introduced from Europe about the same time as the related gypsy moth in the late 19th cent. Browntail moth adults are white, with a tuft of brownish hairs at the tip of the abdomen, the abdomen of the male is rust colored. The female, with a wingspread of 1½ in. (3.8 cm) is slightly larger than the male. The dark, red- and white-mottled larvae, or caterpillars, may completely defoliate trees. They have netting hairs that cause a skin rash if touched. Young larvae overwinter in small clumps of leaves fastened together with silk, emerging in early spring. In early summer they pupate in a cocoon in the soil, and the nocturnal adult emerges in about three weeks. An introduced fungus has helped keep this pest in check, and it has not spread in North America beyond New England. However, it is still a serious pest in parts of Eurasia. Good pruning of overwintering leaf nests and spraying are important control measures. The browntail moth is classified in the phylum ARTHROPODA, class Insecta, order Lepidoptera, family Liparidae.

brown thrush: see MIMIC THRUSH

Brown University, at Providence, R.I., for men, chartered 1764 as Rhode Island College at Warren, opened 1765. It moved to Providence in 1770 and was renamed for Nicholas BROWN in 1804. Pembroke College, a separate though affiliated college for women, was established in 1891. The John Carter Brown Library (see BROWN, JOHN CARTER) is especially significant for its early Americana.

Brown vs. Board of Education of Topeka, Kansas, case decided by the U.S. Supreme Court in 1954. Linda Brown was denied admission to her local elementary school in Topeka, Kansas, because she was black. When the case came before the Su-

preme Court, the court, in an opinion by Chief Justice Earl Warren, unanimously overruled the separate but equal doctrine of PLESSY VS. FERGUSON and held that de jure segregation in the public schools was unconstitutional. The court stressed that the badge of inferiority stamped on minority children by segregation hindered their full development no matter how equal the physical facilities. The unequal treatment of children violated the equal protection clause of the Fourteenth Amendment to the U.S. Constitution. After hearing arguments on implementation, the court declared in 1955 that schools must be integrated "with all deliberate speed." Restricted in application to de jure segregation, the decision was applied mainly to Southern systems. After strong resistance, Southern states slowly began integration under Federal court orders and the threat of loss of Federal funds. The decision provided a tremendous impetus to the civil rights movement of the 1950s and 60s and immeasurably hastened the end of segregation in all public facilities and accommodations. In 1973 the doctrine was applied to the school system of Denver, Colo., where segregation had until then been achieved through the gerrymandering of school districts.

Brownwood, city (1970 pop. 17,368), seat of Brown co., central Texas, inc. 1876. It is an industrial community, its products include brick, clothing, glass, furniture, leather products, mobile homes, plastic pipe, food products, beverage cartons, concrete mixers, reflective products, sportswear, cable, and wire. Brownwood processes and ships pecans, peanuts, cattle, wool, poultry, and meat from the surrounding agricultural area. Nearby Lake Brownwood is a large reservoir used for irrigation as well as for fishing and boating. In the city is Howard Payne College. The Douglas MacArthur Academy of Freedom is on its campus.

Bruay-en-Artois (bruā'-aN-artwa'), town (1968 pop. 28,628), Pas-de-Calais dept., NE France, on the Loire River. Primarily a coal-mining center, the town also produces fuels, boilers, clothing, beer, and candy.

Brubeck, Dave, 1920-, American pianist and composer, b. Concord, Calif. Brubeck began studying piano at the age of four and later studied composition with Milhaud and Schoenberg. In 1951 he organized a modern jazz quartet. His music, influenced by modern classical composers, is distinguished by complex harmony and the use of meters not typical in jazz. He has made numerous recordings and foreign tours.

Bruce, Scottish royal family descended from an 11th-century Norman duke, Robert de Brus. He aided William I in his conquest of England (1066) and was given lands in England. His son was granted fiefs in Scotland, and the family therefore rendered homage in both kingdoms. The 5th Robert the Bruce was married to Isobel, second daughter of David, earl of Huntingdon, brother of the Scottish kings Malcolm IV and William the Lion. The son of that marriage, the 6th Robert the Bruce, was a claimant to the Scottish throne after the death of Margaret Maid of Norway in 1290. The crown, however, was awarded by EDWARD I to John de BALIOL, grandson of the eldest daughter of David of Huntingdon. A grandson of this Robert was the famous Robert Bruce or Robert the Bruce who became king of Scotland as ROBERT I. The brother of Robert I, Edward BRUCE, was crowned king of Ireland in 1316. The young son of Robert I succeeded his father as David II and was in turn succeeded by his nephew, ROBERT II, son of Robert I's daughter Marjory and the first king of Scotland of the STUART family.

Bruce, Sir David, 1855-1931, British bacteriologist, b. Melbourne, Australia. He isolated (1887) the bacterium of Malta fever, the disease was renamed brucellosis after him, and the genus of bacteria causing it, *Brucella*. Bruce also discovered the cause and mode of transmission of nagana (a disease of horses and cattle) and (with David N. Nabarro and Sir Aldo Castellani) of African sleeping sickness. He was head of the Royal Society's commission to study sleeping sickness in Uganda (1903, 1908-10) and Malta fever in Malta (1904-6).

Bruce, Edward, d. 1318, Scottish king of Ireland, brother of ROBERT I of Scotland. He aided his brother in the war for independence from England and in 1315 was declared heir to Robert's throne. With Robert's approval he then invaded Ulster, to which he had some hereditary claim. He was crowned king of Ireland in 1316 and found many Irish allies against the Anglo-Irish rulers. However, he failed to consolidate his gains and was killed in battle in 1318.

Bruce, James, 1730-94, Scottish explorer in Africa. He explored Roman ruins in N. Africa (1755) from Tunis to Tripoli and visited Crete, Rhodes, and Asia Minor. In 1768 he traveled down the Red Sea as far as the straits of Bab el Mandeb. From Massawa he struck inland for Gondar, then the capital of Ethiopia. He rediscovered (1770) the source of the Blue Nile, which he followed (1771) to its confluence with the White Nile. He wrote *Travels to Discover the Source of the Nile, 1768-73* (3d ed. 1813). For his travels in Barbary, see R. L. Playfair, *Travels in the Footsteps of Bruce* (1877). See biography by J. M. Reid (1968).

Bruce, James, 8th earl of Elgin: see ELGIN, JAMES BRUCE, 8TH EARL OF

Bruce, Lenny, 1925-66, American comedian, b. Long Island, N.Y., as Leonard Alfred Schneider. Possessed of a cynical, surreal, and intensely comic view of the world, Bruce brutally satirized such sensitive areas of American life as sex, religion, and race relations. His comedy left no group unscathed, and his routines were replete with four-letter words. Consequently Bruce was continually being arrested and tried for obscenity and forbidden to perform. He was also arrested for narcotics violations. In Aug., 1966, he died of an overdose of narcotics at the age of 41. After his death Bruce became a cult figure, considered by many to be a martyr to the cause of free speech. His autobiography, *How to Talk Dirty and Influence People* (1965), sold well, and his nightclub routines were collected and published as *The Essential Lenny Bruce* (1966). *Lenny*, a musical based on his life and including much of his comic material, was a hit on Broadway in 1971. After his cult popularity had diminished, he was still regarded as a seminal figure in American culture, whose influence could be seen in the work of important novelists, playwrights, and filmmakers of the 1970s. See biography by Albert Goldman (with Lawrence Schiller), *Ladies and Gentlemen, Lenny Bruce!* (1974).

Bruce, Stanley Melbourne (mël'børn), 1883-1967, Australian political leader. Educated at Cambridge, he was called to the bar (1906) in England. After service in World War I, he entered the commonwealth legislature in 1918, was treasurer (1921-23) in the cabinet of W. M. Hughes, and served (1923-29) as prime minister. He was notable for promoting the closest relations of Australia with the empire compatible with Australian self-government, and he also advocated international cooperation. Bruce served as Australian delegate to the League of Nations and in 1936 was president of the council. From 1933 to 1945 he was high commissioner for Australia in London. In 1947 he was made Viscount Bruce of Melbourne.

Bruce, Thomas, 7th earl of Elgin: see ELGIN, THOMAS BRUCE, 7TH EARL OF

Bruce, Victor Alexander, 9th earl of Elgin: see under ELGIN, JAMES BRUCE, 8TH EARL OF

Bruce, William Speirs, 1867-1921, Scottish explorer and authority on the polar regions. He first went to the Antarctic as ship's surgeon in 1892 and later did survey work in Franz Josef Land and oceanographic work in the Arctic Ocean. He led (1902-4) the Scottish National Antarctic Expedition in the *Scotia*, performing much valuable scientific research in the Weddell Sea and discovering Coats Land. Bruce established a meteorological station on Laurie Island (in the South Orkney group). He edited the reports of the expedition (6 vol.) and wrote *Polar Exploration* (1911). Bruce made a number of voyages to Spitsbergen and became an authority on the islands. See R. N. Rudmose Brown, *A Naturalist at the Poles* (1923).

brucellosis (brōō'sələ'sis) or **Bang's disease**, in febrile disease of farm animals that is sometimes transmitted to humans. In humans the disease is also known as undulant fever, Mediterranean fever, or Malta fever. In susceptible animals, primarily cattle, swine, and goats, brucellosis causes sterility and death. The symptoms are spontaneous abortion and inability to conceive in females and inflammation of sex organs in male animals. Animal brucellosis is transmitted by contact or by such mechanical vectors as contaminated food, water, and excrement. The disease is caused by three species of *Brucella* bacteria, and the causative organism is present in aborted fetuses and uterine secretions, antibodies to the bacteria are present in the blood or milk, an important diagnostic factor. Measures for prevention and control of brucellosis include vaccination of calves, blood tests of adults, and slaughtering of infected animals. Human brucellosis is an occupational disease among farmers, slaughterhouse work.

ers, and others who come in direct contact with infected animals or their products (raw meat or unpasteurized dairy products). The most prominent symptoms are weakness and intermittent fever. The disease persists for months if left untreated but is seldom fatal in humans. There is no effective vaccine for human brucellosis, and antibiotics are the usual treatment.

Bruce of Melbourne, Stanley Melbourne Bruce, Viscount* see BRUCE, STANLEY MELBOURNE

Bruch, Max (maks brö'kh), 1838-1920, German composer. He conducted the Liverpool Philharmonic Orchestra (1880-83) and taught at the Berlin Hochschule (1892-1910). His Violin Concerto in G Minor (1868) and his variations on the *Kol Nidre* (1881) for cello and orchestra are his best-known compositions.

brucine (bröō'sēn), alkaloid similar to STRYCHNINE. See NUX VOMICA

Bruck an der Mur (bröök än dēr mōōr), city (1971 pop 16,400), in Styria prov., E central Austria, at the confluence of the Mur and the Mürz rivers. Manufactures include metal products and paper. Bruck was founded in 1263 by King Ottocar II of Bohemia. There is a 15th-century Gothic church in the city.

Brücke, Die [Ger., =the bridge], German expressionist art movement, lasting from 1905 to 1913. Influenced by the art of *Jugendstil* (the German equivalent of art nouveau), Van Gogh, and the primitive sculpture of Africa and the South Seas, the *Brücke* group developed an art of fervent emotionalism. Founded in Dresden by Kirchner, Schmidt-Rottluff, and Heckel, the group invited Nolde and Pechstein to join in 1906 and Otto Mueller in 1910. They lived and worked communally, periodically issuing portfolios of their graphic art, which at first bore a rather communal style. By 1911 most of them had gone to Berlin. In their exhibitions they displayed brutally deformed, boldly colored portraits, landscapes, and city themes. Like their French contemporaries developing FAUVISM, the art of the *Brücke* expressionists was intense and violent but more inclined toward primitivistic and demonic qualities, symbolism, and introspection. Their uncomfortable art was essentially a reaction against impressionism and realism but lacked a coherent definition. The members fell out in 1913 over a statement of their aims formulated by Kirchner.

Bruckner, Anton (än'tōn bröök'när), 1824-96, Austrian composer. He taught himself to play the organ, and in 1856 he was appointed organist at the Linz cathedral. He became court organist in Vienna in 1867, and later he taught at the Vienna Conservatory and at the university there. He established a reputation as a virtuoso organist on trips to France in 1869 and to England in 1871, but as a composer he gained recognition slowly. In his composition he was influenced by the chromatic harmony and orchestral grandeur of Wagner's music. At the same time, Bruckner's work is marked by contrapuntal complexity and extended melodies, in the formal tradition of Beethoven and Schubert. His outstanding works are the Masses in D Minor (1864), in E Minor (1866), and F Minor (1867-71), a *Te Deum* (1881-84), and nine symphonies, of which the Fourth or *Romantic* (1874), the Eighth, or *Apocalyptic* (1884-87), and the Ninth (1895-96) are best known. He also wrote motets, cantatas, chamber music, piano and organ pieces, and pieces for male chorus. See studies by H. F. Redlich (1955), Erwin Doernberg (1960, repr 1968), and R. Simpson (Am. ed., 1968).

Brudenell, James Thomas* see CARDIGAN, JAMES THOMAS BRUDENELL, 7TH EARL OF

Bruegel, Brueghel, or Breughel (all brö'gäl), outstanding family of Flemish genre and landscape painters. The foremost, Pieter Bruegel, the Elder, c 1525-1569, called Peasant Bruegel, studied in Antwerp with his future father-in-law, Pieter Coecke van Aelst, but was influenced primarily by Bosch. In 1551 he became a member of the Antwerp Guild. Bruegel visited Italy in the early 1550s. However, he remained close to the Flemish tradition and employed his native powers of minute observation in depicting the whole living world of field and forest and of sturdy peasants at work and play. He was, himself, a learned city-dweller and friend of humanists. His paintings of genre subjects have allegorical or moralizing significance. In his tremendous range of invention, Bruegel approached Bosch in creating nightmarish fantasies in such works as *The Fall of the Rebel Angels* (Brussels). He also painted cheerful, acutely perceived scenes of daily life, e.g., *Peasant Wedding* (Vienna), for which he is best known. *The Fall of Icarus* (versions in Brussels and New

York) is his only mythological subject. He painted religious histories—*Numbering at Bethlehem* (Brussels), *Way to Calvary* (Vienna), with figures clothed in contemporary Flemish dress, parables—*The Sower* (Antwerp), *The Blind Leading the Blind* (Naples), genre scenes—*Children's Games*, *Peasant Dance* (both Vienna), and landscapes showing the activities of the months—(several in Vienna, *Harvesters in the Metropolitan Mus*), and other works. A skilled draftsman and etcher, Bruegel uses a delicate line to define his figures. His people are stubby in proportion, but lively and solid. His color is remarkably sensitive, as is his feeling for landscape. His compositions are often based on diagonal lines, creating gentle rhythms and allowing planes of landscape to unfold into the distance. See studies by Ludwig Münz (1961), Wolfgang Stechow (1971), and Fritz Grossmann (3d ed 1973). His son, Pieter Bruegel, the Younger, 1564-1637, often copied his father's works. Two of his paintings are in the Metropolitan Museum. His brother, Jan Bruegel, 1568-1625, called Velvet Bruegel, specialized in still life, rendered with extreme smoothness and finesse. He was a friend of Rubens, and occasionally supplied floral ornament for works from Rubens's shop. He was also adept at landscape. Representative works are in Brussels and Berlin.

Bruges (brööz, fr brüz), Flemish *Brugge*, city (1970 pop 51,300), capital of West Flanders prov., NW Belgium, connected by canal with Zeebrugge (on the North Sea), its outer port. It is a commercial, industrial, and tourist center and a rail junction. Manufactures include lace, textiles, ships, railroad cars, communications equipment, chemicals, and processed food. Bruges was founded on an inlet of the North Sea in the 9th cent. and became (11th cent.) a center of trade with England. In the 13th cent. it flourished as the major entrepôt port of the HANSEATIC LEAGUE and as one of the chief wool-processing centers of Flanders. New ports (notably SLUIS) were founded to help accommodate its increasing trade. At its zenith (14th cent.), Bruges was one of the great commercial hubs of Europe. An early COMMUNE of the Low Countries, the city held extensive political privileges and often played a part in the chronic struggle between England, France, and the counts of Flanders. Its government, at first in patrician hands, gradually passed to the trade guilds of the wool industry. When Philip IV of France annexed Flanders in 1301, Bruges led the rebellion against him. The French garrison was massacred (1302), and shortly afterward the citizen-army of Bruges was led to victory in the BATTLE OF THE SPURS. Despite frequent political disturbances, Bruges continued to prosper until the Flemish wool industry declined (early 15th cent.) as a result of foreign competition. In addition, the North Sea inlet on which Bruges was located silted up completely by 1490, and the city lost its access to the sea and to its outer ports. By c 1500, Antwerp had replaced Bruges as the major entrepôt of N Europe. The commercial and industrial revival of Bruges began only in 1895, with the start of extensive repairs to its port, in 1907 the Zeebrugge canal was opened. The city was occupied by the Germans in World Wars I and II. Bruges was the cradle of FLEMISH ART during the rule (14th-15th cent.) of the Burgundian dukes in Flanders. Jan van Eyck, Gerard David, and many other masters are richly represented in the churches, public buildings, and museums of the city. Among its noted structures are the Hospital of St. John (12th cent.), containing several masterpieces by Hans Memling, the 13th-century market hall or cloth-workers hall, with its famous carillon, the city hall (14th cent.), the Church of Notre Dame (13th-15th cent.), with the tombs of Charles the Bold and Mary of Burgundy and with Michelangelo's *Virgin*, the Cathedral of Saint-Sauveur (begun 10th cent.), and the Chapel of the Precious Blood (begun 12th cent.), a major place of pilgrimage.

Brugmann, Karl (kär'l bröök'män), 1849-1919, German philologist. A professor at Leipzig, Brugmann believed that scientific rules of linguistics do not admit of exceptions. With the help of others, notably Hermann Osthoff, Wilhelm Scherer, and Berthold Delbrück, he did much work in Indo-European linguistics and issued a large comparative grammar of Indo-European languages that is still a standard reference.

Brühl, Heinrich, Graf von (hän'rikh gräf' fən brul), 1700-1763, Saxon statesman. He was adviser to Augustus II, king of Poland and elector of Saxony, and gained control of both governments after the accession (1733) of AUGUSTUS III. Brühl advanced the economic and cultural development of Saxony but did

not succeed in making the Polish crown hereditary with the Saxon rulers. An able diplomat, he neglected Saxon military potential and sought powerful allies. When King Frederick II of Prussia made (1756) a surprise attack on Saxony, initiating the SEVEN YEARS WAR in Europe, Brühl fled with his king to Poland. There he remained throughout the war, while Frederick exploited Saxony. Charges that Brühl amassed his fortune through fraud have not been proved.

Bruhn, Erik (ēr'ik bröön), 1929-, Danish ballet dancer, b. Copenhagen. Bruhn joined the Royal Danish Ballet in 1947 and became a soloist there in 1949. He is widely regarded as one of the world's foremost dancers, combining dramatic flair with a subtle precision of style. Best-known for his roles in *La Sylphide*, *Giselle*, and *Swan Lake*, he has appeared throughout the world as guest artist and director with many companies, including the American Ballet Theatre.

Brulé, Étienne (ätyēn' brülä'), c 1592-1632, French explorer in North America. He arrived (1608) in the New World with Samuel de Champlain, who sent him (1610) into the wilderness to learn about the Indians and the land. He lived with the Huron Indians and accompanied (c 1612) a group of them to Georgian Bay of Lake Huron. In 1612 he guided Champlain to that lake, and on the return journey they were, so far as is known, the first white men to see Lake Ontario. Brulé was then sent to the headwaters of the Susquehanna River and followed it to Chesapeake Bay. On his way back he was captured by the Iroquois and tortured, but he escaped (1618). He lived with the Huron once again, making many explorations of which no definite record remains. He probably visited Lake Superior and thus saw all the Great Lakes except Lake Michigan, being the first white man to do so. In 1629 he piloted the English vessels that captured Quebec and his old commander, Champlain. Then he retired to live an increasingly dissolute life among the Huron. He was killed in an Indian quarrel, and his remains were eaten. See C. W. Butterfield, *History of Brulé's Discoveries and Explorations, 1610-1626* (1898).

Brumaire (brümär'), second month of the FRENCH REVOLUTIONARY CALENDAR. The coup d'état of 18 (actually 18-19) Brumaire (Nov. 9-10, 1799), engineered chiefly by Sieyès, overthrew the DIRECTORY and established the CONSULATE under Napoleon. It nearly failed because of Napoleon's inept conduct at the Council of Five Hundred, but the situation was saved by his brother Lucien BONAPARTE.

Brummell, Beau (George Bryan Brummell) (brüm'-əl), 1778-1840, English dandy and wit. Brummell was greatly admired for his fastidious appearance and confident manner. He was an intimate of the prince regent (later George IV), and as such influenced men of society to wear dark, simply cut clothes and elaborate neckwear. He is also credited with having set the fashion for trousers rather than breeches. Having quarreled with the prince, and deeply in debt from gambling, Brummell fled to France, where, ironically, he lived for 14 years in poverty and squalor. He died insane in a hospital at Caen. See biographies by C. M. Franzero (1958) and Samuel Tenenbaum (1967).

Brunanburh, battle of (bröō'nənbürg), A.D. 937, a victory won by ÆTHELSTAN, king of the English, over a coalition of Irish, Scots, and Britons (or Welsh) of Strathclyde. The site of the battle is not known. The battle is celebrated in a poem in the *Anglo-Saxon Chronicle*. See translation by Dorothy Whitelock and others (1962).

Brundisium: see BRINDISI, Italy

Brunehaut* see BRUNHILDA

Brunei (bröōnī'), sultanate (1971 pop 135,665), 2,226 sq mi (5,765 sq km), NW Borneo, on the South China Sea, a British protectorate since 1888. Its two sections are surrounded by SARAWAK, Malaysia. Oil is Brunei's main export. Rubber is also produced, and cassava, pineapples, bananas, rice, and other crops are raised. A majority of the population are Malays, but the small Chinese community (c 35,000) dominates the economy. Islam is the predominant religion. A native sultanate was established on Brunei in the 15th cent. At one time the sultan controlled nearly all of Borneo, but by the 19th cent. his power had declined and Brunei had become a haven for pirates. In 1888 the British established a protectorate over Brunei, administered by a British resident, although the sultan retained formal authority. The Japanese overran the area during World War II. In 1959 a written constitution went into effect. Under it, as amended in 1965, the sultanate remains and

the protectorate is governed by a chief minister, council of ministers, and elected legislative council. There was a leftist revolt in 1962. The Federation of Malaysia was planned to include Brunei, but at the last moment the sultan refused to join. The capital and major port of Brunei is Bandar Seri Begawan (formerly Brunei, 1971 pop. 36,574).

Brunel, Sir Marc Isambard (brōōnēl'), 1769-1849, British engineer and inventor. Born in France, he came to the United States in 1793 as a royalist refugee. He became chief engineer of New York City, and his projects included building the old Bowery theater (burned in 1821) and constructing a canal between Lake Champlain and the Hudson. In 1799 he went to England, where he patented machinery for making ships' blocks and later invented many other mechanical labor-saving devices. In 1825, Brunel began the construction of the Thames Tunnel (the first in which a shield was used, see TUNNEL). In 1841 he was knighted. See biography by Paul Clements (1970), study by Peter Hay (1973). In the work on the tunnel Sir Marc was assisted by his son, Isambard Kingdom Brunel, 1806-59, British civil engineer and an authority on railway traction and steam navigation. He was engineer of the Great Western Railway, building bridges and docks. Later he constructed railways in Italy and was a consulting engineer in Australia and India. He is best known, however, for his designing and construction of the three ocean steamships the *Great Western* (1838), which was the first transatlantic steam vessel, the *Great Britain* (1845), the first ocean screw steamship, and the *Great Eastern* (1858), the largest steam vessel of its time. See biographies by his son, Isambard Brunel (1870, repr. 1972), and L. T. Rolt (1959), Celia Brunel Noble, *The Brunels: Father and Son* (1938).

Brunelleschi, Filippo (fēlēp'pō brōōnēl-lēs'kē), 1377-1446, first great architect of the Italian Renaissance, a Florentine by birth. Trained as sculptor and goldsmith, he designed a trial panel, *The Sacrifice of Isaac* (1401, Bargello, Florence) for the bronze doors of the Florence baptistery. The commission, however, was won by Lorenzo Ghiberti. Thereafter, Brunelleschi became more interested in architectural planning. He made several trips to Rome, where he devoted himself to the study of classical buildings. About 1420 he drew two panels in perspective (now lost) that had important consequences for both architectural and art theory. The Church of San Lorenzo, Florence, reveals his systematic use of perspective in the careful proportioning of the interior structure and in the articulation of spatial volumes. In the Ospedale degli Innocenti (founding hospital, 1419-45), Brunelleschi introduced a motif that was widely imitated during the Renaissance—a series of arches supported on columns. In 1420 he began to build the dome for the cathedral in Florence. This octagonal ribbed dome is one of the most celebrated and original domical constructions in architectural history. Brunelleschi's other works include the churches of Santa Maria degli Angeli and Santo Spirito and the Pazzi Chapel, all in Florence. His designs exhibit beauty of detail and elegance, as well as mastery of construction. See studies by A. Man-tonio (1970), F. D. Prager (1970), and Isabelle Hyman, ed. (1973).

Brunetière, Ferdinand (fērdēna' brunatyēr'), 1849-1906, French literary critic. An opponent of naturalism, he believed that literature should reflect a moral order. His vast learning is evident in the masterly *Manuel de l'histoire de la littérature française* (1897) and in the history of French literature from 1515, most of which was published (1904-17) posthumously from his notes. See study by Elton Hocking (1936).

Brunhild (brōōn'hīld), **Brunnehilde** (brun'ähild'a), or **Brynhild** (brīn'hīld), mighty female warrior of Germanic mythology and literature. In the Nibelungenlied, a medieval German epic poem (see under NIBELUNGEN), she is the warlike queen of Iceland, whom Siegfried defeats in combat and wins for his brother-in-law, Gunther. Hating Siegfried, Brunhild contrives his death at the hands of Gunther's henchman, Hagen. In the Icelandic version of the story, the VOLUNCASAGA, as Brynhild, she is the chief of the Valkyries. Sigurd (Siegfried) saves her from an enchanted stronghold, and the two fall in love. Later, Gudrun makes him forget Brynhild by means of a magic potion and takes him as her husband. Sigurd then wins Brynhild for Gunnar (Gunther). After bringing about Sigurd's death, Brynhild destroys herself on his funeral pyre. Wagner in his opera cycle *The Ring of the Nibelungs*, in which she is Brünnehilde, makes her a Valkyrie who defies her father, the god Wotan (see WODEN), to help the lov-

ers Siegmund and Sieglinde. Wotan places her sleeping on a mountaintop surrounded by fire, from which she is rescued by Siegfried. He is made by magic to forget her, and for his unfaithfulness she brings about his death, her own death on his pyre, and the burning of Valhalla.

Brunhilda (branhīld'a) or **Brunehaut** (brun'ō'), d. 613, Frankish queen, wife of SIGEBERT I of the East Frankish kingdom of Austrasia, daughter of Athanagild, the Visigothic king of Spain. After the murder (567) of her sister Galswintha, who was the wife of Sigebert's brother Chilperic I of the West Frankish kingdom of Neustria, and Chilperic's marriage to his mistress FREDEGUNDE, Brunhilda was the major instigator in the war against Neustria. The struggle continued between Brunhilda and Fredegunde after the death (575) of Sigebert and the murder (584) of Chilperic. Throughout the reigns of her son, Childbert II, and of two grandsons, Brunhilda was the actual ruler of Austrasia and of Burgundy, when by her design that country was united with Austrasia after the death (592) of King GUNTAM. She was endowed with the gifts of a great statesman, but her unscrupulousness in the execution of her plans earned her the fierce hatred of the nobles, whom she nonetheless controlled. She was finally betrayed by them to Fredegunde's son, CLOTAIRE II of Neustria. He put her to a horrible death.

Brunig Pass (bru'nīkh), 3,396 ft (1,035 m) high, ancient route between the Forest Cantons and the Bernese Alps, central Switzerland. It is crossed by a highway and a railroad.

Bruning, Heinrich (hīn'rīkh brun'īng), 1885-1970, German chancellor. Elected to the Reichstag in 1924, he was a leader of the Catholic Center party and a fiscal expert. In 1930 he was appointed chancellor of the Reich to put German finances in order. The Reichstag, which failed to support him, was dissolved (1930), and new elections were ordered. The new Reichstag was equally unable to produce a working majority, but Bruning continued to govern by decree. His drastic deflationary measures were very unpopular. In foreign policy he attempted to gain equality for Germany among the great powers and to persuade the former Allied powers to rescind German arms limitation. Bruning was forced to resign in 1932 by President Hindenburg, who appointed Franz von Papen as the new chancellor. Bruning left Germany in 1934 and from 1937 to 1952 was a member of the faculty at Harvard. In 1951 he resumed residence in Germany and became a professor of political science at the Univ. of Cologne. From 1955 until his death he was professor emeritus there.

Brunn: see BRNO, Czechoslovakia

Brunnehilde: see BRUNHILD

Brunner, Emil (āmēl brōōn'ēr), 1889-1966, Swiss Protestant theologian. The clearest and most systematic thinker of the school of dialectical theology, he was a professor of theology at the Univ. of Zürich (1924-53) and Christian Univ., Tokyo (1953-55). He several times visited and lectured in the United States. Like Karl BARTH he challenged the leaders of modern rational and liberal Christian theology and proclaimed a theology of revelation. The Christian faith, he maintained, arises from the encounter between man and God as He is revealed in the Bible. Brunner, in attempting later to leave a place for natural theology in his system, came into conflict with Barth over the question of natural revelation—Brunner refusing to separate theology completely from the general consciousness of man. His more important works include *Die Mystik und das Wort* (1924), *Der Mittler* (1927, tr. *The Mediator*, 1934), *Das Gebot und die Ordnungen* (1932, tr. *The Divine Imperative*, 1937), *Der Mensch in Widerspruch* (1937, tr. *Man in Revolt*, 1939), *Wahrheit als Begegnung* (1938, tr. *The Divine-Human Encounter*, 1943), and *Christianity and Civilization* (2 vol., 1948-49). See studies by P. K. Jewett (1954) and C. W. Kegley, ed. (1962), Cornelius Van Til, *The New Modernism* (1946).

Brunnich's murre: see MURRE

Bruno, Saint, 925-965, German churchman and statesman, brother and chief adviser of the first Holy Roman emperor, Otto I, whose chancellor he was from c.950. He was made (953) archbishop of Cologne and in the same year became duke of LOTHARINGIA. He organized the civil service, led the revival of learning, and reformed the monasteries according to the pattern laid down by the Cluniac reform. He is also known as St. Bruno the Great. Feast: Oct. 11.

Bruno, Saint, c.1030-1101, German monk, founder of the CARTHUSIANS, b. Cologne. He studied and

taught at Rheims. In 1084 he took six companions and founded a little monastery in the Alps, which became the mother house of the Carthusian order (see CHARTREUSE, GRANDE). In 1090, Pope Urban II, whom Bruno had taught, called him to Rome as a counselor. He died in Italy in retirement at a monastery he had founded. Feast: Oct. 6.

Bruno, Giordano (jōrda'nō brōō'nō), 1548-1600, Italian philosopher, b. Nola. He entered the Dominican order early in his youth but was accused of heresy and fled (c.1576) to take up a career of study and travel. He taught briefly at Toulouse, Paris, Oxford, and Wittenberg, but, personally restless and in constant opposition to the traditional schools, he found no permanent post. His major metaphysical works, *De la causa, principio, et uno* (1584, tr. *The Infinite in Giordano Bruno*, 1950) and *De l'infinito, universo et mondi* (1584), were published in France. Further works appeared in England and Germany. Bruno also wrote satire and poetry. In 1591 he returned to Venice, where he was tried for heresy by the Inquisition. After imprisonment at Rome, he was burned to death. Bruno challenged all dogmatism, including that of the Copernican cosmology, the main tenets of which, however, he upheld. He believed that our perception of the world is relative to the position in space and time from which we view it and that there are as many possible modes of viewing the world as there are possible positions. Therefore we cannot postulate absolute truth or any limit to the progress of knowledge. He pictured the world as composed of individual elements of being, governed by fixed laws of relationship. These elements, called monads, were ultimate and irreducible and were based on a pantheistic infinite principle, or cause, or Deity, manifest in us and in all the world. He was the first to state what has now become the cosmic theory. Bruno's influence on later philosophy, especially that of Spinoza and Leibniz, was profound. See D. W. Singer, *Giordano Bruno: His Life and Thought*, with annotated trans. of his "On the Infinite Universe and Worlds" (1950, repr. 1968), I. L. Horowitz, *The Renaissance Philosophy of Giordano Bruno* (1952), Ksenija Atanasijevic, *The Metaphysical and Geometrical Doctrine of Bruno* (tr. 1972), P. H. Michel, *The Cosmology of Giordano Bruno* (tr. 1973).

Bruno of Querfurt: see BONIFACE, SAINT (d. 1009)

Bruno the Great, Saint: see BRUNO, SAINT (d. 965)

Brunschvicg, Léon (lāōn' brun'shvēk'), 1869-1944, French philosopher, b. Paris. From 1909 until his death he taught at the Sorbonne. Brunschvicg's philosophy, which has had considerable influence on modern European thought, is usually called critical idealism. He extended the teachings of Kant and Hegel and also drew upon Plato, Descartes, Spinoza, and Pascal. He regarded mathematics as the highest level yet reached by human thought, and maintained that judgment preceded all other activities of the mind. For Brunschvicg, God was whatever enables us to live the life of the spirit. His principal works are *La Modalité du jugement* (1897), *Les Étapes de la philosophie mathématique* (1912), *Le Progres de la conscience dans la philosophie occidentale* (2 vol., 1927), and *La Raison et la religion* (1939).

Brunswick, dukes of: see CHARLES WILLIAM FERDINAND, FERDINAND, FREDERICK WILLIAM

Brunswick, Ger. Braunschweig, former state, E. West Germany—W. East Germany, surrounded by the former Prussian provinces of Saxony, Hanover, and Westphalia. In 1946 it was included (except for several small territories placed in East Germany) in the West German state of Lower Saxony. Braunschweig (the former capital), Goslar, Helmstedt, and Wolfenbützel were the chief towns. The region of Braunschweig is situated on the North German plain and in the northern foothills of the Harz mts. The land is drained by the Leine and Oker rivers. The duchy of Braunschweig emerged (13th cent.) from the remnants of the domains of Henry the Lion, the duke of Saxony, to whom Emperor Frederick I had left only the territories of Braunschweig and Lüneburg (roughly modern Braunschweig and Hanover). The Guelphic house repeatedly divided into several branches, the main ones being Braunschweig-Wolfenbützel and Braunschweig-Lüneburg. In 1692 the duke of Braunschweig-Lüneburg became elector of Hanover. The Braunschweig-Wolfenbützel line (itself a cadet branch of the Lüneburg line since 1634) ruled over Braunschweig and had, among its dukes, the famous generals Charles William Ferdinand (1735-1806) and Frederick William (1771-1815). Frederick William recovered (1813) the duchy, which Napoleon I had incorporated (1807) in the

kingdom of Westphalia. The line became extinct in 1884, and Braunschweig was ruled by regents until 1913, when Ernest Augustus of Cumberland, grandson of King George V of Hanover, was made duke. A member of the North German Confederation from 1866 and of the German Empire from 1871, Braunschweig became a republic in 1918 and then joined the Weimar Republic.

Brunswick or Braunschweig (broun'shvik), city (1970 pop 223,700), Lower Saxony, E West Germany, on the Oker River. It is an industrial and commercial center, its manufactures include pianos, optical equipment, food products, and printed materials. Motor vehicles are assembled there. Reputedly founded c861 and chartered in the 12th cent., Braunschweig became (13th cent.) a prominent member of the Hanseatic League. In 1753 the residence of the dukes of Braunschweig was shifted there from Wolfenbüttel. In 1830 the duke was deposed and the city became a self-governing municipality. The city has a 12th-century Romanesque cathedral, which contains the tombs of Henry the Lion (d 1195) and Emperor Otto IV (d 1218), several Gothic churches, and a famous fountain representing Till Eulenspiegel, the legendary prankster. The city is the site of a technical university and an art museum. The philosopher and dramatist Gotthold Lessing (1729-81) is buried in Brunswick.

Brunswick, 1 City (1970 pop 19,585), seat of Glynn co., SE Ga., on St. Simon's Sound near the Atlantic coast, laid out 1771-72, inc 1856. It is a port of entry, and its sheltered harbor is used by coastal freighters and fishing and shrimp fleets. The gateway to offshore resort islands (see SEA ISLANDS), Brunswick has a large seafood-processing industry and a great variety of manufactures, based principally upon forest products (e.g., naval stores, turpentine, pine oil, pulp, paper, lumber). The city was named for George III of the house of Brunswick (Hanover). It has a junior college, and a large U.S. naval training station for radar operators is nearby. 2 Town (1970 pop 16,195), Cumberland co., S Maine, on the Androscoggin River and Casco Bay, in a resort area, settled as a trading post in 1628, inc 1738. It is a growing commercial center for S Maine, with plants that make footwear, clothing, and paint brushes. Bowdoin College (1794) and a U.S. naval air station are in Brunswick. Nathaniel Hawthorne and Henry Wadsworth Longfellow were students at Bowdoin College during the 1820s, and Longfellow later taught there. A house dating from 1808 was once his home. Hawthorne's first novel, *Fanshawe* (1828) was printed in the town. In 1851, Harriet Beecher Stowe, then a Bowdoin faculty wife, wrote *Uncle Tom's Cabin* there; her house is a national landmark. In the first half of the 19th cent. Brunswick enjoyed prosperity based on shipbuilding. After the Civil War, textiles became the chief industry. The town's textile mill closed in 1955. 3 City (1970 pop 15,852), Medina co., N Ohio, a suburb of Cleveland, settled 1815 as part of the Connecticut Western Reserve, inc 1960. A small farm community for many years, its population burgeoned with the housing boom after World War II. It has a tire retread plant and a factory that makes powdered metals for roof coatings.

Brusa, Turkey see BURSA

Brush, George de Forest, 1855-1941, American painter, b. Shelbyville, Tenn., studied in New York City at the National Academy of Design and with Gérôme in Paris. His early, scrupulously realistic paintings of Indians gave way, in later work, to Italianate figure compositions. Examples of his work are *Mother and Child* (Mus. of Fine Arts, Boston) and *Mother and Child* (Corcoran Gall.).

brush turkey: see MEGAPODE

brush wolf: see COYOTE

Brusilov, Aleksey Alekseyevich (alyk'syā'alyk'syā'evich brōōsē'laif), 1853-1926, Russian general. As a commander in World War I, he won victories in Galicia. In 1916 he organized the Russian offensive against Austria, which relieved the pressure on the Allies. The offensive, successful at first, cost Russia at least a million lives. Brusilov was briefly commander in chief under the Kerensky provisional government set up after the Russian Revolution (1917), and in 1920 he joined the Soviet army's staff in directing the war against Poland.

Brussels (brū'salz), Fr. *Bruxelles*, Flemish *Brussel*, city (1970 pop 161,080), capital of Belgium and of Brabant prov., central Belgium, on the Senne River and at the junction of the Charleroi-Brussels and Willebroek canals. The city is officially bilingual (French and Flemish). Brussels is an important commercial, financial, industrial, administrative, and cultural center and a major rail junction. Among its varied

manufactures are pharmaceuticals, electronics equipment, machine tools, rubber, processed food, and lace. It is the seat of the Council of Ministers and of the Commission of the European Communities, of the Economic and Social Committee of the European Economic Community, and of the North Atlantic Treaty Organization. Brussels was inhabited by the Romans and later (7th cent. A.D.) by the Franks; an oratory was founded there (c 600) by the bishop of Cambrai on an island in the Senne. The city was fortified (c 1100) and became (late 12th cent.) a commercial center on the trade route from Bruges and Ghent to the Rhineland. It developed into a center of the wool industry in the 13th cent. In the 15th cent. the arts flourished there and many stately mansions (some still standing) were built. Brussels became (1430) the seat of the dukes of Burgundy and later (1477) of the governors of the Spanish (after 1714, Austrian) Netherlands. In 1561 the Willebroek Canal, connecting Brussels with the Scheldt River, was completed. Renowned for the luxury and gaiety of its life, the city became (late 16th cent.) the center of the duke de Alba's grim reign of terror. The city suffered heavily in the wars fought in the Low Countries in the 16th to 18th cent. Brussels changed hands several times in the French Revolutionary Wars, later, during the Waterloo campaign (1815), it was Wellington's headquarters. From 1815 to 1830 it was, with The Hague, the alternate meeting place of the Netherlands parliament; in 1830 it became the capital of independent Belgium. Brussels was occupied by the Germans in World Wars I and II. The historical nucleus of the city, the medieval and Renaissance Grand' Place, a large square, is the site of the Gothic city hall (15th cent.), the Renaissance-style Maison du Roi or Broodhuis (13th cent.), meeting place of the old States-General of the Netherlands, and a number of rebuilt Gothic guildhalls. Near the Grand' Place is the famous fountain of a small boy urinating, *Manneken-Pis* (1619). The rest of Brussels is mostly modern, with contemporary style office buildings and broad boulevards that circle the city along its former ramparts. Other noteworthy buildings include the Collegiate Church of St. Michael and St. Gudule (founded in the 11th cent. and rebuilt in the 13th-15th cent.), which contains many noted Flemish paintings, the late-18th-century Palais de la Nation (parliament building), the Palais de Justice (late 19th cent.), and the Palais du Roi (royal palace). Brussels is the seat of a university (founded 1834), a noted conservatory, and academies of art, science, and medicine. There are also excellent art museums and a botanical garden. In 1958 Brussels was the site of a world's fair.

Brussels carpet: see CARPET

Brussels griffon, breed of sturdy TOY DOG developed in Belgium in the 18th and 19th cent. It stands about 8 in. (20.3 cm) high at the shoulder and weighs from 6 to 12 lb (2.7-5.5 kg). There are two varieties, the wirehaired and the smooth. The coat of the former is dense and wiry with a fringe of hair around the eyes, nose, cheeks, and chin. Its color is reddish brown, black, or a combination of these two. The smooth variety, called Brabançon, has a short, finely textured coat and may be reddish brown or black marked with reddish brown, but not solid black. Believed to have been produced by crossing affenpinschers with the pug, and possibly the toy spaniels, the Brussels griffon is popular as a companion and house pet. See DOG.

Brussels sprouts, variety (*gemmifera*) of CABBAGE producing small edible heads (sprouts) along the stem. It is cultivated like cabbage and was first developed in Belgium and France in the 18th cent. Brussels sprouts are classified in the division MAGNOLIOPHYTES, class Magnoliopsida, order Capparales, family Cruciferae.

Brustein, Robert, 1927-, American educator and drama critic, b. New York City, grad. Columbia (Ph.D., 1957). Since 1966 he has been Dean of the Yale Drama School. An exacting critic of American theater, he brings great knowledge of the medium and moral vision to his work. He has written drama criticism for such periodicals as the *New Republic* and the *New York Review of Books*. His books include *The Theatre of Revolt* (1964), *Seasons of Discontent* (1965), and *Revolution as Theatre* (1971).

Brut, Brute (both brōōt), or **Brutus** (brōō'tas), a Trojan, legendary founder of the British race, descendant of Aeneas. His story appears in Nennius and in Geoffrey of Monmouth, and his name gives the titles to long poems by Wace and Layamon.

Bruttium (brū'tēam), ancient region, S Italy, roughly occupying the present CALABRIA, the "toe" of the

Italian peninsula. Bruttium faced Sicily across the Strait of Messina. Inhabited in the interior by the Brutii (whose chief town was Cosenza) and by the Lucani, it was settled (8th cent. B.C.) along the coast by Greek colonists SYBARIS and CROTONA were among the most prosperous towns of the colonies of MAGNA GRAECIA. The Romans conquered Bruttium in the 3d cent. B.C. RHEGIUM and VIBO VALENTIA were important Roman cities of Bruttium. The region passed to Byzantium after the fall of Rome and became known as Calabria.

Brutus (brōō'tas), in ancient Rome, a surname of the Junian gens Lucius Junius Brutus, fl. 510 B.C., was the founder of the Roman republic. He feigned idiocy to escape death at the hands of Lucius Tarquinius Superbus (see under TARQUIN). Roman historians tell how he led the Romans in expelling the Tarquins after the rape of Lucretia, how he became one of the first praetors (there were no consuls), and how he executed his sons for plotting a Tarquinian restoration. *Decimus Junius Brutus Gallaeus*, fl. 138 B.C., consul, consolidated the province of Farther Spain and stopped the encroaching Lusitanian tribesmen. Marcus Junius Brutus, d. c. 77 B.C., was a partisan of LEPIDUS (d. 77 B.C.) in the struggle with CATULUS (d. 60 B.C.); POMPEY had him murdered. His wife Servilia was the half sister of Cato the Younger. Their son was Marcus Junius Brutus, 85? B.C.-42 B.C. He and Caius Cassius Longinus (see under CASSIUS) were the principal assassins of Julius CAESAR. He had sided with Pompey, but after the battle of PHARSALA, Caesar pardoned him, made him governor of Cisalpine Gaul (46 B.C.), and, in 44 B.C., urban praetor. Nevertheless, he joined Cassius in the plot against Caesar. After the murder of Caesar, Brutus went east and, in the republican cause, joined Cassius and held Macedonia with him. Late in 42 B.C., Octavian (later AUGUSTUS) and Antony arrived, and a battle was fought at Philippi. When it went against the republicans, Brutus committed suicide. Brutus' wife Portia was the daughter of Cato the Younger. Brutus had a contemporary reputation as a Stoic philosopher, and his admirers have regarded him as a second Cato, driven reluctantly to commit murder in order to save the republic. His detractors, on the other hand, have considered his friendship with the self-seeking Cassius as indicative of his true character. A lesser member of the conspiracy was *Decimus Junius Brutus*, d. 43 B.C., a partisan of Caesar against Pompey and a favorite of the dictator. Caesar gave him command in Gaul and appointed him to be his heir in case of Octavian's death. After Caesar's death, Brutus refused to surrender Cisalpine Gaul. In 43 B.C., Antony, to whom the senate had assigned the province, besieged Brutus at Mutina (modern Modena). He tried to escape and was killed.

Brux: see MOST, Czechoslovakia

Bruyn, Barthel Bartholomaeus (bār'tal bār'tōlōmā'ōos broin), 1493-1555, German Renaissance painter, active in Cologne from 1515. Known especially for his portraits, which combine Northern realism with Italian-inspired monumentality and breadth, Bruyn also painted religious works such as the high altar at Essen Cathedral (1522). A portrait of a man and three religious works are in the Philadelphia Museum; many of his works are in Germany.

Bruyn, Cornelis de (kōrnā'lis də), 1652-c 1726, Dutch portrait painter and traveler. He painted for some years in Italy, where he was known, in Rome, as Adonis. Bruyn is remembered chiefly for the records of his extensive travels in Egypt, Persia, India, and other countries, illustrated with his own designs.

Bry, Théodore de (tēōdōr' də brē, brī), 1528-98, Flemish engraver and publisher, b. Liege. He spent most of his life in Frankfurt-am-Main. He visited London, where he executed a series of 12 plates, *The Procession of the Knights of the Garter*, and another of 34 plates, *The Funeral of Sir Philip Sidney*. The British geographer Hakluyt assisted him in obtaining materials for an illustrated collection of voyages and travels, *Collectiones peregrinationum* (1590-1634). Bry also published a series of portraits of famous men and illustrated the works of Thomas Hariot and J. J. Boissard. His son John Théodore de Bry, 1561-1623, assisted him and continued or completed several of his works.

Bryan, William Jennings, 1850-1925, American political leader, b. Salem, Ill. He practiced law at Jacksonville, Ill., and in 1887 he moved to Lincoln, Nebr. Bryan was a U.S. Representative from 1891 to 1895 but was defeated for the U.S. Senate in 1894. The next two years he spent as editor in chief of the Omaha *World-Herald*. Having ardently identified

himself with the FREE SILVER forces in Congress, he became their most popular speaker in a pre-convention drive to control the Democratic national convention at Chicago in 1896. At the convention his famous "Cross of Gold" speech so swayed the delegates that his nomination for President was assured, even though he was only 36 years old. The POPULIST PARTY also nominated him, but the conservative, gold Democrats ran John M. Palmer. The chief issue of the campaign was Bryan's proposal for free and unlimited coinage of silver, which he thought would remedy the economic ills then plaguing farmers and industrial workers. He lost the bitterly fought contest to Republican William MCKINLEY, whose campaign was skillfully managed by Marcus A. HANNA. Bryan controlled the Democratic convention in 1900 and saved the silver plank from removal by Eastern gold factions, but he agreed to put the campaign emphasis on anti-imperialism. Defeated again by McKinley, Bryan in 1901 started the *Commoner*, a widely read weekly that kept him in the public eye. His reduced party power in 1904 resulted in the compromise nomination of Alton B. PARKER, a conservative New Yorker, upon a platform dictated by Bryan Parker, however, disavowed the silver plank, and Bryan unwillingly acquiesced. Parker's overwhelming defeat by Theodore Roosevelt turned the Democrats again to Bryan, who in 1908 was nominated a third time Roosevelt's candidate, William H. TAFT, defeated him. The last Democratic convention in which Bryan played an important role was that of 1912, where his switch to Woodrow WILSON helped gain Wilson the nomination. Upon his election Wilson named Bryan Secretary of State. Bryan was influential in holding the Democrats together during the first 18 months of Wilson's administration, when unity was essential to the enactment of the President's reform legislation. He had little previous experience in foreign affairs but studied international questions conscientiously. With some 30 nations he negotiated treaties providing for investigation of all disputes. Antiwar leanings made Bryan more conciliatory than Wilson toward Germany. His Latin American policies, particularly those involving Nicaragua, caused a good deal of friction. Disliking the strong language of the second *Lusitania* note drafted by Wilson, he resigned on June 9, 1915, rather than sign it. However, he supported Wilson in the 1916 election and after war was declared. In the 1920 Democratic convention at San Francisco he fought in vain for a prohibition plank, and in 1924 at New York City he supported William G. McAdoo against Alfred E. Smith, but he was no longer the party's leader. In his later years Bryan, a Presbyterian, devoted himself to the defense of fundamentalism. He addressed legislatures urging measures against teaching evolution and appeared for the prosecution in the famous SCOPES TRIAL in Tennessee. Although he won the case in the trial court, Bryan's beliefs were subjected to severe ridicule in a searching examination by opposing counsel, Clarence DARROW. Five days after the trial, Bryan died in his sleep. Although the nation consistently rejected him for the presidency, it eventually adopted many of the reforms he urged—the income tax, popular election of Senators, woman suffrage, public knowledge of newspaper ownership, and prohibition. See the memoirs (1925, repr. 1971), begun by Bryan and finished by his widow, biographies by W. C. Williams (1936), P. W. Glad (1960), P. E. Coletta (3 vol., 1964–69), and L. W. Koenig (1971), studies by L. W. Levine (1965) and P. W. Glad, ed. (1968). His brother, Charles Wayland Bryan, 1867–1945, b. Salem, Ill., was for many years W. J. Bryan's political secretary and business agent. He was publisher and associate editor of the *Commoner*, mayor of Lincoln, Nebr., and governor of Nebraska.

Bryan, city (1970 pop. 33,719), seat of Brazos co., E central Texas, inc. 1872. Settled in the early 19th cent. in an area of large plantations, Bryan was long a cotton center. Farms producing alfalfa, truck crops, dairy goods, and poultry now occupy much of the land. Bryan's manufactures include aluminum products, furniture, building materials, agricultural chemicals, business forms, loose-leaf binders, shoe soles, electronic components, gravel extractions, and laboratory research equipment. The Research and Development Center of Texas A & M Univ. is in Bryan.

Bryansk (brěānsk'), city (1970 pop. 1,582,000), capital of Bryansk oblast, central European USSR, on the Desna River. The city is a transportation hub, and it forms an important industrial district with nearby Bezhitsa, with which it was incorporated in 1956.

There are ironworks and locomotive, machine, and cement plants. Bryansk is also a major distributing center for natural gas. Originally called Brinyu and later Debryansk, the city was first known in 1146. For a time it was the capital of a principality. Bryansk later passed to Lithuania and in the 16th cent. was annexed by Muscovy. It served as a fortress until the 19th cent.

Bryant, William Cullen, 1794–1878, American poet and newspaper editor, b. Cummington, Mass. The son of a learned and highly respected physician, Bryant was exposed to English poetry in his father's vast library. As a boy he became devoted to the New England countryside and was a keen observer of nature. In his early poems such as "Thanatopsis," "To a Waterfowl," "Inscription for the Entrance to a Wood," and "The Yellow Violet," all written before he was 21, he celebrated the majesty of nature in a style that was influenced by the English romantics but also reflected a personal simplicity and dignity. Admitted to the bar in 1815 after a year at Williams and private study, Bryant practiced law in Great Barrington, Mass., until 1825, when he went to New York City. By that time he was already known as a poet and critic. He became associate editor of the *New York Evening Post* in 1826, and from 1829 to his death he was part owner and editor in chief. An industrious and forthright editor of a highly literate paper, he was a defender of human rights and an advocate of free trade, abolition of slavery, and other reforms. He also holds an important place in literature as the earliest American theorist of poetry. In his *Lectures on Poetry* (delivered 1825, published 1884) and other critical essays he stressed the values of simplicity, original imagination, and morality. During his later career Bryant traveled widely, made many public speeches, and continued to write a few poems (e.g., "The Death of the Flowers," "To the Fringed Gentian," and "The Battle-Field"). His blank verse translation of the *Iliad* appeared in 1870, that of the *Odyssey* in 1872. See biographies by Parke Godwin (2 vol., 1883, repr. 1967), John Bigelow (1890, repr. 1970), H. H. Peckham (1950, repr. 1971), and C. H. Brown (1971).

Bryaxis (brīāk'sis), 4th cent. B.C., Greek sculptor. With Scopas, Leochares, and Timotheus, he worked on the sculptures of the Mausoleum at Halicarnassus (c. 350 B.C.). Among other works attributed to him were several statues, including one of Apollo in the grove of Daphne, near Antioch. In 1891 at Athens his signature was discovered on a base for a tripod. The base is sculptured in relief with figures of horsemen.

Bryce, James Bryce, Viscount, 1838–1922, British historian, statesman, and diplomat, b. Belfast. After his education at the Univ. of Glasgow and at Oxford, he practiced law in London for a short time before becoming professor of civil law at Oxford. He wrote monumental works in several fields, the first of these was his *History of the Holy Roman Empire* (1864), a book still widely used. He entered politics and became a leader of the Liberal party, occupying a variety of posts, including the presidency of the Board of Trade and the chief secretaryship of Ireland. His interest in sociology and philosophy is evident in the second of his great treatises, *The American Commonwealth* (1888), a classic that is still read and used. Bryce was ambassador to the United States from 1907 to 1913; he was one of the most popular ever to be in Washington, since his knowledge of Americans, as revealed in his writings, was profound. He was created a peer in 1914. His other major works were *Studies in History and Jurisprudence* (1901) and *Modern Democracies* (1921). See biography by H. A. L. Fisher (2 vol., 1927, repr. 1973), *Bryce's American Commonwealth* (1939, abr. ed. 1959), E. S. Ions, *James Bryce and American Democracy 1870–1922* (1968, repr. 1970).

Bryce Canyon National Park, 36,010 acres (14,573 hectares), SW Utah, est. 1924. The Pink Cliffs of the Paunsaugut Plateau, c. 2,000 ft (610 m) high, were formed by water, frost, and wind action on alternate strata of softer and harder limestone; the result is colorful and unique erosional forms, including miniature cities, cathedrals, and spires. The BASKET MAKERS were probably the first Indians to inhabit the area, many of their artifacts are exhibited.

Bryhtnoth see BYRHTNOTH

Brynhild see BRUNHILD

Bryn Mawr (brīn mār), uninc. village (1970 pop. 5,737), Montgomery co., SE Pa., a suburb of Philadelphia. It is the seat of Bryn Mawr College (for women), opened in 1885 by the Society of Friends. A junior college is also in Bryn Mawr.

Bryn Mawr College, at Bryn Mawr, Pa., undergraduate for women, graduate coeducational, opened 1885 by the Society of Friends, with a bequest from Joseph W. Taylor of Burlington, N.J. Modeled on a group curriculum plan at Johns Hopkins Univ., Bryn Mawr was one of the first women's colleges in the United States to offer graduate degrees. The library is especially noted for its collection of rare books and medieval incunabula. The school maintains a cooperative program with Haverford College and Swarthmore College.

bryony, see GOURD

Bryophyta, division of green land plants that includes the MOSSES (class Bryopsida), the LIVERWORTS (Marchantiopsida), and the hornworts (Anthocerotopsida). Bryophytes differ from ferns, cone-bearing plants, and flowering plants in that they lack a vascular system for the transportation of water. Since their cells must absorb water directly from the air or the ground, nearly all bryophytes grow in moist places. The conspicuous green plant body of a bryophyte is the haploid, or GAMETOPHYTE, generation of the plant life cycle. It consists of a small stem with leaflike projections, as in all mosses and most liverworts, or a leafless, flattened body (thallus), as in some liverworts and all hornworts. The plant is anchored by means of threadlike structures called rhizoids. The leaflike structures and the rhizoids lack the complex internal anatomy found in the leaves and roots of plants with vascular systems. The gametophyte reproduces sexually, giving rise to a diploid, or sporophyte, generation, the sporophyte is a structure that grows directly out of the gametophyte and is at least partly dependent on the gametophyte for nourishment (see ALTERNATION OF GENERATIONS). In mosses, germinating spores (haploid) produce a green filamentous structure on the surface, called a protonema, the first stage of the gametophyte. Erect branches arise out of the protonema. After the branches produce rhizoids, the protonema dies. Antheridia (or sperm-producing structures) and archegonia (egg-producing structures) are borne in clusters on the tips of the branches of the gametophytes; these structures are usually microscopic. The different sex organs may be in a single cluster, in separate clusters on the same branch, or on separate branches, depending on the species. In the hornworts, antheridia and archegonia are borne either on the same thallus or, in some species, on separate thalli, the antheridia are borne either singly or in small groups, and the archegonia are borne singly. In the liverworts, the gametophyte may be a thallus or may be leafy, the antheridia and archegonia are borne on special branches that arise from the leafy stem. In all bryophytes fertilization is dependent on water—usually a film of water or the splashing of raindrops—for the transfer of sperm to the egg. Chemical stimuli direct the motile flagellate sperm to the archegonium. The fertilized egg (zygote) grows out of the gametophyte, which is also the source of its nourishment. Typically the sporophyte is a slender stalk from 1 to 2 in. (2.5–5 cm) long, with a capsule at the tip, in some species it may be green and manufacture some of its own food. Cells within the capsule undergo meiosis (reduction division) to produce haploid spores. In many mosses the capsule has a lid, the operculum, which is shed, releasing spores. In other bryophytes the mature capsule ruptures in other ways to release spores. The liverworts and hornworts are generally inconspicuous plants, common liverworts include species of the genera *Porella* and *Marchantia*. *Anthoceros* is the most familiar temperate-zone hornwort genus. The mosses are generally divided into three orders, with the order Bryales most prominent. The bryophytes are important because they are pioneer plants and soil builders on surfaces lacking other vegetation. SPHAGNUM moss (order Sphagnales) has been economically important as packing material and as PEAT. It is now believed that the bryophytes descended from green algae by way of now extinct ancestors (the RHYNIOPHYTES).

Bryozoa (brī'azō'a), name of a phylum, in older systems of classification, that included the invertebrate animals now classified in the phyla ECTOPROCTA and ECTOPROCTA. The term bryozoan (or moss animal) is still commonly used for members of the Ectoprocta.

Bryson, Lyman, 1888–1959, American educator, b. Valentine, Nebr., grad. Univ. of Michigan (B.A. 1910, M.A. 1915). He taught there from 1913 to 1917. From 1918 to 1924 he was active in Red Cross work. He was appointed professor at Teachers College, Columbia, in 1935, and during World War II he

worked in the Office of War Information Consultant on public affairs for the Columbia Broadcasting System, he was instrumental in popularizing such forms of adult education as the public forum. Among his books are *Adult Education* (1936), *Which Way America?* (1939), *The New Prometheus* (1941), *Science and Freedom* (1946), and *The Next America* (1952).

Brythonic (brīthōn'ik), group of languages belonging to the Celtic subfamily of the Indo-European family of languages. See **CELTIC LANGUAGES**.

Bryusov, Valery Yakovlevich (vəlyě'rē ya'kav-lyivich brēō'saf), 1873–1924, Russian poet, novelist, and critic. He was the spearhead of the **SYMBOLIST** movement and wrote highly polished and esoteric verse celebrating sensual pleasures. Of his poetry, *Stephanos* (1906) is perhaps the best known. His two novels are *The Fiery Angel* (1903), concerning 16th-century German mystics, and *Altar of Victory* (1913). Bryusov was revered for his scholarly criticism. He also translated a number of works by French, American, and Armenian poets.

Brześć nad Bugiem: see **BREST**, U55R

Btu: see **BRITISH THERMAL UNIT**

Bubastis (byōōbās'tis), ancient city, NE Egypt, in the Nile delta, near the modern Az Zagaziq. Capital of Egypt in the XXII and XXIII dynasties, it began to decline after the second Persian conquest (343 B C). Bubastis was the center of the worship of the lion-headed (or cat-headed) goddess Bast. In the time of Herodotus it had an annual Saturnalia, an orgiastic festival honoring the god SATURN. As Pi-beseth, Bubastis is mentioned in Ezek. 30:17. Excavations were made in 1886, 1887, and 1906. Among the finds were a chapel of the VI dynasty (proving that the site dates back to the Old Kingdom) and a great temple built in the 8th cent. B C.

bubble chamber, device for detecting charged particles and other radiation by means of tracks of bubbles left in a chamber filled with liquid hydrogen or other liquefied gas. It was invented in 1952 by Donald Glaser. The bubble chamber consists essentially of a sealed chamber to be filled with a liquefied gas and constructed so that the pressure inside can be reduced quickly. The liquid is originally at a temperature just below its **BOILING POINT**. When the pressure is reduced, the boiling point becomes lowered so that it is less than the temperature of the liquid, leaving the liquid superheated. When a charged particle passes through this superheated liquid, it leaves a trail of tiny gas bubbles that can be illuminated and photographed. The track of a charged particle can be used to identify the particle and to analyze complex events in which it may be involved. If a magnetic field is present, the tracks of the particles will be curved, positively charged particles curving in one direction and negatively charged particles curving in the opposite direction. The degree of curvature depends on the mass, speed, and charge of the particle. Neutral particles can be detected indirectly by applying various **CONSERVATION LAWS** to the events recorded in the bubble chamber or by observing their decay into pairs of oppositely charged particles. The bubble chamber is particularly useful for studying high-energy particles that would pass through a **CLOUD CHAMBER** too quickly to leave a detailed enough track but which pass more slowly through the bubble chamber because of the greater density of the liquid. Liquid hydrogen and helium are commonly used in bubble chambers, with special equipment needed to maintain these gases in their liquid state (see **LOW TEMPERATURE PHYSICS**). For experiments requiring very dense liquids, a variety of organic compounds may be used. See **ELEMENTARY PARTICLES**, **PARTICLE ACCELERATOR**, **SPARK CHAMBER**.

Buber, Martin (bōō'bēr), 1878–1965, Jewish philosopher, b. Vienna. Educated at German universities, he was active in Zionist affairs, and he taught philosophy and religion at the University of Frankfurt-am-Main (1924–33). From 1938 to 1951 he held a professorship in the sociology of religion at the Hebrew University in Jerusalem. Greatly influenced by the mysticism of the **HASIDIM**, which he interpreted in many of his works, and by the Christian existentialism of Søren Kierkegaard, Buber evolved his own philosophy of religion, especially in his book *I and Thou* (1923, 2d ed. 1958). Conceiving the relations between God and man not as abstract and impersonal, but as an inspired and direct dialogue, Buber has also had a great impact on contemporary Christian thinkers. He worked to permeate political Zionism with ethical and spiritual values and strongly

advocated Arab-Israeli understanding. Among his writings are *Jewish Mysticism and the Legends of Baalshem* (1931), *Mamre* (tr. 1946, repr. 1970), *Moses* (1946), and *The Origin and Meaning of Hasidism* (2 vol., tr. 1960). See his *A Believing Humanism: My Testament, 1902–1965* (tr. 1967) and his *Meetings*, ed. by Maurice Friedman (1973), Aubrey Hodes, Martin Buber. *An Intimate Portrait* (1971).

bubonic plague: see **PLAGUE**

Buçaco: see **BUSSACO**, Portugal

Bucaramanga (bōō'karamang'ga), city (1968 est. pop. 250,000), capital of Santander dept., N central Colombia, in the eastern highlands of the Andes. A leading commercial city, Bucaramanga is in the center of Colombia's rich coffee and tobacco area. Founded in 1622, the city still preserves many monuments from the colonial period. Bucaramanga also has a huge sports arena.

Bucareli y Ursua, Antonio María (antō'nyō marē'a bōōkarā'lē ē ōrsōō'a), 1717–79, Spanish colonial administrator. He served in the Spanish army and as governor of Cuba before succeeding (1771) the marqués de Croix as viceroy of New Spain (Mexico). His administration, which lasted until his death, brought peace and prosperity, and Bucareli was widely popular. See B. E. Bobb, *The Viceregency of Antonio María Bucareli in New Spain, 1771–1779* (1962).

buccaneer: see **PIRACY**

Bucephalus (byōōsē'fələs), favorite horse of Alexander the Great. There are legends of his speed and the wondrous deeds that Alexander performed while riding him. He died in 326 B C after the battle on the Hydaspes River. The city Bucephala was founded there by Alexander in his honor.

Bucer or Butzer, Martin (byōō'sər, bōōt'sər), 1491–1551, German Protestant reformer. His original name was Kuhlhorn [cow's horn], of which Bucer is a Greek translation. At 14 years of age he joined the Dominican order, and he studied at Heidelberg, where he heard (1518) Luther in his public disputation on the doctrine of free will. Influenced by the reformist thought, Bucer left the order and accepted a pastorate at Landstuhl. In 1523 he entered upon the work of the Reformation in Strasbourg—preaching, writing, and helping to lay the foundations of the Protestant educational system. Many of his activities were devoted to attempts to reconcile the differences in regard to the Eucharist (see **LORD'S SUPPER**) which divided the Lutherans from the Swiss and 5 German reformers. Bucer's position was closer to that of the Swiss leader, Zwingli, and in this as in other doctrinal matters he is credited with a spiritual kinship to Calvin. In spite of his desire for unity, Bucer rejected the Augsburg Confession (see **CREED**), drawn up in 1530 in the hope of achieving religious peace. It was not until a personal meeting with Luther in 1536 that, in the Wittenberg Concord, Bucer was successful in securing agreement on the Eucharist among himself, Luther, and the reformers of S. Germany. When Bucer failed to subscribe to the Augsburg Interim (1548)—a compromise between Roman Catholics and Protestants proposed by Holy Roman Emperor Charles V—he found it expedient to accept the invitation of Cranmer and moved to England. There, highly honored, he taught at Cambridge and tutored Edward VI, at whose request he wrote *De regno Christi*. See Hastings Fells, *Martin Bucer* (1931), Constantin Hopf, *Martin Bucer and the English Reformation* (1946).

Buch, Christian Leopold, Freiherr von (krīs'tyan lā'ōpōlt frī'hēr fən bōōkh), 1774–1853, German geologist and paleontologist, graduate of the mining academy, Freiberg, Germany. One of the most influential geologists of his age, he is noted especially for his study of volcanism. In addition to a valuable geological map of Germany, his works include geological and paleontological studies of several areas in Europe.

Buchan, John, 1st Baron Tweedsmuir (būk'an, twēdz'myōōr), 1875–1940, Scottish author and statesman. Included among his works are a four-volume history (1921–22) of World War I, biographies of Julius Caesar (1932), Scott (1932), and Cromwell (1934), and adventure novels, including *The Thirty-nine Steps* (1915), *The Path of the King* (1921), and *Mountain Meadow* (1941). Elected to Parliament in 1927, he was appointed governor general of Canada in 1935 and was raised to the peerage. His administration of Canada was popular, and he promoted good relations with the United States. See his autobiography, *Pilgrim's Way* (1940), biography by Janet Smith (1965).

Buchanan, Franklin (byōōkā'nan), 1800–1874, American naval officer, b. Baltimore. Appointed a midshipman in 1815, Buchanan rose to be a commander in 1841. He was chief adviser to Secretary of the Navy George BANCROFT in planning the U S Naval Academy at Annapolis and was its first superintendent (1845–47). In Sept., 1861, he took the rank of captain in the Confederate navy, commanding the *Virginia* (formerly the *Merrimack*) against the Union blockading squadron in Hampton Roads (March 8, 1863). Wounded in that engagement, he took no part in the battle of the *MONITOR* and *MERRIMACK* the next day. Promoted to ranking officer in the Confederate navy, he was forced to surrender to David G. FARRAGUT in the battle of Mobile Bay (Aug. 5, 1864). See biography by C. L. Lewis (1929).

Buchanan, George, 1506–82, Scottish humanist. Educated at St. Andrews and Paris, he became (1536) tutor to James V's illegitimate son James Stuart (later earl of Murray). He was imprisoned (1539) for satirizing the Franciscans but escaped to the Continent. He taught at Bordeaux, where Montaigne was among his pupils, and at Coimbra and became highly regarded as a Latin poet. Returning to Scotland in 1560, Buchanan declared himself a Protestant. He became an opponent of Mary Queen of Scots after the murder (1567) of Lord Darnley and in 1571 published the *Detectio Mariae Reginae*, a bitter attack on the queen. From 1570 to 1578 he was tutor of the young king James VI (later James I of England). Buchanan's *Rerum Scotticarum historia* (1582) is a useful source for his time, but his most influential work was the *De jure regni apud Scotos* (1579), which argued that the king rules by popular will and for the general good. See biographies by P. Hulme Brown (1890) and Donald Macmillan (1906).

Buchanan, James, 1791–1868, 15th President of the United States (1857–61), b. near Mercersburg, Pa., grad. Dickinson College, 1809. He studied law at Lancaster, Pa., and in practice there gained a considerable reputation for his wide learning and brilliant oratory. Thus prepared, he went into state politics, then entered the national scene as Congressman (1821–31), and was later minister to Russia (1832–33) and Senator (1834–45). A Federalist early in his career, he was later a conservative mainstay of the Democratic party. He served (1845–49) as Secretary of State under President Polk and although Polk exercised a strong personal hand in foreign affairs, Buchanan ably seconded his efforts. The quarrel with Great Britain over Oregon was settled peacefully. That with Mexico, which followed the annexation of Texas and the failure of the mission of John SULLIVAN, led to the Mexican War and the Treaty of Guadalupe Hidalgo (1848). Under President Pierce, Buchanan served (1853–56) as minister to Great Britain. He collaborated with Pierre SOULÉ, minister to Spain, and John Y. MASON, minister to France, in drawing up the **OSTEND MANIFESTO** (1854), which was promptly repudiated by the U.S. Dept. of State. His open advocacy of purchasing Cuba (which would presumably have come into the Union as a slaveholding state) won him the hatred of the abolitionists, whom he in turn despised as impractical troublemakers. He was nominated as a Democratic candidate for the presidency in 1856, with John C. BRECKINRIDGE as his running mate, and he won the election over John C. Fremont, the candidate of the newly formed Republican party, and Millard Fillmore, candidate of the Whig and Know-Nothing parties. Buchanan did not have the majority of the popular vote, and his moderate views were disliked and mistrusted by extremists both in the North and in the South. Although he attempted to keep the "sacred balance" between proslavery and antislavery factions, in his administration the United States plunged toward the armed strife of the Civil War. Buchanan, who disapproved of slavery as morally wrong, felt that under the Constitution slavery had to be protected where it was established and that the inhabitants of a new territory should decide whether that territory should be free or slave. He angered many in the North by renewing efforts to purchase Cuba and by favoring the proslavery Leecompton Constitution in KANSAS. As his administration drew to a close, after the election (1860) of Abraham Lincoln to succeed him as President, Buchanan was faced with the secession of the Southern states. Very learned in constitutional law, he maintained that no state had the right to secede, but he held, on the other hand, that he had no power to coerce the erring states. He believed that the Federal government was authorized to use force only in protecting Federal property and in collecting customs. Therefore the question of the Federal forts in

Southern states became of great importance, particularly in South Carolina. Buchanan tried desperately to keep peace and promised South Carolina Congressmen that no hostile moves would be made as long as negotiations were in progress. When Major Robert Anderson moved U.S. troops from Fort Moultrie to Fort Sumter, there was an outcry from South Carolina that the President's promise had been broken. Buchanan defended Anderson but, reluctant to act, sent supplies to Fort Sumter only belatedly. He was battered with criticism from North and South, and shortly after his administration ended, gunfire at Fort Sumter precipitated the war. John Bassett Moore edited his works (12 vol., 1909–11). See biographies by G. T. Curtis (1883, repr. 1969) and P. S. Klein (1962).

Buchans, town (1971 pop. 2,338), central N.F., Canada, on Red Indian Lake. It has a large mine that yields lead, silver, zinc, and copper.

Bucharest (bōō'karēst, byōō'-), Rum. *București*, city (1969 est. pop. 1,526,000), capital and largest city of Rumania, SE Rumania, in Walachia, on the Dâmbovița River, a tributary of the Danube. It is Rumania's chief industrial and communications center. Machine-building, metalworking, engineering, oil refining, food processing, and the manufacture of textiles, chemicals, automobiles, and footwear are the chief industries. The city, probably founded in the late 14th cent., was first known as *Cetatea Dambovitei* [Dambovita citadel] and was a military fortress and commercial center astride the trade routes to Constantinople. It became (1459) a residence of the Walachian princes and changed its name (15th cent.) to Bucharest. In 1698 the city became the capital of Walachia under Constantine Brancovan, after the union (1859) of Walachia and Moldavia it was made (1861) the capital of Rumania. The Treaty of Bucharest (1913) stripped Bulgaria of its conquests in the Second Balkan War (see BALKAN WARS). During World War I, Bucharest was occupied (1916–18) by the Central Powers. After Rumania's surrender to the Allies (Aug., 1944) in World War II, German planes severely bombed the city. Soviet troops entered on Aug. 31, by which time a coalition of leftist parties had seized power. Bucharest served as headquarters of the Cominform from 1948 to 1956. Today it is a modern city, with fine parks, libraries, museums, and theaters, and is the seat of the patriarch of the Rumanian Orthodox Church. Landmarks include the Metropolitan Church (1649), the 17th-century St. George Church, the Radu Voda (1649) and Stavropoleos (1724–30) churches, and the Athe-naeum, devoted to art and music. Among the city's educational institutions are the old university (founded 1864), the new university (1935), an engineering college, and several academies and scientific institutes.

Buchenwald (bōō'khānvalt'), village, Erfurt dist., SW East Germany, in the Buchenwald forest, near Weimar. It was the site of a CONCENTRATION CAMP established by the National Socialist (Nazi) regime.

Buchman, Frank Nathan Daniel (bōōk'mān), 1878–1961, American evangelist, b. Pennsylvania, Pa. The international movement he founded has been variously called First Century Christian Fellowship, the Oxford Group, Moral Re-Armament (often known as MRA), and Buchmanism. Buchman was ordained in the Lutheran ministry in 1902. He was head (1905–15) of religious work at Pennsylvania State College. In 1921, Buchman, after five years of extension lecturing for the Hartford Theological Foundation, visited England. There he preached "world-changing through life-changing" among the students at Oxford, hence the name Oxford Group. In 1938 he instituted a campaign known as Moral Re-Armament. The work of evangelism for personal and national spiritual reconstruction is conducted informally and intimately in groups gathered in educational institutions, in church congregations, or in homes. "House parties" take the place of conferences, and religious experiences are shared in personal confessions. The evangelists stress absolute honesty, purity, love, and unselfishness. Moral Re-Armament has always been a controversial organization, resulting from its strident anti-Communist positions as well as from Buchman's open admiration of Adolf Hitler. See his speeches, *Remaking the World* (new and rev. ed. 1961), Peter Howard, *Frank Buchman's Secret* (1962), Gösta Ekman, *Experiment with God*, *Frank Buchman Reconsidered* (tr. 1972).

Buchner, Eduard (ä'dōōärt bōōkh'när), 1860–1917, German chemist. He taught at Berlin, Breslau, and, from 1911, at Würzburg. He discovered (1896) that alcoholic fermentation of sugars is caused by yeast enzymes and not by the yeast cells themselves. Zy-

mase, part of the enzyme system causing fermentation, was discovered by him in 1903. For this work he received the 1907 Nobel Prize in Chemistry.

Buchner, Georg (gä'örk bukh'när), 1813–37, German dramatist. He was a student of medicine and a political agitator. He died at the age of 24, leaving a powerful drama, *Danton's Death* (1835, tr. 1928), a fragmentary tragedy, *Wozzeck* (1850, tr. 1928), which Alban Berg adapted for his opera, and a comedy, *Leonce and Lena* (1850, tr. 1928). Buchner greatly admired the poet J. M. R. Lenz, whom he made the hero of a novella, *Lenz* (1838, tr. 1955), which he never completed. See collections of his plays ed. by Victor Price (tr. 1971) and Michael Hamburger (tr. 1972), studies by A. H. J. Knight (1951) and Ronald Hauser (1974).

Buck, Carl Darling, 1866–1955, American philologist, b. Orlando, Maine. Buck taught at the Univ. of Chicago from 1892 to 1933. His *Grammar of Oscan and Umbrian* (1904) is still authoritative.

Buck, Pearl (Sydenstricker), 1892–1973, American author, b. Hillsboro, W. Va., grad. Randolph-Macon Women's College, 1914. Pearl Buck was awarded the 1938 Nobel Prize in Literature. Until 1924 she lived principally in China, where she, her parents, and her first husband, John Lossing Buck, were missionaries. She is famous for her vivid, compassionate novels about life in China. *The Good Earth* (1931, Pulitzer Prize), considered her finest work, describes a Chinese peasant's rise to wealth and brilliantly conveys a sense of the daily life of ordinary Chinese people. Among her other novels of China are *East Wind West Wind* (1930), *Dragon Seed* (1942), *Peony* (1948), *Imperial Woman* (1956), and *Mandala* (1971). In 1935, Pearl Buck married her publisher Richard J. Walsh, president of the John Day Company. In 1949 she founded Welcome House, which provided care for the children of Asian women and American soldiers, the Pearl Buck Foundation of Philadelphia, to which she consigned most of her royalties, aids in the adoption of Amerasian children. During her lifetime Buck produced more than 85 books, including works for children, plays, biographies—such as those of her parents, *The Exile* (1936) and *Fighting Angel* (1936)—and many works of nonfiction, such as *China As I See It* (1970) and *The Kennedy Women* (1972). See her autobiography, *My Several Worlds* (1954), biography by T. F. Harris (2 vol., 1969–71).

buckeye: see HORSE CHESTNUT

Buckhaven and Methil (mēth'īl), burgh (1971 pop. 21,318), Fife, E. Scotland, on the Firth of Forth. Methil is a leading port, coal mined in the area is among the exports. In the burgh is Wemyss Castle (13th cent.), where Mary Queen of Scots met Lord Darnley in 1565. In 1975, Buckhaven and Methil became part of the Fife region.

Buckholdt, Johann: see JOHN OF LEIDEN

Buckhurst, Lord: see SACKVILLE, CHARLES, and SACKVILLE, THOMAS

Buckingham, dukes of (Stafford line): see STAFFORD, EDWARD, STAFFORD, HENRY, STAFFORD, HUMPHREY

Buckingham, George Nugent Temple Grenville, 1st marquess of: see GRENVILLE, GEORGE NUGENT TEMPLE, 1ST MARQUESS OF BUCKINGHAM

Buckingham, George Villiers, 1st duke of (vīl'yärz, bük'īng'am), 1592–1628, English courtier and royal favorite. He arrived (1614) at the English court as JAMES I was tiring of his favorite, Robert Carr, earl of Somerset. Villiers was made a gentleman of the bedchamber (1615) and, after Somerset's disgrace, rose rapidly, becoming earl of Buckingham (1617), marquess, (1618), and lord high admiral (1619). In 1620 he married Lady Katherine Manners, daughter of the Roman Catholic earl of Rutland. By this time Buckingham controlled dispensation of the king's patronage, which enabled him to grant lucrative monopolies to his relatives. In 1621, Parliament began to investigate abuses of these monopolies, but Buckingham prevented action against himself (though not against his friend Sir Francis Bacon) by joining in the condemnation of his relatives. Buckingham favored the proposed marriage of Prince Charles (later CHARLES I) with the Infanta Maria of Spain and in 1623 went with Charles to Madrid. There his arrogance contributed to the final breakdown of the long deadlocked marriage negotiations. Buckingham, now a duke, returned to England, advocating war with Spain, which made him the hero of Parliament. He lost that popularity rapidly by negotiating (1624) the marriage of Charles with another Catholic princess, Henrietta Maria, sister of Louis XIII of France. He was also blamed for the disastrous failure (Feb.–March, 1625) of an English expedition, under Graf von Mansfeld, to recover

the Palatinate for FREDERICK THE WINTER KING. Buckingham failed to supply it adequately. By this time Charles had become king, and Buckingham was more powerful than ever, a fact that enraged Parliament. After the complete failure (Oct., 1625) of an expedition against Cadiz, Buckingham was impeached (1626), and Charles dissolved Parliament to prevent his trial. The following year Buckingham himself led an expedition (another failure) to relieve the HUGUENOTS of La Rochelle, and Parliament delivered another remonstrance against him. The duke was at Portsmouth preparing another expedition for La Rochelle when he was killed by John Felton, a discontented naval officer. The romantic aspects of the duke's career figure largely in Alexander Dumas's historical novel, *The Three Musketeers*. See biographies by C. R. Cammell (1939) and Hugh Ross Williamson (1940).

Buckingham, George Villiers, 2d duke of, 1628–87, English courtier, son of the 1st duke. Brought up with the royal family and educated at Cambridge, he was a strong royalist in the English civil war. In 1648 he escaped to the Continent, where he became a privy councillor of the exiled CHARLES II. He accompanied Charles to Scotland in 1650 and fought at Worcester (1651), but later intrigues with Oliver Cromwell's government estranged him from Charles. In 1657, Buckingham returned to England and married Mary, the daughter of the Puritan general Thomas Fairfax of Cameron. He hoped thereby to recover his estates, which had been confiscated in 1651, but instead he was imprisoned until 1659. After the Restoration (1660) he regained the favor of Charles II and was one of the most powerful courtiers of the reign. Vain and ambitious, he was known for his recklessness, quarrelsome temper, and lack of principle. He was a member of the CABAL and a bitter rival of his fellow minister, the earl of ARLINGTON. He was furious when he was kept in ignorance of the provisions of the secret Treaty of Dover (1670) with Louis XIV. Attacked by the House of Commons for misusing public funds and conducting secret negotiations with France and by the House of Lords for his open liaison with the countess of Shrewsbury (whose husband he had killed in a duel in 1668), he was dismissed from office in 1674. He joined the enemies of the duke of York (later James II) and participated vigorously in the outcry against Roman Catholics in the furor over Titus Oates's Popish Plot (1678), although he had earlier been much in favor of religious tolerance. He did not vote for exclusion of the duke of York from succession to the throne, however, and in 1684 was restored to favor and retired from politics. Buckingham showed the good as well as the bad aspects of the Restoration courtier: he patronized science and literature, had refined tastes, wrote poetry, religious tracts, and plays, and dabbled in chemistry. He was producer and partial author of a celebrated satire on heroic drama, *The Rehearsal* (1671, ed. by Montague Summers, 1914). See biographies by R. P. T. Colfin (1931), H. W. Chapman (1949), and J. H. Wilson (1954).

Buckingham Palace (bük'īng'am), residence of British sovereigns from 1837, Westminster metropolitan borough, London, England, adjacent to St. James's Park. Built (1703) by the duke of Buckingham on the site of a mulberry grove, it was purchased (1761) by George III and was remodeled (1825) by John Nash, the eastern facade was added in 1847. The great ballroom was added in 1856, and in 1913 Sir Aston Webb designed a new front. The palace has nearly 600 rooms and contains a collection of paintings, including many royal portraits, by noted artists.

Buckinghamshire (bük'īng'amshīr), Buckingham, or Bucks, county (1971 pop. 586,211), central England. The county town is AYLESBURY. The Thames River forms the southern boundary of the county. In S Buckinghamshire are the chalky Chiltern Hills with their beech forests, furniture made from beech wood is the county's most notable manufacture. The area is mostly agricultural, barley, wheat, oats, and beans are the chief crops of the fertile Vale of Aylesbury in N Buckinghamshire. Cattle, pigs, sheep, and poultry are raised farther south. In ancient times Icknield Street and Watling Street crossed the county, which has extensive Roman and pre-Roman remains. Thomas Gray is buried at Stoke Poges, in the country churchyard that inspired his "Elegy." The poet John Milton had a cottage for a time at Chalfont St. Giles, and William Cowper spent many years at Olney. Also in Buckinghamshire are Hughenden Manor, home of the statesman Benjamin Disraeli, Chequers, a historic Tudor mansion and resi-

dence of British prime ministers since 1921, and Eton College, England's most famous public school. In 1974, Buckinghamshire was reorganized as a non-metropolitan county.

Buck Island Reef National Monument· see NATIONAL PARKS AND MONUMENTS (table)

Buckland, William, 1784–1856, English geologist. He was dean of Westminster from 1845. First to note in England the action of glacial ice on rocks, he did much to bring physical and natural science into high repute and was responsible for giving Oxford (where he was a student and later a fellow) an international name in science. He wrote *Reliquiae Diluvianae* (1823) and *Geology and Mineralogy Considered with Reference to Natural Theology* (1836). Francis T. Buckland, English surgeon and naturalist, was his son.

Buckle, Henry Thomas, 1821–62, English historian. Contemptuous of the historical writing of his day with its intense concern with politics, wars, and heroes, Buckle undertook the ambitious plan of writing a history of civilization, treating all men in their relation with each other and with the natural world around them. At the time of his early death he had completed only two volumes of his panoramic *History of Civilization in England* (1857–61, new ed. in 1 vol., 1904). Attempting to make history a genuine science, Buckle arrived at various "laws" of history by an inductive process. It is easy to point out that these "laws"—e.g., the law of climate, by which he demonstrated that only in Europe could men reach high levels of civilization—were to a large extent only rationalizations of his own progressive and liberal views. Yet the effect that the book had in shaping English liberal thought was immediate and huge. It profoundly influenced later scientific historians, and it helped to fasten attention on masses rather than individuals, on the wide levels of all life rather than politics, and on the interrelations of man and nature rather than man and morals. See G. R. St. Aubyn, *A Victorian Eminence: Life and Works of Henry Thomas Buckle* (1964).

Buckley, William F., Jr., 1925–, American editor, author, and lecturer, b. New York City, grad. Yale, 1946. Buckley is a popular, eloquent, and witty spokesman for the conservative point of view. Editor of *American Mercury* (1951–52), he founded the *National Review* in 1955. In 1965 he was an unsuccessful candidate for mayor of New York City. He has hosted the weekly television show "Firing Line" since 1966 and writes a syndicated newspaper column. His books include *God and Man at Yale* (1951), *The Unmaking of a Mayor* (1966), and *Four Reformists—A Guide for the Seventies* (1973). His experience as a delegate to the 29th session of the UN General Assembly is recounted in *United Nations Journal: A Delegate's Odyssey* (1974).

Bucknell University, at Lewisburg, Pa., coeducational, founded 1846 as the Univ. of Lewisburg. Its present name was adopted in 1886.

Buckner, Simon Bolivar, 1823–1914, Confederate general, b. Hart co., Ky., grad. West Point, 1844. In 1860, Buckner, a Louisville businessman, secured passage of a bill creating a large Kentucky militia and as inspector general trained it. Although he attempted to keep Kentucky neutral during the Civil War, when the legislature became strongly Unionist he took a commission as Confederate brigadier general (Sept., 1861). At FORT DONELSON (Feb., 1862) he surrendered to Grant and was taken prisoner but was soon exchanged and promoted to major general. He fought in Bragg's invasion of Kentucky (Oct., 1862), Mobile (Dec., 1862–63), and Chattanooga (Sept., 1863), and commanded the Dept. of East Tennessee (May–Aug., 1863) and Louisiana from 1864 to the end of the war. Later he was editor of the Louisville *Courier* and governor of Kentucky (1887–91). See biography by A. M. Stickles (1940).

Bucks, see BUCKINGHAMSHIRE

buckthorn, common name for some members of the Rhamnaceae, a family of woody shrubs, small trees, and climbing vines widely distributed throughout the world. The buckthorns (several species of the genus *Rhamnus*) and the jujube (*Zizyphus jujuba*) are cultivated for their ornamental foliage. The jujube was also used locally and exported for use in confectionery and as a flavoring, now largely replaced by artificial flavorings. The lotus of Tennyson's "Lotus-Eaters" is thought to have been the jujube. Other members of the family yield dyes and a limited amount of lumber, e.g., cogwood, a hardwood. Other American species of *Rhamnus* are the redberry, the Indian cherry, and, in California, *Rhamnus purshiana*, which yields the purgative cas-

cara sagrada. Buckthorn is classified in the division MAGNOLIOPHYTA, class Magnoliopsida, order Rhamnales.

buckwheat, common name for certain members of the Polygonaceae, a family of herbs and shrubs found chiefly in north temperate areas and having a characteristic pungent juice containing oxalic acid. Species native to the United States are most common in the West. The largest genus of the family, *Polygonum* (or *Persicaria*), contains the knotweeds and the smartweeds, found in many parts of the world. The common smartweed (*P. hydropiper*) is an annual sometimes called water pepper for its acrid quality. Several species of the dock genus (*Rumex*) are sorrels (the common name used also for the similarly acrid but unrelated *OXALIS*). The garden, or green, sorrel (*R. acetosa*) and the sheep, red, or field sorrel (*R. acetosella*) have long been used in Europe for salads and greens. Among the plants used as potherbs are the patience or spinach dock (*R. patens*) and the tanner's dock (*R. hymenosepalus*), the latter is the source of canaigre, a substance used for tanning. Economically the important members of the family are of the rhubarb genus (*Rheum*) and the buckwheat genus (*Fagopyrum*), both native to Asia. Most of the rhubarb cultivated for the edible thick, fleshy leafstalks is *R. rhaponticum*, called also pieplant and wine plant. Medicinal rhubarb is obtained from this and other species of the genus. The cultivated buckwheat (*F. esculentum*) has been grown in the Old World since the Middle Ages as a honey plant and for its characteristic three-cornered grain, which is utilized for poultry and stock feed. Buckwheat flour is used in the United States, Japan, and eastern Europe; the plant is sown as a cover crop and is a food staple. The genus *Eriogonum* includes the wild, or yellow, buckwheat (*E. allenii*), restricted to the Appalachian shale barrens, and many Western species, e.g., the desert trumpet (*E. inflatum*), a desert flower of arid plains and plateaus. The interesting genus *Koenigia* has only one species, but it is found in arctic regions, in the Himalayas, and in Tierra del Fuego. Buckwheat is classified in the division MAGNOLIOPHYTA, class Magnoliopsida, order Polygonales, family Polygonaceae.

bucolics: see PASTORAL

București: see BUCHAREST

Bucyrus (byōōs'ras), city (1970 pop. 13,111), seat of Crawford co., N. central Ohio, on the Sandusky River, in a farm area, settled 1818, inc. 1886. It is a trade and industrial center and has varied manufactures.

bud, in lower plants and animals, a protuberance from which a new organism or limb develops, in seed plants, a miniaturized twig bearing compressed rudimentary lateral stems (branches), leaves, or flowers, or all three, and protected in cold climates by overlapping bud scales. In warm climates buds grow all year, in temperate climates they grow in summer and remain dormant in the winter. The winter buds (particularly the larger terminal buds on twigs) of trees and shrubs are almost always so characteristic that they serve to identify the species. The "eyes" of a potato are undeveloped buds. See BUD DING, STEM.

Budaëus: see BUDÉ, GUILLAUME

Budapest (bōō'dapēst'), city (1970 pop. 1,940,212), capital of Hungary, N. central Hungary, on both banks of the Danube. The largest city of Hungary and its industrial, cultural, and transportation center, Budapest has varied manufactures, notably machinery, iron and steel, chemicals, pharmaceuticals, and textiles. Together with its industrial suburbs (particularly Csepel, Kispest, Pestszenterzsebet, Pestszentlőrinc, and Úpest, all joined to Budapest in 1949), the city accounts for about half of Hungary's total industrial production. Budapest was formed in 1873 by the union of Buda (Ger. *Ofen*) and Óbuda (Ger. *Alt-Ofen*) on the right bank of the Danube River with Pest on the left bank. Buda, situated among a series of hills, was traditionally the center of government buildings, palaces, and villas belonging to the landed gentry. Pest, a flat area, has long been a commercial and industrial center. The area around Budapest may have been settled as early as the Neolithic era. Aquincum, the Roman capital of Lower Pannonia, was near the modern Óbuda, and Pest developed around another Roman town. Both cities were destroyed by Mongols in 1241, but in the 13th cent. King Bela IV built a fortress (Buda) on a hill around there, and in the 14th cent. Emperor Sigismund built a palace for the Hungarian rulers. Buda became the capital of Hungary in 1361, reach-

ing its height as a cultural center under Matthias Corvinus. Pest fell to the Turks in 1526, Buda in 1541. When Charles V of Lorraine conquered them for the Hapsburgs in 1686, both Buda and Pest were in ruins. They were resettled, Buda with Germans, Pest with Serbs and Hungarians. Buda, a free royal town after 1703, had a renaissance under Maria Theresa, who built a royal palace and in 1777 transferred to Buda the university founded in 1635 by Peter Pazmany at Nagyszombat. The university was later moved (1784) to Pest. In the 19th cent. Pest flourished as an intellectual and commercial center, after the flood of 1838, it was rebuilt on modern lines. Buda became largely a residential sector. After the union of Buda and Pest in 1873, the united city grew rapidly as one of the two capitals of the Austro-Hungarian monarchy. The city was by 1917 Hungary's leading commercial center and was already ringed by industrial suburbs. Also a beautiful city, Budapest became famed for its literary, theatrical, and musical life and attracted tourists with its mineral springs, its historic buildings, and its parks. Especially notable is the large municipal park and the showplace of Margaret Island (Hung. *Margit Sziget*), in the Danube, where St. Margaret, daughter of Bela IV, had lived in a convent. With the collapse of the Austro-Hungarian monarchy (Oct., 1918), Hungary, under Count Michael Karolyi, was proclaimed an independent republic. Budapest became its capital. When Karolyi resigned (March, 1919) the Communists, led by Bela Kun, gained temporary control of the city and established a Soviet republic in Hungary, but his troops were defeated in July, and Budapest was occupied and looted by Rumanian forces in Nov., 1919. Budapest was seized by forces of Admiral Horthy, who in March, 1920, was proclaimed a regent of Hungary. In Oct., 1944, Horthy announced Hungary's withdrawal, as Germany's ally, from World War II, and that same month German troops occupied Budapest. After a 14-week siege the city fell (Feb., 1945) to Soviet troops. Almost 70% of Buda was destroyed or heavily damaged, including the royal palace and the Romanesque Coronation Church. When Hungary was proclaimed a republic (Jan., 1946), Budapest became its capital. In 1948 the Hungarian Communists, backed by Soviet troops, seized control of Hungary and proclaimed it (Aug., 1949) a people's republic. Budapest was the center of a popular uprising against the Hungarian Communist regime in Oct.–Nov., 1956 (see HUNGARY). Educational and cultural institutions in the city include Roland Eötvös Univ. (1635), the Hungarian Academy of Sciences, the National Széchenyi Library, the National Museum, the National Theater, and the State Opera House.

Budaun (bādoun'), town (1971 pop. 72,109), Uttar Pradesh state, N. India, on the Sot River. An administrative center, it trades in grain, cotton, sugarcane, and oilseed. It was an important military outpost under the Mogul empire. The Great Mosque (the Jama Masjid), which dates from 1223, is in Budaun.

Buddha (bōō'dā, bōō-) [Skt., =the enlightened One], usual title given to the founder of BUDDHISM. He is also called the Tathagata [he who has come thus], Bhagavat [the Lord], and Sugata [well-gone]. He probably lived from 563 to 483 B.C. The story of his life is overlaid with legend, the earliest written accounts dating 200 years after his death (see BUDDHIST LITERATURE). His given name was Siddhartha and his family name Gautama (or Gotama). He was born the son of a king of the Sakya clan of the Kshatriya, or warrior, caste (hence his later epithet Sakyamuni, "the sage of the Sakyas"), in the Himalayan foothills in what is now S. Nepal. It was predicted at his birth that he would become either a world ruler or a world teacher, therefore his father, King Suddhodana, who wished Siddhartha to succeed him as ruler, took great pains to shelter him from all misery and anything that might influence him toward the religious life. Siddhartha spent his youth in great luxury, married, and fathered a son. The scriptures relate that at the age of 29, wishing to see more of the world, he left the palace grounds in his chariot. He saw on successive excursions an old man, a sick man, a corpse, and a mendicant monk. From the first three of these sights he learned the inescapability of suffering and death, and in the serenity of the monk he saw his destiny. Forsaking his wife, Yashodhara, and his son, Rahula, he secretly left the palace and became a wandering ascetic. He first studied yogic meditation under the teachers Alara Kalama and Udraka Ramaputra, and after mastering their techniques, decided that these did not lead to the highest realization. He then undertook fasting and extreme austerities, but after six years gave these up fearing that they might cause his

death before he attained illumination. Taking moderate food, he seated himself under a pipal tree at Bodh Gaya and swore not to stir until he had attained the supreme enlightenment. On the night of the full moon, after overcoming the attacks and temptations of Mara, "the evil one," he reached enlightenment, becoming a Buddha at the age of 35. Leaving what was now the Bodhi Tree, or Tree of Enlightenment, he proceeded to the Deer Park at Sarnath, N of Benares (Varanasi), where he preached his first sermon to five ascetics who had been with him when he practiced austerities. They became his first disciples. The first sermon, known as "the setting into motion of the wheel of the dharma," contained the basic doctrines of the "four noble truths" and the "eightfold path." For the remainder of his life he traveled and taught in the Gangetic plain, instructing disciples and giving his teaching to all who came to him, regardless of caste or religion. He spent much of his time in monasteries donated to the sangha, or community of monks, by wealthy lay devotees. Tradition says that he died at the age of 80. He appointed no successor but on his deathbed told his disciples to maintain the sangha and achieve their own liberation by relying on his teaching. He was cremated and his relics divided among eight groups, who deposited them in shrines called stupas. See E. J. Thomas, *The Life of Buddha as Legend and History* (3d ed. 1952, repr. 1960), A. C. A. Foucher, *The Life of the Buddha* (1963, repr. 1972), Trevor Ling, *The Buddha* (1973).

Buddh Gaya, India see BODH GAYA

Buddhism (bōōd'izəm), religion and philosophy founded in India in the 6th to 5th cent. B.C. by Siddhartha Gautama, called the BUDDHA. One of the great Asian religions, it is divided into two main schools: the Theravada, or Hinayana, which predominates in Sri Lanka (formerly Ceylon), Burma, and SE Asia, and the Mahayana, found in China, Korea, and Japan. A third school, the Vajrayana, is confined largely to Tibet (see TIBETAN BUDDHISM). Buddhism has largely died out in the country of its origin, India, except for the presence there of many refugees from the Communist Chinese regime in Tibet.

Early Buddhism India during the lifetime of the Buddha was in a state of religious and cultural ferment. Sects, teachers, and wandering ascetics abounded, espousing many different philosophical views and religious practices. Some of these sects derived from the Brahmanical tradition (see HINDUISM), while others opposed the Vedic and Upanishadic ideas of that tradition. Buddhism, which did not recognize the efficacy of Vedic ritual and did not accept the caste system, and which spread its teachings in the dialects of the people, was by far the most successful of the heterodox or non-Vedic systems. Buddhist tradition tells how Siddhartha Gautama, born a prince and raised in luxury, renounced the world at the age of 29 to search for an ultimate solution to the problem of the suffering innate in the human condition. After six years of spiritual discipline he achieved the supreme enlightenment and spent the remaining 45 years of his life teaching and establishing a community of monks, the sangha, to continue his work. The basic doctrines of early Buddhism, which remain common to all Buddhism, include the "four noble truths": Existence is suffering (*dukkha*), suffering has a cause, namely craving and attachment (*trishna*), there is a cessation of suffering, which is NIRVANA, and there is a path to the cessation of suffering, the "eightfold path" of right views, right resolve, right speech, right action, right livelihood, right effort, right mindfulness, and right concentration. Buddhism characteristically describes reality in terms of process and relation rather than entity or substance. Experience is analyzed into five aggregates (*skandhas*). The first, form (*rupa*), refers to material existence, the following four, feelings (*vedana*), ideas (*samjna*), volitions (*samskara*), and consciousness (*vijnana*), refer to psychological processes. The central Buddhist teaching of non-self (*anatman*) asserts that in the five aggregates no independently existent, immutable self, or soul, can be found. All phenomena arise in interrelation and in dependence on causes and conditions and thus are subject to inevitable decay and perishing. The casual conditions are defined as a 12-membered chain called dependent origination (*pratityasamutpada*), its links are ignorance, predisposition, consciousness, name-form, the senses, contact, craving, grasping, becoming, birth, old age and death, whence again ignorance. With this distinctive view of cause and effect, Buddhism accepts the doctrine common to other Indian religions of samsara, or bondage in the repeating cycles of birth-and-death,

the momentum to rebirth being afforded by one's actions, both physical and mental (see KARMA). The release from this cycle of rebirth and suffering is the total transcendence called nirvana. The ideal of early Buddhism was the perfected saint, arahant or arhat, who had attained liberation by purifying himself of all defilements and desires. From the beginning, meditation and observance of moral precepts were the foundation of Buddhist practice. There are 10 major precepts for monks, of which laymen keep the first five. The ten are: no taking of life, no stealing, no unchaste acts, no false speaking, no drinking of intoxicants, no eating at improper times, no seeing of secular entertainments, no use of garlands, perfumes, and other adornments, no high and wide beds, and no receiving of money. The monastic order (sangha) is venerated along with the dharma, or religious teaching, and the Buddha as one of the "three jewels." Lay practices such as the worship of stupas (burial mounds containing relics) were probably present from earliest times, giving rise to later ritualistic and devotional practices. After the Buddha's death his teachings were transmitted at first by oral tradition and later written down in the 2d and 1st cent. B.C. (see BUDDHIST LITERATURE, PALI LITERATURE). Different sects arose probably very quickly, with varying views on a number of religious and philosophical issues, the latter concerning primarily the analyses of experience elaborated as the systems of ABHIDHARMA. Knowledge of early differences is limited, however, because the earliest extant written version of the scriptures is the Pali canon (1st cent. A.D.) of the Theravada school of Ceylon. Although Theravada [doctrine of the elders] is known to be only one of many early schools of Buddhism (traditionally numbered at 18), its beliefs are generally accepted as representative of early Buddhist doctrine as described above.

Mahayana Buddhism From other of the early schools of Buddhism developed the lines of thought that led toward the positions advocated by Mahayana [great vehicle] Buddhism, it gave itself this name in polemical writings to distinguish itself from what it called the Hinayana [lesser vehicle], Theravada, and related schools. Mahayana is identifiable as a definable movement through the appearance, beginning in the 1st cent. B.C., of a new class of literature, the Mahayana sutras. The main philosophical tenet of the Mahayana is that all things are empty, or devoid of self-nature (see SUNYATA). Its chief religious concept was that of the BODHISATTVA, who replaced the arahant as the ideal and was distinguished from him by his vow to postpone entry into nirvana (although meriting it) until all others may be similarly enlightened and saved. The state of bodhisattva was an actual goal of both lay and monastic Buddhists; it was also the name of a class of celestial beings who were worshiped along with the Buddha. The Mahayana developed doctrines of the eternal and absolute nature of the Buddha, of which the historical Buddha was regarded as a temporary manifestation. Teachings that consciousness is intrinsically pure developed into ideas of potential Buddhahood innate in all beings. The chief philosophical schools of Indian Mahayana were the MADHYAMIKA, founded by Nagarjuna (2d cent. A.D.), and the YOGACARA, founded by the brothers Asanga and Vasubandhu (4th cent. A.D.). In this later Indian period, authors in different schools wrote specialized treatises, Buddhist logic was systematized, and the practices of TANTRA came into prominence.

The Spread of Buddhism In the 3d cent. B.C. the Indian emperor ASOKA greatly strengthened Buddhism by his support and sent Buddhist missionaries as far afield as Syria. In the succeeding centuries, however, Buddhism began to decline in India itself, losing adherents to Hinduism. The destruction of Buddhist centers by the invasions of the White Huns (6th cent.) and the Muslims (11th cent.) were other major factors leading to the virtual extinction of Buddhism in India by the 13th cent. In the meantime, however, its beliefs had spread widely. Ceylon was converted to Buddhism in the 3d cent., and Buddhism has remained its national religion up to the present. The Indian Buddhist scholar Buddhaghosa (5th cent. A.D.) produced some of Theravada Buddhism's most important scholastic writings after taking up residence in Ceylon. Buddhism entered Tibet in the 7th cent. A.D. and flourished there, its main philosophy being that of the Madhyamika and its practices those of the Tantra. The religion reached SE Asia in the first five centuries A.D. Both Mahayana and Hinayana were established, but today the surviving forms are mostly Hinayana. About the 1st cent. A.D. Buddhism entered China along trade routes from central Asia. There followed a four-cen-

tury period of assimilation. In the 3d and 4th cent. Buddhist concepts were interpreted by analogy with native philosophy, mostly Taoism, but the work of the great translators KUMARAJIVA and HSIUAN TSANG established a basis for better understanding of Buddhist concepts. The 6th cent. saw the development of the great philosophical schools, each centering on a certain scripture and having a lineage of teachers. Two such schools, the T'ien-t'ai and the HUA YEN, made a synthesis of the widely varying scriptures and doctrines that had come to China from India and arranged them in hierarchical order. Branches of Madhyamika and Yogacara were also founded. The two great nonacademic sects were Ch'an Buddhism, or ZEN BUDDHISM, whose chief practice was sitting in meditation to achieve "sudden enlightenment," and PURE LAND BUDDHISM, which advocated repetition of the name of the Buddha Amitabha to attain rebirth in his paradise. Buddhism in China encountered opposition from Confucianism and Taoism and resistance from government threatened by the growing power of the sangha, which was tax-exempt. The great persecution by the emperor Wu-tsung in 845 dealt Chinese Buddhism a blow from which it never fully recovered. The only schools that retained vitality were Zen and Pure Land. These increasingly fused with one another and with the native religion, and after the decline of Buddhism in India, neo-Confucianism rose to intellectual and cultural dominance. From China and Korea, Buddhism was imported into Japan. Its schools, with the exception of the nationalistic Nichiren sect, established by Nichiren (1222-82), were those of Chinese Buddhism. The philosophical schools were transmitted first, and Buddhism until the 12th cent. was centered in the life of the nobility. Zen and Pure Land grew to become popular movements after the 13th cent. After World War II new sects arose in Japan such as the Soka Gakkai, a branch of Nichiren, and the Rissho koseikai. They have attracted a large following. See T. W. Rhys Davids, *Buddhism, Its History and Literature* (1896, 5th ed. 1962), H. C. Warren, *Buddhism in Translations* (1896, repr. 1963), C. N. E. Eliot, *Japanese Buddhism* (1935, repr. 1969), K. P. Landon, *Southeast Asia, Crossroads of Religion* (1949, repr. 1969), E. A. Burtt, ed., *The Teachings of the Compassionate Buddha* (1955, repr. 1963), Christmas Humphreys, *A Popular Dictionary of Buddhism* (1962), Edward Conze, *Buddhism: Its Essence and Development* (1953, repr. 1959) and *Buddhist Thought in India* (1962, repr. 1967), Erik Zürcher, *Buddhism* (1962), K. S. S. Ch'en, *Buddhism in China* (1964, repr. 1972), and *Buddhism: The Light of Asia* (1968), R. H. Robinson, *The Buddhist Religion* (1970), M. E. Spiro, *Buddhism and Society* (1970), D. A. Fox, *The Vagrant Lotus* (1973), Trevor Ling, *The Buddha* (1973).

Buddhist literature. During his lifetime the Buddha taught not in Vedic Sanskrit, which had become unintelligible to the people, but in his own NE Indian dialect; he also encouraged his monks to propagate his teachings in the vernacular. After his death, the Buddhist canon was formulated and transmitted by oral tradition, and it was written down in several versions in the 2d and 1st cent. B.C. Its main divisions, called *pitakas* [baskets], are the Vinaya or monastic rules, the Sutra (Pali Sutta) or discourses of the Buddha, and the ABHIDHARMA (Pali *Abhidhamma*) or scholastic metaphysics. Also included are the Jataka, stories about the previous births of the Buddha, many of which are non-Buddhist in origin. The only complete Indian version of the canon now extant is that of the Ceylonese Theravada school, in the Pali language, written 29-17 B.C. (see PALI LITERATURE). North Indian Buddhist texts were written in a type of Sanskrit influenced by the vernaculars. Mahayana Buddhism produced its own class of sutras, and all schools of Buddhism generated a considerable body of commentary and philosophy. The entire corpus of Buddhist writings was translated into Chinese over a period of a thousand years, beginning in the 1st cent. A.D. This was a collaborative effort of foreign and Chinese monks. Its most recent edition, the *Taisho Daizokyo* (1922-33), is in 45 volumes of some 1,000 pages of Chinese characters. Each translation of Buddhist texts into Tibetan was begun in the 7th cent. The final reduction of the canon was by the Buddhist historian Butson (1290-1364) and is in two sections, the *Kanjur* (translation of the Buddha's words) and the *Tanjur* (translation of treatises), consisting altogether of about 320 volumes of Tibetan script. The Tibetan translation is extremely literal, following the Sanskrit almost word for word and based on standardized Sanskrit Tibetan equivalences for Buddhist terms, thus it is

particularly useful for scholars. See Lucien Stryk, ed., *World of the Buddha* (1968)

budding, type of GRAFTING in which a plant bud is inserted under the bark of the stock (usually not more than a year old). It is best done when the bark will peel easily and the buds are mature, as in spring, late summer, or early autumn. Budding is a standard means of propagating roses and most fruit trees in nurseries.

buddleja or **buddleia**: see LOGANIA.

Budé, Guillaume (gēyōm' būdā'), 1467-1540, French humanist, b. Paris. Bude, known also by the Latinized form of his name, Budaeus, was a towering figure of the Renaissance. He was secretary to Louis XII, coming to power and prestige under Francis I. With the latter's patronage he established the study of classical works. Budé persuaded Francis to found the COLLÈGE DE FRANCE and to amass a library at Fontainebleau, which became the nucleus of the BIBLIOTHÈQUE NATIONALE. Acquainted with nearly all the great minds of his age, Bude carried on a voluminous correspondence in several languages. His treatises on language helped to establish the discipline of philology. He translated and commented on Greek literature.

Budenny, Semyon Mikhailovich (sīmyōn mēkhīr-lāvich būdyō'nē), 1883-1973, Russian marshal. A sergeant major in the czarist cavalry, he joined the Communist party in 1919, helped to organize the Soviet cavalry, and served in the Russian civil war (1918-20). He was made marshal in 1935. He commanded in the war against Finland (1940) and was made deputy commissar for defense. In World War II, he was placed in command of the southwest Soviet forces. His gross incompetence was a major cause of the severe defeat inflicted by the Germans on the Russian forces at Kiev in 1941. Budenny was shifted to the rear.

Budge, John Donald (Don Budge), 1915-, American tennis player, b. Oakland, Calif. He won the U.S. and British (Wimbledon) singles titles in 1937 and 1938. Budge also was a member of the 1937 U.S. team that won the Davis Cup from Great Britain. In 1938 he scored the grand slam of tennis by winning the U.S., Australian, French, and British singles championships (the first person to do so), in the same year Budge and Gene Mako won the U.S. doubles crown. He turned professional in 1939. He wrote *How Lawn Tennis is Played* (1937) and *On Tennis* (1939).

Budgell, Eustace (būj'əl), 1686-1737, English essayist. He was a cousin of Addison, through whose aid he obtained several public offices. Budgell contributed to the *Tatler*, the *Spectator*, and the *Guardian*, and wrote pamphlets against the ministry in the *Craftsman*. He lost a fortune in the collapse of the South Sea Bubble and later became involved in the losing end of a controversy over a sum of money left him by Matthew Tindal. He ended his life by committing suicide.

budgetigar (būj'arēgār') see PARAKEET

budget, inclusive list of proposed expenditures and expected receipts of any person, enterprise, or government for a definite period, usually one year. Budget estimates are based on the expenditures and receipts of a similar previous period, modified by any expected changes. The governmental budget originated during the late 18th cent. in England. In the United States an annual Federal budget was not required until the passage (1921) of the Budget and Accounting Act. According to the act, the President must annually submit to Congress a budget that shows the condition of the Treasury at the end of the last completed fiscal year, its estimated condition at the end of the current fiscal year, and its estimated condition at the end of the ensuing year if the budget proposals are carried out, the revenues and expenditures during the last completed year and the estimates thereof for the current year, recommendations of provisions for meeting the revenues and expenditures for the ensuing year, and any other data considered helpful to Congress in its determination of the government's financial policy. No other administrative officer is allowed to make revenue recommendations unless asked to do so by Congress. To help the President, the Budget and Accounting Act also created the Bureau of the Budget, under the Treasury Dept., to receive, compile, and criticize estimates of expenditure needs submitted by the various governmental services and to study in detail all government services and recommend to the President any changes that will increase their economy and efficiency. The bureau was transferred (1939) to the executive office of the President. The national budget is often regarded as one of the ma-

jor policy statements of a presidential administration. Since the beginning of World War II the national budget has grown immensely, mainly because of increased defense expenditures. Revenues, however, have not always kept pace with expenditures, often leading to annual budget deficits. Thus, the 1972 Federal budget, with a deficit of some \$22 billion, was about 25 times as large as the \$9.1 billion budget of 1940. Every state in the United States has some form of budget system. See B. F. Davie, *Modern Political Arithmetic* (1970), R. D. Lee, *Public Budgeting Systems* (1973).

Budweis: see ČESKÉ BUDĚJOVICE, Czechoslovakia

Buell, Abel (byūō'al), 1742-1822, American silversmith, engraver, and type founder, b. Killingworth, Conn. He engraved a number of maps, including maps of the Florida coast and a large wall map of the United States, the first produced in America after the Treaty of Paris in 1783. He experimented in type founding, cast the first font of native-made American type (1769), and later supplied type to Connecticut printers. He invented machinery for cutting and polishing precious stones, for coining money, and for a period produced copper coins for the state. He also established in 1795, at New Haven, one of the first cotton mills in the country (which soon failed), and was involved in many other projects. See biography by L. C. Wroth (rev. ed. 1958).

Buell, Don Carlos, 1818-98, Union general in the Civil War, b. near Marietta, Ohio, grad. West Point, 1841. Buell was appointed brigadier general of volunteers in the Civil War (May, 1861), helped organize the Army of the Potomac, and took command of the Dept. of Ohio (Nov., 1861). He supported Grant's move up the Tennessee and Cumberland rivers by marching on Bowling Green, and after the fall of Fort Donelson he pursued the retreating Confederates to Nashville. In March, 1862, he was placed under Gen. H. W. Halleck and made major general of the Army of the Ohio, in which service he played a decisive role at Shiloh (see SHILOH, BATTLE OF). He forced the Confederates to retreat from Kentucky at Perryville (Oct. 8, 1862) but was dilatory in his pursuit. He was replaced by Gen. W. S. Rosecrans; subsequently he was investigated by the military and discharged. See B. J. Fry, *The Army under Buell* (1886).

Buena Park (bwā'nā), city (1970 pop. 63,646), Orange co., S. Calif., inc. 1953. Food is processed, and tourism is an important industry. Knott's Berry Farm, a re-created gold rush town with many additional features and activities, a movieland wax museum, and a Japanese village surrounding a deer compound are there.

Buenaventura (bwā'nāvēntō'rā), city (1968 est. pop. 78,700), W. Colombia, a port on the Pacific Ocean. The city, located on Cascajal Island in Buenaventura Bay, is the shipping point for the tobacco and sugar of the Cauca valley. Coffee, platinum, gold, and hides are also exported. The original settlement was founded in 1545 and was burned by Indians at the end of the 16th cent. Buenaventura's importance as a port came with the opening of the Panama Canal and with the improvement of communications inland in the 1930s.

Buena Vista, battle of, military engagement in the Mexican War, fought Feb. 22-23, 1847. The battle site was just S. of Saltillo, Coahuila, in Mexico. Gen. Zachary Taylor, disobeying orders from the U.S. government, had advanced here. Gen. Santa Anna, having gathered a Mexican army, made a long march north and, attacking Taylor's forces furiously, outflanked them. The fighting was hard and at the end of the second day seemed a drawn battle, but on the night of Feb. 23 the Mexican army withdrew, leaving Taylor in control of the north of Mexico.

Buenos Aires (bwā'nās īrēs, -ār'ēs, Span. bwā'nōs īrās), city and federal district (1970 pop. 2,972,453, metropolitan area 8,352,900), the capital of Argentina, E. Argentina, on the Rio de la Plata. One of the largest cities of Latin America, Buenos Aires is Argentina's chief port and its financial, industrial, commercial, and social center. Located on the eastern edge of the Pampa, Argentina's most productive agricultural region, and linked with Uruguay, Paraguay, and Brazil by a great inland river system, the city is the distribution hub and trade outlet for a vast area. The historical importance of its port, one of the world's busiest, has led the citizens of Buenos Aires to call themselves *porteños* [people of the port]. Meat, meat products, grain, dairy products, hides, wool, flax, and linseed oil are the chief exports. Buenos Aires, the most heavily industrialized city of Argentina, is a major food-processing center, with huge meat-packing and refrigeration plants

and flour mills. Other leading industries are metalworking, automobile manufacturing, oil refining, printing and publishing, machine building, and the production of textiles, chemicals, paper, clothing, beverages, and tobacco products. Buenos Aires is a modern city of great wealth. In its center are the Plaza de Mayo, a square whose buildings include the Casa Rosada [pink house], office of the national president, and the *cabildo*, former meeting place of the colonial town council and now the home of a national museum. The Avenida de Mayo extends from the square to the Palace of the National Congress, c. 1 mi (1.6 km) away. Other famous streets are the Avenida 9 de Julio (commemorating the date of Argentina's independence from Spain, July 9, 1816), said to be the world's widest boulevard, Calle Florida, the main shopping thoroughfare, and the Avenida de Corrientes, which is the nucleus of the theater and nightclub district, often called the Broadway of Argentina. Buenos Aires also has many beautiful parks, including Palermo Park. The cathedral (completed 1804) is a well-known landmark containing the tomb of Jose de San Martin. Among the numerous educational, scientific, and cultural institutions are the Univ. of Buenos Aires (est. 1821), several private universities, the National Library, and the Teatro Colon, one of the world's most famous opera houses. *La Prensa* and *La Nacion* are daily newspapers famous throughout the Spanish-speaking world. The city has a modern subway system and is a railroad hub, as well as a center of inland seaborne traffic. Nearby, at Ezeiza, is a large international airport. Buenos Aires is inhabited mostly by people of Spanish and Italian extraction, but there are many residents of French, British, German, and Syrian background and some communities of Paraguayans and other Latin Americans. The city was first founded in 1536 by a Spanish royal gold-seeking expedition under Pedro de Mendoza. However, Indian attacks forced the settlers in 1539 to move Asuncion (now the capital of Paraguay), and in 1541 the old site was burned by Indians. A second and permanent settlement was planted in 1580 by Juan de Garay, who set out from Asuncion. Although Spain long neglected Buenos Aires in favor of the riches of Mexico and Peru, the settlement's growth was enhanced by the development of trade, much of it contraband. In 1617 the province of Buenos Aires, or Rio de la Plata, was separated from the administration of Asuncion and was given its own governor, a bishopric was established there in 1620. During the 17th cent. the city ceased to be endangered by Indians, but French, Portuguese, and Danish raids were frequent. Buenos Aires remained subordinate to the Spanish viceroy in Peru until 1776, when it became the capital of a newly created vice-royalty of the Rio de la Plata, including much of present-day Argentina, Uruguay, Paraguay, and Bolivia. Prosperity increased with the gradual removal of restrictions on trade, which formerly had to pass through Lima, Peru. The creation of an open port at Buenos Aires by Charles III of Spain, however, only made the *porteños* more desirous of separation from the Spanish Empire. In 1806, when Spain was allied with France during the Napoleonic Wars, British troops invaded Buenos Aires, their expulsion by the colonial militia without Spanish help further stimulated the drive for independence from Spain. Another British attack was repelled the following year. On May 25, 1810 (now celebrated as a national holiday), armed citizens of the *cabildo*, or town council, successfully demanded the resignation of the Spanish viceroy and established a provisional representative government. This action inaugurated the Latin American revolt against Spanish rule. Argentina's official independence (July 9, 1816) was followed by a long conflict between the unitarians, strongest in Buenos Aires prov., who advocated a centralized government dominated by the city of Buenos Aires, and the federalists, mostly from the interior provinces, who supported provincial autonomy and equality. In 1853 the city and province of Buenos Aires refused to participate in a constituent congress and seceded from Argentina. National political unity was finally achieved when Bartolomé Mitre became Argentina's president in 1862 and made Buenos Aires his capital. Bitterness between Buenos Aires and the province continued, however, until 1880, when the city was detached from the province and federalized. A new city, La Plata, was built as the provincial capital. Argentine railroad construction in the second half of the 19th cent. stimulated settlement and cultivation of the pampas, whose products Buenos Aires marketed and exported. The city's spectacular economic development attracted immigration from all over the world.

Buero Vallejo, Antonio (antō'nyō bwā'rō valyā'-hō), 1916-, Spanish playwright, b. Guadalajara His plays are highly serious with a strong moral vein, and they often depict characters consumed by despair and frustration His best-known works, of paramount importance to the revitalization of the contemporary Spanish theater, include *Historia de una escalera* [the story of a staircase] (1949), *La tejedora de sueños* [the weaver of dreams] (1952), and *El tragaluz* [the skylight] (1967) See study by M. T. Halsey (1973)

Buffalo, city (1970 pop. 462,768), seat of Erie co., W N.Y., on Lake Erie and the Niagara and Buffalo rivers, inc. 1832 With more than 37 mi (60 km) of waterfront, it is an important port of entry and one of the largest grain-distributing ports in the United States It is also a major railroad hub Buffalo is a great flour-milling center and has an enormous steel mill, many automobile plants, some of the world's largest electrochemical and electrometallurgical industries, and numerous other diversified manufactures In 1803 a village was laid out on the site of modern Buffalo by Joseph Ellicott for the Holland Land Company The village was almost destroyed by fire (1813) in the War of 1812 and recovered slowly until the opening of the Erie Canal in 1825 Transportation was a primary factor in the city's growth, and Buffalo became a major Great Lakes port Its educational institutions today include the State Univ. of New York at Buffalo, State Univ. College of Arts and Science at Buffalo, Canisius College, D'Youville College, and Rosary Hill College Of interest are the Albright-Knox Art Gallery, the Buffalo Museum of Science, the county historical museum, and the Buffalo Zoological Gardens Notable buildings include the city hall (1932), the Prudential Building (1895-96), designed by Louis Sullivan, and the Larkin office building, designed by Frank Lloyd Wright Buffalo has a music hall and a philharmonic orchestra A state mental hospital and a state institute for the study of malignant diseases are also located there The Peace Bridge (1927) connects Buffalo with Fort Erie, Canada The city also has an international airport Grover Cleveland became mayor of Buffalo in 1882 There in 1901, at the Pan-American Exposition, President McKinley was assassinated, Theodore Roosevelt took the presidential oath in Buffalo The McKinley monument and the Theodore Roosevelt Inaugural National Historic Site (see NATIONAL PARKS AND MONUMENTS, table) commemorate the two events Millard Fillmore's home was in Buffalo

buffalo, name commonly applied to the American BISON but correctly restricted to certain related African and Asian mammals of the cattle family The water buffalo, or Indian buffalo, *Bubalus bubalis*, is found in S Asia It is a large, extremely strong, dark gray animal, standing nearly 6 ft (180 cm) at the shoulder and weighing up to 2,000 lb (900 kg) Its widely spread horns curve out and back in a semicircle and may reach a length of 6 ft (180 cm) For many centuries it has been domesticated as a draft animal, but wild forms still exist in Borneo and herds descended from domesticated animals live in a wild state elsewhere Water buffalo live in swampy areas and near rivers, where they wallow in the mud Wild water buffalo are extremely fierce and have been known to kill fully grown tigers The domestic forms are somewhat more docile They are used throughout S Asia to pull plows and carts, they are of little importance as dairy animals, as their milk is scant Their diet consists chiefly of grass The anoa, *Anoa depressicornis*, also called dwarf buffalo or wood buffalo, is the smallest of the buffalo, standing only 40 in (100 cm) high at the shoulder, it is found in the Celebes Its slightly larger relative, the tamarou, *Anoa mindorensis*, is found in the Mindoro region of the Philippines Both are forest dwellers The large, fierce CAPE BUFFALO is found in Africa Buffalo are classified in the phylum CHORDATA, subphylum Vertebrata, class Mammalia, order Artiodactyla, family Bovidae See D. A. Dary, *The Buffalo Book* (1974)

Buffalo, University of: see NEW YORK, STATE UNIV. OF

buffalo berry: see OLEASTER

Buffalo Bill, 1846-1917, American plainsman, scout, and showman, b. near Davenport, Iowa His real name was William Frederick Cody His family moved (1854) to Kansas, and after the death of his father (1857) he set out to earn the family living, working for supply trains and a freighting company In 1859 he went to the Colorado gold fields, and in 1860 he rode briefly for the Pony Express His adventures on the Western frontier as an army scout and later as a buffalo hunter for railroad construction camps on the Great Plains were the basis for the

stories later told about him Ned BUNTLINE in 1872 persuaded him to appear on the stage, and, except for a brief period of scouting against the Sioux in 1876, he was from that time connected with show business In 1883 he organized Buffalo Bill's Wild West Show, and he toured with it throughout the United States and Europe for many years Wyoming granted him a stock ranch, on which the town of Cody was laid out He died in Denver and was buried on Lookout Mt. near Golden, Colo. The exploits attributed to him in the dime novels of Buntline and Prentice Ingraham are only slightly more imaginative than his own autobiography (1920) See R. J. Walsh and M. Salsbury, *The Making of Buffalo Bill* (1928), biographies by D. B. Russell (1960, repr. 1969) and John Burke (1973)

buffalo bur: see NIGHTSHADE

buffalo clover: see LUPINE

buffalo fish: see SUCKER

buffalo grass, low perennial grass (*Buchloe dactyloides*) of the plains regions, one of the most important range grasses Its dense matted growth is valuable also in erosion control Buffalo grass usually grows together with the grama, or mesquite, grasses (genus *Bouteloua*), especially blue grama and side-oats grama These taller grasses have the same distribution as buffalo grass, but none of them produce a continuous sod, as prairie grasses do Buffalo grass is classified in the division MAGNOLIOPHYTA, class Liliatae, order Cyperales, family Gramineae

Buffalo Grove, village (1970 pop. 11,799), Cook and Lake counties, NE Ill., inc. 1958

Buffalo National River, Ark. see NATIONAL PARKS AND MONUMENTS, table

buffer, solution that can keep its relative acidity or alkalinity constant, i.e., keep its pH constant, despite the addition of strong acids or strong bases Buffer solutions are frequently solutions that contain either a weak acid and one of its salts or a weak base and one of its salts Many acid-base reactions take place in living organisms However, for organisms to perform certain vital functions, the body fluids associated with these functions must maintain a constant pH For example, blood must maintain a pH of close to 7.4 in order to carry oxygen from the lungs to cells, blood is therefore a powerful buffer

Buffet, Bernard (bērnar' bufā'), 1928-, French painter Buffet's melancholy paintings are characterized by a prominent black line and grayed, muddled colors His subjects include still life, city scenes, and figures Buffet illustrated Jean Cocteau's *La Voix Humaine* (1957)

Buffon, Georges Louis Leclerc, comte de (zhōrhzh lwē lāklerk' kōntē dā bufōn'), 1707-88, French naturalist and author From 1739 he was keeper of the Jardin du Roi (later the Jardin des Plantes) in Paris and made it a center of research during the Enlightenment He devoted his life to his monumental *Histoire naturelle* (44 vol., 1749-1804), a popular and brilliantly written compendium of data on natural history interspersed with Buffon's own speculations and theories Of this work, the volumes *Histoire naturelle des animaux* and *Époques de la nature* are of special interest His famous *Discours sur le style* was delivered (1753) on his reception into the French Academy See study by O. E. Fellows and S. F. Miliken (1972)

Bug (bōōg, būg, Rus bōōk), Ukr *Buh*, river, c. 480 mi (770 km) long, rising in the Volhynian-Podolian hills, the Ukraine, W European USSR It flows N along the Polish-Ukrainian and Polish-Belorussian borders past Brest and then NW through Poland to join the Vistula River near Warsaw It is linked with the Dnepr by the Dnepr-Bug Canal via the Pina River and with the Niemen by the Augustov Canal via the Narva River The Bug is also known as the Western Bug

Bug or Southern Bug, Rus *Yuzhny Bug*, Ukr *Privdnyy Buh*, river, c. 490 mi (790 km) long, rising in the Volhynian-Podolian hills, the Ukraine, W European USSR The Bug, flowing generally SE into the Black Sea, is navigable for c. 100 mi (160 km) from Voznesensk to its mouth

bug, common name correctly applied to insects belonging to the order Hemiptera (suborder Heteroptera), although members of the order Homoptera (e.g., MEALYBUG) are sometimes referred to as bugs, as are other insects in general The true bugs (Hemipterans) have a characteristic pair of front wings that are partially thickened and darkened at the base and partially membranous at the apex Development is gradual through an incomplete METAMORPHOSIS with a number of nymphal stages before the reproductively mature adult stage is reached

Most bugs are terrestrial, but many are aquatic (e.g., various WATER BUGS) Although bugs vary greatly in size, color, and physical appearance, they all have piercing-sucking mouthparts in the form of a jointed beak Most species suck plant juices (e.g., the SQUASH BUG and CHINCH BUG), however, some suck the blood of other insects and spiders (e.g., the ASSASSIN BUG and BACKSWIMMER) Others, such as the BEDBUG, feed on man and other animals Many of these insects characteristically secrete defensive substances (e.g., the STINK BUG) The true bugs are classified in the phylum ARTHROPODA, class Insecta, order Hemiptera

Buganda, kingdom, E Africa see UGANDA

Bugayev, Boris Nikolayevich: see BELY, ANDREI

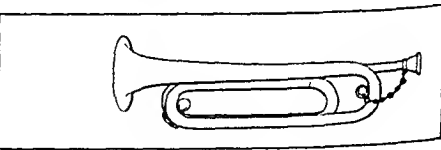
bugbane, any plant of the genus *Cimicifuga*, tall north-temperate perennials of the family Ranunculaceae (BUTTERCUP family) The white spirelike bloom has a rank odor that attracts flies, which pollinate the plant Common in woodlands of E North America is *C. racemosa*, black snakeroot, or black cohosh, sometimes gathered for its medicinal root Other plants are also called bugbane and snakeroot, most plants called cohosh belong to the related BANEERRY genus Bugbane is classified in the division MAGNOLIOPHYTA, class Magnoliopsida, order Ranunculales, family Ranunculaceae

Bugeaud de la Piconnerie, Thomas Robert (tōma' rôbēr' buzhō' dā la pēkōnārē'), 1784-1849, marshal of France, duc d'Isly, general and administrator in Algeria He served in the army of the French emperor Napoleon I until forced into retirement in 1815 Returning to public life after the July Revolution of 1830, he became a deputy Sent twice (1836, 1837) to Algeria on special missions, he returned again in 1841 to undertake the pacification of Algeria as governor general His celebrated victory at Isly (1844) finally broke the power of ABD AL-KADIR Bugeaud attempted to cooperate with the Arabs, to promote military colonization, and to encourage French settlers, but the unpopularity of his policies forced his resignation in 1847 He was named commander of the troops in Paris by Louis Philippe during the February Revolution of 1848 A strong general, he was feared in France as a potential dictator He wrote on colonial, military, and economic subjects

Bugenhagen, Johann (yō'han bōō'ganha'gan), 1485-1558, German Protestant reformer Born in Pomerania, he is sometimes called Dr. Pomeranus Bugenhagen, an ordained priest, was attracted to the reform movement by Martin Luther's writings In 1521 he went to Wittenberg and entered upon a lasting friendship with Luther and Melancthon He was a lecturer in the university and pastor of the principal church in Wittenberg Much of Bugenhagen's attention was devoted to ecclesiastical and educational organization in Brunswick, Hamburg, Lubeck, Pomerania, and Denmark Bugenhagen helped Luther in his translation of the Bible Of his own literary works the most important is *Interpretatio in librum Psalmorum* (1523) See biography by W. M. Ruccius (1924)

Bugge, Sophus (sō'fōōs bōō'ga), 1833-1907, Norwegian philologist He made a notable edition of the Old Norse runes, and his was the first critical edition (1881-89, 2d series 1896) of the poems of the *Eddas*

bugle, brass wind musical instrument consisting of a conical tube coiled once upon itself, capable of producing five or six harmonics It is usually in G or B flat Its principal use is for military and naval bugle



Bugle

calls, such as taps and reveille, and, in earlier times, for hunting calls In the early 19th cent., keyed bugles were made in order to obtain a complete scale

Buhl, Andre Charles: see BOUILLE, ANDRÉ CHARLES

building and loan association: see SAVINGS AND LOAN ASSOCIATION

Buisson, Ferdinand Édouard (fērdīnān' ādwār' būsōn'), 1841-1932, French educator and Nobel Peace Prize winner He studied at the Sorbonne and later taught (1866-70) in Switzerland After 1870 he served in the French department of education, first as an inspector of schools and later as a director of

primary education, resigning in 1886 to become professor of pedagogy at the Sorbonne. He produced the *Dictionnaire de pedagogie* (1882-93). From 1902 to 1914 and again from 1919 to 1924, he was a member of the chamber of deputies and was also active in working for civil rights. An ardent pacifist, he attended (1867) the first congress of the International Peace League, with Ludwig Quidde of Germany he received the 1927 Nobel Peace Prize.

Buitenzorg: see BOGOR, Indonesia

Bujumbura (bōō'jəm'bōō'rā), city (1971 est. pop. 57,000), capital of Burundi and of Bujumbura prov., W Burundi, a port on Lake Tanganyika. Formerly known as Usumbura, it is Burundi's largest city and its administrative, communications, and economic center. Manufactures include food products, cement and other building materials, textiles, soap, shoes, and metal goods. Livestock and agricultural produce from the surrounding region are traded in the city. Bujumbura is Burundi's main port and ships most of the country's chief export, coffee, as well as cotton, skins, and tin ore, via Lake Tanganyika to Tanzania and Zaïre. The city attracts many tourists. A small village in the 19th cent., Bujumbura grew after it became (1899) a military post in German East Africa. After World War I it was made the administrative center of the Belgian Ruanda-Urundi League of Nations mandate. Its name was changed from Usumbura to Bujumbura when Burundi became independent in 1962. The Univ. of Bujumbura (1960) is there. The city has an international airport.

Bukavu (bōō'ka'vōō), city (1970 pop. 135,000), capital of Kivu region, E Zaïre, a port on Lake Kivu. It is an administrative, commercial, and transportation center. Hides and coffee are processed. The city was founded in 1901 and was formerly known as Costermansville. In 1967, Bukavu was briefly held by rebel Katangan and mercenary forces. A school of mines is there.

Bukhara (bakā'rā), city (1970 pop. 112,000), capital of Bukhara oblast, S Central Asian USSR, in Uzbekistan, in the Zeravshan River valley. The name is also spelled Bokhara. On the Shkhrud irrigation canal system, it is the center of a large cotton district and has textile mills as well as cotton-ginning industries and the largest karakul skin processing plant in the USSR. First mentioned in Chinese chronicles in the 5th cent. A.D., Bukhara is one of the oldest trade and cultural centers in central Asia. It came under the Arab caliphate in the 8th cent. and became a major center of Islamic learning. During the 9th and 10th cent. it was the capital of the Samanid state. From the 16th cent. to 1920 it was the capital of the khanate of Bukhara, which was ceded to Russia in 1868. From 1920 to 1924 it was the capital of the Bukhara People's Republic. There are many monuments, including the mausoleum of Ismail Samanid (892-907), the minaret of Kalyan (1127), the mosque of Magoki-Attari (12th cent.), the Ulugbek (1417-18) and Mir-Arab (1535-36) medreses (schools), and the medresah of Abdylazizkhana (1651-52). The population is mainly Uzbek, with Arab, Afghan, and Jewish minorities.

Bukhara, emirate of, former state, central Asia, in TURKISTAN, in the Amu Darya River basin. Part of ancient Sogdiana, it was ruled (A.D. 709-874) by the Umayyad Arabs and played an important role under the Samanid dynasties (875-1000). It was a trade, transport, and cultural center of the Islamic world. The Seljuk Turks ruled from 1004 to 1133, later, the realm was conquered by Jenghiz Khan (1220) and in the 14th cent. by Tamerlane. The Timurid dynasties ruled until the invasion of Uzbek tribes early in the 16th cent. The Bukhara emirate was founded by the Uzbek Khan Sheybani, who between 1500 and 1507 conquered the Timurid domains in Transoxania. In 1555, Abdullah Khan transferred the capital from Samarkand to Bukhara, from which the state then took its name. Internal feuds weakened Bukhara, it split into a number of principalities, and in 1740 it was conquered by Nadir Shah of Persia. In 1753, Bukhara again became an independent emirate but did not recover its supremacy over Khorezm, Merv, Badakhshan, Tashkent, and the Fergana Valley. Bukhara's population consisted principally of Uzbeks (who remained politically dominant), Sarts, and Tadzhiks. Defeated by Russia in 1866, the emirate became a Russian protectorate in 1868. In 1920, after a prolonged battle with Bolshevik forces, the last emir was driven into Afghanistan. The Bukhara People's Soviet Republic was established (1920) and lasted until 1924. In the same year it was proclaimed a socialist republic and was included in the USSR, a few months later, however, it was dismembered and divided between Uzbekistan, Tadzhikistan, and Turkmenistan.

Bukhari, al- (bōōk-harē'), d. 870, Arabic scholar and Muslim saint, b. Bukhara. He traveled widely over Muslim regions and made a tremendous collection of the traditional sayings of the Prophet. It is regarded in ISLAM as the commentary par excellence and the law book second only to the Koran. The tomb of al-Bukhari, near Samarkand, is a noted place of pilgrimage.

Bukharin, Nikolai Ivanovich (nyī'kalī' ēva'nāvīch bōōkhar'ēn), 1888-1938, Russian Communist leader and theoretician. A member of the Bolshevik wing of the Social Democratic party, he spent the years 1911-17 abroad and edited (1916) the revolutionary paper *Novy Mir* [new world] in New York City. He took part in the Bolshevik Revolution in Nov., 1917 (Oct., 1917, O.S.) in Russia and became a leader in the COMINTERN and editor of the Soviet newspaper *Pravda* [truth]. In 1924 he was made a full member of the politburo. As STALIN rose to power in the 1920s, Bukharin first allied with him against KAMENEV and ZINOVIEV. An advocate of slow agricultural collectivization and industrialization (the position of the so-called right opposition), Bukharin lost (1929) his major posts after that position was defeated by the Stalinist majority in the party. He edited *Izvestia* [news] briefly in 1934 but was dismissed. In 1938 he was tried publicly for treason and was executed. He wrote and translated many works on economics and political science. See study by S. F. Cohen (1973).

Bukidnon (bōōkīd'nōn, Sp. bōōkēdh'nōn), province (1970 pop. 400,307), N central Mindanao, the Philippines. Malaybalay is the provincial capital. Much of the area is on a high plateau (alt. c. 2,000 ft/610 m). With very fertile soil and a heavy, evenly distributed annual rainfall, Bukidnon is of great importance agriculturally. Intensely cultivated, it is the nation's major pineapple-producing region and a center of coffee production. A great variety of fruits is also grown, primarily for canning and export. The province has a high percentage of owner-operated farms. Central Mindanao Univ. is at Musuan.

Bukki (bū'kī) 1. Descendant of Aaron. 1 Chron. 6:5, 51, Ezra 7:4. 2. Danite. Num. 34:22.

Bukkiāh (bak'ā), Levite. 1 Chron. 25:4, 13.

Bukovina (bōō'kavē'nā), Rum. *Bucovina*, Ukr. *Bukovyna*, historic region of E Europe, in W Ukraine and NE Rumania. Traversed by the Carpathian Mts. and the upper Prut and Siret rivers, it is heavily forested. [Bukovina means "beechwood" in Rumanian] and produces timber, textiles, grain, and livestock. Petroleum and salt are produced in quantity, other mineral resources include manganese, iron, and copper. CHERNOVTSY, in the Ukraine, is the chief city. The population is largely Rumanian, in S Bukovina and Ukrainian in the north. Most of the region's Jews were exterminated during World War II. A part of the Roman province of Dacia, Bukovina was overrun after the 3d cent. A.D. by the Huns and other nomads. It later (10th-13th cent.) belonged to the Kievan state (see KIEV) and the Galich and Volhynia principalities. After the Mongols withdrew from Moldavia, Bukovina became (14th cent.) the nucleus of the Moldavian principality. The term *Bukovina* was first mentioned in an agreement concluded in 1412 between King Ladislaus II of Poland and Sigismund of Hungary. In 1514, Bukovina, then part of Moldavia, became tributary to the Turkish sultans. Ceded by the Ottoman Empire to Austria in 1775, it was at first a district of Galicia but in 1848 was made, as a titular duchy, a separate Austrian crownland. The region won limited autonomy from Austria, and in 1861 Chernovtsy was made the seat of a provincial diet. Bukovina became an object of irredentism when Rumania achieved full independence in 1878. The country's boundaries encompassed SUCEAVA, the ancient capital of Moldavia, but Chernovtsy was incorporated into Austria. With the dissolution of the Austrian empire in 1918, the Ukrainian national council at Chernovtsy voted the incorporation of N Bukovina into the West Ukrainian Democratic Republic. The Treaty of Saint-Germain (1919) gave only the southern part of Bukovina to Rumania, but the subsequent Treaty of Sevres awarded Rumania the entire region. Self-government was suppressed in N Bukovina. In a treaty of June, 1940, Rumania ceded the northern part of Bukovina (c. 2,140 sq mi/5,540 sq km) to the USSR, which incorporated it into the Ukrainian SSR. Although Rumanian troops reoccupied N Bukovina during World War II, the Rumanian peace treaty of 1947 confirmed Soviet possession of the area. N Bukovina now forms part of the Chernovtsy oblast in the Ukraine. The remainder of the area (c. 1,890 sq mi/4,895 sq km) forms one of the historical prov-

inces of Rumania and is part of the administrative region of Suceava.

Bulawayo (bōō'lāwā'yō), city (1970 est. pop. 70,000), SW Rhodesia. It is the second largest city of Rhodesia and an important industrial, commercial, and railroad center. Among its manufactures are textiles, motor vehicles, metal products, and cement. Founded by the British in 1893, it was the scene (1896) of a Matabele revolt. Nearby are the 18th-century African ruins of Khami.

bulb, thickened, fleshy plant bud, usually formed under the surface of the soil, which carries the plant over from one blooming season to another. It may have layers (as in the onion and hyacinth) or scales (as in some lilies)—both of which are highly modified leaves. Many popular outdoor and house plants, such as the tulip and the narcissus, are grown from bulbs, some of them out of their usual flowering season by forcing. Not true bulbs, but often so called, are the CORM of the crocus and the gladiolus, the TUBER of the dahlia and the potato, and the RHIZOME of certain irises. All such organs are specialized subterranean stems serving for food storage and asexual reproduction. See Marc Reynolds and W. L. Meachem, *The Complete Book of Garden Bulbs* (1972).

bulbul, antelope. See HAPTEBEEST.

bulbul (bōō'l'bōōl), bird, common name for members of the family Pycnonotidae, comprising 119 species of medium-sized, dull-colored passerine birds with short necks and wings, native to Africa and S Asia. Bulbuls are famed as songsters and are popular as cage birds in the Orient, frequently mentioned in Persian poetry, the word *bulbul* is often mistranslated "nightingale." Bulbuls range in size from 6 in. (15 cm) to about 12 in. (30.5 cm). They inhabit grasslands and shrubby countrysides, from sea level to 10,000 ft (3,050 m) in the Himalayas. A common Asian species, the red-whiskered bulbul, *Pycnonotus jocosus*, is easily tamed and is popular as a cage bird. Bulbuls feed mainly on fruits and berries and sometimes do crop damage. They build cleverly concealed cup-shaped grass nests, in which the female lays from three to five eggs per clutch. Both parents brood the nestlings. Bulbuls are classified in the phylum CHORDATA, subphylum Vertebrata, class Aves, order Passeriformes, family Pycnonotidae.

Bulfinch, Charles, 1763-1844, American architect, b. Boston. A member of the Boston board of selectmen in 1791, he was chosen chairman in 1799—an office equivalent to mayor and held by Bulfinch for 19 years. Of the numerous structures that he designed in Boston, most have long been demolished, including the Federal Street Theater (1794), the first theater in New England. His chief monumental works remain—the statehouse in Boston (1799), University Hall at Harvard (1815), and the Massachusetts General Hospital (1820). From 1818 to 1830 Bulfinch carried to completion the CAPITOL at Washington, of his own contributions there remains the west portico, with the terraces and steps forming the approach to it. In this work and in the Massachusetts statehouse he evolved an architectural composition that has been used for state capitols throughout the country. He designed a memorial column on Beacon Hill (1789), Massachusetts State Prison (1803), a number of Massachusetts courthouses, and Franklin Crescent in Boston (1793). The last was a long curved row of 16 residences, inspired by the continuous block of houses that had been erected by Robert Adam and others in England. The First Church of Christ in Lancaster, Mass. (1816-17), one of the few remaining churches of the many that he designed, is one of his finest works. While Bulfinch's works fall into the general category of "early American" architecture, they bear a distinctive stamp of his own. Their elegance, repose, and refinement of detail rank them among the best products of the nation's early years. See H. Kirker, *The Architecture of Charles Bulfinch* (1969).

Bulfinch, Thomas, 1796-1867, American author, b. Newton, Mass., grad. Harvard, 1814. He wrote a series of works popularizing fable and legend, including *The Age of Fables* (1855), *The Age of Chivalry* (1858), *Legends of Charlemagne* (1863), and *Oregon and Eldorado* (1866).

Bulgakov, Mikhail Afanasyevich (mēkhayēl' āfa-nā'syavīch bōōlgā'kaf), 1891-1940, Russian novelist and playwright. He wrote satirical stories (*The Devil*, 1925, tr. 1972) and comedies (*Zoe's Apartment*, 1926) and the long novel *The White Guard* (1925, tr. 1971), in which a Kievan family hostile to the revolution is sympathetically and realistically portrayed. He condensed and dramatized this as *The Days of the Turbines* (1926, tr. 1934). The novel *The Master*

and Margarita (tr 1967), which he worked on intermittently from 1928 until his death, is considered his most important work. His other novels include *The Heart of a Dog* (1925, tr 1968). Bulgakov was officially criticized for several of his works. See *The Early Plays of Mikhail Bulgakov 1926-1936* (tr 1972).

Bulganin, Nikolai Aleksandrovich (ny'kālī'alyik'sān'drāvich boōlgā'nīn), 1895-, Soviet military and political leader. He held posts in industrial management, was mayor of Moscow (1931-37) and chairman of the state bank (1937-41), and served on a military council in World War II. Made a marshal and a deputy premier in 1947, and a full member of the politburo in 1948, he was also defense minister under Joseph Stalin and later under Georgi Malenkov. With the support of Nikita KHRUSHCHEV, who was then head of the Communist party, Bulganin succeeded Malenkov as premier (Feb, 1955). In 1958, however, he was forced from office by Khrushchev, who took over the post of premier. Bulganin was accused of having sided with the "antiparty faction" that opposed Khrushchev in 1957, he was expelled from the central committee of the Communist party in Sept, 1958.

Bulgari: see BULGARS, EASTERN

Bulgaria (būlgā'ēə), republic (1973 est pop 8,620,000), 42,823 sq mi (110,912 sq km), SE Europe, on the E Balkan Peninsula. It is bounded by the Black Sea on the east, by Rumania on the north, by Yugoslavia on the west, by Greece on the south, and by European Turkey on the southeast. SOFIA is the capital. Other important cities are VARNA and BURGAS (the main Black Sea ports of Bulgaria), PLOVDIV and RUSE. Central Bulgaria is traversed from east to west by ranges of the Balkan Mts. A fertile plateau runs north of the Balkans to the Danube River, which forms most of the northern border. In the southwest is the Rhodope range, which includes Bulgaria's highest point, Musala mt (9,592 ft/2,923 m). The Thracian plain lies south of the Balkans and east of the Rhodope. The Danube, the Iskūr, the Maritsa, and the Struma are the principal rivers. Bulgaria's mineral resources include brown coal (lignite), bauxite, iron ore, lead, zinc, and oil and natural gas. There are many mineral springs. Traditionally an agricultural country, Bulgaria has been considerably industrialized since World War II. The leading industries are engineering, metallurgy, and the production of chemicals and fertilizers. Agriculture, however, remains the chief occupation, the principal crops are wheat, corn, barley, and sugar beets. Grapes and other fruit, as well as roses, are grown, and much stock is raised. Most of the land was collectivized by 1958. The chief exports are foodstuffs and attar of roses, manufactured goods and fuels are the leading imports. The population consists chiefly of Bulgars (85%) and Turks (8%), with small minorities of Macedonians and Gypsies. About 27% belong to the Orthodox Eastern Church, and 7% are Muslims. In 1953 the Bulgarian patriarchate was reestablished, it had been disestablished in 1946. Institutions of higher education include the universities of Sofia, Plovdiv, and Varna. Ancient Thrace and Moesia, which modern Bulgaria occupies, were settled (6th cent AD) by Slavic tribes. In 679-80, Bulgar tribes from the banks of the Volga (see BULGARS, EASTERN) crossed the Danube, subjugated the Slavs, and settled permanently in the territory of Bulgaria. The language and culture remained Slavic, and by the 9th cent the Bulgars had fully merged with the Slavs. The first Bulgarian empire (681-1018), established by Khan Asparuh, or Isperikh (ruled 680-701), and his successor, Terrel (ruled 701-718), soon emerged as a significant Balkan power and a threat to Byzantium. In 809 the khan Krum (ruled 803-814) captured Sofia from the Byzantines, defeated (811) Emperor Nicephorus I, besieged Constantinople, and withdrew only after obtaining yearly tribute. In the 9th cent Bulgaria became the arena of political

and cultural rivalry between Constantinople and Rome. In 865, BORIS I adopted Christianity, and in 870 Constantinople recognized the independence of the Bulgarian church. Bulgaria received Byzantine culture through the Slavic literary language developed by St Cyril and St Methodius in Moravia and brought to the Balkans by their disciples. The first Bulgarian empire reached its height under SIMEON I (893-927), who took the title of czar. After his death the country was rent by the heresy of the BOGOMILS. In the 10th cent Bulgaria crumbled under the attacks of a reinvigorated Byzantium, and in 1018 it was annexed by Emperor BASIL II. Byzantine domination was weakened by the invasions of the PECHENEGS and CUMANS and by internal disorders at Constantinople. The second Bulgarian empire (1186-1396) rose in 1186 when Ivan Asen (Ivan I) was crowned czar at TRNOVO. His son, Kaloyan, crowned in 1204 with the approval of the pope, defeated (1205) Emperor Baldwin I of Constantinople. The height of Bulgar power was reached under Ivan II (Ivan Asen), whose rule (1218-1241) extended over nearly the whole Balkan Peninsula except Greece. His successors could not maintain his empire. In 1330, Macedonian Bulgaria was conquered by Serbia. After the battles of KOSOVO (1389) and NIKOPOL (1396) Bulgaria was absorbed into the Ottoman Empire. Turkish rule was often oppressive, and rebellions were frequent. By recognizing the authority of the Orthodox Eastern Church in Constantinople over all Christians in their empire, the Turks undermined the basis of Bulgarian culture. A determined effort was made to destroy Bulgarian Christianity and the Bulgarian language. The role of the Phanariots (see PHANAR) was particularly resented. Although the administration (1864-69) of MIDHAT PASHA made Bulgaria briefly a model province, by then Bulgarian nationalism was strong. The Mount Athos monastery had continued to use Bulgarian, there, in 1762, a monk had written a history, the first modern literary work in Bulgarian. Bulgarian schools were allowed to open in 1835. In 1870 the Bulgarian Church was reestablished. In 1876 a rebellion, led by Stefan STAMBULOV, broke out. The subsequent Turkish reprisals (famous as the "Bulgarian atrocities") provided a reason for the Russians to liberate (1877-78) their neighbors (see RUSSO-TURKISH WARS). The Treaty of San Stefano created a large autonomous Bulgaria within the Ottoman Empire—a Bulgaria that Russia expected to dominate. In order to avert the expansion of Russian influence in the Balkans, a European congress was called to revise the treaty (see BERLIN, CONGRESS OF). By the new terms Bulgaria was reduced to the territory between the Danube and the Balkans, while present-day S Bulgaria—then called Eastern RUMELIA—became a separate autonomous province, and Macedonia remained under direct Turkish rule. ALEXANDER (Alexander of Battenberg), first prince of Bulgaria, annexed (1885) Eastern RUMELIA and repulsed a consequent Serbian attack. His successor, Prince FERDINAND of Saxe-Coburg-Gotha, profiting from the revolution of the Young Turks in the Ottoman Empire in 1908, proclaimed Bulgaria independent with himself as czar. Bulgaria was victorious against Turkey in the first (1911-12) of the BALKAN WARS, but claims to Macedonia involved it in the Second Balkan War with its former allies Greece and Serbia, and it was soon defeated. By the Treaty of Bucharest (1913), Bulgaria lost S DOBRUJA and a large part of Macedonia. The Macedonian issue was largely responsible for the entry in 1915 of Bulgaria into World War I on the side of Germany and Austria-Hungary. There was much domestic opposition to the war, and when Bulgaria's military position crumbled, Ferdinand fled and BORIS III succeeded (1918). In the peace (see NEUILLY, TREATY OF) Bulgaria was forced to pay reparations and lost its outlet to the Aegean Sea to Greece and some territory to Yugoslavia, S Dobruja was confirmed in Rumanian possession. The Agrarian party cabinet established (1919) by STAMBULSKI held power until overthrown (1923) in a bloody coup. An era of political confusion ensued, dominated by the violent activities of an irredentist Macedonian terrorist group. The world economic crisis of 1929 had a disastrous impact on impoverished Bulgaria as markets for agricultural exports shrunk. In 1934, Kimon Georgiev became premier with the help of the army and ended constitutional government, but he was ousted in 1935 by Boris III, who established his personal dictatorship. Bulgaria saw in an alliance with Germany in World War II an opportunity to satisfy its territorial claims. In 1940, Germany forced Rumania to restore to Bulgaria S Dobruja. In 1941, Bulgaria occupied parts of Yugoslavia and Greece (including Macedonia), and declared war on Great

Britain and the United States—but not the Soviet Union, because the populace was pro-Russian. The child SIMEON II succeeded when Boris died mysteriously (1943). In 1944 the Soviet Union declared war on Bulgaria, and Soviet troops entered the country (September). Pro-Allied political forces (Communists, Agrarians, and the pro-Soviet army officers), headed by Georgiev, seized power immediately. Bulgaria declared war on Germany, and an armistice with the USSR followed (October). After a short period of coalition rule, the Communists succeeded in taking over the government. The monarchy was abolished, and in 1946 Bulgaria was proclaimed a republic with Georgi DIMITROV as premier. The peace treaty with the Allies (1947) allowed Bulgaria to keep S Dobruja, but no gains were made in Macedonia. Dimitrov proceeded to eliminate possible opponents. The Agrarian leader Nikola Petrov was executed (1947). A new constitution was enacted, and Bulgaria became a one-party state. Industry was nationalized and farms collectivized. Bulgaria closely followed the Soviet Union in its domestic and foreign policies, after the expulsion of Yugoslavia from the Cominform in 1948, Bulgaria sided with the USSR. Dimitrov's successor, Vulko Chervenkov, massively purged the Communist party (1950). In 1951-52, Bulgaria deported to Turkey some 160,000 citizens of Turkish origin. Relations with Greece and Turkey improved somewhat after 1954. Bulgaria joined (1949) the Council for Economic Mutual Assistance and in 1955 became a member of the Warsaw Treaty Organization and the United Nations. In the mid-1950s the government loosened its grip somewhat. Stalinists fell from power and purge victims were rehabilitated (posthumously in some cases). In 1965 army officers and party officials unsuccessfully attempted a coup. Bulgaria aided the USSR in the invasion of Czechoslovakia in 1968. A new constitution was adopted in 1971. It provided for a unicameral national assembly to be elected every five years. The assembly elects a council of state and the cabinet of ministers. But actual power resides in the Communist party, which heads the Fatherland Front, a grouping of organizations that support the regime. See W S Monroe, *Bulgaria and Her People* (1914), Steven Runciman, *A History of the First Bulgarian Empire* (1930), L A D Dellin, ed., *Bulgaria* (1957), Mercia MacDermott, *A History of Bulgaria, 1393-1885* (1962), J F Brown, *Bulgaria under Communist Rule* (1970), Ferdinand Schevill, *A History of the Balkan Peninsula* (1922, repr 1971).

Bulgarian languages, member of the South Slavic group of the Slavic subfamily of the Indo-European family of languages (see SLAVIC LANGUAGES). Bulgarian is the native tongue of more than eight million people, most of whom live in Bulgaria, where it is the official language. It is also spoken to some extent in bordering and nearby countries. Although the Bulgars were originally a Turkic-speaking people from Asia, they merged with the Slavic tribes whom they conquered in the 7th cent AD in the territory of present-day Bulgaria and took over their Slavic language. Old Bulgarian is an alternate name for the literary and liturgical language of the 9th to 11th cent AD that is usually called Old Church Slavonic (see CHURCH SLAVONIC). From Old Church Slavonic, in Bulgaria, a later local form known as Bulgarian Church Slavonic evolved, which was current from the 12th to 15th cent. The Turkish conquest of Bulgaria in 1396 seriously hampered the development of the Bulgarian language for several centuries. After the Bulgarians threw off the Turkish yoke in 1878, a modern literary language based on the vernacular came into its own. Modern Bulgarian, which is generally said to date from the 16th cent, borrowed many words from Greek and Turkish during the period of Turkish domination, more recently it has borrowed words from Russian, French, and German. The Bulgarian language lacks definite rules for stress, therefore, the accent of every word must be learned individually. Unlike most other Slavic tongues, Bulgarian has a definite article. This is in the form of a suffix joined to the noun. Another difference between Bulgarian and most other Slavic languages is that Bulgarian has almost completely dropped the numerous case forms of the noun. It uses position and prepositions (like English) to indicate grammatical relationships in a sentence instead of cases (like Russian). Despite these differences, Bulgarian closely resembles the other Slavic languages, especially with regard to grammar. A modified form of the Cyrillic alphabet is used for writing Bulgarian. See S B Bernshtein, *Short Grammatical Sketch of the Bulgarian Language* (tr 1952), H I Aronson, *Bulgarian Inflectional Morphophonology* (1968).



Bulgarian literature. For early ecclesiastical writings, see OLD CHURCH SLAVONIC. Modern Bulgarian literature stems from the work of Father Paisi, who in 1762 began his history of the Slav Bulgarians, in an effort to inspire national feeling and to stimulate the use of the Bulgarian language. There was not at that time even a single printing press in Bulgaria. His imitators continued the effort to make Bulgarian a literary language, but the period of struggle for political and ecclesiastical independence (1840-75) saw the real beginnings of a national literature in the work of the poets Sava Rakovski (1821-67) and Petko Rachev Slaveykov (1827-95), the story writer Lyuben Karavelov (1837-79), the dramatist Vasil Drumev (1841-1901), and the great national poet Khristo BOTEV, who died fighting the Turks. Ivan VAZOV was the first professional man of letters, writing plays, novels, poetry, and short stories. After Bulgaria's liberation from Turkish rule (1876), the literature of the country became less revolutionary. A group of regional writers of the late 19th cent. included Todor Genchov Vlaykov (1865-1943), Georgi P. Stamatov (1869-1942), Anton Strashimirov (1872-1937), the satirist Stoyan Mikhaylovski (1856-1927), and Aleko Konstantinov (1863-97), whose humorous *Bay-Ganyu* is one of the most popular of Bulgarian novels. The poet Pencho Slaveykov (1866-1912), a son of P. R. Slaveykov, led in introducing other European literatures and literary trends into Bulgaria, his *Song of Blood* (1911-13) is an epic of the struggle against the Turks. Others of his period were the symbolist poet Peyo K. Yavorov (1878-1914), the poet and dramatist Petko Y. Todorov (1879-1916), and the story writer Elin Pelin (1878-1949). Bulgaria's losses in the Balkan Wars and World War I gave rise to a poetry whose chief quality was mysticism. Among the poets of this period are the symbolist Nikolay Liliyev, Dora Gabe and Elisaveta Bagryans, and Dimcho Debelyanov (1887-1916). The prose writers of the early 20th cent. include the novelists of peasant life Jordan Iovkov (1884-1938) and Dobri Nemirov (1882-1945), and the psychological novelist Georgi Raichev. After 1945, the writers most admired include the poets Khristo Smymenski (1898-1923), Khristo Radevski, and Nikola Vaptsarov (1909-42), and the prose writers Lyudmil Stoyanov, Georgi Karaslavov, and Dimiter Dimov, author of the popular novel *Tobacco*. Recent Bulgarian literature has undergone Soviet influence. Although there was a relaxation of the pressure to conform to SOCIALIST REALISM after Stalin's death (1953), controls were reintroduced in 1957. See Vivian Pinto, *Bulgarian Prose and Poetry* (1957), Clarence Manning and Roman Smal-Stocki, *The History of Modern Bulgarian Literature* (1960), C. A. Moser, *A History of Bulgarian Literature* (1972).

Bulgarian, Faddey Venediktovich (fadyā' vīnyā-dyēkt'ovich böölga'rēn), 1789-1859, Russian journalist and novelist, b. Poland. Bulgarian's original name was Tadeusz Bulharyn. In 1825 he and Nicholas Grech founded the influential conservative daily *Northern Bee*, in which he inveighed against liberal writers, notably Pushkin. He wrote several historical novels, including *Ivan Vyzhigin* (1830, tr. 1831).

Bulgars, Eastern, Turkic-speaking people, who possessed a powerful state (10th-14th cent.) at the confluence of the Volga and the Kama, E. European Russia. The Bulgars appeared on the Middle Volga by the 8th cent. and became known as the Eastern, Volga, or Kama Bulgars. Another branch of the same people moved west into present Bulgaria and merged with the Slavs. The Eastern Bulgars accepted Islam in the 10th cent. From the 10th to the 12th cent. the Bulgar state was at the height of its power. Its chief city, the Great Bulgar, was a prosperous trade center. Destroyed by the Mongols in 1237, the state flourished again until it was conquered by Tamerlane in 1361. It finally disappeared after its capture by the grand duke of Moscow in 1431. The modern Tatars and Chuvash may be descended from the Eastern Bulgars. The Great Bulgar and the Bulgars themselves are sometimes called Bulgari or Bolgari.

Bulge, Battle of the see BATTLE OF THE BULGE

Bull, Olaf (ō'laf bööl), 1883-1933, Norwegian lyric poet. The son of a successful writer, Bull began his career as a journalist. His poetic brilliance was revealed by the publication of his collection *Digte* [poems] (1909). He is noted for a style characterized by flawlessness of form and the use of daring imagery. Among his other major collections is *Metope* (1927).

Bull, Ole Bornemann (ō'la böör'nāman), 1810-80, Norwegian violinist. After his debut in Paris (1832) he toured in Europe and in the United States, play-

ing mainly his own compositions and Norwegian folk music. He founded a theater for national drama at Bergen (1849), and in 1852 he attempted to found a Norwegian settlement in Pennsylvania. See biography by Mortimer Smith (1943, repr. 1973).

bull [Lat. *bullo*=leaden seal], apostolic letter containing some important pronouncement of the pope. The papal bull is more solemn than the papal brief or ENCICLICAL. The letter, traditionally sealed with lead, but in special circumstances with silver or gold, begins with the name of the pope and his title as *servus servorum Dei* [servant of the servants of God]. Today only the consistorial bull, the most solemn of all papal pronouncements, carries the leaden seal, all other bulls and lesser documents have a red ink seal. Famous bulls include *Clericis laicos* (1296) and *Unam sanctam* (1302) issued by Boniface VIII in his struggle with Philip IV of France, the Bull of Demarcation (1493) by Alexander VI, *Exsurge Domine* (1520) by Leo X against Martin Luther, *Unigenitus* (1713) by Clement XI, against Jansenism, *Dominus ac Redemptor* (1773) by Clement XIV, suppressing the Jesuits, *Quanta cura* (1864) by Pius IX, introducing the *Syllabus errorum*, *Pastor aeternus* (1871) by Pius IX, on papal infallibility, and *Munificentissimus Deus* (1950) by Pius XII, defining the dogma of the Assumption of the Virgin Mary. Pope John XXIII issued a consistorial bull, *Humanae Salutis* in 1961 to convoke the 21st ecumenical council. The papal bull is used to proclaim the canonization of a saint. A bullarium is a collection of papal bulls, the most famous bullaria are the Roman Bullarium (1733-62) and the Turin Bullarium (1857-85).

Bull, The, English name for TAURUS, a CONSTELLATION. **bullbaiting**, 17th-century amusement, particularly popular in England, in which trained dogs (bull-dogs) attacked a tethered bull. Bullbaiting, along with bullrunning (in which the bull was run down and killed by humans), bearbaiting, cockfighting, and dogfighting, was prohibited in Great Britain by an act of Parliament in 1835.

bull bat: see GOATSUCKER

bulldog, breed of thick-set NONSPORTING DOG developed in the British Isles many centuries ago. It stands from 13 to 15 in (33-38.1 cm) high at the shoulder and weighs from 40 to 50 lb (18.1-22.7 kg). Its short, straight, flat-lying coat is a glossy brindle, white, red, or fawn in color. The low-slung body, broad chest, large skull, and undershot jaw of the bulldog give it an appearance of stubbornness and defiance, two qualities necessary to its original role as a bullbaiter and pit fighter. These "sports" also required a high degree of ferocity, but after 1835, when such contests were made illegal, viciousness and intractability were progressively eliminated from the breed. Today the bulldog makes a gentle, devoted companion and pet. See DOG.

Buller, Sir Redvers Henry, 1839-1908, British general. His military career began in China, and he later took part in the suppression of the Red River Rebellion (1870) in Canada. In Africa he fought in the Kafir and Zulu wars (1878-79), against the Boers in the Transvaal (1881), and against the Mahdists in the Sudan (1884-85). As adjutant general (1890-97), Buller reorganized the army's supply and transport services. He was made commander in chief of troops in the South African War in 1899, but his initial failure to relieve the besieged town of Ladysmith led to his supersession (1899) by Lord Roberts of Kandahar. See memoir by Lewis Butler (1907), biography by C. H. Melville (1923), study by Julian Symons (1963).

bullfighting, national sport and spectacle of Spain. Called *corrida de toros* in Spanish, the bullfight takes place in a large outdoor arena known as the *plaza de toros*. The object is for one of the bullfighters, the matador, to kill a wild bull, or toro, with a sword. The matador is assisted by five other toreros, two picadors, mounted on armored horses, and three peones, or capemen on foot, also called *banderilleros* because they plant in the bull the short barbed sticks known as *banderillas*. An early type of bullfighting was practiced by the Minoans, Greeks, and Romans. The Moors probably introduced the sport to Spain (c. 11th cent.), whence it spread to S. France and Morocco. Originally the central figure in the Spanish bullfight was the mounted torero, Francisco Romero is generally credited with being the first (c. 1726) torero to fight on foot. A modern bullfight consists of three stylized parts, sometimes likened to the three acts of a drama, preceded by the color and pageantry of a grand ceremonial parade (*paseillo*) in which the matadors and other toreros take part. After the parade, the president, the official who supervises the proceedings, signals for the first

bull to be sent out. The toreros then wave capes (*capas*) at the bull, forcing the animal to make a charge, this is known as "running" the bull. In this first part the picadors administer four *pica* (lance) thrusts, there may be more or fewer thrusts depending on the condition of the animal. In the second part, which is brief, the *banderilleros* come out and, while on the run, plant the *banderillas* on the withers of the bull behind the neck muscle, these sting the bull and often spur him into making a livelier charge in the third part. Then comes the matador. He holds the *muleta*, a small cloth cape, in one hand, and his sword in the other. Using the *muleta*, he makes daring passes at the bull that are often of great grace and beauty. He thus works at dominating the animal until the latter stands with his four feet square on the ground and his head hung low, according to ritual and law, the matador must then kill the bull by thrusting his sword between the animal's shoulder blades and into the heart. If the matador has performed well he may be awarded an ear or the tail of the bull as a token of his craftsmanship. In the typical bullfight program there are six bulls and three matadors. Each matador contests two bulls, chosen by lot on the morning of the fight. A matador's performance requires great skill and courage, and successful matadors such as Pedro ROMERO (grandson of Francisco Romero), Juan BELMONTE, JOSE LITO, MANOLETE, Carlos Arzuza, and Manuel Benítez (El Cordobes) reaped immense awards of praise and money. The fighting bulls are bred and selected for spirit and strength. They must weigh not less than 542 kg (1,194 lb) and are usually from four to five years old. Bullfighting is also popular in the Latin American countries of Mexico, Peru, Colombia, Venezuela, and Ecuador, and in S. France. Critics contend that it is an inhumane spectacle of animal torture. Aficionados say it is an important part of Spanish culture and ritual. The Portuguese practice a style of bullfighting from horseback (*rejoneo*) in which the bull is not killed. See Ernest Hemingway, *Death in the Afternoon* (1932, repr. 1971), Kenneth Tynan, *Bull Fever* (1955, rev. ed. 1966), Rex Smith, ed., *Biography of the Bulls* (1957), Angus MacNab, *Fighting Bulls* (1959), Barnaby Conrad, *La Fiesta Brava* (1953) and *Barnaby Conrad's Encyclopedia of Bullfighting* (1961), Larry Collins and Dominique Lapierre, *Or I'll Dress You in Mourning* (1968), Adolfo Bollain et al., *Bulls and Bullfighting* (1970), John Fulton, *Bullfighting* (1971).

bullfinch: see FINCH

bullfrog, common name of the largest North American frog, *Rana catesbeiana*. Native to the E. United States, this species has been successfully introduced in the West and in other parts of the world. The body length is 4 to 8 in. (10-20 cm), and the legs may be up to 10 in. (25 cm) long. An aquatic form with fully webbed toes, the bullfrog can close its nostrils and lie at the bottom of a pond for some time. Males have a loud, booming call. Bullfrog tadpoles require two or three years to become adults. The bullfrog is the only frog whose legs are marketed in quantity for food in the United States. Several other large frogs of the genus *Rana* are called bullfrogs in other regions. Bullfrogs are classified in the phylum CHORDATA, subphylum Vertebrata, class Amphibia, order Anura, family Ranidae.

bullhead, common name for several species of fish. See CATFISH, SCULPIN.

Bullinger, Heinrich (hīn'rikh bööl'ing-ər), 1504-75, Swiss Protestant reformer. After the death of Zwingli in 1531, Bullinger became pastor of the principal church in Zurich and a leader of the reformed party in Switzerland. He played an important part in compiling the first Helvetic Confession (1536), a creed based largely on Zwingli's theological views as distinct from Lutheran doctrine. In 1549 the Consensus Tigurinus, drawn up by Bullinger and Calvin, marked the departure of Swiss theology from Zwinglian to Calvinist theory. His later views were embodied in the second Helvetic Confession (1566), which was accepted in Switzerland, France, Scotland, and Hungary and became one of the most generally accepted creeds of the reformed churches. He wrote a life of Zwingli and edited his complete works.

Bullitt, William Christian (bööl'it), 1891-1967, American diplomat, b. Philadelphia. A member of the American delegation to the Paris Peace Conference following World War I, he was sent by President Wilson on a secret mission to Russia. When his report favoring recognition of the Communist government was rejected, he resigned and later bitterly attacked the Versailles Treaty before the Senate. After 12 years of private life, he was made spe-

cial assistant to Cordell Hull and served (1933-36) as first U S ambassador to the USSR. Later he was ambassador to France (1936-40), ambassador at large in the Middle East (1941-42), and special assistant to the Secretary of the Navy (1942-43). He served (1944-45) as a major in the Free French army under Charles De Gaulle. See his *The Great Globe Itself* (1946), *For the President*, selections from his diplomatic correspondence with President Franklin Delano Roosevelt, ed by O H Bullitt (1972), biography by Beatrice Farnsworth (1967).

bull mastiff (mäst'f), breed of powerful WORKING DOG developed in England in the second half of the 19th cent. It stands from 24 to 27 in (61-68.6 cm) high at the shoulder and weighs from 100 to 130 lb (45.4-59 kg). Its dense, short coat may be fawn, red, or brindle, with a darker shading on the ears and muzzle. Because of the increasing need to protect game preserves and large estates from poachers, English gamekeepers began to cross existing breeds in an attempt to produce a dog that would possess the required speed, strength, aggressiveness, good night vision, and the capacity to remain silent at the approach of the poacher. It would be the task of the desired dog to knock down the intruder and keep him down until he was captured, rather than simply alarming him into running away. After many breeds were tried, mastiff and bulldog stock were crossed, producing a dog with all the necessary qualities, the bull mastiff. Today it is raised as a guard and show dog and as a pet. See DOG.

Bull Moose party* see PROGRESSIVE PARTY

bull nettle. see NIGHTSHADE

Bull Run, small stream, NE Va., c. 30 mi (50 km) SW of Washington, D.C. Two important battles of the Civil War were fought there on July 21, 1861, and Aug. 29-30, 1862. The first battle of Bull Run (or first battle of Manassas) was the first major engagement of the war. On July 16, 1861, the Union army under Gen. Irvin McDowell began to move on the Confederate force under Gen. P. G. T. Beauregard at Manassas Junction. Gen. Robert Patterson's force at Martinsburg, which was to prevent the Confederate army under Gen. Joseph E. Johnston at Winchester from uniting with Beauregard, failed, and by July 20 part of Johnston's army had reached Manassas. On July 21, McDowell, turning Beauregard's left, attacked the Confederates near the stone bridge over Bull Run and drove them back to the Henry House Hill. There Confederate resistance, with Gen. Thomas J. Jackson standing like a "stone wall," checked the Union advance, and the arrival of Gen. E. Kirby Smith's brigade turned the tide against the Union forces. The unseasoned Union volunteers retreated, fleeing along roads jammed by panicked civilians who had turned out in their Sunday finery to watch the battle. The retreat became a rout as the soldiers made for the defenses of Washington, but the equally inexperienced Confederates were in no condition to make an effective pursuit. The South rejoiced at the result, while the North was spurred to greater efforts to win the war. See R. H. Beatie, *Road to Manassas*. The second battle of Bull Run (or second battle of Manassas) was also a victory for the Confederates. In July, 1862, the Union Army of Virginia under Gen. John Pope threatened the town of Gordonsville, a railroad junction between Richmond and the Shenandoah valley. Gen. Robert E. Lee sent Stonewall Jackson to protect the town, and on Aug. 9, 1862, Jackson defeated Nathaniel Banks's corps, the vanguard of Pope's army, in the battle of Cedar Mt. (or Cedar Run). When George McClellan's army was gradually withdrawn from Harrison's Landing on the James River (where it had remained after the SEVEN DAYS BATTLES) to reinforce Pope, Lee concentrated his whole army at Gordonsville. He planned to strike before Pope could be reinforced. Pope withdrew to the north side of the Rappahannock River. Lee followed to the south side and on Aug. 25 boldly divided his army. By Aug. 28, Jackson had marched to the Union right and rear, destroyed Union communications and supplies, and stationed his troops just west of the first Bull Run battlefield, where he awaited the arrival of James Longstreet with the rest of Lee's army. Pope was attacking Jackson when Longstreet came up on Aug. 29. The attack was repulsed, but Pope, mistaking a re-formation of Jackson's lines for a retreat, renewed it the next day. After the Union troops were again driven back, Lee ordered Longstreet to counterattack. Longstreet, supported by Jackson, swept Pope from the field. The Union forces retreated across Bull Run, badly defeated. Lee's pursuit ended at Chantilly, where the Union forces stopped Jackson on Sept. 1, 1862. Pope then withdrew to Washington. Both battle-

fields are included in Manassas National Battlefield Park (est. 1940). See E. J. Stackpole, *From Cedar Mountain to Antietam* (1959), Allan Nevins, *The War for the Union* (Vol. II, 1960).

bull terrier, breed of large, muscular TERRIER originating in England around 1835. It stands from 19 to 22 in (48.3-55.9 cm) high at the shoulder and weighs from 30 to 36 lb (13.6-16.3 kg). Its short, flat-lying, harsh coat is glossy white or, in the colored variety, most popularly brindle with white markings. Developed for dogfighting from a cross of bulldog and a now extinct English terrier, the bull terrier was renowned for its courage, strength, and intelligence. However, down through the years English breeders placed increasing emphasis on the breed's overall disposition and less on its aggressiveness. As a result, the bull terrier of today is a friendly, gentle dog that makes a responsible and devoted companion. See DOG.

Bulnes, Manuel (manwél' bööl'näs), 1799-1866, president of Chile (1841-51). He served in the revolt against Spain and commanded the victorious Chilean forces at the battle of Yungay (1839), where the Peru-Bolivia confederation of Andrés Santa Cruz was destroyed. Bulnes, a conservative, was elected president and, through stern and repressive measures, fostered economic and educational progress.

Bulow, Bernhard Heinrich Martin, Fürst von (bär'n'hart hīn'rīkh mar'fīn fūrst fən bu'lö), 1849-1929, German chancellor. He held many diplomatic posts before he became, through the influence of Friedrich von Holstein, foreign secretary in 1897 and succeeded Hohenlohe-Schillingsfürst as chancellor in 1900. He inadvertently increased German isolation by his failure to gain the friendship of England and by his aggressive foreign policy. He antagonized France by his actions in the Moroccan crisis of 1905 (see MOROCCO). Bulow later alienated Russia in the Bosnian crisis of 1908 by thwarting Russian goals for the opening of the Dardanelles and supporting Austria-Hungary's annexation of Bosnia and Herzegovina. As a result he strengthened the Triple Entente between Great Britain, France, and Russia (see TRIPLE ALLIANCE AND TRIPLE ENTENTE). Bulow lost the confidence of Emperor William II in the *Daily Telegraph* affair (Oct., 1908) in which William indiscreetly revealed his foreign policy toward Britain in an interview with the London newspaper; the interview caused a national uproar. Bulow had approved the text of William's remarks, but had not read them. Bulow subsequently lost support in the Reichstag over a proposed tax and was forced to resign in 1909. He later (1914-15) was ambassador to Italy. See his memoirs (tr. 4 vol., 1931-32).

Bulow, Friedrich Wilhelm, Freiherr von (frē'drīkh vī'hēlm frī'hēr), 1755-1816, Prussian general in the Napoleonic Wars. After his victories (1813) over the French at Gross Beeren and at Dennewitz, he was created count of Dennewitz. In 1815 he played a conspicuous part in the Waterloo campaign.

Bulow, Hans Guido, Freiherr von (hans gē'dō), 1830-94, German pianist and conductor. After hearing Wagner's *Lohengrin* in 1850 at Weimar under Liszt's direction, he studied piano with Liszt and later conducted the premieres of several of Wagner's operas. In 1857 he married Liszt's daughter Cosima, who left him in 1869 and later became the wife of Wagner. While retaining his admiration of Wagner's music, Bulow became the most ardent champion of Brahms. He framed the aphorism that Bach, Beethoven, and Brahms are the three 8's of music. One of the first pianists to be concerned with stylistically proper performances, Bulow made critical editions of the works of many composers. The first of the modern virtuoso conductors, he achieved his greatest distinction as conductor (1880-85) of the ducal orchestra at Meiningen.

bulrush: see SEDGE

Bultmann, Rudolf Karl (bööl't'män), 1884-, German existentialist theologian, educated at the universities of Tübingen, Berlin, and Marburg. He taught at the universities of Breslau and Gießen and from 1921 to 1950 was professor at the Univ. of Marburg. Strongly influenced by the existentialist philosophy of Martin Heidegger, Bultmann is best known for his work on the New Testament, which he reduced—with the exception of the Passion—to basic elements of myth, which then have application to contemporary concerns. His approach is termed "demythologization." His classic work is *Theology of the New Testament* (tr. 1951). Other writings in English translation include *Essays, Philosophical and Theological* (1952, tr. 1955), *Primitive Christianity in its Contemporary Setting* (1949, tr.

1963), *Jesus and the World* (1951, tr. 1958), *The Gospel of John* (1953, tr. 1971), *The History of the Synoptic Tradition* (1957, 2d ed. tr. 1968), see also his selected shorter writings, *Existence and Faith* (tr. 1960), studies by E. T. Lang (1968), Walter Schmithals (tr. 1968), and Andre Malet (tr. 1969).

Bulwer, William Henry Lytton Earle, Baron Dalling and Bulwer (bööl'wār, lit'an), 1801-72, English diplomat and author, brother of the novelist Edward Bulwer-Lytton. He was known most of his life as Sir Henry Bulwer. Although he sat in Parliament for some years (1830-37, 1868-71), he was most prominent as a diplomat. As secretary of the embassy in Constantinople (1837-38) he secured a commercial treaty with Turkey. He was ambassador to Spain (1843-48) during the affair of the Spanish Marriages (see ISABELLA II) but was ordered to leave by the dictator Ramon Narvaez, whom he offended. As minister to Washington (1849-52), he concluded the important CLAYTON-BULWER TREATY of 1850. Among his later diplomatic posts were Florence, Bucharest, and, again, Constantinople (1858-65). He was created a baron in 1871. His writings include *An Autumn in Greece* (1826), *France, Social, Literary, and Political* (1834-36), *Historical Characters* (1867), and biographies of Lord Byron (1835) and Viscount Palmerston (1870-74, unfinished).

Bulwer-Lytton, Edward George Earle Lytton, 1st Baron Lytton, 1803-73, English novelist. The son of Gen. William Bulwer and Elizabeth Lytton, he assumed the name Bulwer-Lytton in 1843 when he inherited the Lytton estate "Knebworth." He was created Baron Lytton of Knebworth in 1866. His varied and highly derivative novels won wide popularity. Many of his early novels of manners—*Falkland* (1827), *Paul Clifford* (1830), and *Eugene Aram* (1832)—reflect the influence of his friend William Godwin. Bulwer-Lytton, however, is best remembered for his extremely well-researched historical novels, particularly *The Last Days of Pompeii* (1834) and *Rienzi* (1835). In 1849, with *The Caxtons*, he began a series of humorous domestic novels, which had recently become the vogue. His utopian novel, *The Coming Race*, prefigured the works of Wells and Huxley. A member of Parliament from 1831 to 1841, Bulwer-Lytton was a reformer, but in 1852 he returned to Parliament as a Conservative. In 1858 he was appointed colonial secretary. He was also a successful dramatist. His plays include *The Lady of Lyons* (1838), *Richelieu* (1839), and *Money* (1840). See study by S. B. Liljegen (1957), Charles Shattuck, ed., *Bulwer and Macready* (1958).

Bulwer-Lytton, Edward Robert, 1st earl of Lytton, pseud. Owen Meredith, 1831-91, English diplomat and poet, son of the novelist, Bulwer-Lytton. He was in the diplomatic service from 1850 to 1875, when Disraeli appointed him viceroy of India, for his services in the Afghan wars he was created (1880) an earl. He was ambassador to France from 1887 until his death. His poems, written at first under his pseudonym, include *The Wanderer* (1858), a collection of lyrics, *Lucile* (1860) and *Glenavon* (1885), long narrative poems, and *King Poppy* (1892), an epic fantasy. His verse has been criticized for its affectation and prolixity. He also wrote a biography of his father, which appeared in 1883. See his letters (1937), studies by Lady Betty Balfour (1899) and A. B. Harlan (1946).

bumblebee: see BEE

Bunah (byōō'nā), Judahite. 1 Chron. 2:25.

Buna rubber (böō'nā, byōō'-) see RUBBER

Bunau-Varilla, Philippe Jean (fēlēp' zhān būnō'-varēyā'), 1859-1940, French engineer, prominent in the PANAMA CANAL controversy. An engineer after 1884 in the original French company for building the canal, he was chief engineer before the company went bankrupt in 1889 and was the organizer (1894) of the new company that took over the rights of the old one. Unable to develop his plans in France, he undertook to sell the company to the United States, converting (1901) Mark Hanna and President McKinley, who had been interested in the Nicaragua route, to the Panama project. After new opposition developed, he persuaded the French directors to reduce the price of the company, and President Theodore Roosevelt was won over to the Panama plan. When difficulties arose with the Colombian government, Bunau-Varilla conspired with insurrectionists in Panama and touched off (1903) a successful revolution. As minister from the new Panamanian republic to the United States, he negotiated the Hay-Bunau-Varilla Treaty, which gave the United States control of the Panama Canal. In World War I a water chlorination process that he had de-

veloped was used at the battle of Verdun. See his *Panama* (tr 1913) and *From Panama to Verdun* (tr 1940).

bunchberry: see DOGWOOD

Bunche, Ralph Johnson, 1904-71, U.S. government official and United Nations diplomat, b. Detroit. He taught political science at Howard Univ. from 1928, becoming a full professor in 1938. He also did worldwide research in colonial administration and race relations. In government service after 1941, he worked under the joint chiefs of staff and was a chief research analyst in the Office of Strategic Services. The first Negro to be a division head in the Dept. of State (July-Oct., 1945), he entered the United Nations in 1946 as director of the Trusteeship Division. He became (Dec., 1947) principal secretary of the UN Palestine Commission and helped to bring peace to the Holy Land. For his work there he was awarded the 1950 Nobel Peace Prize. He served as undersecretary general for special political affairs from 1958 until his retirement due to poor health shortly before his death.

Bundaberg, city (1971 pop. 27,394), Queensland, E. Australia, on the Burnett River. It is a sugar-refining center and a port.

Bundestag (bōōn'dēstāh") [Ger., = federal parliament], lower house of the parliament of the Federal Republic of Germany (West Germany). It succeeded the REICHSTAG. It is a popularly elected body that elects the chancellor, passes all legislation and ratifies the most important treaties. It can remove the chancellor by a vote of no confidence, but only if it simultaneously elects a new chancellor. In the German Democratic Republic (East Germany), the Volkskammer [people's chamber] according to the constitution exercises similar powers. The upper house of the West German parliament, the Bundesrat [federal council], represents the states. It must approve certain laws.

bundling, courtship custom, thought to have originated in Holland and the British Isles. It was extended to America, particularly to New England, and most widely practiced in the years prior to the Revolution of 1776. Engaged or courting couples, dressed or partially dressed, traditionally lay together on a bed pursuing their romance. They were sometimes separated by a board, or the girl's legs were tied together, or the couple was in some other way constrained from completing the sexual act. As a formal custom the practice was abandoned in the early 19th cent. because of widespread social disapproval.

Bundy, McGeorge, 1919-, U.S. educator and government official, b. Boston. An intelligence officer in the U.S. army during World War II, he joined (1949) the Harvard faculty and later became (1953) the youngest dean of the faculty of arts and sciences there, serving until 1961. As the special assistant to Presidents Kennedy and Lyndon B. Johnson for national security affairs (1961-66), Bundy supervised the staff of the National Security Council and played a major role in making foreign policy. He supported (1961) the Bay of Pigs invasion, helped determine (1962) strategy during the Cuban missile crisis, and strongly advocated the increasing U.S. military involvement in Vietnam. He resigned from government service to become (1966) president of the Ford Foundation. Bundy is the author of *The Strength of Government* (1968).

bungalow [from Indian *bangla*, = house], dwelling built in a style developed from that of a form of rural house in India. The original bungalow typically has one story, few rooms, and a maximum of cross drafts, with high ceilings, unusually large window and door openings, and verandas on all sides to shade the rooms from the intense light and tropical heat. Dwellings of this general type became popular in S. California, with numerous differences in plan and materials, and were termed bungalows. The word thus came to be used for a cottage or for any small house with verandas covered by low, wide eaves.

Bunin, Ivan Alekseyevich (bōō'nin, Rus. ēvān' āl'īksē'yevich bōō'nin), 1870-1953, Russian writer. Born of a poor aristocratic family, he was encouraged in his literary precocity. His first volume of verse was published in 1891. He traveled extensively, writing while working as a librarian and statistician. Bunin won the Pushkin Prize in 1903 for his own verse and for his translations of "works by Byron and Longfellow." *The Village* (1910, tr. 1923), a novel in the Turgenyev tradition, won him international fame. It depicts the ugliness of peasant life before the Revolution of 1905. The story "Dry Valley" describes the decline of the country gentry. Bunin is best

known for his short stories, particularly for the title story of the collection *The Gentleman from San Francisco* (1916, tr. 1923), which treats powerfully the themes of vanity and death. His autobiographical novel *The Well of Days* (1930, tr. 1933) is equally celebrated. Bunin's *Memoirs and Portraits* (1950, tr. 1951) contains reminiscences of famous contemporaries. His elegant style, descriptive genius, and choice of themes place Bunin among the classic Russian authors. A nostalgia for the aristocracy contributed to his reactionary political stance, which compelled him to leave Russia in 1919. His last years were spent in France. Bunin was awarded the 1933 Nobel Prize in Literature. See study by Serge Kryzyski (1971).

bunion, swelling or thickening around the first joint of the big toe. The toe is forced inward and compresses the other toes. The fluid-filled sac, or bursa, in the toe joint becomes inflamed (a condition called bursitis), which may lead to pain, deformity, and an inability to wear ordinary shoes. Bunions may arise from years of wearing ill-fitting shoes. However, congenital bone deformities are usually indicated when they occur on both feet. Proper foot care, especially in selecting shoes, is the most important aspect of treatment and prevention. The toes can often be straightened by pads or splints, and orthopedic shoes are generally prescribed. Serious cases may require surgery.

Bunker Hill, battle of, in the American Revolution, June 17, 1775. Detachments of colonial militia under Artemas WARD, Nathaniel Greene, John STAFF, and Israel PUTNAM laid siege to Boston shortly after the battles of Lexington and Concord. However, Thomas Gage, British commander in the city, made no attempt to break the siege until he was reinforced (in May) by troops led by William HOWE, Sir Henry Clinton, and John Burgoyne. The Continental forces learned of the British plan to take the heights of Dorchester and Charlestown, and William PRESCOTT was sent to occupy Bunker Hill outside Charlestown. Prescott instead chose the neighboring Breed's Hill to the southeast, but the engagement that ensued has become known as the battle of Bunker Hill. Howe was ordered to attack the American position, and after two slaughterous failures a third charge dislodged the Americans, who had run out of powder. The British victory failed to break the siege, and the gallant American defense heightened colonial morale and resistance. See T. J. Fleming, *Now We Are Enemies: The Story of Bunker Hill* (1950), R. M. Ketchum, *The Battle for Bunker Hill* (1962).

Bunni (būnī), Levitical name mentioned in confusing passages Neh. 10:15, 11:15. In one case the name seems to be an alternative of BUNUT.

Bunsen, Christian Karl Josias, Freiherr von (krī'st'yan kār'l yōzē'ās frī'hēr fən bōōn'zan), 1791-1860, Prussian diplomat and scholar. He studied theology at the Univ. of Göttingen. He was a friend of King Frederick William IV and urged him to accept liberal ideas. Bunsen was minister to the papal court at Rome (1824-33) and ambassador to Bern (1839-41) and to London (1842-54), but he was recalled from London because he supported alliance with the Western powers in the Crimean War. A scholar of note, Bunsen wrote on religion, language, literature, history, and law.

Bunsen, Robert Wilhelm (būn'sən, Ger. rō'bērt vīlhēlm bōōn'zan), 1811-93, German scientist, educated at the Univ. of Göttingen, where he received his doctorate in 1830. He served on the faculties of several universities and was at Heidelberg from 1852 to 1859. His first important contribution to chemistry came with his investigation of certain organic compounds of arsenic, in the process of which he discovered that ferric oxide could be used as an antidote to arsenic poisoning. From his studies of the gaseous products of blast furnaces he evolved a method of gas analysis, presented in his book *Gasometrische Methoden* (1857). With Kirchhoff at Heidelberg he discovered by spectroscopy the elements cesium and rubidium. Bunsen wrote many articles and collaborated with Kirchhoff on *Chemische Analyse durch Spektralbeobachtungen* (1869). His important contributions to petrology and chemico-geology include the explanation of GEYSER action. He invented and improved various kinds of laboratory equipment, including the Bunsen cell (see CELL, in electricity), the Bunsen photometer (see PHOTOMETRY), and the BUNSEN BURNER.

Bunsen burner, gas burner, commonly used in scientific laboratories, consisting essentially of a hollow tube which is fitted vertically around the flame and which has an opening at the base to admit air. A

smokeless, nonluminous flame of high temperature is produced. The underlying principle of the Bunsen burner is basic to common gas stoves and lamps.

Bunshaft, Gordon, 1909-, American architect, b. Buffalo, N.Y. As chief designer for the architectural firm of SPIDROPE, O'NEALS, AND McEPPIELL, Bunshaft was responsible for Lever House, New York City's first glass curtain-wall skyscraper (1952), which has been widely imitated. Among his other works are the Manufacturers Trust Company building on Fifth Ave. at 43d St. in Manhattan, New York City, a complex of buildings near Hartford for the Connecticut General Life Insurance Company, the Albright-Knox Art Gallery, Buffalo, and the Banque Lambert, Brussels (1965).

bunt: see SMUT

hunting, common name for small, plump birds of the family Fringillidae (FINCH family). Among the American buntings are the indigo bunting, in which the summer plumage of the male reflects sunlight as a rich, metallic blue, the painted bunting, or nonpareil (*Passerina ciris*), with showy red, blue, and green plumage, the hardy snow bunting (*Plectrophenax nivalis*), whose winter plumage is white marked with light brown on the head and sides, and the lazuli bunting of the West, turquoise above with a chestnut breast and white wing bars. European buntings include the corn, snow, and civil buntings, the yellowhammer, and the ortolan (*Emberiza hortulana*), which is caught and fattened as a table delicacy. Buntings are also called sparrows in the United States. They are classified in the phylum CHORDATA, subphylum Vertebrata, class Aves, order Passeriformes, family Fringillidae.

Buntline, Ned, pseud. of Edward Zane Carroll Judson, 1823-86, American adventurer and writer. In 1845 he founded in Nashville *Ned Buntline's Own*, a sensational magazine. After being lynched (1846) for a murder, not secretly cut down alive and released, he went to New York City, where he resumed the magazine. He led a mob in the Astor Place riot of 1849 against the English actor Macready. In the '50s he turned up in St. Louis as an organizer of the Know-Nothing movement. After 1846 Buntline wrote more than 400 action novels, forerunners of the dime novels. Typical are *The Mysteries and Miseries of New York* (1848) and *Stella Delorme, or, The Comanche's Dream* (1850). In 1872 he persuaded W. F. Cody (Buffalo Bill) to act in his play, *The Scouts of the Plains*, which started Cody on his stage career. See biography by James Monaghan (1952).

Buñuel, Luis (lūōēs' būnyūdōē'), 1900-, Spanish film director, working in France, Mexico, and Spain. He joined Dali to make some early surrealist films, notably *Un Chien andalou* (1929). His powerful and realistic *Las hurdes* (1932) is a documentary about Spanish agrarian poverty. *Los olvidados* (1949), made in Mexico, brutally portrays his view of human corruption and cruelty. Harshly critical of the church and of crusading morality, Buñuel continued to examine social hypocrisy and turpitude in *Viridiana* (1961), *Diary of a Chambermaid* (1964), *Belle de Jour* (1966), *Isitana* (1970), *The Discreet Charm of the Bourgeoisie* (1972), and *The Phantom of Liberty* (1974).

bunya-bunya (būn'yā-būn'yā) see MONKEY-PUZZLE TREE

Bunyan, John, 1628-88, English author, b. Elstow, Bedfordshire. After a brief period at the village free school, Bunyan learned the tinker's trade, which he followed intermittently throughout his life. Joining the parliamentary army in 1644, he served until 1647. The reading of several pious books and a constant study of the Bible intensified Bunyan's religious beliefs, and in 1653 he began acting as lay preacher for a congregation of Baptists in Bedford. In this capacity he came into conflict with the Quakers led by George FOX and turned to writing in defense of his beliefs. In 1660 agents of the restored monarchy arrested him for unlicensed preaching, and he remained in prison for the next 12 years. During this period Bunyan wrote nine books, the most famous of which is *Grace Abounding to the Chief of Sinners* (1666), a fervent spiritual autobiography. Soon after his release in 1672 he was reimprisoned briefly and wrote the first part of his masterpiece *The Pilgrim's Progress from This World to That Which Is to Come*, published in 1678. A second part appeared in 1684. By the time Bunyan was released from his second imprisonment, he had become a hero to the members of his sect, and he continued preaching and writing until his death. The principal works of these later years are *The Life and Death of Mr. Badman* (1692) and *The Holy War* (1692). *Pilgrim's Progress* is

an allegory recounting Christian's journey from the City of Destruction to the Celestial City, the second part describes the manner in which Christian's wife, Christiana, makes the same pilgrimage. Remarkable for its simple, biblical style and its vivid presentation of character and incident, *Pilgrim's Progress* is considered one of the world's great works of literature. Bunyan's continued popularity rests on the spiritual fervor that permeates his works and on the compelling style in which they are written. His prose unites the eloquence of the Bible with the vigorous realism of common speech. See biography by O. E. Winslow (1961), studies by H. A. Talon (1951), W. Y. Tindall (1934, repr. 1964), David E. Smith (1966), and Roger Sharrock (rev. ed. 1968).

Bunyan, Paul, legendary American lumberjack. He was the hero of a series of "tall tales" popular through the timber country from Michigan westward. Bunyan was known for his fantastic strength and gigantic size. He is said to have ruled his gargantuan lumber camp between the winter of the blue snow and the spring that came up from China. His prized possession was Babe the Blue Ox, the distance between whose horns measured 42 ax handles and a plug of tobacco. In Southern lumber camps a similar legendary figure is known as Tony Beaver. See collections of legends by Louis Untermeyer (1945) and H. W. Felton (1947), study of the legend by D. G. Hoffman (1952, repr. 1966).

Buonaparte: see BONAPARTE and NAPOLEON I

Buonarroti, Michelangelo: see MICHELANGELO BUONARROTI

Buoninsegni, Duccio di: see DUCCIO DI BUONINSEGNA

Buononcini, Italian musicians: see BONONCINI

buoy (boi, bö'ē), float anchored in navigable waters to mark channels and indicate dangers to navigation (isolated rocks, mine fields, cables, and the like). The shape, color, number, and marking of the buoy are significant, but unfortunately the significance varies in different countries, and the color-code system devised by the International Maritime Conference at Washington, D.C., in 1889 was not adopted. Although the spar buoys (upright posts) used in northern latitudes are usually wooden, large buoys are generally made of steel or iron. Nun buoys have conical tops, can buoys, flat tops. Buoys may be fitted with bells or whistles (usually operated by motion of the waves), and battery-powered light buoys are much used; radio buoys came into use in 1939. There are also mooring buoys, used for the anchoring of ships. In 1972 the United States launched the first of a series of 100-ton data buoys, which, it was planned, would encircle the globe transmitting oceanographic and meteorological data via satellite.

buoyancy, upward force exerted by a fluid on any body immersed in it. Buoyant force can be explained in terms of ARCHIMEDES PRINCIPLE.

bur or **burr**, popular name for fruits that have barbed, pointed, or rough outgrowths. By clinging to the fur or hair of animals and the clothing of man they are transported from the parent plant, often great distances. Some common burs include those of the chestnut, burdock, bur marigold, and cocklebur. Burs are particularly obnoxious to sheep growers because of the difficulty of removing them from wool.

Buraimi (bö'ri'mē), group of small oases, SE Arabia, on the border between Abu Dhabi and Oman. In the 1950s the area, rich in oil, was claimed by Saudi Arabia, causing a dispute with Great Britain, which at the time was the protector of Oman and Abu Dhabi.

Burano (bö'ra'nō), former town, now part of Venice, in Venetia, NE Italy, built on four islets in the lagoon of Venice. It is a fishing center and has been famous for its lace since the 15th cent.

Burage, Richard, 1567?-1619, first great English actor. The leading tragedian of the CHAMBERLAIN'S MEN, he originated the title roles in Shakespeare's *Hamlet*, *Lear*, *Othello*, and *Richard III*. He also appeared in many of the first productions of plays by Thomas Kyd, Beaumont and Fletcher, Ben Jonson, and John Webster. His name came to symbolize acting of the highest quality. Burbage's father, James Burbage, had built the first permanent theater in London in 1576, called the Theatre. In 1598 the building was removed to Bankside and set up as the GLOBE THEATRE by Richard's brother, Cuthbert, on the death of their father. The brothers also inherited shares in the Blackfriars Theatre, built by their father in 1596, which became the winter home of the company.

Burbank, Luther, 1849-1926, American plant breeder, b. Lancaster, Mass. He experimented with

thousands of plant varieties and developed many new ones, including new varieties of prunes, plums, raspberries, blackberries, apples, peaches, and nectarines. Besides the Burbank potato, he produced new tomato, corn, squash, pea, and asparagus forms, a spineless cactus useful in cattle feeding, and many new flowers, especially lilies and the famous Shasta daisy. His methods and results are described in his books—*How Plants Are Trained to Work for Man* (8 vol., 1921) and, with Wilbur Hall, *Harvest of the Years* (1927) and *Partner of Nature* (1939)—and in his descriptive catalogs, *New Creations*. After 1875 his work was done at Santa Rosa, Calif. See D. S. Jordan and Vernon Kellogg, *The Scientific Aspects of Luther Burbank's Work* (1909), E. B. Beeson, *The Early Life and Letters of Luther Burbank* (1927), W. L. Howard, *Luther Burbank* (1945), Ken Kraft, *Luther Burbank* (1967).

Burbank, city (1970 pop. 88,871), Los Angeles co., S Calif., inc. 1911. Aircraft manufacturing is the major industry. Several motion-picture and television studios are in Burbank.

burbot (bü'r'bat): see COD

Burchfield, Charles, 1893-1967, American painter, b. Ashtabula, Ohio, studied at the Cleveland School of Art. From 1921 to 1929 he worked as a wallpaper designer. His paintings, predominantly in watercolor, fall into three periods: from 1916 to the early 1920s, poetic evocations of nature, from the early 1920s to the early 1940s, bold, somber landscapes and urban scenes, and after 1943, a return to lyric expressions of nature. Burchfield is widely known for his depiction of crumbling Victorian mansions, false-front stores, and other relics of the late 19th cent. Weather and sunlight effects are important in all his work. Among his many works in museums are *Setting Sun through the Catalpas* (Cleveland Mus. of Art), *October* (Columbus Gall. of Fine Art, Ohio), *Freight Cars Under a Bridge* (Detroit Inst. of Arts), and *An April Mood* (Whitney Mus., New York City). See *The Drawings of Charles Burchfield* with text by the artist (1968), study by John Baur (1956).

Burckhardt, Jacob Christoph (ya'köp krīs'tōf böör'hart), 1818-97, Swiss historian, one of the founders of the cultural interpretation of history. Of patrician background, he studied under Ranke at the Univ. of Berlin and taught (1844-53, 1858-93) art history and history at the Univ. of Basel. His best-known work is *Die Kultur der Renaissance in Italien* (1860, *The Civilization of the Renaissance in Italy*, available in many English editions). It remains the great classic on the subject, although its primarily political and cultural interpretation of the Renaissance period is a controversial issue among historians. Believing in a pattern of culture peculiar to each age, Burckhardt found the shift from corporate medieval society to the modern spirit in the history of Italy in the 14th and 15th cent. The strife between empire and papacy had created a political and moral vacuum, which resulted in the birth of the modern self-conscious state and in the liberation of the creative individual. Burckhardt saw Renaissance humanism as the revival of classical antiquity, and he conceived the era as one of man's joyous new discovery of himself and the world about him. He profoundly influenced his friend Nietzsche, and the work of J. A. Symonds is based largely on Burckhardt's synthesis. In *The Age of Constantine the Great* (1852, tr. 1949), Burckhardt analyzed the transition from classical times to the Middle Ages. Among his other works on history and art is *Cicerone* (1855), a guide to Italian art. Burckhardt feared that the spiritual and aesthetic human values were doomed to submersion by the rise of industrial democracy.

Burckhardt, John Lewis, 1784-1817, explorer, b. Switzerland, educated in Germany. Supported by an English association for promoting African discovery, he visited Egypt and Syria (1809-13), rediscovered PETRA (1812), then, posing as a learned Muslim, he became the first Christian to reach Medina. He died while preparing to set out from Upper Egypt for his original goal, the Niger River. Included in his *Travels in Arabia* (1829) is a notable account of Mecca. His journals, published by the African Association, include *Travels in Nubia* (1819), *Travels in Syria and the Holy Land* (1822), *Notes on the Bedouin and Wahabys* (1830), and *Arabic Proverbs* (1830). See biography by Katharine Sim (1969).

Burckmair, Hans: see BURCKMAIR, HANS

burdock, common name of any plant of the genus *Arctium* of the family Compositae (COMPOSITE family), coarse biennials indigenous to temperate Eurasia and mostly weedy in North America. The flowers, usually purple, are followed by roundish many-

seeded burs. The great burdock (*A. lappa*) has been used medicinally and (in Japan) cultivated as a vegetable called gobo. The common burdock is *A. minus*. The cocklebur is sometimes confused with burdock. Burdock is classified in the division MAGNOLIOPHYTES, class Magnoliopsida, order Asterales, family Compositae.

Burdwan (bärdwan'), town (1971 pop. 144,970), West Bengal state, E central India. It has cutlery and tool industries but is chiefly known for its 108 linga temples dedicated to Siva. Rice is the chief product of the surrounding area. Burdwan is a district administrative center and the seat of Burdwan Univ. A hydroelectric project on the nearby Damodar River has aided the town's growth.

bureaucracy, the administrative structure of any large organization, public or private. Ideally bureaucracy is characterized by hierarchical authority relations, defined spheres of competence subject to impersonal rules, recruitment by competence, and fixed salaries. Its goal is to be rational, efficient, and professional. Max WEBER, the most important student of bureaucracy, described it as technically superior to all other forms of organization and hence indispensable to large, complex enterprises. However, because of the shortcomings that have in practice afflicted such large administrative structures, the terms *bureaucracy* and *bureaucrat* in popular usage usually carry a suggestion of probation and imply incompetence, a narrow outlook, duplication of effort, and application of a rigid rule without due consideration of specific cases. Bureaucracy existed in imperial Rome and China and in the national monarchies, but in modern states complex industrial and social legislation has called for a vast growth of administrative functions of government. The power of permanent and nonselective officials to apply and even initiate measures of control over the national administration and economy has raised the bureaucracy to critical importance in the life of the state, and critics object that it is largely unresponsive to control by the people or their elected representatives. The institution of the OMBUDSMAN has been one means adopted in an attempt to remedy this situation. Administrative bureaucracies in private organizations have also grown rapidly, especially since the development of the corporation. See CIVIL SERVICE. See H. H. Gerth and C. Wright Mills, *From Max Weber: Essays in Sociology* (1946, repr. 1958), Marshall Dimock, *Administrative Vitality: The Conflict with Bureaucracy* (1959), M. Crozier, *The Bureaucratic Phenomenon* (1964), Martin Albrow, *Bureaucracy* (1970), P. M. Blau, *Bureaucracy in Modern Society* (2d ed. 1971).

Bureya (bö'ra'ä), mountain range, Khabarovsk Krai, SE Far Eastern USSR, extending into NE China as the Lesser Khingan range. The site of the Bureya coal basin, it rises to 7,150 ft (2,180 m) and yields iron and coal. The Bureya River, c. 445 mi (720 km) long, rises in the N Bureya range and flows southwest to join the Amur River.

Burgas (bö'rgas'), city (1968 est. pop. 126,500), SE Bulgaria, on the Black Sea. It rivals Varna as the chief export port of Bulgaria and is an important commercial center. Fishing and fish canning, flour milling, sugar refining, copper mining, and soap making are carried on in Burgas, which also has engineering works and an oil refinery. The city was founded (18th cent.) on the site of a 14th-century fortified town.

Burgdorf (bö'örk'dörf), Fr. *Berthoud*, town (1970 pop. 15,888), NW Switzerland, on the Emme River. It is a manufacturing and cheese-trading town. There is a 12th-century castle in which J. H. Pestalozzi, the educational reformer, held (1799-1804) his first school.

Burgenland (böör'ganlant), province (1971 pop. 272,000), 1,530 sq mi (3,963 sq km), E Austria. The capital is EISENSTADT. It is a narrow, hilly region bordering Czechoslovakia in the northeast and Hungary in the east, and it is indented by Neusiedler Lake. It is primarily agricultural, but industry and tourism are being developed. A battleground for nearly 1,000 years, Burgenland has many castles, fortified churches, and walled villages. It is the newest of the Austrian provinces, its territory was transferred from Hungary by the treaties of Saint Germain (1919) and Trianon (1920). SOPRON, the region's leading town, was returned (1921) to Hungary after a plebiscite.

Burger, Gottfried August (gōt'frīt ou'gōst bū'gar), 1747-94, German poet. He is best known for his ballads in folk song style, the famous *Lenore* (1773) was widely translated and had far-reaching influence. Bürger edited and wrote for the *Göttinger*

gen *Musenalmanach* and taught aesthetics at the Univ. of Göttingen. He translated many works of Homer, Shakespeare, and others, as well as the famous stories of Baron Munchausen. His unconventional approach to poetry was severely criticized by Schiller. See study by W. A. Little (1974).

Burger, Warren Earl, 1907–, American jurist, fourteenth Chief Justice of the United States (1969–), b. St. Paul, Minn. After receiving his law degree in 1931 from St. Paul College of Law (now Mitchell College of Law), he was admitted to the Minnesota bar and taught and practiced law in St. Paul. He was (1953–56) assistant attorney general in charge of the civil division of the Department of Justice before becoming judge of the U.S. Court of Appeals for the District of Columbia. He was appointed to the Supreme Court by President Nixon. A conservative and an advocate of judicial restraint, Burger led the court in halting and sometimes reversing the liberal decisions of the court headed by his predecessor Earl Warren, particularly in criminal cases.

Burges, William (būr'jiz), 1827–81, English architect. An ardent proponent of medievalism, he was prominent in the GOTHIC REVIVAL. Burges is known for his designs for Cork Cathedral (1862) and Trinity College, Hartford, Conn., and for the rebuilding of Cardiff Castle (1865).

Burgess, Anthony (būr'jis), 1917–, English novelist, b. Manchester, grad. Manchester Univ., 1940. He taught school in England and in the Far East and pursued an early interest in music. His many novels are marked by an adroit use of language and a surreal, darkly comic imagination. Burgess's best-known work is *A Clockwork Orange* (1962), a thriller set in a classless, futuristic society, in which an intelligent young hoodlum asserts his individuality by deliberately choosing to do evil. His other works include the novels *Inside Mr. Enderby* (1961), *MF* (1971), and *Napoleon Symphony: A Novel in Four Movements* (1974), and *Here Comes Everybody* (1955), a study of James Joyce.

Burgess, Gelett (Frank Gelett Burgess), 1866–1951, American humorist, b. Boston. His ability as an illustrator led him into magazine work, and he was soon writing humorous articles and stories to accompany his illustrations. His best-known poem, "The Purple Cow," first appeared in the San Francisco periodical *The Lark* (1895–97), of which he was an editor and steady contributor. Among his books are *Goops and How to Be Them* (1900) and *Are You a Bromide?* (1907).

Burgess, John William, 1844–1931, American educator and political scientist, b. Tennessee. He served in the Union army in the Civil War and after the war graduated from Amherst (1867). He was admitted to the Massachusetts bar in 1869, but did not practice. That same year he joined the faculty of Knox College. In 1871 he went to Germany, where he studied at the universities of Göttingen, Leipzig, and Berlin. He returned in 1873 to teach history and political science at Amherst. In 1876 he began his long association with Columbia, where he was professor of political science and constitutional law until 1912. Burgess, with Nicholas Murray BUTLER, was a major influence in the creation (1880) of a faculty and school of political science, the first such faculty organized for graduate work in the country and the chief step in changing Columbia College into a university. He was dean of the Faculty of Political Science from 1890 until his retirement. In 1906–7 he served as first Roosevelt professor at the Univ. of Berlin. Burgess's fundamental political philosophy was expressed in *Political Science and Comparative Constitutional Law* (1890–91), the more permanently valuable portions of which were republished as *The Foundations of Political Science* (1933). He interpreted American history in *The Middle Period, 1817–1858*, *The Civil War and the Constitution, 1859–1865*, and *Reconstruction and the Constitution, 1866–1876*, a trilogy published between 1897 and 1902, to which was added *The Administration of Rutherford B. Hayes* (1915). In *Recent Changes in American Constitutional Theory* (1923) he protested against the encroachment of the Federal government upon state and individual rights and immunities. He founded the *Political Science Quarterly*. See his autobiography, *The Reminiscences of an American Scholar* (1934). R. G. Hoxie, *A History of the Faculty of Political Science, Columbia University* (1955).

Burgh, Hubert de, d. 1243, chief justiciar of England under kings John and HENRY III. Having served as a royal minister and commander in France, he was appointed justiciar by John in 1215. He continued in this position after John's death (1216) and in 1217 took part in the defeat of the French fleet at

Sandwich that led to the withdrawal of Prince Louis (later LOUIS VII of France) from England. Thereafter the justiciar rapidly became the most powerful man in the government of the young Henry III. His administration temporarily strengthened the position of the crown against the unruly barons, but his own territorial acquisitions made him many enemies. After 1227, when Henry was declared of age, relations between Hubert and the king deteriorated. Hubert tried to prevent the king's disastrous expedition to France (1230), he also apparently approved the widespread English movement to resist the drain of money to the papacy. In the meantime the justiciar's longtime rival Peter des ROCHES intrigued against him, and finally in 1232 Hubert was deprived of office on charges of disloyalty to the crown. He was imprisoned but eventually became reconciled with Henry and successfully withstood a revival of the old charges in 1239. See biography by Clarence Ellis (1952).

Burgh, Ulick de, earl of Clanricarde: see CLANRICARDE. ULICK DE BURGH, 5TH EARL OF.

Burghers, in the 18th cent., a party of the Secession Church of Scotland, resulting from one of the "breaches" in the history of Presbyterianism. To qualify as a burgher in certain burghs one was required to take an oath accepting the "true religion presently professed within this realm." Opinion differed as to whether this referred to the Protestant religion in general or to the Established Church. Those in the Secession Church who understood the oath in the former sense were the "Burghers," or the Associate Synod. Opposed to them were the Anti-Burghers, or the General Associate Synod, who refused to take the oath. The two bodies mutually excluded each other in 1747. By the end of the century both divisions were further split apart into "Old Light Anti-Burghers" and "Old Light Burghers" and "New Lights" in each division, over questions of civil magistracy. In 1820 Old Lights and New Lights were brought together again in the United Secession Church.

Burghley or Burleigh, William Cecil, 1st Baron (both būr'lē), 1520–98, English statesman. He first rose to prominence during the protectorate of Edward Seymour, duke of Somerset, and he served as secretary of state (1550–53) during the ascendancy of John Dudley, duke of Northumberland. He avoided direct involvement in Northumberland's seizure (1553) of the throne for Lady Jane Grey and thus did not lose favor when Mary I succeeded. Although he held no office during her reign, he was sent on several diplomatic missions and sat in Parliament. He was reappointed to office by ELIZABETH I, whom he served faithfully for 40 years—as secretary (1558–72) and as lord treasurer (1572–98). He continued to sit in Parliament, as a commoner until 1571 and as Lord Burghley thereafter, and was Elizabeth's chief spokesman there, as well as administrative head of her government. One of his greatest skills was his ability to function as a liaison, representing royal policy to Parliament and keeping Elizabeth in touch with its feelings. His personal religious sympathies were with the Puritans, but politically he considered the interests of the country best served by a middle-of-the-road Anglican church, which he supported against both Protestant and Roman Catholic extremes. He urged Elizabeth to marry and perpetuate a Protestant Tudor house, and he supported the cause of the Scottish Protestants against the Roman Catholic Mary Queen of Scots. He was not able to maintain a policy of moderation, however. A succession of Catholic plots against Elizabeth led to increasing harshness toward Catholics generally and finally the execution of Mary Queen of Scots. In the privy council Burghley took a decisive role in the suppression of the Catholic revolts, but he was opposed to the entrance of England into European wars on behalf of the Protestants. This policy was defeated (1585) by the Puntan wing of the council under Robert Dudley, earl of Leicester, and Sir Francis Walsingham. Although Elizabeth's favorites often opposed Burghley's influence, his role as chief adviser was never seriously challenged. See biography by B. W. Beckingsale (1967), Conyers Read, *Secretary Cecil and Queen Elizabeth* (1955) and *Lord Burghley and Queen Elizabeth* (1960).

Burgis, William (būr'jis), fl. 1717–31, American engraver and publisher of maps and views, b. London. His name appears as publisher on the views *South Prospect of ye Flourishing City of New York* (1717, copy, N.Y. Historical Society), *The New Dutch Church in New York City, A Prospect of the Colledges in Cambridge in New England* (only known copy, Massachusetts Historical Society, Boston), A

South East View of the Great Town of Boston, and *Plan of Boston in New England* (copy, Lib. of Congress, Washington, D.C.). The mezzotint *The Boston Light House* is the only plate which contains Burgis's name as engraver (copy, U.S. Lighthouse Board, Washington, D.C.).

Burgkmair or Burckmair, Hans (both hāns bōrk'mīar), 1473–1531, German engraver, woodcut designer, and painter. Having learned woodcutting from Schongauer, he settled in 1498 in his native Augsburg. His work shows the influence of his friend Dürer, whose enthusiasm for the Italian Renaissance he shared. Among his well-known paintings are the *Rosary Altar* (Augsburg) and *Holy Family* (1511, Berlin). After c.1508 he executed designs for woodcuts for Emperor Maximilian I, among these prints a series of episodes in the emperor's life is notable. Among his other works of graphic art are *Death as Destroyer* (1520) and *Virtues and Vices*.

burglary, at COMMON LAW, the breaking and entering of a dwelling house of another at night with the intent to commit a FELONY, whether the intent is carried out or not. This definition has been generally adopted with some modifications in the criminal law of the various states of the United States. At common law burglary is primarily an offense against the security of habitation, not against the property as such, but today by statute burglary usually includes breaking into places other than dwellings. Breaking as well as entering is essential to commission of the crime, to constitute a breaking, the use of physical force is necessary and sufficient, even though the amount of force may be slight, e.g., turning a key, opening a partly closed window, pushing out a windowpane. Entry through FRAUD (as by posing as a guest), through THREAT, or through CONSPIRACY with servants is deemed by the law equivalent to breaking and is called "constructive breaking." By statute most states do not restrict burglary to action at night, as the common law does. Burglary under common law requires that the intent be to commit a felony, but some statutes declare that the intent need only be "to commit some crime." See ROBBERY.

Bürglen (bürk'lan), town (1970 pop. 3,401), Uri canton, central Switzerland. It is the legendary birthplace of William TELL. A 16th-century chapel stands on the supposed site of Tell's house.

Burgos (bōr'gōs), city (1970 pop. 119,915), capital of Burgos prov., N Spain, in Old Castile, on a mountainous plateau c.2,800 ft (850 m) above sea level, near the Arlanzon River. It is an important trade center with a large tourist industry. It was one of the ancient capitals of Castile but is chiefly known for its outstanding architecture and great historic tradition. Founded c.855, it was the seat of the county of Castile under the kings of León and became the capital of the kingdom of Castile under Ferdinand I (1035). The royal residence was moved (1087) to Toledo, and Burgos lost some of its cultural importance. In the civil war of 1936–39, Burgos was the capital of Franco's regime. Its most notable building is the cathedral of white limestone, begun in 1221, one of the finest examples of Gothic architecture in Europe, its lofty, filigree spires dominate the city. The Cid, a native of Burgos, is buried in the cathedral. Among the many other landmarks are the castle, atop a hill overlooking the city, the Gothic Church of San Esteban, and the Arco de Santa Maria, a 16th-century gateway leading to the cathedral.

Burgoyne, John (bārgoin'), 1722–92, British general and playwright. In the Seven Years War, his victory over the Spanish in storming (1762) Valencia de Alcántara in Portugal made him the toast of London. He was elected to Parliament in 1761 and took his seat in 1763. In 1772 his attack on the East India Company helped bring about some reform of the company in the Regulating Act of that year. As the American Revolution was beginning, he was sent (1775) with reinforcements to support General Gage at Boston. Burgoyne witnessed the battle of Bunker Hill and returned home in disgust (Dec., 1775). He joined (1776) Sir Guy Carleton in Canada and served at Crown Point, but, critical of Sir Guy's inaction, Burgoyne returned to England to join Lord George Germain in laying the plans that resulted in the SARATOGA CAMPAIGN. In the summer of 1777, Burgoyne began the ill-fated expedition with an army poorly equipped, untrained for frontier fighting, and numbering far less than he had requested. After minor initial success, stiffened American resistance coupled with the failure of Barry ST. LEGER and Sir William HOWE to reach Albany led to his surrender at Saratoga (Oct. 17, 1777). He returned to England, was given (1782) a command in Ireland, and managed the impeachment of Warren HASTINGS. Bur-

goyne wrote several plays, of which *The Heiress* (1786) is best known. See biographies by Showell Styles (1962) and N. B. Gerson (1973). His illegitimate son Sir John Fox Burgoyne (1782-1871) served with distinction in the Peninsular War. In the Crimean War his advice was followed in attacking Sevastopol from the south—an action that led to a long and hard siege. He was created field marshal in 1868.

bur grass: see SANDBUR

Burgundians, medieval French political faction. see ARMAGNACS AND BURGUNDIANS

Burgundy (bûr'gændē), Fr. *Bourgogne* (bōrgō'nyā), historic region, E. France. The name once applied to a large area embracing several kingdoms, a free county (see FRANCHE-COMTÉ), and a duchy. The present region is identical with the province of Burgundy of the 17th and 18th cent. It is now administratively divided into the departments of Yonne, Côte-d'Or, Saône-et-Loire, Ain, and Nièvre. Burgundy west of the Saône River is generally hilly, the southeast includes the southern spurs of the Jura mts., the center is a lowland, extending south almost to the junction of the Saône and Rhône rivers (see BRESSE). A rich agricultural country, Burgundy is especially famous for the wine produced in the Chablis region, the mountains of the Côte d'Or, and the Saône and Rhône valleys. Dijon is the historic capital, other cities are Autun, Auxerre, Beaune, Bourg-en-Bresse, Chalon-sur-Saône, and Mâcon. The territory, conquered by Caesar in the GALLIC WARS, was divided first into the Roman provinces of Lugdunensis and Belgic Gaul, then into Lugdunensis and Upper Germany (see GAUL). It prospered, and Autun became a major intellectual center. In the 4th cent. Roman power dissolved, and the country was invaded by Germanic tribes. It was finally conquered (c. 480) by the Burgundii, a tribe from Savoy. The Burgundii accepted Christianity, established their *Lex Burgundionum*, and formed the First Kingdom of Burgundy, which at its height covered SE France and reached as far south as Arles and W. Switzerland. Conquered (534) by the FRANKS, it was throughout the Merovingian period subjected to numerous partitions. Burgundy nevertheless survived as a political concept, and after the partitions of the Carolingian empire two new Burgundian kingdoms were founded, Cisjurane Burgundy, or PROVENÇE, in the south (879) and Transjurane Burgundy in the north (888). These two were united (933) in the Second Kingdom of Burgundy (see ARLES, KINGDOM OF). A smaller area, corresponding roughly to present Burgundy, was created as the duchy of Burgundy by Emperor Charles II in 877. In 1002, King Robert II of France made good his claim to the duchy, but his son, Henry I, gave it in 1031 as a fief to his brother Robert, whose line died out in 1361. The golden age of Burgundy began (1364) when John II of France bestowed the fief on his son, PHILIP THE BOLD, thus founding the line of Valois-Bourgogne. Philip and his successors, JOHN THE FEARLESS, PHILIP THE GOOD, and CHARLES THE BOLD, acquired—by conquest, treaty, and marriage—vast territories, including most of the present Netherlands and Belgium, the then extensive duchy of Luxembourg, Picardy, Artois, Lorraine, S. Baden, Alsace, the Franche-Comté, Nivernais, and Charolais. In the early 15th cent. the dukes of Burgundy, through their partisans in France, dominated French politics (see ARMAGNACS AND BURGUNDIANS). England, at first supported by Burgundy in the HUNDRED YEARS WAR, suffered a crucial setback when Philip the Good withdrew that support in the Treaty of Arras (1435). A great power, Burgundy at that time had the most important trade, industry, and agriculture of Europe. Its court, a center of the arts, was second to none. The wars of ambitious Charles the Bold, however, proved ruinous. Charles, opposed by the determined and resourceful Louis XI of France, was defeated by the Swiss at Grandson, Morat (1476), and Nancy (1477), where he lost his life. His daughter, MARY OF BURGUNDY, by marrying Emperor Maximilian I, brought most of the Burgundian possessions (but not the original French duchy) to the house of Hapsburg. The duchy itself was seized by Louis XI, who incorporated it into the French crownlands as a province, to which Gex, Bresse, and Charolais were added later by Henry IV and Louis XIV. See studies by Richard Vaughan (1962, 1966, and 1970), Otto Cartellieri, *The Court of Burgundy* (1929, repr. 1972).

Burgundy mixture: see BORDEAUX MIXTURE

Burhanpur (bûr'hanpōr'), town (1971 pop. 105,349), Madhya Pradesh state, W. central India, on the Tapi River. It trades in cotton and oilseed, and

is known for its gold and silver embroidery. Founded c. 1400, Burhanpur has a partially ruined palace (c. 1610) of Akbar.

burial, disposal of a corpse in a GRAVE or TOMB. The first evidence of deliberate burial was found in European caves of the Paleolithic period. Prehistoric discoveries include both individual and communal burials, the latter indicating that pits or ossuaries were unsealed for later use or that servants or members of the family were slain to accompany the deceased. Both practices have been followed by various peoples into modern times. The ancient Egyptians developed the coffin to keep bodies from touching the earth, this burial practice was continued by the Greeks and Romans when they used the burial form of disposal. The word *burial* has been applied to funerary practices other than interment, such as sea burial, or tree burial (which usually precedes later interment). Secondary burial frequently occurs to terminate a period of mourning (see FUNERAL CUSTOMS). See also CEMETERY.

Buriat-Mongolia: see BURYAT AUTONOMOUS SOVIET SOCIALIST REPUBLIC

Buridan, Jean (byōō'rīdān, Fr. zhaN burēdāN'), d. c. 1358, French scholastic philosopher. Rector of the Univ. of Paris, he was a follower of William of Ockham and a nominalist. His theory of the will was that choice is determined by the greater good and that the freedom man possesses is the power to suspend choice and reconsider motives for action. Traditionally but almost certainly erroneously he is supposed to have used the simile of "Buridan's ass"—an unfortunate animal midway between two identical bundles of hay and starving to death because it cannot choose between them.

Burkburnett (bûrkbernēt'), city (1970 pop. 9,230), Wichita co., N. Texas, near the Okla. line, inc. 1913. A shipping center for livestock, cotton, and wheat, it also has many oil wells and refineries. The area's first big gusher (1918) brought a boom that transformed the quiet little community into one of the wildest and roughest of all the oil towns, at one time its population approached 30,000.

Burke, Edmund, 1729-97, British political writer and statesman, b. Dublin, Ireland. The son of a Protestant father and a Roman Catholic mother and himself a Protestant, he never ceased to criticize the stupidity of the English administration in Ireland and the galling discrimination against Catholics. After graduating (1748) from Trinity College, Dublin, he began the study of law in London but abandoned it to devote himself to writing. His satirical *Vindication of Natural Society* (1756) attacked the political rationalism and religious skepticism of Henry St. John, Viscount Bolingbroke, and his *Philosophical Enquiry into the Origin of Our Ideas of the Sublime and Beautiful* (1757) was a study in aesthetics. In 1759 he founded the *Annual Register*, a periodical to which he contributed until 1788. Burke was a member of Samuel Johnson's intimate circle. His political career began in 1765 when he became private secretary to the marquess of ROCKINGHAM, then prime minister, and formed a lifelong friendship with that leader. He also entered Parliament in 1765 and there strove for a wiser treatment of the American colonies. In 1766 he spoke in favor of the repeal of the Stamp Act, although he also supported the Declaratory Act, asserting Britain's constitutional right to tax the colonists. In his famous later speeches on American taxation (1774) and on conciliation with the colonies (1775), he did not abandon that position, rather he urged the imprudence of exercising such theoretical rights. At a time when political allegiances were based largely on family connections and patronage and political opposition was generally regarded as factionalism, Burke, in his *Thoughts on the Cause of the Present Discontents* (1770), became the first political philosopher to argue the value of political parties. He called for a limitation of crown patronage (so-called "economical reform") and as postmaster general (1782-83) in the second Rockingham ministry was able to enact some of his proposals. He was also interested in reform of the East India Company and drafted the East India Bill presented (1783) by Charles James Fox. Influenced by Sir Philip FRANKS, he also instigated the impeachment and long trial of Warren HASTINGS. Hastings was acquitted, but Burke's speeches created some new awareness of the responsibilities of empire and of the injustices perpetrated in India and previously unpublicized in England. Although he championed many liberal and reform causes, Burke believed that political, social, and religious institutions represented the wisdom of the ages. He feared political reform beyond limitations on the

power of the crown. Consequently, his *Reflections on the Revolution in France* (1790) made him the spokesman of European conservatives. His stand against the French Revolution—and, by implication, against parliamentary reform—caused him to break with Fox and his Whigs in 1791. Burke's *Appeal from the New to the Old Whigs* (1791) shows how closely he approached the Tory position of the younger William PITT. Burke left, in his many and diverse writings a monumental construction of British political thought that had far-reaching influence among conservatives in England, America, and France for many years. He held unrestricted rationalism in human affairs to be destructive and affirmed the utility of habit and prejudice and the importance of continuity in political experience. He withdrew from political life in 1795. See his correspondence (9 vol., 1958-70), selections ed. by W. J. Bate (1960), biography by P. M. Magnus (1939, repr. 1973), studies by T. W. Copeland (1949, repr. 1970), Charles Parkin (1956, repr. 1968), C. B. Cone (2 vol., 1957-64), P. J. Stanlis (1958, repr. 1965), G. W. Chapman (1967), Russell Kirk (1967), and B. T. Wilkins (1967).

Burke, John, 1787-1848, Irish genealogist. He issued (1826) *A Genealogical and Heraldic Dictionary of the Peerage and Baronetage of the United Kingdom*. He published the guide irregularly until 1847, after which it became an annual, commonly called *Burke's Peerage*. It was edited from 1847 to 1892 by his son, Sir John Bernard Burke, 1814-92, who was knighted (1854) and appointed (1855) keeper of the state papers in Ireland. As a companion to Burke's *Peerage*, he established the regular publication of another work begun by his father, commonly called *Burke's Landed Gentry*. His other works include *The Romance of the Aristocracy* (1855) and *Vicissitudes of Families* (1859-63).

Burke, Kenneth, 1897-, American critic, b. Pittsburgh, Pa. He was music critic for *The Dial* (1927-29) and *The Nation* (1934-36). A profound thinker whose writings have influenced other critics, Burke sees literature as "symbolic action"—man must view everything through a haze of symbols (language). Among his works are *Counter-Statement* (1931), *Attitudes Towards History* (1937), *A Grammar of Motives* (1962), *Collected Poems* (1968), and *The Complete White Oxen* (1968), short fiction.

Burke, Robert O'Hara, 1820-61, Irish explorer of Australia. After service in the Belgian and Austrian armies he went (1853) as inspector of police to Melbourne. In 1860, with W. J. Wills and eight other whites, he left Menindee, on the Darling River, to cross the continent. Dissensions broke up the party, but the leaders reached the estuary of the Flinders River, in the Gulf of Carpentaria. On the return journey both Burke and Wills died from famine and exposure. Although the geographical achievements of the expedition itself were few, rescue parties seeking it added much to the knowledge of central Australia. See C. G. D. Roberts, *Discoveries and Explorations in the Century* (1906), Max Colwell, *The Journey of Burke and Wills* (1971).

Burlamaqui, Jean Jacques (zhaN zhak bōrlā make'), 1694-1748, Swiss jurist. His chief works are *Principes du droit naturel* [principles of natural law] (1747) and *Principes du droit politique* [principles of political law] (1751). He attempted to demonstrate the reality of natural law by tracing its origin in God's rule and in human reason and moral instinct. He believed that both international and domestic law were based on natural law.

Burleigh, Henry Thacker (bûr'lē), 1866-1949, American baritone and composer, b. Erie, Pa., pupil of Dvořák at the National Conservatory, New York, where he later taught. He was soloist at St. George's Church, New York City, from 1892 to 1946 and also at Temple Emanu-El for 25 years. His concert arrangements of Negro spirituals such as *Deep River*, employing chromatic harmonies in the style of art songs, are widely used.

Burleigh, William Cecil, 1st Baron: see BURGLEY
Burleson, Albert Sidney (bûr'lē'son), 1863-1937, US Postmaster General (1913-21), b. San Marcos, Texas, grandson of Edward Burleson. He was a lawyer of Austin, Texas, and a member of the US House of Representatives (1899-1913) before resigning to take a cabinet post under President Wilson. His methods of administering communications in World War I angered many businessmen, who charged him with inefficiency and interference with private business, labor unions, because he forbade strikes of postal employees, and liberals whose antiwar periodicals he banned from the mails. Bur-

leson continued to exercise strict control and to advocate government ownership of communications. In 1918 he established airmail service.

Burleson, Edward, 1798-1851, pioneer of Texas, b. Buncombe co., N.C. After living in Tennessee and serving under Andrew Jackson in the war against the Creek Indians (1813-14), he moved to Texas. He distinguished himself in the Texas Revolution and was later (1840) successful in the warfare against the Cherokee in East Texas. Burleson was a senator, then vice president of the Republic of Texas, but was defeated for the presidency in 1844. He also served in the Mexican War.

burlesque (bûrlĕsk') [Ital., = mockery], form of entertainment differing from comedy or farce in that it achieves its effects through caricature, ridicule, and distortion. It differs from satire in that it is devoid of any ethical element. The word first came into use in the 16th cent. in an opera of the Italian Francesco Bemini, who called his works *burleschi*. Early English burlesque often ridiculed celebrated literary works, especially sentimental drama. Beaumont and Fletcher's *Knight of the Burning Pestle* (1613), Buckingham's *The Rehearsal* (1671), Gay's *Beggar's Opera* (1728), Fielding's *Tom Thumb* (1730), and Sheridan's *Critic* (1779) may be classed as dramatic burlesque. In the 19th cent. English burlesque depended less on parody of literary styles and models. H. J. Bryon was a major writer of the new, pun-filled burlesque. The extravaganza and burletta were forms of amusement similar to burlesque, the latter being primarily a musical production. They were performed in small theaters in an effort to evade the strict licensing laws that forbade major dramatic productions to these theaters. American stage burlesque (from 1865), often referred to as "burleycue" or "leg show," began as a variety show, characterized by vulgar dialogue and broad comedy, and uninhibited behavior by performers and audience. Such stars as Al Jolson, W. C. Fields, Mae West, Fannie Brice, Sophie Tucker, Bert Lahr, and Joe Weber and Lew Fields began their careers in burlesque. About 1920 the term began to refer to the "strip-tease" show, which created its own stars, such as Gypsy Rose Lee, in c. 1937 burlesque performances in New York City were banned. With the increase in popularity of nightclubs and movies, the burlesque entertainment died. See studies by C. V. Clinton-Baddeley (1952, repr. 1974), R. P. Bond (1932, repr. 1964), and J. D. Jupp (1972).

Burlin, Natalie Curtis, 1875-1921, American writer and musician, b. New York City, studied music in France and Germany. She was one of the leading transcribers of the primitive music of America and Africa, and it was through her efforts that Indian music was encouraged, rather than forbidden by law, in government schools. She visited the Navaho, Zuni, Hopi, and other Indian tribes, recording words and music with fidelity. Songs of African tribes and American Negroes are also included in her works—*Songs of Ancient America* (1905), *The Indians' Book* (1907), *Hampton Series Negro Folk-Songs* (4 vol., 1918-19), and *Songs and Tales from the Dark Continent* (1920).

Burlingame, Anson (bûrl'ing-gām), 1820-70, American diplomat, b. New Berlin, N.Y. He became a lawyer in Boston and later (1855-61) a Congressman. Defeated for reelection, he was made (1861) minister to China. By his tact and understanding of Chinese opposition to the autocratic methods of foreigners in the treaty ports, he won a place as adviser to the Chinese government. In 1867, China sent him as head of a mission to visit foreign lands in order to secure information and sign treaties of amity. He visited Washington, London, and capitals on the Continent. One result was a treaty between China and the United States, supplementary to the 1858 treaty. This, usually called the Burlingame Treaty, was signed in 1868. It was a treaty of friendship based on Western principles of international law. One clause encouraged Chinese immigration—laborers were then much in demand in the West, later the heavy influx of Chinese under its provisions caused friction on the West Coast and led to the exclusion of Chinese immigrants (see CHINESE EXCLUSION). See biography by F. W. Williams (1912, repr. 1972).

Burlingame, city, (1970 pop. 27,320), San Mateo co., W. Calif., on San Francisco Bay, founded 1868, inc. 1908. Burlingame is mainly residential, with some commercial and light industries. The city is named for U.S. diplomat Anson Burlingame.

Burlingame Treaty. see under BURLINGAME ANSON

Burlington, Richard Boyle, 3d earl of, 1694-1753, English patron and architect of the Neo-Palladian

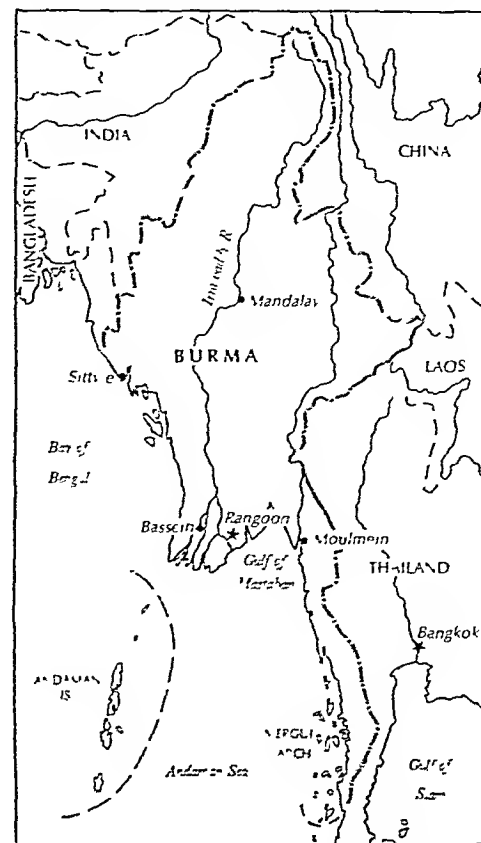
movement. Even before age 21, when he became a member of the Privy Council and Lord High Treasurer of Ireland, he showed an interest in architecture. In 1714, Burlington made a tour of Italy and also subscribed to the *Vitruvius Britannicus* of Colin Campbell. He employed Campbell to remodel the Burlington House in London (c. 1717). In 1719, Burlington was again in Italy, specifically to study the architecture of Palladio. Through his patronage of other artists, notably William Kent, and in his own buildings, he furthered the revival of an architecture based on the styles of Palladio and Inigo Jones. The most important of Burlington's own works are the villa for his estate at Chiswick (begun 1725) and the Assembly Room, York (1730).

Burlington, town (1971 pop. 87,023), SE Ont., Canada, on Lake Ontario. It is a suburb of Hamilton.

Burlington, 1 City (1970 pop. 32,366), seat of Des Moines co., SE Iowa, on four hills overlooking the Mississippi (spanned there by rail and highway bridges), inc. 1836. It is a farm, shipping, and manufacturing center with railroad shops and docks. Zebulon Pike selected this spot for a fort in 1805. An Indian village, Sho-quo-quon ("Flint Hills") was there. White settlement began in 1833. Burlington was the temporary capital of Wisconsin Territory (1837) and of Iowa Territory (1838-40). One of the oldest newspapers in the state, the *Burlington Hawk-Eye*, is still published. The city has a junior college and several parks along the Mississippi. 2 Town (1970 pop. 21,980), Middlesex co., E. Mass., a residential suburb of Boston, in a farm area, settled 1641, inc. 1799. Its pre-Revolutionary meetinghouse, remodeled, still stands. 3 City (1970 pop. 11,991), Burlington co., W. N.J., on the Delaware (bridged there to Bristol, Pa.) between Trenton and Camden, in a rich farm area, settled 1677 by Friends, inc. 1733. A shipping point for farm and dairy products, it also has varied manufactures. Burlington grew mainly as a port, it was capital of West Jersey from 1681 until the union of East and West Jersey (1702), and thereafter until 1790 was alternate capital with Perth Amboy. It was on a Philadelphia-New York coach line, and railroad tracks were laid down Broad St. in 1834. The first colonial money was printed there by Benjamin Franklin in 1726, and the first newspaper in New Jersey appeared in 1777. G. W. Doane, for many years rector of old St. Mary's (built 1703), founded St. Mary's Hall for girls there (1837). The newer St. Mary's church was designed by Richard Upjohn. The Friends' school (1792, now the Y.W.C.A.) and meetinghouse (1784) still stand. The birthplaces of James Fenimore Cooper and of James Lawrence are preserved. 4 City (1970 pop. 35,930), Alamance co., N. C., on the Haw River, settled c. 1700, inc. 1866. It is a great textile center in a heavily industrialized area, with plants manufacturing textiles, hosiery, and yarn. In May, 1771, 2,000 colonial "Regulators" clashed with British troops c. 5 mi (8 km) south of Burlington, the site is in Alamance Battleground State Park. In the city are a notable wildlife museum and the Technical Institute of Alamance. Elon College is to the west. 5 City (1970 pop. 38,633), seat of Chittenden co., NW Vt., on Lake Champlain, settled 1773, inc. 1865. The largest city in the state, it is a port of entry and a major industrial center. Missile and ordnance parts, data-processing machinery, textiles, canned goods, and wood and steel products are its chief manufactures. Battery Park, famous for sunset views, was the scene of an abortive British naval attack (Aug. 3, 1813) during the War of 1812. The city is the seat of the Univ. of Vermont, Trinity College, and Champlain College (a junior college). American Revolutionary hero Ethan Allen spent his last years near Burlington village (part of his farm is included in Ethan Allen Park) and is buried nearby. The *Burlington Free Press* (founded 1827) became Vermont's first daily newspaper in 1847. The philosopher John Dewey was born in the city.

Burma, Union of, republic (1969 est. pop. 26,980,000), 261,789 sq. mi. (678,033 sq. km), SE Asia. The capital is RANGOON. Burma is bounded on the W by Bangladesh, India, and the Bay of Bengal, on the N and NE by China, on the E by Laos and Thailand, and on the S by the Andaman Sea. The most densely populated part of the country is the valley of the Irrawaddy River, which, with its vast delta, is one of the main rice-growing regions of the world. MANDALAY, the country's second largest city, is on the Irrawaddy in central Burma. The Irrawaddy basin is inhabited by the Burmans proper, a Mongoloid race who came down from Tibet by the 9th cent. The valley is surrounded by a chain of mountains that stem from the E Himalayas and spread out roughly

in the shape of a giant horseshoe, the ranges and river valleys of the Chindwin (a tributary of the Irrawaddy) and of the Sittang and the Salween (both to



the E of the Irrawaddy) trend from north to south. In the mountains of N Burma (rising to more than 19,000 ft/5,791 m) and along the India-Burma frontier live various Mongoloid peoples, the most important are the Kachins (in the Kachin State in the north) and the Chins (in the Chin Special Division in the west). These peoples practice shifting cultivation (taungya) and cut teak in the forests. Between the Bay of Bengal and the hills of the Arakan Yoma is the ARAKAN, a narrow coastal plain with the port of SITTAWE. In E Burma on the Shan Plateau is the SHAN STATE, home of the Shans, a Tai race closely related to the Siamese. South of the Shan State are the mountainous Kayah State and the Kawthle State, the Karens, who inhabit this region, are of Tai-Chinese origin, and many are Christians. South of the Kawthle State is the TENASSERIM region, a long, narrow strip of coast extending to the Isthmus of Kra. At its northern end is the port of MOULMEIN, Burma's third largest city. Most of Burma has a tropical, monsoon climate, however, N of the Pegu Hills around Mandalay is the so-called Dry Zone with a rainfall of 20 to 40 in. (51-102 cm). On the Shan Plateau temperatures are moderate. Burma suffered extensive damage in World War II, and some sectors of its economy have not yet fully recovered. Most of the population work in agriculture and forestry, and rice accounts for about half of the agricultural output. (Until 1964 Burma was the world's largest rice exporter.) Other important crops are sugarcane, groundnuts, and pulses. Burma's forests, which are government-owned, are the source of teak and other hardwoods. The country is rich in minerals. Petroleum is found E of the Irrawaddy in the Dry Zone. Tin and tungsten are mined in E Burma, the Mawchi mines in Kayah State are also rich in tungsten. In the Shan State, NW of Lashio, are the Bawdwin mines, the source of lead, silver, and zinc. Coal and iron deposits have also been found in Burma. Gems (notably rubies and sapphires) are found near MOGOK. Since the 13th cent., Burma has exported to China jade from the Hunkawng valley in the north. Aside from food-processing establishments, there are few manufacturing industries in Burma. The country's chief trade partners are Japan, Great Britain, West Germany, and India. Rice and teak are the leading exports, and machinery, transportation equipment, and textiles are the chief imports. Hinayana Buddhism is the religion of about 85% of the population. Burmese (the tongue of the Burmans) is the official language, but the Shans, Kachins, and Karens speak their own languages in all, over 100 languages

are spoken in Burma. There are colleges and universities in Rangoon and Mandalay.

History Burma's early history is mainly the story of the struggle of the Burmans against the Mons, or Talaings (of Mon-Khmer origin, now assimilated). In 1044, King Anawratha established Burman supremacy over the Irrawaddy delta and over Thaton, capital of the Mon kingdom. Anawratha adopted Hinayana Buddhism from the Mons. His capital, Paga, "the city of a thousand temples," was the seat of his dynasty until it was conquered by Kublai Khan in 1287. Then Shan princes predominated in upper Burma, and the Mons revived in the south. In the 16th cent the Burman Toungoo dynasty unified the country and initiated the permanent subjugation of the Shans to the Burmans. In the 18th cent the Mons of the Irrawaddy delta overran the Dry Zone. In 1758, Alaungapaya rallied the Burmans, crushed the Mons, and established his capital at Rangoon. He extended Burman influence to areas in present-day India (Assam and Manipur) and Thailand. Burma was ruled by his successors (the Konbaung dynasty) when friction with the British over border areas in India led to war in 1824. The Treaty of Yandabo (1826) forced Burma to cede to British India the Arakan and Tenasserim coasts. In a second war (1852) the British occupied the Irrawaddy delta. Fear of growing French strength in the region, in addition to economic considerations, caused the British to instigate the third Anglo-Burman War (1885) to gain complete control of Burma. The Burman king was captured, and the remainder of the country was annexed to India. Under British rule rice cultivation in the delta was expanded, an extensive railroad network was built, and the natural resources of Burma were developed. Exploitation of the rich oil deposits of Yenangyaung in central Burma was begun in 1871, the export of metals also became important. Until the 20th cent, however, Burma was allowed no self-government. In 1923 a system of "dyarchy," already in effect in the rest of British India, was introduced, whereby a partially elected legislature was established and some ministers were made responsible to it. In 1935 the British gave Burma a new constitution (effective 1937), which separated the country from British India and provided for a fully elected assembly and a responsible cabinet. During World War II, Burma was invaded and quickly occupied by the Japanese, who set up a nominally independent Burman regime under Dr. Ba Maw. Disillusioned members of the Burmese Independent Army (which the Japanese had formed secretly before the war to assist in expelling the British) under Aung San formed an anti-Japanese resistance movement, the Anti-Fascist People's Freedom League (AFPFL). Allied forces drove the Japanese out of Burma in April, 1945. In 1947 the British and Aung San reached agreement on full independence for Burma. Most of the non-Burman peoples supported the agreement, although the acquiescence of many proved short-lived. Despite the assassination of Aung San in July, 1947, the agreement went into effect in Jan., 1948. Burma became an independent republic outside the British Commonwealth of Nations. The new constitution provided for a bicameral legislature with a responsible prime minister and cabinet. Non-Burman areas were organized as the Shan, Kachin, Kachin, Kachin, and Kayah states and the Chin Special Division, each possessed a degree of autonomy. The government, controlled by the socialist AFPFL, was soon faced with armed risings of Communist rebels and of Karen tribesmen, who wanted a separate Karen nation. International tension grew over the presence in Burma of Chinese Nationalist troops who had been forced across the border by the Chinese Communists in 1950 and who were making forays into China. Burma took the matter to the United Nations, which in 1953 ordered the Nationalists to leave Burma. In foreign affairs Burma has followed a generally neutralist course. It refused to join the Southeast Asia Treaty Organization and was one of the first countries to recognize the Communist government in China. In the elections of 1951-52 the AFPFL triumphed. The AFPFL leaders intended to socialize the country rapidly, but lower rice prices after the Korean War and a shortage of trained personnel forced the abandonment of most of the plans. In 1958 the AFPFL split into two factions, with a breakdown of order threatening. Premier U Nu invited General Ne Win, head of the army, to take over the government (Oct., 1958). After the 1960 elections, which were won by U Nu's faction, civilian government was restored. However, as rebellions among the minorities flared and opposition to U Nu's plan to make Buddhism the state

religion mounted, conditions deteriorated rapidly. In March, 1962, Ne Win staged a military coup, discarded the constitution, and established a Revolutionary Council, made up of military leaders who ruled by decree. While the federal structure was retained, a hierarchy of workers' and peasants' councils was created. A new party, the Burma Socialist Program party, was made the only legal political organization. The Revolutionary Council fully nationalized the industrial and commercial sectors of the economy. Discussions were entered into with the minority peoples in 1963, but no agreement was reached. Insurgency became a major problem of the Ne Win regime. Pro-Chinese Communist rebels—the "White Flag" Communists—were active in the northern part of the country, where, from 1967 on, they received aid from Communist China, the Chinese established links with the Shan and Kachin insurgents as well. The deposed U Nu, who managed to leave Burma in 1969, also used minority rebels to organize an anti-Ne Win movement, the National Liberation Council, among the Shans, Karens, and others in the east. However, in 1972, U Nu split with minority leaders over their assertion of the right to secede from Burma. By the early 1970s the various insurgent groups controlled about one third of Burma. Ne Win and other top leaders resigned from the military in 1972 but continued to retain power. A new constitution, providing for a unicameral legislature and one legal political party, took effect in Mar., 1974, and the Revolutionary Council was disbanded. Ne Win continued as prime minister. See J. F. Cady, *A History of Modern Burma* (1958), F. N. Trager, *Burma From Kingdom to Republic* (1966), M. Htin Aung, *A History of Burma* (1967), Hugh Tinker, *The Union of Burma* (4th ed. 1967), F. S. Donison, *Burma* (1970), Norma Bixler, *Burma: A Profile* (1971), J. W. Henderson et al., *Area Handbook for Burma* (1971).

bur marigold or **sticktight**, common name for any species of *Bidens*, a genus of chiefly weedy North American plants of the Compositae (COMPOSITE family) with two-pronged burlike fruits (achenes) that have gained various species such additional names as beggar-ticks, Spanish needles, tickseed, and boot-jacks. A few showy yellow-flowered species are occasionally cultivated. Many of the common names are also used for other weeds with burs. Bur marigold is classified in the division MAGNOLIOPHYTES, class Magnoliopsida, order Asterales, family Compositae.

Burma Road, in China and Burma, extending from the Burmese railroad of Lashio to K'un-ming, Yunnan prov., China. About 700 mi (1,130 km) long and constructed through rough mountain country, it was a remarkable engineering achievement. Undertaken by the Chinese after the start of the Sino-Japanese war in 1937 and completed in 1938, it was used to transport war supplies landed at Rangoon and shipped by railroad to Lashio. This traffic increased in importance to China after the Japanese took effective control of the Chinese coast and of Indochina. The Ledo Road (later called the Stilwell Road) from Ledo, India, into Burma was begun in Dec., 1942. In 1944 the Ledo Road reached Myitkyina and was joined to the Burma Road. Both roads have lost their former importance and are in a state of disrepair. See study by Leslie Anders (1965).

Burmese, language belonging to the Tibeto-Burman subfamily of the Sino-Tibetan family of languages (see SINO-TIBETAN LANGUAGES). It is spoken by about 18 million people in the Union of Burma, where it is both the principal and the official language. Burmese can be described as monosyllabic because root words generally consist of a single syllable. Context, word order, and the use of musical pitch or tones, of which Burmese has three, help to differentiate the meanings of the many homonyms. Syllables are often used in combination, thereby increasing the number of ideas that can be expressed. Burmese has its own alphabet, which is ultimately descended from an old script from S. India. There is a great difference between the spoken and written forms of the language. See John Okell, *Reference Grammar of Colloquial Burmese* (1969), William S. Cornyn, *Spoken Burmese* (1971).

Burmese cat see CAT

burn, injury resulting from exposure to heat, electricity, radiation, or caustic chemicals. Three degrees of burn are commonly recognized. In first-degree burns the outer layer of skin, called epidermis, becomes red, sensitive to the touch, and often swollen. Medical attention is not required but applica-

tion of an ointment may relieve the pain. Second-degree burns are characterized by the variable destruction of epidermis and the formation of blisters; nerve endings may be exposed. The more serious cases should be seen by a physician and care should be taken to avoid infection. Local therapy includes application of a chemical such as silver nitrate to produce a soft crust, reduce the threat of infection, and relieve the pain. Third-degree burns involve destruction of the entire thickness of skin and the underlying connective tissue. In the more severe cases underlying bones are also charred. The surface area involved is more significant than the depth of the burn. SHOCK must be prevented or counteracted; blood transfusion may be required to replace lost body fluids. Invasion of various bacteria must be prevented or cured by administering antibiotics and other drugs. Morphine may be employed to ease pain. Long-term treatment may include TRANSPLANTATION of skin tissue from other parts of the body.

Burne-Jones, Sir Edward, 1833-98. English painter and decorator, b. Birmingham. Expected to enter the Church, he went to Exeter College, Oxford, where he met William Morris, who became his lifelong friend. He left Oxford to study painting with Rossetti in London and joined the PRE-RAPHAELITES. Burne-Jones's early work shows Rossetti's strong influence, which was later replaced by his emulation of Botticelli and Mantegna. Burne-Jones rose to success in 1877 with the opening of the Grosvenor Gallery. Among his well-known paintings are *King Co. phetua* and *The Beggar Maid* (1884, Tate Gall., London), *Depths of the Sea*, and *Star of Bethlehem* (Birmingham Gall.). His works described a dream like, medieval world, a vision popular with his contemporaries. His designs for stained glass, executed by Morris and Company, may be seen in churches throughout England. Burne-Jones also created the woodcut illustrations for the Kelmscott Press edition of the works of Chaucer. In his day he received many honors, and his delicate, though mannered, work continues to be admired. See his drawings, studies, and paintings, ed. by Piccadilly Gallery (1971), studies by L. D. Cecil (1960) and Martin Harrison and Bill Waters (1973).

Burnes, Sir Alexander, 1805-41, British traveler in India. As an army officer in India, he studied Oriental languages. In 1832 he left Lahore in Afghan dress and traveled by way of Peshawar and Kabul across the Hindu Kush to Balkh and from there by Bukhara, Asterabad, and Teheran to Bushire. On his return to England (1833) he was honored. In 1839 he was appointed political resident at Kabul, where he was assassinated two years later. See his *Narrative of a Visit to the Court of Scinde* (1830), *Travels into Bokhara* (1834), and *Cabool* (1842). See also biography by J. D. Lunt (1969).

Burnet, David Gouverneur, 1788-1870, provisional president of Texas (1836), b. Newark, N.J., son of William Burnet (1730-91). He went to Texas c. 1817, and his legal training enabled him to become a spokesman for the American settlers there as dissension with the Mexican government grew. Appointed (1834) a district judge, he opposed the measures of the Mexican government and was gradually led to favor the independence of Texas from Mexico. In 1836 he drew up the declaration of independence at the convention at Washington-on-the-Brazos, where he was made president ad interim of Texas. His eight-month administration in the chaotic times during and after the revolution (see TEXAS) was not effective. He quarreled bitterly with Sam Houston and thereafter opposed him in politics. Burnet was vice president under Mirabeau B. Lamar, was defeated by Houston for the presidency in 1841, and was chosen in 1866 (because he had opposed secession) U.S. Senator from Texas in the Reconstruction era, but was denied his seat. See biography by Mary Clarke (1969).

Burnet, Gilbert (börn't), 1643-1715, British bishop and writer. He studied abroad, held (1665-69) the living of Saltoun in Scotland, and was appointed (1669) professor of divinity at Glasgow Univ. He went to London in 1673 and was lecturer at St. Clements until his defense of his friend Lord William Russell made it unsafe for him in England after the Rye House Plot executions. During James II's reign Burnet's anti-Catholic writing and preaching barred him from court, and he found favor and friendship with William of Orange at The Hague. Accompanying William to England, he was a trusted adviser to William III and Mary II and was made bishop of Salisbury. His celebrated *History of My Own Times* (published only 1723-24, ed. by M. I. Routh, 6 vol., 1833) is fiercely biased against James II.

II, but it is also an informative contemporary source for the period Burnet made a translation of Sir Thomas More's *Utopia*. He also wrote *History of the Reformation in England* (3 vol., 1679-1714, abridged ed. 1719), notable for its understanding of the economic, social, and cultural causes and effects of the Reformation, and many lesser works on history and theology. See biography by T. E. S. Clarke and H. C. Foxcroft (1907).

Burnet, Sir Macfarlane, 1899-, Australian virologist and physician. He was resident pathologist (1923-24) at the Royal Melbourne Hospital and a Beit fellow (1926-27) at the Lister Institute, London. He became assistant director (1928) and director (1944) of the Walter and Eliza Hall Institute at the Royal Melbourne Hospital. From 1944 he was professor of experimental medicine at the Univ. of Melbourne. He lectured at several universities in the United States, including Harvard (1944), Johns Hopkins (1950), and Vanderbilt (1958). An expert on viruses and virus diseases, Burnet made important contributions to the understanding of influenza and the development of immunity against it. He shared the 1960 Nobel Prize in Medicine and Physiology with P. B. Medawar for their work in immunological tolerances, specifically the reactions of the body to the transplantation of foreign living tissues. His writings include *Natural History of Infectious Disease* (3d ed. 1962) and *Viruses and Man* (2d ed. 1955). See his autobiography (1969).

Burnet, Thomas, c. 1635-1715, English cleric and scientist, b. Croft, in Yorkshire, England. He was educated at Northallerton and Cambridge. Following travels in Europe, Burnet published in 1681 the first two parts of his theory of the formation of the earth under the title *Telluris theoria sacra* (English version *Sacred Theory of the Earth*, 1684), in which he held that at the time of the Deluge the earth was crushed like an egg, the fragments of the shell becoming mountains. Burnet's book attracted much attention, and his description of the creation of mountains and his stress on the account of creation in Genesis influenced the new science of geology for a hundred years. In his *Archaeologiae philosophicae* (1692) he treated the account of the fall of man as an allegory. See M. H. Nicolson, *Mountain Gloom and Mountain Glory* (1963).

Burnet, William, 1688-1729, English colonial governor in America, son of Gilbert Burnet. As governor of New York and New Jersey (1720-28), he advocated extending the trade with the Indians, thereby seeking to bind the Iroquois to the British and keep them from French influence—a move that was to be of great significance in the French and Indian Wars. He had the first English fort on the Great Lakes built at Oswego. His efforts to regulate trade were opposed by Albany merchants who made great profit in selling English goods to French traders. Burnet was embroiled in arguments with the assembly over policies and finance. After he dissolved the assembly in 1727, he was transferred to govern Massachusetts and New Hampshire.

Burnet, William, 1730-91, political leader in the American Revolution, b. near the present Elizabeth, N.J., father of David G. Burnet. A physician practicing in Newark, Burnet was chairman of the Revolutionary committee of safety there. He set up (1775) a military hospital and helped to furnish troops and supplies for the Continental army. He became surgeon general of the army for the eastern district and was also a member of the Continental Congress in 1776 and in 1780.

burnet, hardy perennial herb of the family Rosaceae (ROSE family) found in temperate regions, usually with white or greenish flowers. The European species are sometimes cultivated for the leaves, which are used in salads, for flavoring, and formerly as a poultice to stop bleeding—hence the botanical name *Sanguisorba* [from Lat. =absorbing blood]. Burnet is classified in the division MAGNOLIOPHYTES, class Magnoliopsida, order Rosales, family Rosaceae.

Burnett, Frances Eliza Hodgson, 1849-1924, American author, b. Manchester, England. In 1865 she went to Knoxville, Tenn., with her family. She is famous for her children's books, particularly *Little Lord Fauntleroy* (1886, successfully dramatized by the author in 1888), *Sara Crewe* (1888), and *The Secret Garden* (1911). See biography by Ann Thwaite (1974).

Burnett, James: see MONBODDO JAMES BURNETT LORD

Burney, Charles, 1726-1814, English music historian, composer, and organist. His *General History of*

Music (1776-89, 2d ed., 1935) was one of the first important music histories in English. He wrote *The Present State of Music in France and Italy* (1771) and *The Present State of Music in Germany* (1773). They were published together as *Dr. Burney's Musical Tours in Europe* (1959). The work describes European society, life, and customs as well as music and important musicians. His daughter, the novelist Fanny Burney, compiled his memoirs (1832). See biographies by P. A. Scholes (1848) and R. H. Lonsdale (1965).

Burney, Fanny, later **Madame D'Arblay** (därbli'), 1752-1840, English novelist, daughter of Charles Burney, the composer and organist. Although she received no formal education, she read prodigiously and had the benefit of conversation with her father's famous friends, including David Garrick and Samuel Crisp. Her first novel, *Evelina* (1778), was published anonymously, but Miss Burney soon acknowledged its authorship and achieved literary prominence. She became an intimate friend of Samuel Johnson and his circle. Her second novel, *Cecilia*, appeared in 1782, *Camilla* in 1796, and *The Wanderer* in 1814. The theme of her books is the entry into society of a virtuous, but inexperienced young girl, her mistakes and her gradual coming of age. Miss Burney spent five unhappy years (1786-91) as a member of Queen Charlotte's household. In 1793 she married General D'Arblay, a French emigré. Her diary and letters give an excellent account of English culture and society from 1768 to 1840. See biography by Emily Hahn (1950), studies by Joyce Hemlow (1958) and M. E. Adelstein (1969).

Burnham, Daniel Hudson, 1846-1912, American architect and city planner. b. Henderson, N.Y., d. Heidelberg, Germany. He was trained in architects' offices in Chicago. With John W. Root he established in Chicago a partnership (1873) which gained many of the most important architectural commissions of the day. Their Chicago works included the Monadnock Building, the 20-story Masonic Temple Building (1892), the first important skeleton skyscraper, the Reliance Building, and the "Rookery" offices, the first suitably planned modern office building. Other works were the Flatiron Building and the Wanamaker store in New York City, the Union Passenger Station in Washington, and buildings in Cleveland, Buffalo, and San Francisco. Burnham and Root designed the general plan for the Columbian Exposition at Chicago (1893), exerting through it an enormous influence upon contemporary civic design. In 1901, Burnham served with C. F. McKim, F. L. Olmsted, Jr., and Augustus Saint-Gaudens on the Senate Park Commission in planning for the future beautification of Washington, D.C. With E. H. Bennett he created a civic improvement plan of great importance for Chicago (1907), much of which has since been put into execution. He also prepared plans for Baltimore, Duluth, and San Francisco and was commissioned by the U.S. government to design plans for Manila and other cities in the Philippines, including Baguio, the summer capital.

Burnham, Forbes, 1923-, prime minister of Guyana (1964-), formerly British Guiana. His full name is Linden Forbes Sampson Burnham. Of black African descent, he received a law degree (1947) from the Univ. of London. Returning to his homeland, he founded (1950), with Cheddi Jagan, a political party devoted to gaining independence from Great Britain. He broke with Jagan in 1955 to form a more moderate party. In the 1964 elections his party trailed Jagan's, but Burnham, overcoming Jagan's plurality by uniting with a small third party, was named prime minister. He led his country to independence within the British Commonwealth (1966), and, despite vigorous opposition from Jagan, was reaffirmed in his position as prime minister in elections in 1968 and 1973. With enormous U.S. aid, he furthered public works and decreased the country's high unemployment rate. He promoted the nationalization of natural resources and attempted to ease racial tensions between Negroes and East Indians by opening government positions to the East Indians.

Burnham, Sherburne Wesley, 1838-1921, American astronomer, b. Thetford, Vt. After serving as observer at Dearborn Observatory, Chicago (1877-81, 1882-84), and as astronomer at Lick Observatory (1888-92), he was from 1893 astronomer at Yerkes Observatory and professor of astronomy at the Univ. of Chicago. Although his interest in astronomy had begun with amateur observations, he became outstanding in the field, especially through his discoveries of double stars. He wrote *General Cata-*

logue of Double Stars (1906) and *Measures of Proper Motion Stars* (1913).

burning bush, name for a North American plant of the family Celastraceae (STAFF-TREE family). The scriptural burning bush not consumed by fire (Ex. 3:2) is sometimes associated with a bramble or thorn and was adopted by the Presbyterian Church as an emblem of its early persecution. Burning bush is classified in the division MAGNOLIOPHYTES, class Magnoliopsida, order Celastrales, family Celastraceae.

Burnley, county borough (1971 pop. 76,483), Lancashire, NW England. Coal mining and cotton weaving, the keys to Burnley's growth, are still important industries. Associated with cotton-cloth production are calico printing and the manufacture of textile machinery. Other products of Burnley are electrical heating appliances, kitchen equipment, and gas turbines.

Burns, Arthur F., 1904-, American economist, b. Austria, grad. Columbia Univ. (A.B., 1925, A.M., 1925, Ph.D., 1934). He taught economics at Rutgers Univ. (1927-44), and then joined (1944) the faculty of Columbia, where he became John Bates Clark professor of economics in 1959. A member of the National Bureau of Economic Research from 1933, he was director of research (1945-53) and president (1957-67) of that organization. Under President Eisenhower, Burns was chairman (1953-56) of the Council of Economic Advisers. He returned to government service as economic counselor (1969-70) to President Nixon and as chairman (1970-) of the board of governors of the Federal Reserve System.

Burns, John, 1858-1943, British union leader and politician. A factory worker as a child, he was largely self-educated and was led by his reading to radical socialism. Burns became an outstanding orator, and in 1889 he was one of the leaders of the London dock strike, an attempt to organize the ill-paid unskilled laborers. Burns was elected (1892) to Parliament among the first labor representatives, but he quarreled with James Kier Hardie and soon abandoned both socialism and the trade union movement. Henceforth associated with the Liberals, he was president of the local government board (1905-14), but resigned from the cabinet in protest against Britain's entry into World War I. He retired from Parliament in 1918. See biographies by G. D. H. Cole (1943) and William Kent (1950).

Burns, Otway, c. 1775-1850, American privateer, b. Onslow co., N.C. At the outbreak of the War of 1812, he outfitted the Baltimore clipper *Snap-Drum* as a privateer and began one of the most spectacular privateering careers in American history. He destroyed and captured millions of dollars worth of British shipping and had a \$50,000 price set on his head by the British. After the war Burns turned to shipbuilding and later served (1821-35) in the North Carolina legislature. See biography by W. F. Burns (1905).

Burns, Robert, 1759-96, Scottish poet. The son of a hard-working and intelligent farmer, Burns was the oldest of seven children, all of whom had to help in the work on the farm. Although always hard pressed financially, the elder Burns, until his death in 1784, encouraged his sons with their education. As a result, Burns as a boy not only read the Scottish poetry of Ramsay and the collections compiled by Hailes and Herd, but also the works of Pope, Locke, and Shakespeare. By 1781, Burns had tried his hand at several agricultural jobs without success. Although he had begun writing, and his poems were circulated widely in manuscript, none were published until 1786. At this time he had already begun a life of dissipation, and he was not only discouraged but poor and was involved simultaneously with several women. He decided to marry Mary Campbell and migrate to Jamaica. To help finance the journey, he published at Kilmarnock *Poems, Chiefly in the Scottish Dialect* (1786), which was an immediate success. Mary Campbell died before she and Burns could marry, and Burns changed his mind about migration. He toured the Highlands, brought out a second edition of his poems at Edinburgh in 1787, and for two winters was socially prominent in the Scottish city. In 1788 he married Jean Armour, who had borne him four children, and retired to a farm at Ellisland. By 1791 Burns had failed as a farmer, and he moved to nearby Dumfries, where he held a position as an exciseman. He died at 37 after a severe attack of rheumatic fever. Burns's art is at its best in songs such as "Flow Gently, Sweet Afton," "My Heart's in the Highlands," and "John Anderson My Jo." Two collections contain 268 of his songs—George Thomson's *Select Collection of Original Scottish Airs for the Voice* (6 vol., 1793-1811) and

James Johnson's *Scots Musical Museum* (5 vol., 1787-1803). Some of these, such as "Auld Lang Syne" and "Comin' thro' the Rye," are among the most familiar and best-loved poems in the English language. But his talent was not confined to song, two descriptive pieces, "Tam o' Shanter" and "The Jolly Beggars," are among his masterpieces. Burns had a fine sense of humor, which was reflected in his satirical, descriptive, and playful verse. His great popularity with the Scots lies in his ability to depict with loving accuracy the life of his fellow rural Scots, as he did in "The Cotter's Saturday Night." His use of dialect brought a stimulating, much-needed freshness and raciness into English poetry, but Burns's greatness extends beyond the limits of dialect. His poems are written about Scots, but, in tune with the rising humanitarianism of his day, they apply to man's universal problems. See his poems (ed. by J. L. Robertson, 1953), biographies by Maurice Lindsay (2d ed., 1968) and R. T. Fitzhugh (1970), studies by David Daiches (rev. ed. 1967, and 1971).

Burnside, Ambrose Everett, 1824-81, Union general in the U.S. Civil War, b. Liberty, Ind. He saw brief service in the Mexican War and remained in the army until 1853, when he entered business in Rhode Island. In the Civil War, Burnside commanded a brigade at the first battle of Bull Run and was made (Aug., 1861) a brigadier general of volunteers. His expedition to the North Carolina coast (1862), resulting in the capture of Roanoke Island, New Bern, Beaufort, and Fort Macon, won him a major generality and much prestige. He commanded under G. B. McClellan in the ANTIETAM CAMPAIGN and shortly afterward succeeded that general in command of the Army of the Potomac. After a costly defeat at the battle of Fredericksburg (see FREDERICKSBURG, BATTLE OF) in Dec., 1862, Burnside asked President Lincoln either to sustain him in dismissing Joseph HOOKER and several other generals who opposed his plans, or to remove Burnside himself. Lincoln relieved him in favor of Joseph Hooker. As commander of the Dept. of the Ohio (March-Dec., 1863), he occupied E. Tennessee, took Knoxville, and repulsed James Longstreet's attempt to recapture the town. In 1864 he commanded under generals Meade and Grant in Virginia. Held partially responsible for the fiasco at PETERSBURG, he was relieved. Burnside was elected governor of Rhode Island in 1866 and was reelected in 1867 and 1868. From 1875 to his death he was a U.S. Senator. He originated the fashion of wearing long side whiskers, thus the term *burnsides* or *sideburns*. See biography by B. P. Poore (1882), K. P. Williams, *Lincoln Finds a General* (Vol. II, 1950).

Burr, Aaron, 1756-1836, American political leader, b. Newark, N.J. A brilliant law student, he interrupted his study to serve in the American Revolution and proved himself a valiant soldier in the early campaigns of the war for independence. In 1779 ill health forced him to leave the army. Upon admission (1782) to the bar, he plunged with characteristic energy into the practice of law and of politics. He served as member (1784-85, 1797-99) of the New York assembly, as state attorney general (1789-91), and as U.S. Senator (1791-97). Defeated for reelection to the assembly in 1799, he set about organizing the Republican (see DEMOCRATIC PARTY) element in New York City for the election of 1800, for the first time making use of the Tammany Society for political purposes. The result was an unexpected victory for the Republicans, who gained control of the state legislature. Since the legislature named the presidential electors and New York was the pivotal state, Burr's victory insured the election of a Republican President. The intention of the party was to make Thomas JEFFERSON President and Burr Vice President, but confusion in the ELECTORAL COLLEGE resulted in a tie vote. This threw the election into the House of Representatives, dominated by the Federalist Alexander HAMILTON. Hamilton, who regarded Jefferson as the lesser evil of the two Republicans, helped to secure Jefferson the presidency, and on the 36th ballot Burr became Vice President. Burr presided over the Senate with a dignity and impartiality that commanded respect from both sides, and in 1804 his friends nominated him for the governorship of New York. Hamilton again contributed to his defeat, in part by statements reflecting on Burr's character. Burr challenged Hamilton to a duel and mortally wounded him. The circumstances of Hamilton's death brought Burr's political career to an end. Soon after, he left Washington on a journey to New Orleans, at that time a center of Spanish conspirings for possession of the lower Mississippi valley. Burr, unaware that Gen. James Wilkinson was in the pay

of the Spanish, laid plans with him, what exactly Burr's plans were has never been made clear. Speculation ranges from the establishment of an independent republic in the American Southwest to seizure of territory in Spanish America. With money secured from Harman BLENNERHASSETT, Burr acquired the Bastrop grant on Washita River to serve as a base of operations. In the autumn of 1806, he and his party of 60-odd colonists, well-armed and supplied, began the journey downstream from Blennerhassett Island. Burr's earlier trip to New Orleans had brought him under suspicion, now distrust became widespread. Wilkinson, in an effort to save himself, turned against Burr, fanned the distrust, and in dispatches to Washington accused Burr of treason. Burr was arrested. He was tried for treason in the U.S. Circuit Court at Richmond, Va., Chief Justice John MARSHALL presiding, and found not guilty. Popular opinion nonetheless condemned him, and his remaining years were spent out of public life. He was married in 1833 to the famous Madame Jumel, they were divorced in 1834. See his correspondence with his daughter, Theodosia (ed. by Mark Van Doren, 1929), biographies by Nathan Schachner (1937, repr. 1961), S. H. Wandell and Meade Minnerode (1925, repr. 1971), H. M. Alexander (1937, repr. 1973) and Philip Vail (1974), H. C. Syrett and J. G. Cooke, ed., *Interview in Weehawken* (1960), Jonathan Daniels, *Ordeal of Ambition* (1970).

Burrillville, town (1970 pop. 10,087), Providence co., NW R.I., inc. 1806. Its manufactures include textiles and plastics.

Burritt, Elihu, 1810-79, American reformer, b. New Britain, Conn. A blacksmith, he studied mathematics, languages, and geography and became known as "the learned blacksmith." Profoundly idealistic, he supported many reform causes—antislavery, temperance, and self-education—and he pleaded for them when he edited (1844-51) the weekly *Christian Citizen* at Worcester, Mass. Most of all, however, he worked to promote world peace, organizing world peace congresses. Burritt argued for cheaper international postal rates and greater intellectual exchange among nations. Among his much-read books were *Sparks from the Anvil* (1846) and *Ten Minute Talks* (1873). See Merle Curti, ed., *The Learned Blacksmith* (his letters and journals, 1937, repr. 1973), biography by Peter Tolis (1968).

burro* see ASS

Burroughs, Edgar Rice, 1875-1950, American novelist, creator of the character Tarzan. He is the author of *Tarzan of the Apes* (1914) and numerous other jungle and science fiction thrillers.

Burroughs, John, 1837-1921, American naturalist and author, b. Roxbury, N.Y., son of a farmer. He became in turn a journalist, a treasury clerk in Washington, and a bank examiner and in 1874 settled on a farm near Esopus, N.Y., where he devoted his time to fruit culture and literature. In his first book, *Walt Whitman, Poet and Person* (1867), he was the first to give adequate recognition to the genius of his poet friend. In the bulk of his prose he made widely popular the type of nature essay that Thoreau had written. His best-known books are *Wake Robin* (1871), *Locusts and Wild Honey* (1879), *Fresh Fields*, a travel book (1884), *Signs and Seasons* (1886), and his one volume of poems, *Bird and Bough* (1906). A growing interest in philosophy and in science is evident in *Time and Change* (1912), *The Summit of the Years* (1913), *The Breath of Life* (1915), and *Accepting the Universe* (1922). "The Sage of Slabsides" became the friend of John Muir, Theodore Roosevelt, Edison, Ford, and other important men of his day. Although attached to his farm home, he traveled to the Pacific coast, the South, the West Indies, Europe, and (with the Harriman expedition) Alaska, observing natural phenomena everywhere and recording them in simple, expressive prose. See his autobiography, *My Boyhood* (1922), biographies by Elizabeth Burroughs Kelley (1959) and P. G. Westbrook (1974).

Burroughs, William S., 1914- American novelist, b. St. Louis, Mo., grad. Harvard, 1936. A narcotics addict from age 30 to age 45, Burroughs has lived most of his life abroad. *Junkie* (1953), published under the pseudonym William Lee, is an autobiographical account of his experiences as a drug addict. Burroughs's best-known work is the novel *Naked Lunch* (1959), a grim and horrifying depiction of the addict's existence with surrealistic portrayals of the drug experience. His other works include *Nova Express* (1964), *The Soft Machine* (1966), *The Ticket That Exploded* (1967), and *Exterminator!* (1973).

Bursa (İzörsä') city (1970 pop. 275,917), capital of Bursa prov., NW Turkey. The market center of a rich

agricultural region, Bursa is a commercial and industrial center, noted for its silk textiles. Founded at the end of the 3d cent. B.C. by the king of Bithynia, Prusias I, it was called Prusia ad Olympium. It was captured by the Seljuk Turks in 1075, taken by the Crusaders in 1096, and in 1204 passed to the Byzantines. Captured in 1326 by the Ottoman Turks under Sultan Orkhan, it became the Ottoman capital and was embellished with mosques, baths, and a caravanserai. It was sacked by Tamerlane in 1402, and Adrianople (now Edirne) became (1413) the new capital of the Ottomans. There are many fine old mosques, notably the Green Mosque (1421) and the mosque of Beyazid I (1399). The town is sometimes called Brusa.

bursa (bür'sä), closed fibrous sac lined with a smooth membrane that produces a viscous lubricant called synovial fluid. Bursas are found wherever muscles or tendons rub against other muscles, tendons, or bones. The bursas function in two ways: they lubricate points of friction, and they dissipate force by distributing it through a fluid medium. Normally the bursas produce just enough synovial fluid to reduce friction, but constant irritation may lead to an oversecretion and consequent enlargement of the bursa, a condition known as *BURSITIS*. In the hand and foot the bursa assumes a tubular form, called the synovial sheath, and encloses the tendons along their entire length.

bursitis (bärs'itäs), acute or chronic inflammation of a BURSA, or fluid sac, located close to a joint. Sacs of fluid may develop about a joint in response to irritation or injury, as in a bunion, and may become inflamed, causing pain, restricting motion, and producing more fluid than can be absorbed readily. An attack of bursitis usually causes great pain and tenderness in the affected area. It is treated with rest, antibiotics, X-ray therapy, diathermy, or cortisone, depending upon the cause and the degree of involvement. Superficial bursas, not necessary to the function of a joint, or bursas that have become calcified, may be excised.

Burton, Ernest De Witt, 1856-1925, American biblical scholar, b. Granville, Ohio. From 1882 to 1923 he served as professor of New Testament literature and interpretation at the Univ. of Chicago, of which he became president in 1923. He wrote *A Short Introduction to the Gospels* (rev. by H. R. Willoughby, 1926), with E. J. Goodspeed, *Harmony of the Synoptic Gospels* (1917) and *Harmony of the Synoptic Gospels in Greek* (1920), and, with Shailer Mathews, *The Life of Christ* (rev. ed. 1927). See biography by T. W. Goodspeed (1926).

Burton, Harold Hitz, 1888-1964, Associate Justice of the U.S. Supreme Court (1945-58), b. Jamaica Plain (now part of Boston), Mass. Admitted to the bar in 1912, he built a prosperous law practice in Cleveland and taught law (1923-25) at Western Reserve Univ. (now Case Western Reserve Univ.). He later served as a representative (1929-31) in the Ohio state assembly and as a reform mayor (1935-40) of Cleveland. As U.S. Senator (1941-45), Burton vigorously pressed for U.S. participation in the United Nations. Appointed by President Harry S. Truman to the Supreme Court, he firmly supported the decisions overturning racial segregation in schools and public transportation.

Burton, Richard, 1925-, British actor, b. Pontrhydfen, Wales, his original name was Richard Jenkins. A dark, somber actor with a splendid speaking voice, Burton specializes in heavily dramatic roles. He appeared with the Old Vic in *Henry V* and *Othello* and on Broadway in *Camelot* (1961) and *Hamlet* (1961). His films include *The Robe* (1953), *Cleopatra* (1962), *Becket* (1964), *The Spy Who Came in from the Cold* (1965), *Who's Afraid of Virginia Woolf?* (1966), and *The Klansman* (1974). His second wife was the actress Elizabeth TAYLOR.

Burton, Sir Richard Francis, 1821-90, English explorer, writer, and linguist. He joined (1842) the service of the East India Company and, while stationed in India, acquired a thorough knowledge of the Persian, Afghan, Hindustani, and Arabic languages. In 1853, in various disguises, he made a famous journey to Mecca and Medina, about which he wrote the vivid *Personal Narrative of a Pilgrimage to El Medinah and Meccah* (3 vol., 1855-56). With John Speke he took a party to Somaliland, he alone disguised as an Arab merchant, made the journey to Harar, Ethiopia, where he met with the local ruler. He went with Speke to uncharted Central Africa to discover the source of the Nile, he found Lake Tanganyika (1858) but abandoned the attempt to reach Lake Nyasa. After a visit to the United States, Burton published an account of the Mormon settlement at

Utah in his *City of the Saints* (1861) While consul (1861-65) at Fernando Po, off W Africa, he explored the Bight of Biafra and conducted a mission to Dahomey, Benin, and the Gold Coast He explored Santos, in Brazil, while consul (1865) there, and after crossing the continent wrote *Explorations of the Highlands of Brazil* (1869) After a short period (1869-71) as consul at Damascus he was consul (1872-90) at Trieste, where he died His last years were devoted chiefly to literature He published remarkable literal translations of Camões and of the *Arabian Nights* (16 vol., 1885-88) See annotated bibliography by N M Penzer (1923), biographies by Lady Burton (2 vol., 1893, repr 1973), G M Stisted (1893, repr 1970), Seton Dearden (rev ed 1953), Alfred Bercevic (1962), and F M Brodie (1966)

Burton, Robert, 1577-1640, English clergyman and scholar, b Leicestershire, educated at Oxford He served as librarian at Christ Church, Oxford, all his life, in addition he was vicar of St Thomas, Oxford, and later was rector of Seagrave, Leicestershire A bachelor, he led an uneventful, scholarly life His famous work, *The Anatomy of Melancholy*, appeared in 1621 under the pen name Democritus Junior Enlarged and revised several times before his death, this treatise originally set out to explore the causes and effects of melancholy, but it eventually covered many areas in the life of man, including science, history, and political and social reform The work is divided into three main portions The first defines and describes various kinds of melancholy, the second puts forward various cures, and the third analyzes love melancholy and religious melancholy Burton's prose style is informal, anecdotal, and thoroughly idiosyncratic, and he includes quotations from a wide range of literature—the Bible, the classics, the Elizabethan authors See studies by W R Mueller (1952) and Lawrence Babb (1959)

Burton upon Trent, county borough (1971 pop 50,175), Staffordshire, W central England, on the Trent River and the Grand Trunk Canal Brewing, begun there by Benedictine monks, is the most famous industry From the 11th cent to the Reformation, the area's history was closely connected with the Benedictine abbey (founded 1002), of which there are remains Other industries in the borough manufacture foundry products, tires, footwear, chemicals, and locomotives

Buru or Boeroe (both böör'ōō), island (c 3,500 sq mi/9,065 sq km), E Indonesia, in the Moluccas, W of Ceram Namlea is the chief town and port Forest products, including cajeput oil, gums and resins, and timber, are exported

Burundi (bārūn'dē), republic (1973 est pop 3,725,000), 10,747 sq mi (27,834 sq km), E central Africa, bordering on Rwanda in the north, on Tanzania in the east, on Lake Tanganyika in the southwest, and on Zaïre in the west BUJUMBURA is the capital and Gitega is the only other major town The country falls into three main geographic regions The narrow area in the west, which includes the Ruzizi River and Lake Tanganyika, is part of the western branch of the Great Rift Valley and includes some lowland To the east of this region are mountains, which run north-south and reach an altitude of c 8,800 ft (2,680 m) Further east is a region of broken plateaus with somewhat lower elevations (c 4,500-6,000 ft/1,370-1,830 m), where most of the population lives The inhabitants of Burundi are divided among three eth-

nic groups the Hutu (about 85% of the population), who are mostly agriculturalists, the Tutsi (about 14%), who dominate the government of the country, and the Twa (about 1%), who are Pygmies For the most part the Tutsi and the Hutu have a lord-serf relationship, with the Hutu tending the farmlands and cattle owned by the Tutsi French and Kirundi (a Bantu language) are both official languages About half the people are Christian, mostly Roman Catholic, the rest follow traditional beliefs Burundi's poor transportation system and its distance from the sea have tended to limit economic growth The economy is almost entirely agricultural Most persons are engaged in subsistence farming, growing beans, cassava, maize, and plantains Coffee (Burundi's chief export), cotton, and tea are also cultivated Large numbers of cattle, goats, and sheep are raised Especially among the Tutsi, a person's status is determined by the number of cattle he owns, however, the animals play a small role in the economy The country's few manufactures include basic consumer goods, such as processed food, beverages, clothing, and footwear Bastnaesite, cassiterite, kolin, and gold are mined in small quantities Burundi's imports usually considerably exceed the value of its exports The United States, Belgium, Luxembourg, and Great Britain are the chief trade partners Most exports are sent by ship to Kigoma in Tanzania and then by railroad to Dar es Salaam on the Indian Ocean There is a university in Bujumbura

History The Twa were the original inhabitants of Burundi and were followed (c 1200), and then outnumbered, by the Hutu Probably in the 15th cent, the Tutsi migrated into the area from the northeast, gained dominance over the Hutu, and established several states By the 19th cent, the country was ruled by the mwami (king)—a Tutsi who controlled the other Tutsi of the region in a vassal relationship In 1890, Burundi (along with Rwanda) became part of GERMAN EAST AFRICA, but the Germans began to govern the area only in 1897 During World War I, Belgian forces occupied (1916) Burundi, and in 1919 it became part of the Belgian League of Nations mandate of RUANDA-URUNDI (which in 1946 became a UN trust territory) Under the German and Belgian administrations Christianity was spread, but the traditional social structure of Burundi was not altered, and there was little economic development On July 1, 1962, the country became an independent kingdom ruled by the mwami of Burundi The mid-1960s were marked by fighting between the Tutsi and Hutu and by struggles for power among the Tutsi In 1965 a coup attempted by the Hutu failed, and the Tutsi retaliated by executing most Hutu political leaders and many other Hutu In July, 1966, Mwambutsa IV was deposed by his son, who became Ntare V In Oct, 1966 The new ruler was deposed by a military coup in Nov, 1966 A republic was established and Michel Micombero, a Tutsi, became president Following an attempted coup in 1969, Micombero concentrated power in his hands and headed the country's only legal political party, the Unity and National Progress party, a new constitution was adopted in 1970 Renewed fighting between the Tutsi and Hutu in the early 1970s resulted in the death of many thousands of Hutu In 1972 a rebellion attempting to return Ntare V to power was crushed by the government, Ntare was executed and the Hutu were further repressed See J B Webster, *The Political Development of Rwanda and Burundi* (1966), J A Nguin, *Contributions to the Study of the Prehistoric Cultures of Rwanda and Burundi* (1967), G C McDonald et al, *Area Handbook for Burundi* (1969), Rene Lemarchand, *Rwanda and Burundi* (1970)

Bury, John Bagnell (bāg'nəl byōō'rē), 1861-1927, Irish historian, an authority on the East Roman Empire He was professor at the Univ of Dublin from 1893 to 1902 and at Cambridge from 1902 Bury considered history a science—"not less, and not more" He stressed historical continuity, and he thought that accident was a frequent determinant in the history of premodern societies His breadth of viewpoint is reflected in his attention to administration, institutions, topography, and the arts, which contributed to his unrivaled knowledge of late Roman and Byzantine times *History of the Eastern Empire from the Fall of Irene to the Accession of Basil I, A.D. 802-867* (1912) is but one of his many outstanding studies Bury also wrote authoritatively on ancient Greece, and his works include as well *History of Freedom of Thought* (1913), *The Idea of Progress* (1920), and a scholarly *Life of St Patrick* (1905) His edition (7 vol., 1896-1900) of Gibbon's *Decline and Fall* was masterful Bury edited Pindar's Nemean and

Isthmian odes and was an editor of and contributor to *The Cambridge Ancient History*

Bury, Richard de: see RICHARD DE BURY

Bury (bē'rē), county borough (1971 pop 67,776), Lancashire, NE England, on the Irwell River and linked by canal with Bolton and Manchester A textile city since the time of Edward III, when wool weaving was introduced by the Flemings, Bury has factories for the spinning, weaving, and bleaching of cotton Hats, paper, machines, and boilers are among its other manufactures Sir Robert Peel, the statesman, and John Kay, inventor of the "flying shuttle," were born in Bury In 1974, Bury became part of the new metropolitan county of Greater Manchester

Buryat Autonomous Soviet Socialist Republic (bōōryāt'), autonomous republic (1970 pop 812,000), c 135,600 sq mi (351,200 sq km), SE Siberian USSR, N of Mongolia, extending between Lake Baykal and the Yablonovy mts ULAN-UDE is the capital The republic is mountainous and heavily forested and has rivers and lakes that are rich in fish and that provide hydroelectric power In the mountains are valuable deposits of coal, iron ore, tungsten, molybdenum, gold, wolfram, nickel, bauxite, and manganese The Buryat ASSR is one of Siberia's most prosperous areas The chief sectors of the economy are mining, lumbering, and livestock raising Agriculture, found mainly in the Selenga River valley, is based on spring wheat and fodder crops There are fisheries and fish-canning plants on Lake Baykal Fur breeding and trading are important in the north, where nomads also keep reindeer herds Major manufactures of the Buryat ASSR include machinery (notably locomotives for the Trans-Siberian RR, which traverses the republic), metal products, pulp, paper, and textiles The Buryats, former nomads who have largely adopted a sedentary existence, are descended from the Huns, Mongols, Evenki, and Turks They speak a Mongolian language and generally adhere to Lamaist Buddhism or to Russian Orthodoxy Buryats constitute about 35% of the republic's population and engage mostly in stock raising Russians make up a majority of the population, and there are Evenki, Tuvian, Tatar, and Ukrainian minorities Russian penetration of the region began in the 1620s and advanced for a century in the face of Buryat resistance until annexation occurred in 1727, followed by intensive Russian colonization The Buryat-Mongol ASSR was formed in 1923 and retained that name until 1958

Bury St. Edmunds, municipal borough (1971 pop 25,629), administrative center of West Suffolk, E central England It is the market and processing center for the surrounding rich farm region The borough also has engineering works, a brewery, timber yards, and a beet-sugar factory In 903 the remains of King Edmund were interred here in a monastery, founded c 630, which later became a famous shrine and Benedictine abbey founded by Canute In 1214, English barons struggling against King John took an oath in the abbey to compel him to accept their demands The result was the MAGNA CARTA (1215) Among the buildings of historical interest in the borough are a Norman gate, ruins of St James Cathedral, and a 15th-century church Moyses Hall, a Norman residence, is now a museum In 1974, Bury St. Edmunds became part of the new nonmetropolitan county of Suffolk

bus [from Lat *omnibus*=for all], large public conveyance A horse-drawn urban omnibus was introduced in Paris in 1662 by Blaise Pascal and his associates, but it remained in operation for only a few years The omnibus reappeared c 1812 in Bordeaux, France, and afterward in Paris (c 1827), London (1829), and New York City (1830) It often carried passengers both inside and on the roof Buses were motorized early in the 20th cent, motorbus transportation increased rapidly and is now used in most countries A number of railroad companies operate subsidiary lines A network of bus lines links all parts of the United States Bus lines have grown at the expense of railroads in intercity travel and of street railways in local travel Buses are powered usually by gasoline or diesel engines, but in a few cities electric motors fed from overhead wires are used The construction of small buses is similar to that of heavy automobiles, while the construction of large buses is similar to that of heavy trucks Some large buses can seat more than 60 passengers

Busaco: see BUSSACO, Portugal

Busch, Adolf (ā'dōlf böōsh), 1891-1952, German-Swiss violinist He studied at the Cologne Conservatory From 1919 to 1935 he headed outstanding chamber music groups, and with his brother Her-



mann Busch, cellist, and his son-in-law Rudolf Serkin, pianist, he played many trio recitals. In his early compositions he was influenced by his friend Max Reger. Another brother, Fritz Busch, 1890-1951, was musical director of the opera in Stuttgart (1919-22) and in Dresden (1922-33), afterward conducting in Europe, particularly at the Glyndebourne Festivals in England, and later at the Metropolitan Opera in New York City (1945-50).

Busch, Wilhelm, 1832-1908, German cartoonist, painter, and poet. After studying at the academies of Antwerp, Düsseldorf, and Munich, he joined the staff of the *Fliegende Blätter*, to which he contributed highly popular humorous drawings from 1859 to 1871. His humorous, illustrated poems for children, such as *Max and Moritz* (1865, tr by Christopher Morley, 1932), are simply drawn, yet highly spirited. Busch's delightful series of wordless pictures were highly influential in the development of the comic strip.

Busching, Anton Friedrich (an'tōn frē'drīkh bush'īng), 1724-93, German geographer and educator. He was professor of philosophy in Göttingen, was a Protestant minister, and was director of a Gymnasium in Berlin. He advocated the collection of data similar to the kind of data now used in political and economic geography. The most important of his many works is *Neue Erdbeschreibung* (10 vol., 1754-92, Vol. XI was written after his death), six volumes of which, describing the geography of Europe, were translated into English as *A New System of Geography* (1762).

Bush, Vannevar, 1890-1974, American electrical engineer and physicist, b. Everett, Mass., grad. Tufts College (B.S., 1913). He went to Massachusetts Institute of Technology (MIT) in 1919, there he was professor (1923-32) and vice president and dean of engineering (1932-38). During this period at MIT he designed the differential analyzer, one of the earliest computers. From 1939 until 1955 he was president of the Carnegie Institution, and from 1941 to 1945 he was also the director of the U.S. Office of Scientific Research and Development. In this later position he administered the U.S. war effort to utilize and advance military technology. He directed such programs as the development of the first atomic bomb, the perfection of radar, and the mass production of sulfa drugs and penicillin. In 1955 he returned to MIT, retiring in 1971.

bush baby, name for several small, active nocturnal primates of the LORIS family, found in forested parts of Africa. Bush babies, also called galagos, form the subfamily Galaginae. The smallest are about 1 ft (30 cm) long, including the long, furry tail. All have fluffy fur, small pointed faces with large eyes, and naked, highly mobile ears. Their pupils contract so as to be almost invisible. The long hind legs are specialized for jumping, the fingers and toes are long and slender, with fleshy terminal pads, and the thumb and big toe are opposable. Extremely swift and agile, bush babies leap like squirrels from branch to branch and hop on their hind legs on the ground. They feed on insects and vegetable matter. Senegal bush babies (*Galago senegalensis*) are familiar as pets. They are gregarious and spend much time grooming each other with their front teeth. Bush babies are classified in the phylum CHORDATA, subphylum Vertebrata, class Mammalia, order Primates, family Lorisidae.

bushbuck, small, delicate, spiral-horned ANTELOPE, *Tragelaphus scriptus*, of tropical Africa. Bushbucks live in pairs in thick forest, browsing on leaves and shrubs by night and resting during the day. Their chief predator is the leopard. Adult males stand less than 3 ft (90 cm) high at the shoulder and weigh about 100 lb (45 kg). The horns, borne only by the male, are about 16 in (40 cm) long. The coat is reddish brown with scattered white markings. Other species of the genus *Tragelaphus* are known as nyalas and situngas, although animals of this genus are sometimes referred to collectively as bushbucks. All are retiring, largely nocturnal antelopes, and in all the female is hornless. The nyala, *T. angasi*, is a medium-sized antelope that inhabits the bush country and thickets of central Africa. The mountain nyala, *T. buxtoni*, is a very large antelope of the highlands of Ethiopia, the male may stand 4½ ft (135 cm) high. The situnga, or marsh buck, *T. spekei*, is a large antelope found in swampy forests in central Africa, it is a good swimmer, but it is awkward on land. Bushbucks are classified in the phylum CHORDATA, subphylum Vertebrata, class Mammalia, order Artiodactyla, family Bovidae.

Bushehr (bōō'shēr') or **Bushire** (-shīr'), city (1971 est. pop. 40,000), SW Iran, on the Persian Gulf. It is

one of the chief ports of Iran and is the terminus of a trade route from Shiraz, Esfahan, and Tehran. Its harbor provides good protective anchorage, but it is too shallow to allow oceangoing vessels to approach the shoreline. Carpets, agricultural products, cotton, and wool are exported. Bushehr was founded in 1736 by Nadir Shah. It was used by the British as a base for their Persian Gulf fleet in the 18th cent and became a major commercial port in the 19th cent.

bushel. see ENGLISH UNITS OF MEASUREMENT

Bushey, urban district (1971 pop. 23,729), Hertfordshire, SE England. Bushey is a residential district just N of Greater London. The local church contains windows by William Morris.

bushido (bōō'shēdō, bōōshēdō') [Jap. = way of the warrior], code of honor and conduct of the Japanese nobility. Of ancient origin, it grew out of the old feudal bond that required unwavering loyalty on the part of the vassal. It borrowed heavily from Zen Buddhism and Confucianism. In its fullest expression the code emphasized loyalty to one's superior, personal honor, and the virtues of austerity, self-sacrifice, and indifference to pain. For the warrior, commerce and the profit motive were to be scorned. The code was first formulated in the Kamakura period (1185-1333) and put into writing in the 16th cent., the term itself, however, did not come into use until the 17th cent. It became the standard of conduct for the DAIMYO and SAMURAI under the Tokugawa shoguns and was taught in state schools as a prerequisite for government service. After the Meiji restoration (1868), it was the basis for the cult of emperor worship taught until 1945.

Bushire. see BUSHEHR, city, Iran

bushmaster, large venomous snake, *Lachesis muta*, of Central America and N. South America. It is a member of the PIT VIPER family, which also includes the rattlesnake. The largest New World snake, it reaches a length of 8 to 12 ft (2.5-3.5 m). It is gray and brown, with a diamond pattern. Unlike most pit vipers, which bear live young, the bushmaster lays eggs. It is classified in the phylum CHORDATA, subphylum Vertebrata, class Reptilia, order Squamata, family Crotalidae.

Bushmen: see SAN

Bushnell, Horace (bōōsh'nāl), 1802-76, American Congregational minister, b. Bantam, Conn. Bushnell became (1833) pastor of the North Church, Hartford, Conn. He wrote *Christian Nurture* (1847) and *God in Christ* (1849). Because of certain views of the Trinity allegedly expressed in the latter, unsuccessful attempts were made to bring him to trial for heresy. Bushnell's dignified reply was made in *Christ in Theology* (1851). His repudiation of the austerity of Calvinism and his stress on the presence of the divine in humanity and nature had profound influence in shaping liberal Protestant thought. Ill health obliged him to retire from the active ministry in 1859, but he continued to write. His works include *The Vicarious Sacrifice* (1866), in which he developed the well-known "moral influence theory" of the atonement, *Sermons on Living Subjects* (1872), and *Forgiveness and Law* (1874). See the *Life and Letters*, ed. by his daughter, Mrs. M. B. Cheney (1880, 1903, repr. 1969), biographies by T. T. Munger (1899) and William R. Adamson (1966), studies by A. J. W. Myers (1937), B. M. Cross (1938), and William A. Johnson (1963).

bushrangers, bandits who terrorized the bush country of Australia in the 19th cent. The first bushrangers (c. 1806-44) were mainly escaped convicts who fled to the bush and soon organized gangs. Their crimes were checked effectively by various Bushranging Acts passed after 1830. With the discovery of gold, however, bushrangers of a new type appeared and flourished from 1850 to 1870, largely brigand-adventurers who attacked gold convoys. The last of the bushrangers were the men of the Kelly gang. This band of desperadoes was exterminated in 1880 when three members were trapped and killed at a hotel in Glenrowan, Victoria, and Edward (Ned) Kelly was hanged at Melbourne. See studies by W. F. Wannon (1963) and T. A. Prior (1966).

Busia, Kofi Abrefa (kō'fē ābrā'fā bōōsē'ā), 1913-, political leader in Ghana. He was educated in Africa and in England and taught sociology in African, American, and European universities in the 1950s and 60s. He served (1951-59) in Ghana's national assembly, where he was opposition leader. In 1969 he became prime minister when his Progress party triumphed in the elections. Busia was overthrown in 1972 and went into exile in Great Britain.

Buskerud (bōōs'karōōd), county (1972 est. pop. 201,000), c. 5,725 sq mi (14,830 sq km), SE Norway.

Drammen (the capital) and Ringerike are the chief towns. The county extends from the Oslofjord in the southeast to the Hardangervidda plateau in the northwest and includes the Hallingdal and Numedal valleys. Farming and the manufacturing of forest products and textiles are the main occupations.

Busoni, Ferruccio Benvenuto (fār-rōōt'chō bānvānōō'tō bōōzō'nē), 1866-1924, Italian pianist and composer. A child prodigy, he gave a concert in Trieste at the age of eight, which was followed by many appearances conducting and performing his own compositions. His style of piano playing was similar to that of Liszt, whom he greatly admired. He later taught at the conservatories in Helsinki and Moscow and from 1891 to 1894 at the New England Conservatory of Music, Boston. He transcribed for piano many of the organ works of J. S. Bach and edited his *Well-tempered Clavier*. Busoni's own compositions include piano pieces, a piano concerto, a violin concerto, and operas. His writings on musical and aesthetic subjects include his *Sketch of a New Esthetic* (tr. 1911). See his letters to his wife (tr. 1938), biography by H. H. Stuckenschmidt (tr. 1971).

Busra: see BASRA, Iraq

Bussaco or **Busaco**, Port. Buçaco (all bōōsā'kō), locality, W central Portugal, in Beira, near Coimbra and around Mt. Bussaco. Now a summer resort, it was formerly a place of seclusion and penitence for monks. At Bussaco in 1810, British and Portuguese troops under Wellington decisively defeated the French in the Peninsular War.

Bussora: see BASRA, Iraq

Bustamante, Alexander (būs'tāmān'tē), 1884-, prime minister of Jamaica (1962-67). The son of an Irish father and a Jamaican mother, he was adopted and taken to Spain as a child. He joined the Spanish army, then traveled extensively, working at a wide variety of jobs. Returning to Jamaica in 1932, he became active in the labor movement, gaining prominence with his flaming oratory, and founded the country's largest trade union. After being jailed (1941-42) as a rabble-rouser, he formed (1943) the Jamaica Labour party, a relatively conservative group that attracted right-wing support. He was chief minister (1953-55) and became prime minister in April, 1962, independence within the British Commonwealth was achieved that August. A flamboyant, demagogic leader, he maintained close relations with the United States and launched an ambitious five-year program of public works and land reform. Illness caused him to retire from politics in 1967. He was knighted by Queen Elizabeth II in 1955.

Bustamante, Anastasio (anasta'syō bōōstāmān'tā), 1780-1853, Mexican general and president (1830-32, 1837-41). He served in the royalist army against Hidalgo y Costilla and Morelos y Pavón, but his adherence to the Plan of Iguala in support of Agustín de Iturbide was a decisive factor in the latter's success. Vice president under Guerrero, he engineered a successful revolution (1829-30) with the aid of Santa Anna. At Bustamante's order Guerrero was captured and shot, but Bustamante in turn fell from power when Santa Anna seized the government (1832). When Santa Anna's failure to crush the Texas revolution temporarily weakened his political hold, Bustamante returned from exile in France and was again president. His regime was reactionary and was plagued by revolution, by trouble with the French, by the blockade of Veracruz (1838), and especially by Santa Anna, who had recovered popularity. Seizing control, Santa Anna forced Bustamante again into exile. Bustamante returned to serve in the Mexican War.

Bustamante, Antonio Sánchez de (antō'n'yō sán'-chās), 1865-1951, Cuban authority on international law, author of the Bustamante Code. A delegate to the Paris Peace Conference (1919), he was later justice of the Hague Tribunal (Permanent Court of Arbitration). He was also president of the Pan American Congress (1928), which ratified his monumental code of private international law, coordinating legislation applying to the international security of person and property.

Bustanai ben Haninar. see BOSTANAI BEN CHANINAI

bustard (būs'tard), a heavy-bodied, ground-running bird of the family Otididae. Various species are found throughout the arid regions of Africa, Asia, Australia, and S. Europe. Bustards range in length from 14½ to 52 in (37-132 cm) and include the heaviest birds capable of flight. The great bustard *Otis tarda*, of Europe and central Asia, is the largest European land-bird, the adult male may be 4 ft (10.2 m) long with an 8-ft (20.3 m) wingspread and may weigh 30 lb (13.6 kg). The Australian bustard, *Chio*

nctis australis, is of similar size. Bustards are stocky birds with long necks and strong legs, their feet are built for running, with flat toes, broad soles, and no hind toe. The species vary in color from gray to brown, and many are spotted or barred above and white, buff, or black below. Bustards live mainly on grassy plains or in brushlands. Although they are strong fliers, they seldom leave the ground. They wander about in flocks of a dozen or more birds, feeding on leaves, seeds, and insects, especially beetles. The males are polygamous and fight fiercely during the breeding season. The female lays and incubates from one to five eggs, according to the species, the chicks are able to fly at the age of six weeks. Bustards have been extensively hunted for food, they are extinct in Britain and are becoming scarce in the northern part of their range. They are classified in 16 genera and 23 species of the phylum CHORDATA, subphylum Vertebrata, class Aves, order Gruiformes, family Otidae.

bustard quail or **button quail**, any of the small ground-running Old World birds of the family Turnicidae. Also called a hemipode, it resembles a true quail in appearance and way of life but is more closely related to sandgrouse and pigeons. Bustard quails have short tails and rounded wings and lack a hind toe. They are secretive birds, inhabiting grass and brush country and open woodlands, and are found throughout Australia, S Asia, and Africa, with one species extending into S Spain. They travel singly, in pairs, in small family groups, or, in some species, in coveys of 15 to 30 birds. Their diet consists of seeds, shoots, and small insects. The bustard quail female is larger and more colorful than the male, and takes the lead in courtship, she has a specialized vocal organ for giving the booming mating call. The nest is on the ground and is constructed by both sexes. After the female has laid her clutch, typically of four eggs, the male incubates the eggs and rears the young. There are 15 species of bustard quail, classified in two genera of the phylum CHORDATA, subphylum Vertebrata, class Aves, order Gruiformes, family Turnicidae.

Busto Arsizio (bō'stō ars'ētsyō), city (1971 pop. 78,632), Lombardy, N Italy. It is a leading center of the Italian cotton industry, metal goods and shoes are also manufactured. The Church of Santa Maria di Piazza was designed (1515) by Bramante.

Butades of Sicily (bū'tadēs, sē'shēōn), fl c 600 B C, semilegendary Greek sculptor. He worked at Corinth and was supposed to have been the first to model in clay.

butadiene (byōōt'ād'ēn), colorless, gaseous hydrocarbon. There are two structural isomers of butadiene, they differ in the location of the two carbon-carbon double bonds in the butadiene molecule. One (1,2-butadiene) has the formula CH₂=C=CHCH₃. The other (1,3-butadiene), often called simply butadiene, has the formula CH₂=CHCH=CH₂. It is used in the manufacture of synthetic rubber, latex paints, and nylon and is obtained chiefly by dehydrogenation of butane and butene obtained by cracking petroleum. CHLOROPRENE and ISOPRENE are the 2-chloro- and 2-methyl- derivatives of 1,3-butadiene, they also are used in the synthesis of rubber.

butane (byōō'tān), C₄H₁₀, gaseous ALKANE, a hydrocarbon that is obtained from natural gas or by refining petroleum. It can be liquefied at room temperature by compression. There are two structural isomers of butane. In normal butane, or *n*-butane, the four carbon atoms are joined in a continuous, unbranched chain, in isobutane, or 2-methylpropane, three of the carbon atoms are joined to the fourth by single bonds, resulting in a branched structure. The two isomers differ in certain of their chemical and physical properties, e.g., liquid *n*-butane has a higher boiling point (−0.6°C) at atmospheric pressure than that of liquid isobutane (−10.2°C).

butanoic acid, IUPAC name for BUTYRIC ACID.

Butaritari (batārē'tarē), also known as Makin (mā'kin, mūg'in), triangular atoll, (4.5 sq mi/11.7 sq km), central Pacific, in the GILBERT ISLANDS. The town of Butaritari on the southernmost islet is a port of entry and the headquarters of a copra company. Butaritari became a part of the British colony of the GILBERT AND ELLICE ISLANDS in 1915. During World War II it was the first central Pacific island to be regained by the Allies (Nov., 1943). Butaritari was formerly called Pitt Island.

butcher bird· see SHRIKE

Bute, John Stuart, 3d earl of (byōōt), 1713–92, British politician. He was prominent as a friend of Frederick Louis, prince of Wales, as early as 1747 and became the tutor of Frederick's impressionable son,

the future GEORGE III. When George became king in 1760, Bute was appointed a privy counselor, first gentleman of the bedchamber, and (March, 1761) a secretary of state. George III's policies of destroying the Whig monopoly of political power, of making the monarch supreme over Parliament, and of ending the war with France were pursued largely under Bute's influence. After the resignation (Oct., 1761) of William Pitt (later earl of Chatham) from office, Bute became chief minister. Although he concluded the Treaty of Paris (1763), ending the increasingly unpopular war, he lacked parliamentary support and resigned shortly thereafter. George III rapidly outgrew his youthful dependence on his friend. See biography by J. A. Lovat Fraser (1912), Romney Sedgwick, ed., *Letters from George III to Lord Bute, 1756–1766* (1936), R. Pares, *George III and the Politicians* (1953).

Bute, island and county, Scotland. see BUTESHIRE

Buteshire (byōōt'shīr) or **Bute** (byōōt), county (1971 pop. 13,237), W Scotland. The county consists primarily of the islands of Bute (the most important island and seat of Rothesay, the county town), ARAN, and the Cumbraes. Agriculture (potatoes, oats, hay, and turnips), the main occupation of the county, is chiefly concentrated in the less hilly central and southern parts of Bute. Cattle and sheep raising and fishing (herring and whitefish) are also important. The scenery and bracing climate of the islands make them popular with tourists. In 1975, Buteshire became part of the Strathclyde region.

Butler, Alban, 1710–73, English Roman Catholic priest, compiler of lives of the saints. He was educated at Douai and was president of the English seminary at Saint-Omer. His monumental work, *The Lives of the Fathers, Martyrs, and Principal Saints* (4 vol. in 7, 1756–59), was the basis for the enlarged edition, *The Lives of the Saints* (12 vol., 1926–38), and for the completely revised work, *Butler's Lives of the Saints* (ed. by Herbert Thurston, 5), and Donald Attwater, 4 vol., 1956), which is a standard, popular reference book.

Butler, Benjamin Franklin, 1795–1858, American political leader and cabinet officer, b. Columbia Co., N.Y. Butler, like his former law associate, Martin Van Buren, was a member of the ALBANY REGENCY, and he devoted himself and his considerable power to reform politics. He was Attorney General (1833–37) under President Jackson and for a time held (1836–37) that post and the office of Secretary of War concurrently. He also served (1837–38) as Attorney General under President Van Buren, but he refused later cabinet appointments. He helped to revise (1825) the New York state statutes and organized what is today the law school of New York Univ.

Butler, Benjamin Franklin, 1818–93, American politician and Union general in the Civil War, b. Deerfield, N.H. He moved to Lowell, Mass., as a youth and later practiced law there and in Boston. He was elected to the state legislature in 1852 and 1858 and ran unsuccessfully for governor in 1859 and 1860. Butler was a Democrat but a strong Unionist. At the beginning of the Civil War his contingent of Massachusetts militia was one of the first to reach Washington. He restored order (May, 1861) in secessionist Baltimore and was given command at Fort Monroe. He commanded the troops that accompanied Admiral Farragut in taking New Orleans and was made military governor of the city. There his high-handed rule (May–Dec., 1862) infuriated the people of New Orleans and the South and earned him the name "Beast." The government, severely criticized both at home and abroad for his actions, finally removed him. In May, 1864, as commander of the Army of the James, Butler was defeated by Beauregard at DREWRY'S BLUFF and was bottled up at Bermuda Hundred until Grant crossed the James in June. After he failed to take FORT FISHER in Dec., 1864, he was removed from active command. From 1867 to 1875 Butler, by then a rabid radical Republican, was in Congress. He was one of the House managers who conducted the impeachment proceedings against President Andrew Johnson, and he ardently advocated the party's Reconstruction policy. He was said to have great influence with President Grant. Butler was (1877–79) an independent Greenbacker in Congress. After several unsuccessful attempts to secure the governorship of Massachusetts, he was elected by the Greenbackers and Democrats in 1882. In 1884 he received the nominations of the Anti-Monopoly and Greenback parties for President. Regarded by many as an unprincipled demagogue of great ability, Butler aroused intense antagonisms and was nearly always in controversy. See his autobiography (1892), biographies by R. S.

Holzman (1954), H. L. Trefousse (1957), R. S. West, Jr. (1965), and H. P. Wash, Jr. (1969).

Butler, James: see ORMONDE, JAMES BUTLER, 12TH EARL AND 1ST DUKE OF

Butler, John, 1728–96, Loyalist commander in the American Revolution, b. New London, Conn. He served in the French and Indian Wars and distinguished himself especially by leading the Indians in the successful British attack (1759) under Sir William Johnson against Niagara. Electing the British side after the Revolution broke out, he became a deputy to Guy Johnson at Niagara and worked to keep the Indians friendly to the British. In the Saratoga campaign (1777) he and Indian troops accompanied Gen. Barry St. Leger in the unsuccessful expedition down the Mohawk valley. Later he organized a Loyalist troop called Butler's Rangers, and with them he and his son, Walter BUTLER, attacked the frontier settlements. John Butler in 1778 raided the Wyoming Valley, defeated Zebulon BUTLER, took Forty Fort, and then was unable to keep his Indian allies from perpetrating the Wyoming Valley massacre. Later that year Walter Butler and Joseph Brant led a similar raid on Cherry Valley, and this also ended in a massacre. The name of Butler was thereafter anathema to the patriots. John Butler was defeated (1779) by the expedition of Gen. John SULLIVAN at Newtown near the present Elmira, N.Y., later in the war Butler joined with Sir John JOHNSON in frontier raids. See Howard Swiggett, *War out of Niagara* (1933, repr. 1963).

Butler, Joseph, 1692–1752, English bishop, theologian, and moral philosopher. He was preacher (1718–26) at the Rolls Chapel, London, his tenure there produced the noted *Fifteen Sermons* (1726), in which he set forth his moral philosophy. While rector of Stanhope (1725–40), he was also prebendary of Salisbury and, later, of Rochester. In 1738 he was made bishop of Bristol and in 1740 became dean of St. Paul's, London. In 1750 he was appointed to the see of Durham, one of the richest in England. He also served as clerk of the closet to Queen Caroline and later to King George II. It is as a writer that he is chiefly remembered. His great book, *The Analogy of Religion, Natural and Revealed, to the Constitution and Course of Nature* (1736) was aimed at combating the influence of deism in England by demonstrating the reasonableness of Christianity. See biographies by E. C. Mossner (1936, repr. 1971) and W. J. Norton (1940), study by A. E. Duncan-Jones (1952).

Butler, Nicholas Murray, 1862–1947, American educator, president of COLUMBIA UNIV. (1902–45), b. Elizabeth, N.J., grad. Columbia (B.A., 1882, Ph.D., 1884). Holding a Columbia fellowship, he studied at Paris and Berlin, specializing in philosophy. Beginning in 1885 he was made successively assistant, tutor, and adjunct professor of philosophy at Columbia. He became (1886) president of the Industrial Education Association, reshaped it into what is today Teachers College, Columbia, and was (1889–91) the institution's first president. He was intimately associated with John W. BURGESS in the struggle to create a university organization and was largely responsible for the expansion of Columbia College into Columbia Univ. In 1890 he became professor of philosophy and education and dean of the Faculty of Philosophy and in 1901 acting president of Columbia. The next year he formally succeeded Seth Low as president. He instituted the Summer Session, University Extension (now the School of General Studies), the School of Journalism, the Medical Center, and other units which have contributed to the magnitude of present-day Columbia. An advocate of peace through education, Butler helped to establish the Carnegie Endowment for International Peace, of which he was a trustee and later president (1925–45). His efforts in behalf of disarmament and international peace won him international prestige, and he shared with Jane Addams the 1931 Nobel Peace Prize. Prominent in national, state, and New York City politics, he remained a regular Republican party member despite differences with its platforms. Though a close friend of Theodore Roosevelt, he refused to join the Progressive movement of 1912, and that year Butler received the Republican electoral votes for Vice President after the death of Vice President James S. Sherman, the regularly nominated candidate. He later was the leading Republican advocate of the repeal of the Eighteenth Amendment, urged economy in government, and supported local reform movements. He was (1928–41) president of the American Academy of Arts and Letters. His books include *Education in the United States* (1910), *The International Mind* (1913), *The Meaning of Education* (rev. ed. 1915), *Scholarship and Service* (1921), *The Faith of a Liberal* (1924), *The Path to*

Peace (1930), *Looking Forward* (1932), *Between Two Worlds* (1934), and *The World Today* (1946). See his autobiography, *Across the Busy Years* (2 vol., 1939-40), Richard Whittemore, *Nicholas Murray Butler and Public Education* (1970), *Bibliography of Nicholas Murray Butler, 1872-1932* (1934).

Butler, Pierce, 1866-1939, Associate Justice of the U.S. Supreme Court (1923-39), b. Dakota co., Minn. Admitted (1888) to the bar, he practiced in St. Paul, specialized in railroad law, and became an expert in railroad-valuation cases, serving (1913-22) both the U.S. and Canadian governments. In the Supreme Court, to which he was appointed by President Harding, he was generally considered a conservative. See D. J. Danelski, *A Supreme Court Justice Is Appointed* (1964).

Butler, Richard Austen, 1902-, British statesman. Educated at Cambridge, he entered Parliament in 1929 as a Conservative. After holding various minor government offices, he became (1941) minister of education and piloted through Parliament the Education Act of 1944, which provided free primary and secondary education for all. He was briefly minister of labor in 1945 before the Conservatives lost power. As chancellor of the exchequer from 1951 to 1955, he led the country out of wartime austerity but opposed major reduction in social services. Leader of the House of Commons from 1955 to 1961, Butler also served as lord privy seal (1955-59), home secretary (1957-62), deputy prime minister and first secretary of state (1962-63), and foreign secretary (1963-64). Retiring from political life, he was given a life peerage as Baron Butler of Saffron Walden and became (1965) master of Trinity College, Cambridge.

Butler, Samuel, 1612-80, English poet and satirist. During the Puritan Revolution he served Sir Samuel Luke, a noted officer of Cromwell. After the restoration of Charles II, he wrote his famous mock-heroic poem *Hudibras* (pub. in 3 parts, 1663, 1664, 1678), an evened-out satire against the Puritans in which Luke was the model for the butt Sir Hudibras. He was also the author of other verse satires, some of them not published until the 20th cent. See the John Wilders edition of his *Hudibras* (1967).

Butler, Samuel, 1835-1902, English author. He was the son and grandson of eminent clergymen. In 1859, refusing to be ordained, he went to New Zealand, where he established a sheep farm and in a few years made a modest fortune. He returned to England in 1864 and devoted himself to a variety of interests, including art, music, biology, and literature. Besides exhibiting some of his paintings (1868-76) at the Royal Academy, he composed several works in collaboration with Henry Festings Jones, among them the *Handelian Narcissus: A Dramatic Cantata* (1888). His *Erewhon*, in which he satirized English social and economic injustices by describing a country in which manners and laws were the reverse of those in England, appeared in 1872. It brought Butler immediate literary fame. *Erewhon Revisited* was published in 1901. Butler opposed Darwin's explanation of evolution, finding it too mechanistic, and he expounded his own theories in *Evolution Old and New* (1879), *Unconscious Memory* (1880), and *Luck or Cunning as the Main Means of Organic Modification?* (1887). In his single novel, the autobiographical *The Way of All Flesh* (1903), he attacked the Victorian pattern of life, in particular the ecclesiastical environment in which he was reared. Brilliantly ironic and witty, *The Way of All Flesh* is ranked among the great English novels. Butler's notebooks were published in 1912. See selections from the notebooks ed. by Geoffrey Keynes and Brian Hill (1951). See also Arnold Silver, ed., *The Family Letters of Samuel Butler, 1841-1886* (1962), biographies by H. F. Jones (1921, repr. 1973), L. E. Holt (1964), and Philip Henderson (1953, repr. 1967), study by W. G. Becker (1925, repr. 1964).

Butler, Thomas: see OSSORY THOMAS BUTLER EARL OF

Butler, Walter, 1752?-1781, Loyalist officer in the American Revolution, b. New York state, son of John BUTLER. He was an officer in his father's Loyalist troop, Butler's Rangers. He was captured (1777) by the patriots and sentenced to death, but the sentence was commuted. He escaped and in 1778 led the Rangers in a raid. This ended with the Cherry Valley massacre, for which his Indian commander, Joseph BRANT, blamed Butler. Walter Butler was killed in a skirmish with patriot troops under Marinus WILLET in the Mohawk valley. See Howard Swiggert, *War out of Niagara* (1933, repr. 1963).

Butler, William Orlando, 1791-1880, American general and political leader, b. Carrollton, Ky. He served in the War of 1812 and distinguished himself

in the battle of New Orleans. He was a Congressman from 1839 to 1843. In the Mexican War he was a major general of volunteers and was second in command to Zachary Taylor at Monterrey, where Butler was wounded. After the fighting ended he succeeded Winfield Scott as commander in chief and superintended the evacuation of the U.S. soldiers from Mexico. In 1848 he was vice presidential candidate on the unsuccessful Democratic ticket headed by Lewis Cass. Although a slaveholder, he opposed secession and supported the Union cause in the Civil War.

Butler, Zebulon, 1731-95, American colonial leader, b. Ipswich, Mass. After serving in the French and Indian Wars, Butler led a group of Connecticut settlers to the WYOMING VALLEY in N. Pennsylvania. He was military leader of the Connecticut settlers in the Pennamite Wars and served as director of the SUSQUEHANNA COMPANY. Butler represented (1774-76) the Wyoming Valley in the Connecticut assembly. A colonel in the Revolution, he was defeated (1778) by Loyalists under John BUTLER and fled to Fort, the Wyoming Valley massacre followed. Butler escaped and later was military commandant of the region.

Butler, city (1970 pop. 18,691), seat of Butler co., W. Pa., inc. as a borough 1817, as a city 1917. It is located in an area rich in coal, natural gas, oil, and limestone. Among its manufactures are steel, railroad-car parts, copper tubing, machinery, and petroleum products. Moraine State Park and a community college are there.

Butlerov, Aleksandr Mikhailovich (alyiksan'dar mēkhil'ovich būōt'lyārōf), 1825-1886, Russian chemist. As professor at the Univ. of Kazan he founded the first school of Russian chemists and directed research designed to confirm the classical theory of chemical structure, which he helped to create. His later work included investigations of polymerization reactions and applications of the theory of chemical structure to organic chemistry.

Butler University, at Indianapolis, Ind., coeducational, chartered 1850 as North Western Christian Univ. Its present name was adopted in 1877.

Buto (byōō'tō), ancient city, N. Egypt, in the Nile delta. The precise location is uncertain. Capital of Lower Egypt in prehistoric times (before 3100 B.C.), it had a temple dedicated to the serpent goddess Buto. During the Saïte period (663-525 B.C.) it was revived as an important religious center.

Butor, Michel (mēshēl' būōr'), 1926-, French novelist and critic. As one of the chief exponents of the new novel, or antinovel, Butor is less interested in the outcome of action in his novels than he is in the action itself. His technique involves the use of shifting time sequences, strong visual images, and the interior monologue. He often focuses on one small area of experience to reveal the larger complexity of life. His novels include *Passage de Milan* (1954), *L'Emploi du Temps* (1956, tr. *Passing Time*, 1960), *La Modification* (1957, tr. *Second Thoughts*, 1958), *Degres* (1960, tr. 1962), *Mobile* (1962, tr. *Mobile Study for a Representation of the U.S.*, 1963), and *Niagara: A Stereophonic Novel* (tr. 1969). He has also written numerous critical pieces. See study by Michael Spencer (1973).

Bütschli, Otto (ō'tō būch'lē), 1848-1920, German zoologist. He was professor of zoology at the Univ. of Heidelberg. His researches on invertebrate animals advanced knowledge of the development of gastropods, insects, and other forms, the structure of nematode worms, and processes of division of the nucleus and cell. A significant contribution was his theory (1878) of the structure of protoplasm, which suggested that it is alveolar or foamlike, he helped to establish that it is fluid in nature.

Butt, Isaac, 1813-79, Irish politician and nationalist leader. A member of both the Irish and the English bar, he was a noted conservative lawyer and scholar and an opponent of Daniel O'CONNELL. After the Irish famine experience of the 1840s, however, he became increasingly liberal, defended participants in the abortive Young Ireland revolt (1848), and entered (1852) Parliament as a Liberal-Conservative. He continually urged land tenure reform, defended the Fenian leaders, and founded (1870) the Home Rule Society. By 1874 the parliamentary group, the Home Rule League, comprised 56 members under his leadership. He remained nominal leader of the HOME RULE movement until his death, although effective leadership gradually passed to Charles Stewart PARNELL. See L. J. McCaffrey, *Irish Federalism in the 1870s* (1962), David Thornley, *Isaac Butt and Home Rule* (1964).

Butte (byōōt), city (1970 pop. 23,368), seat of Silver Bow co., SW Mont., inc. 1879. It is a trade, distribution, and industrial center. The mining industry has dominated the city's economy since its establishment in 1862. Copper is the major product, and zinc, silver, manganese, gold, lead, and arsenic are also extracted from the numerous mines in the region. First a gold-mining camp, then a silver center, Butte gained importance when copper was discovered (c. 1880) and Marcus Daly with his Anaconda Copper Mining Company began to exploit the "richest hill on earth." The expansion of the open-pit copper mine within the city limits is forcing sections of the city to relocate. Butte's reputation as a "wide-open" town reached its height during the "War of the Copper Kings." The Montana College of Mineral Science and Technology is in the city. Local attractions include tours of the mines, a mining museum, and the Columbia Gardens recreational area, maintained for the public by the Anaconda Company. Butte is the headquarters of Deerlodge National Forest.

butte, an isolated hill with steep sides and a flat top, resulting from the more rapid erosion of the surrounding areas. Buttes are characteristic of the plains of the W. United States. See MESA.

butter, dairy product obtained by churning the fat from milk until it reaches a solidified form. In most areas the milk of cows is the basis, but elsewhere that of goats, sheep, and mares has been used. Butter was known by 2000 B.C., although in ancient times it was used less as a food than as an ointment, a medicine, or an illuminating oil. At first it was rudely churned in skin pouches thrown back and forth or swung over the back of trotting horses. As butter became a staple food, various sorts of hand churns were devised, including rotating, swinging, and rocking containers operated by plungers. Butter-making on the farm consists of allowing the milk to cool in pans, letting the cream rise to the top, skimming the cream off, and letting it ripen by natural fermentation, it is then churned. Exclusively farm-made until about 1850, butter has become increasingly a factory product. The centrifugal cream SEPARATOR, introduced into the United States c. 1880 and a method devised in 1890 by Stephen Moulton BABCOCK to determine the butterfat content of milk and cream gave impetus to large-scale production. The application of principles of chemistry and bacteriology facilitates the making of butter of uniform quality. The percentage of fat extraction and the time required for churning depend on the composition of the butterfat (see FATS AND OILS), the temperature, acidity, richness, and viscosity of the cream, the speed and motion of the churn, and the size of the fat globules. Commercial butter usually contains from 80% to 85% milk fat, from 12% to 16% water, and about 2% salt. Sweet, or unsalted, butter is favored in Europe, but other markets prefer at least 2% salt. Renovated or process butter is made from rancid or inferior butter, melted and refined, then re-churned. Whey butter, made from cream separated from whey, is usually oily and of inferior quality. The natural color of butter, derived from the carotene of green plant fodder, ranges from pale yellow to deep gold. Australia, France, West Germany, New Zealand, the Soviet Union, and the United States are the leading producers, Denmark, New Zealand, and Australia, the chief exporters, and Great Britain, a heavy importer. The major production centers in the United States are in the N. Middle West, especially Minnesota, Iowa, and Wisconsin. Clarified butter, butterfat with the milk solids removed, is useful in cooking and has good keeping qualities. It is made in quantity in Egypt and in India, where it is known as GHEE. The high dietary value of butter is due to its large proportion of easily digested fat and to its vitamin A and vitamin D content.

butter-and-eggs, common name for a plant of the family Scrophulariaceae (FIGWORT family) and sometimes for other yellow-and-orange flowers. Butter-and-eggs plants are classified in the division MAGNOLIOPHYTES, class Magnoliopsida, order Scrophulariales, family Scrophulariaceae.

buttercup or crowfoot, common name for the Ranunculaceae, a family of chiefly annual or perennial herbs of cool regions of the Northern Hemisphere. Thought to be one of the most primitive families of dicotyledonous plants, the Ranunculaceae typically have a simple flower structure in which each flower part may be separate rather than fused into a single organ (see FLOWER). Some botanists believe that the preference of this family for swamps and wet places also indicates its low evolutionary position. The family includes numerous familiar wild flowers and

many cultivated ornamentals. Well-known representatives are the ACONITE, ANEMONE, BANEERRY, BUG-BANE, CLEMATIS (one of the few vine species), COLUM-



Common buttercup, *Ranunculus acris*

BINE, GLOBEFLOWER, HELLEBORE, HEPATICA, LARKSPUR, LOVE IN A MIST, MARSH MARIGOLD (the American cow-slip), MEADOW RUE, and PEONY. The largest genus, *Ranunculus*, comprises the buttercups and crowfoots, names often used interchangeably. Found throughout arctic, north temperate, and alpine regions, with species in the Andes and in subantarctic areas, this genus is characterized by glossy yellow flowers (hence the name buttercup) and deeply cut leaves (supposedly resembling crows' feet). Like some other members of the family, species of this genus contain an acid juice that makes them unpalatable for livestock and in some species poisonous. A dozen or more species are common in every part of the United States. Among those cultivated for garden and cut flowers are some double-blossomed Old World species, e.g., the turban, or Persian, buttercup (*R. asiaticus*), valued for the variety of its colors (all but blue), and the creeping buttercup (*R. repens*), native to both North America and Europe. *R. ficaria*, of Eurasia, is the lesser celandine—a name more commonly applied to some plants of the poppy family, which it resembles. Many buttercups are aquatic plants, hence the Latin name for the genus *Ranunculus* [little frog]. The buttercup family is classified in the division MAGNOLIOPHYTA, class Magnoliopsida, order Ranunculales.

Butterfield, Herbert, 1900–, English historian. He was educated at Cambridge and became professor of modern history there in 1944. His works cover a variety of topics in modern European history, outstanding are his volumes on 18th-century English history and historiography and his *Origins of Modern Science* (1949). *The Whig Interpretation of History* (1931) showed that many accepted views of English history had grown from the bias of such Whig historians as T. B. Macaulay. In *George III, Lord North, and the People* (1948), Butterfield traced political reform ideas in England in the era of the American Revolution. A critic of the historical method of L. B. Namier, Butterfield emphasizes great ideas as being central to man's development. Other works include *The Englishman and His History* (1944), *Christianity and History* (1950), and *History and Human Relations* (1951). He was knighted in 1968.

Butterfield, John, 1801–69, American stagecoach proprietor and expressman, b. near Albany, N.Y. Beginning as a stage driver out of Albany, he rose to ownership of a large network of stage lines. He helped to merge his express company with others to form (1850) the American Express Company. In 1857, when Congress established the overland mail route to Los Angeles, Butterfield was awarded the mail contract. He organized the service on the 2,800-mi (4,500-km) southern route efficiently and continued it until 1861, when the stages were moved to the central route. He also promoted the development of telegraph lines and railroads, and in 1865 he was elected mayor of Utica, N.Y.

Butterfield, William, 1814–1900, English Gothic-revival architect. Favored by the Ecclesiological Society for his Pugin-like correctness in recalling Gothic forms, Butterfield rose to prominence in the middle

of the 19th cent. The brilliant polychromy that he created through his combinations of brick, stone, and tile (e.g., All Saints' Church, London, 1849–59) introduced the High Victorian Gothic manner. The softer hues of the interior and the variously textured stone of the church at Baldersby St. James near Beverley in Yorkshire (1856) mark what is perhaps Butterfield's finest church. General interest in polychromy soon waned, but Butterfield continued in this mode with Keble College, Oxford (1868–70), and several buildings at Rugby School (1868–72).

butterfish: see HARVEST FISH

butterfly, any of a large group of INSECTS found throughout most of the world, with the MOTHS, they comprise the order Lepidoptera. There are about 12 families of butterflies. Like moths, butterflies have coiled, sucking mouthparts and two pairs of wings that function as a single pair; the wings are covered with scales that come off as dust when the insect is handled. Butterflies can be distinguished from moths in several ways. The antennae of butterflies are knobbed at the tips, while those of moths almost never have terminal knobs and are often feathery; the body of a butterfly is more slender and usually smoother than that of a moth; butterflies are active by day, while most moths are nocturnal, when at rest most butterflies hold the wings vertically, while most moths flatten them against the surface on which they are resting. The skippers are intermediate in characteristics, but they are usually called butterflies. The Lepidoptera, especially the butterflies, are known for the beautiful colors and patterns of their wings. Red, yellow, black, and white pigments are found in the scales, the blues and greens, and the metallic, iridescent hues found especially in tropical species, are caused chiefly by refraction. Some butterflies are protectively colored to match the environment. Many conspicuously colored species are distasteful to birds, which learn to avoid them, and others are protected by their resemblance to the distasteful species (see MIMICRY). Most adult moths and butterflies feed on nectar sucked from flowers. In the process they may transfer pollen from one flower to another, and many plants depend on moths or butterflies for pollination. Metamorphosis is complete, that is, the insect goes through four stages: egg, LARVA, PUPA, and adult. The eggs, which hatch in 2 to 30 days, are usually laid on a plant that the larva (called a CATERPILLAR) uses for food. Most caterpillars eat leaves. After the last of several molts the larva is transformed into a pupa with a hard, often sculptured outer integument, within which it changes to the adult form. The butterfly pupa is called a chrysalis, or chrysalid. Most chrysalids (unlike the pupae of most moths) are not enclosed in a cocoon, however, they are usually suspended from some object by a silken thread and may have a partial covering. Except in those species which winter in the pupa stage, the adult usually emerges from the integument in two or three weeks. Members of some species winter in the egg stage, others as larvae or adults. The adults of most species, however, live only about a month. Some butterflies migrate, usually traveling toward the equator in the fall and away from it in the spring. The North American monarch butterfly makes mass migrations of several thousand miles. Among the most beautiful butterflies are the swallowtails, found all over the world, the monarchs, and the peacock and tortoiseshell butterflies. Butterflies are classified in the phylum Arthropoda, class Insecta, order Lepidoptera. The true butterflies form the superfamily Papilionoidea, and the skippers form the superfamily Hesperioidea. See L. G. Higgins and N. D. Riley, *A Field Guide to the Butterflies of Britain and Europe* (1970), Michael Dickens, *The World of Butterflies* (1973), H. L. Lewis, *Butterflies of the World* (1973).

butterfly fish, common name for certain members of the Chaetodontidae, a family of reef-dwelling tropical fishes that also includes the angelfishes and is closely allied to the spadefishes and the tangs. All have compressed bodies and small mouths and teeth. Butterfly fish are carnivorous, feeding on crabs, barnacles, and other invertebrates. The fast and aggressive common butterfly fish, 5 to 8 in. (12.5–20 cm) long, is marked by dark lines through the eyes and near the tail. The angelfishes have spines on their gill covers and long filaments on their dorsal fins. The queen angelfish, a good food fish that reaches 2 ft (60 cm) in length, is colored in blues and yellows, the smaller, more numerous common angelfish is similar. The French angelfish is black with yellow scale edgings, the black angelfish is solid black, and the bizarre rock beauty has a black body with yellow head, fins, and tail. The

spadefishes are larger (up to 3 ft/90 cm) and faster than the angelfishes and are valued both as food and as game fishes. They are barred in black and white. The tangs have variable coloration. They include the violet-brown doctorfish or surgeonfish, the 8-in. (20-cm) blue tang, and the larger and more abundant ocean tang of deep waters. The butterfly fishes are classified in the phylum CHORDATA, subphylum Vertebrata, class Osteichthyes, order Perciformes, family Chaetodontidae.

butterfly flower, fringeflower, or poor-man's-orchid, any of the showy plants of the genus *Schizanthus* of the family Solanaceae (NIGHTSHADE family), native to Chile but grown elsewhere as garden or greenhouse annuals. The flowers resemble butterflies and are found in a variety of colors, usually mottled. Butterfly flowers are classified in the division MAGNOLIOPHYTA, class Magnoliopsida, order Polemoniales, family Solanaceae.

butterfly weed: see MILKWEED

butternut: see WALNUT

butterwort, common name for several species of the plant genus *Pinguicula* of the north temperate zone and the mountains of tropical America. It is a member of the family Lentibulariaceae (BLADDERWORT family).

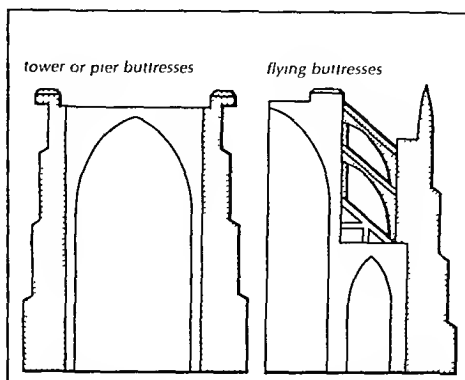
Buttle Lake, 11 sq mi (28 sq km), central Vancouver Island, SW British Columbia, Canada. It is the site of major zinc and copper deposits.

button quail: see BUSTARD QUAIL

buttons, knoblike appendages used on wearing apparel either for ornament or for fastening. Although buttons were sometimes used as fasteners by Greeks and Romans, they were more often merely ornamental disks. They first became widely used when fitted garments came into use in the 13th cent., and their popularity has varied with the changes in fashion. In the 16th cent. they were magnificent and were classed among the vanities, made of silver or gold and jeweled, they were often set in a long row touching one another. In the 17th cent. cloth-covered buttons with embroidered decoration were popular, buttons appeared on everything, even handkerchiefs. The Puritans, considering buttons a vanity, used hooks and eyes. Early settlers in North America often used buttons in trading with the Indians. The manufacture of buttons began in the United States c.1826. Buttons, originally made of bronze or bone, have also been made of materials such as metal, porcelain, paste, wood, ivory, horn, pearl, glass, and plastic. There are two main types, those made with holes and those with shanks. The latter have a loop of metal let in through a hole or soldered into place. See S. C. Luscombe, *The Collector's Encyclopedia of Buttons* (1967).

buttonwood: see PLANE TREE

buttress, mass of masonry built against a wall to strengthen it. It is especially necessary when a vault or an arch places a heavy load or thrust on one part of a wall. In the case of a wall carrying the uniform load of a floor or roof, it is more economical to buttress it at certain intervals than to make the entire wall thicker. Even when a wall carries no load, it is usually buttressed rather than uniformly thickened. For a load-bearing brick wall more than 8 ft (2 m) high a buttress is used every 20 ft (6 m). The decorative possibilities of the buttress were discovered in the ancient temples at Abu Shahrein in Mesopotamia (3500–3000 B.C.), where they were used both as utilitarian and decorative forms. The Romans employed buttresses, which sometimes projected from the exteriors of the walls and were then left as mere piles of masonry, without architec-



Types of buttresses

tural treatment But in the large structures, such as basilicas and baths, the buttresses that received the thrusts from the main vaulting were confined to the interior of the building, where they served also as partition walls The basilica of Constantine in Rome (A D 312) exemplifies this arrangement In the medieval church, the groined vaults, concentrating their great lateral thrusts at points along the exterior walls, required buttresses as an essential element to achieve stability Beginning with Romanesque architecture about A D 1000, a steady evolution of buttresses can be traced, from the simple, slightly projecting piers of the 11th cent to the bold and complex Gothic examples of the 13th, 14th, and 15th cent Builders in England, Germany, and N France achieved striking architectural effects They devised the flying buttress, an arch of masonry abutting against the wall of the nave, the thrust of the nave vault could thus be received and transferred to the vertical buttress built against the outside walls of the side aisles These flying arches, at first concealed beneath the roofs, began to be exposed outside the roofs in the mid-12th cent Later they were enriched with gables, stone tracery, and sculpture and were topped with pinnacles to give them extra weight They constitute, especially in such French cathedrals as Amiens, Beauvais, and Notre-Dame de Paris, the true expression of the elasticity and equilibrium which were the basic principles of the Gothic structural system

Butuan (bōōtōō'an), city (1970 est pop 116,900), capital of Agusan del Norte prov, NE Mindanao, the Philippines It is a port on the Agusan River near its mouth at Butuan Bay An outlet for the fertile Agusan River valley, it is one of the fastest growing cities in the Philippines

butyl rubber (byōō'tīl) see RUBBER

butyric acid (byōōtīr'ik) or **butanoic acid** (byōōtā-nō'tīk), $\text{CH}_3\text{CH}_2\text{CH}_2\text{CO}_2\text{H}$, viscous, foul-smelling, liquid carboxylic acid, m p about -5°C , b p 163.5°C It is miscible with water, ethanol, and ether It is a low molecular weight FATTY ACID that is present in butter as an ester of glycerol, the odor of rancid butter is due largely to the presence of free butyric acid Butyric acid is used in the manufacture of plastics Isobutyric acid, or 2-methylpropanoic acid, $(\text{CH}_3)_2\text{CHCO}_2\text{H}$, is a geometric ISOMER of the butyric acid described above, it has different physical properties but similar chemical properties

Butzer, Martin: see BUCER, MARTIN

Buxar or **Baxar** (both bəksar'), village (1971 pop 31,694), West Bengal state, E central India A British victory over the Nawab of Oudh at Buxar in 1764 assured British control of the Bengal area

Buxtehude, Dietrich (dē'trīkh bōōks'təhōō'də), 1637-1707, Swedish composer and organist From 1668 until his death he was organist at Lubeck, where he established a famous series of evening concerts that attracted musicians from all over northern Germany On one occasion J S Bach walked about 200 miles (320 km) to hear these concerts, and his own style was much influenced by Buxtehude's choral, orchestral, and organ music His best-known works are freely developed organ fugues and concerted choral music

Buxton, Sir Thomas Fowell, 1786-1845, British social reformer As a member of Parliament (1818-37) he began his reform activities immediately with the publication of *An Inquiry Whether Crime and Misery Are Produced or Prevented by Our Present System of Prison Discipline*, this work led to the establishment of the Society for the Reformation of Prison Discipline An abolitionist, Buxton succeeded William Wilberforce as leader of the anti-slavery group His efforts resulted in the passage of an act (1833) abolishing slavery in the British colonies He wrote *The African Slave Trade* (1839) and *The Remedy* (1840, 2d ed 1967) See his memoirs (ed by his son Charles Buxton, 1872)

Buxton, municipal borough (1971 pop 20,316), Derbyshire, central England, on the Wye River in Peak District National Park It is c 1,000 ft (305 m) high, the "old town" is on a hill above it There is limestone quarrying, but Buxton is primarily a year-round resort, with mineral springs and baths

Buys Ballot, Christoph Heinrich Diedrich (krīs'tōf hīn'rīkh dēd'rīkh bōis'-bālō'), 1817-90, Dutch meteorologist Director of the Dutch Royal Meteorological Institute after 1854, he strove to organize and standardize a system for representing meteorological findings and formulated (1857) Buys Ballot's law This states that, in the Northern Hemisphere, if one stands with his back to the wind, the area of low pressure is to his left In the Southern Hemisphere the reverse is true The explanation lies in the

deflection, caused by the earth's rotation, in the movement of air from areas of high pressure to areas of lower pressure A related law had been deduced earlier by the U S meteorologist William Ferrel

Buyuk Menderes, river, Turkey see MAEANDER

Buz (büz) 1 Son of Nahor and Milcah Gen 22:21 He was apparently the eponym of an Arabian tribe Jer 25:23 The term Buzite is probably derived from his name Job 32:2 2 Gadite 1 Chron 5:14

Buzău (bōōzū'ōō), city (1968 est pop 55,000), SE Rumania, in Walachia, on the Buzău River It is a district administrative center, an important railroad junction, and a market for petroleum, timber, and grain Buzău is also an active industrial city, with oil refineries, foundries, distilleries, and a textile industry Long the residence of an Orthodox bishop, it has an episcopal palace and a 16th-century cathedral, restored in 1740

Buzi (byōō'zī), father of Ezekiel Ezek 1:3

buzzard, common name for hawks of the genus *Buteo* and the genus *Pernis*, or honey buzzard, of the Old World family Accipitridae Honey buzzards feed on insects, wasp and bumblebee larvae, and small reptiles The name buzzard is also incorrectly applied to various hawks and New World vultures, such as the turkey vulture (*Cathartes aura*) and the black vulture (*Coragyps atratus*) of the family Cathartidae Buzzards are classified in the phylum CHORDATA, subphylum Vertebrata, class Aves, order Falconiformes, family Accipitridae

Buzzards Bay, inlet of the Atlantic Ocean, 30 mi (48 km) long, from 5 to 10 mi (8-16 m) wide, SE Mass, connected with Cape Cod Bay by the Cape Cod Canal and bounded on the SE by the Elizabeth Islands Its shores are very irregular The village of Buzzards Bay (1970 pop 2,422), seat of Cape Cod Canal administration, is in the town of Bourne on the shore of the bay

Byblos (bīb'lās), ancient city, Phoenicia, a port 17 mi (27 km) NNE of modern Beirut, Lebanon The principal city of Phoenicia during the 2d millennium B C, it long retained importance as an active port under the Persians Byblos was the chief center of the worship of Adonis Because of its papyrus, it was also the source of the Greek word for book and, hence, of the name of the Bible Excavations of Byblos, especially since 1922, have shown that trade existed between Byblos and Egypt as early as c 2800 B C A syllabic script found at Byblos dates from the 18th to the 15th cent B C The name of the modern town on the site, Jebail, preserves the form Gebal, the name given the city in the Old Testament (Ezek 27:9) The inhabitants are called Giblites (Joshua 13:5) The Gebal of Psalms B3:7 is almost certainly not the same city, it is otherwise unknown

Bydgoszcz (bīd'gōshch), Ger *Bromberg*, city (1970 pop 280,460), capital of Bydgoszcz prov, N central Poland, on the Brda River, a tributary of the Vistula One of Poland's major inland ports, it stands on the Bydgoszcz Canal (built 1773-74), which links the Brda and Noteć rivers and is part of the Vistula-Oder waterway The city is also an important railway junction Its chief industries produce machinery and machine tools, electrical equipment, metal goods, precision instruments, and chemicals Chartered in 1346, the city developed during the Middle Ages around the site of a prehistoric fort In the 15th and 16th cent it became an important commercial center It passed to Prussia in 1772 and was returned to Poland in 1919 Occupied by German forces from 1939 to 1945, the city suffered heavy damage in World War II The most notable surviving building is a 15th-century Gothic church

Byelo- For some names beginning thus, see BELO, e.g., for Byelorussia, see BELORUSSIA

Byles, Mather, 1707-88, American clergyman and poet, b Boston Famous minister of the Hollis St Congregational Church, Boston, from 1732, he was dismissed for his Tory sympathies after the British evacuation of Boston From his uncle, Cotton Mather, he inherited a valuable library, to which he added his own unique collection His poetry, imitative but witty, appeared in *Poems on Several Occasions* (1744) and other volumes, his prose includes sermons and *The Flourish of Annual Spring* (1741) See A W H Eaton, *The Famous Mather Byles* (1914, repr 1972)

byliny (bīl'ēnē) [Rus, = what has happened], Russian scholarly term first applied in the 1840s to a great body of narrative and heroic poems They are called by the folk *starny* [Rus, = what is old] Most *byliny* are loosely connected with historical events dating from the 11th to the 16th cent, particularly the siege

of Kazan (1552), and have been handed down by word of mouth by professional reciters The poems were first collected and studied in the 18th cent The largest of the *byliny* cycles is that from Kiev concerning Prince Vladimir, the Little Sun, and the warrior Ilya of Murom Of importance also is the Novgorod cycle, concerning the adventures of the merchant prince Sadko and Vasily Buslayevich A third cycle of Older Heroes relates tales of the strong plowman Mikula The characters of the *byliny* all possess supernatural powers Though modified by elements of Scandinavian, Byzantine, and Oriental folk tales, *byliny* are strikingly Russian and have had an enriching influence on Russian literature, music, and art See N K Chadwick, *Russian Heroic Poetry* (1932, repr 1964), L A Magnus, *The Heroic Ballads of Russia* (1921, repr 1967)

Byng, George: see TORRINGTON, GEORGE BYNG, VIS COUNT

Byng, John, 1704-57, British admiral, son of George Byng, Viscount Torrington Sent (1756) to prevent the French from taking Minorca, he arrived when the island was already under siege and, after an in decisive naval engagement, withdrew without relieving the siege His court-martial and execution for neglect of duty brought charges that he had been used as a scapegoat for ministerial failure and prompted Voltaire's suggestion (in *Candide*) that from time to time the British find it desirable to shoot an admiral "pour encourager les autres" [to encourage the others] See study by D B E Pope (1962)

Byng, Julian Hedworth George, 1st Viscount **Byng of Vimy**, 1862-1935, British general He served in India and South Africa and had several commands in World War I In April, 1917, Canadian troops under his command took Vimy Ridge, in N France For his distinguished services he was made a baron and, in 1926, a viscount He was governor general of Canada from 1921 to 1926

Bynkershoek, Cornelius van (kōrnā'līs vān bīng'-kars-hōōk), 1673-1743, Dutch writer on international law His *De dominio maris* [on the rule of the seas] (1702, tr 1923) is a classic on maritime law, and he also wrote on diplomatic rights and, in *Quaestiones juris publici* [questions of public law] (1737), on public law It was Bynkershoek who first proposed the "three-mile limit" rule, which states that a nation may claim sovereignty over territorial waters to a distance of 3 mi (4.8 km) from shore

Bynner, Witter (bīn'ər), 1881-1968, American poet, b Brooklyn, N Y, grad Harvard, 1902 As a poet Bynner had a remarkable facility for catching the cadences of other writers and cultures Under the pseudonym Emanuel Morgan he collaborated with Arthur Davidson Ficke in writing *Spectra* (1917), a book parodying contemporary poetic vogues such as imagism, *Spectra* was for a time considered a serious work (see LITERARY FRAUDS) With Dr Kaing Kung-Ho, Bynner translated 300 Chinese poems published in *The Jade Mountain* (1929) His other works include several plays and essays, a reminiscence of D H Lawrence, *Journey with Genius* (1951), and such volumes of poetry as *Greystone Poems* (1917), *Indian Earth* (1929), *Selected Poems* (1943), *Take Away the Darkness* (1947), and *New Poems* (1960)

Byrd, Harry Flood (būrd), 1887-1966, U S Senator from Virginia (1933-65), b Martinsburg, W Va, brother of Richard E Byrd Educated at Shenandoah Academy in Winchester, Va, he became publisher of the *Winchester Star* and an important figure in state Democratic politics His administration as governor (1926-30) was marked by the development of the state highway system Appointed Senator in 1933, he was continually reelected until his retirement in 1965 He was a leading conservative Democrat and opposed the New Deal and later progressive measures For many years he was chairman of the Senate Finance Committee, and he advocated government economy

Byrd, Richard Evelyn, 1888-1957, American aviator and polar explorer, b Winchester, Va He took up aviation in 1917, and after World War I he gained great fame in the air He commanded the naval air unit with the Arctic expedition of D B MacMillan in 1925, he and Floyd Bennett flew from Spitsbergen to the North Pole and back in 1926 (the first men to fly over the pole), and in 1927 he and three companions made one of the spectacular flights across the Atlantic A record of his flights was presented in *Skyward* (1928) Two years later he led a well equipped and efficiently organized expedition to Antarctica Establishing a base at LITTLE AMERICA, he discovered the Rockefeller Range and Marie Byrd

Land, and late in 1929 he and Bernt BALCHEN flew to the South Pole and back. The large party gathered much scientific information. In 1930, Byrd was promoted to rear admiral, and his *Little America* was published. His second large expedition was organized in 1933, and headquarters were established once again at Little America. As winter approached, he set up an advance base 123 mi (198 km) closer to the South Pole and stayed there alone for several months making observations. *Discovery* (1935) and *Alone* (1938) were records of this fruitful expedition. In 1939–40 he was again in the Antarctic commanding a government expedition, and in 1946–47 he headed the U.S. navy expedition, the largest yet sent to the region (see ANTARCTICA). In 1955, Byrd was placed in command of all U.S. Antarctic activities, and in 1955–56 he led his fifth expedition to the region. Due mainly to his efforts, the U.S. navy organized (1955–59) Operation Deep Freeze. Byrd's explorations form much of the basis for U.S. claims in Antarctica. See Martin Gladych, *Admiral Byrd of Antarctica* (1960), E. P. Hoyt, *The Last Explorer* (1968).

Byrd, William, 1543–1623, English composer, organist at Lincoln Cathedral and, jointly with Tallis, at the Chapel Royal. Although Roman Catholic, he composed anthems and services for the English Church in addition to his great Roman masses and Latin motets. He was highly esteemed by his contemporaries and was favored by Queen Elizabeth I, who, in 1575, granted to Byrd and Tallis a patent for the exclusive printing and selling of music. Byrd also composed music for the virginal and other instruments. See studies by E. H. Fellowes (2d ed. 1948), and Imogen Holst (1972).

Byrd, William, 1652–1704, English planter in early Virginia. He came to America as a youth and took up lands he had inherited on both sides of the James River, including the site that would later be Richmond. In 1691 he moved to "Westover," long famous as the Byrd family home. His landed fortune was increased by his interest in trade, and he served (1703) as president of the Virginia council. Byrd's wealth, culture, and character made him the ideal tidewater aristocrat. He was the father of William Byrd (1674–1744).

Byrd, William, 1674–1744, American colonial writer, planter, and government official, son of William Byrd (1652–1704). After being educated in England, he became active in the politics of colonial America. He served as member of the house of burgesses, as receiver-general of Virginia, as Virginia council member, and as colonial agent in England. Byrd inherited a great estate from his father and ultimately owned over 179,000 acres (72,000 hectares). In 1737 he had the city that was to be Richmond laid out on one of his estates. His service in 1728 as one of the commissioners to survey the North Carolina-Virginia boundary and his many trips into the backwoods provided the material for much of his writings. *A History of the Dividing Line, A Journey to the Land of Eden*, and *A Progress to the Mines* were all based on his diaries. Byrd's polished style and crisp wit, in addition to his valuable record of Southern life, have won him a reputation as one of the foremost colonial authors. At his death he left a library of some 4,000 volumes at his Westover estate. See his diaries and other writings (1941, 1942, 1970), biography by Pierre Marambaud (1971).

Byrde, William—see BYRD, WILLIAM

Byrhtnoth (bīrkht'noth) or **Bryhtnoth** (brīkht'noth), d. 991, alderman of the East Saxons. Leader of the English forces in the battle of Maldon, he was killed in the battle and was buried at Ely.

Byrnes, James Francis, 1879–1972, American public official, Secretary of State (1945–47), governor of South Carolina (1951–55), b. Charleston, S.C. He studied law while working (1900–1908) as a court reporter, owned and edited a newspaper in Aiken, S.C., and represented (1911–25) South Carolina in the House as Senator (1931–41). Byrnes, a Southern Democrat, became budgetary expert for the New Deal. He served as an Associate Justice of the Supreme Court (1941–42), but resigned and became director of economic stabilization (1942) and later (1943) director of war mobilization. As Secretary of State he tried to mend postwar differences with the USSR. He later became extremely anti-Soviet. An opponent of racial integration, he was elected governor of South Carolina, and opposed further Federal centralization. See his *Speaking Frankly* (1947) and *All in One Lifetime* (1958).

Byrom, John (bī'ram), 1692–1763, English shorthand expert and poet, educated at Trinity College, Cambridge. He devised an early shorthand system,

which he taught in Manchester. Although he copyrighted his system in 1742, his book, *The Universal English Shorthand*, was not published until after his death. He was a great admirer of William Law, and much information about Law is found in Byrom's *Private Journal and Literary Remains* (1854–57). He wrote *Seasonably Alarming and Humiliating Truths in a Metrical Version of Certain Select Passages Taken from the Works of William Law* (1774) and other facetiously rhyming, rather eccentric religious verse.

Byron, George Gordon Noel Byron, 6th Baron (bī'ran), 1788–1824, English poet and satirist, son of Capt. John ("Mad Jack") Byron and his second wife, Catherine Gordon of Gight. His father died in 1791, and Byron, born with a clubfoot, was subjected alternately to the excessive tenderness and violent temper of his mother. In 1798, after years of poverty, Byron succeeded to the title and took up residence at the family seat, "Newstead Abbey." He subsequently attended Dulwich school and Harrow (1801–5) and then matriculated at Trinity College, Cambridge. Although the academic atmosphere did nothing to lessen Byron's sensitivity about his lameness, he made several close friends while at school. His first volume, *Fugitive Pieces* (1806), was suppressed, revised and expanded, it appeared in 1807 as *Poems on Various Occasions*. This was followed by *Hours of Idleness* (1807), which provoked such severe criticism from the *Edinburgh Review* that Byron replied with *English Bards and Scotch Reviewers* (1809), a satire in heroic couplets reminiscent of Pope, which brought him immediate fame. He left England the same year for a grand tour through Spain, Portugal, Italy, and the Balkans. He returned in 1811 with Canto I and II of *Childe Harold* (1812), a melancholy, philosophic poem in Spenserian stanzas, which made him the social lion of London. It was followed by the verse tales *The Giaour* (1813), *The Bride of Abydos* (1813), *The Corsair* (1814), *Lara* (1814), *The Siege of Corinth* (1816), and *Parisina* (1816). Byron's name at this time was linked with those of several women, notably Viscount Melbourne's wife, Lady Caroline Lamb. In Jan., 1815, he married Anne Isabella Milbanke, a serious, rather cold, young woman with whom he had little in common. She gave birth to a daughter, Augusta Ada, the following December. In 1816 she secured a separation. Although her reasons for such an action remain obscure, evidence indicates that she discovered the existence of an incestuous relationship between Byron and his half-sister, Mrs. Augusta Leigh. Although his many attachments to women are notorious, Byron was actually ambivalent toward women. There is some evidence that he had several homosexual relationships. In April, 1816, a social outcast, Byron left England, never to return. He passed some time with Shelley in Switzerland, writing Canto III of *Childe Harold* (1816) and *The Prisoner of Chillon* (1816). With the party was Shelley's sister-in-law, Claire Clairmont, who had practically forced Byron into a liaison before he left England, and who, in Jan., 1817, bore him a daughter, Allegra. Settling in Venice (1817), he led for a time a life of dissipation, but produced Canto IV of *Childe Harold* (1818), *Beppo* (1818), and *Mazeppa* (1819) and began *Don Juan*. In 1819 he formed a liaison with the Countess Teresa Guiccioli, who remained his acknowledged mistress for the rest of his life. Byron was induced to interest himself in the cause of Greek independence from the Turks and sailed for Missolonghi, where he arrived in 1824. He worked unsparingly with Prince Alexander Mavrocordatos to unify the divergent Greek forces, but caught a fever and died the same year. Ranked with Shelley and Keats as one of the great Romantic poets, Byron became famous throughout Europe as the embodiment of romanticism. His good looks, his lameness, his flamboyant life style all contributed to the formation of the Byronic legend. By the mid-20th cent. his reputation as a poet had been eclipsed by growing critical recognition of his talents as a wit and satirist. Byron's poetry covers a wide range. In *English Bards and Scotch Reviewers* and in *The Vision of Judgment* (1822), he wrote 18th-century satire. He created the "Byronic hero," who appears consummately in the Faustian tragedy *Manfred* (1817)—a mysterious, lonely, defiant figure whose past hides some great crime. *Cain* (1821) raised a storm of abuse for its skeptical attitude toward religion. The verse tale *Beppo* is in the ottava rima (eight-line stanzas in iambic pentameter) that Byron later used for his acknowledged masterpiece *Don Juan* (1819–24), an epic-satire combining Byron's art as a storyteller, his lyricism, his cynicism, and his detestation of convention. See his letters and diaries, ed. by Les-

lie Marchand (2 vol., 1973, others planned), biographies by Andre Maurois (1930, repr. 1964), Leslie Marchand (3 vol., 1957, and 1 vol., 1970), studies by Peter Quennell (rev. ed. 1967, and 1941, repr. 1957), G. Wilson Knight (1952 and 1957), L. A. Marchand (1965), and Michael G. Cooke (1969).

Byron, John, 1723–86, British vice admiral and explorer. Sailing in 1740 with Admiral George Anson on a voyage around the world, he was shipwrecked off Chile. His *Narrative of Great Distresses on the Shores of Patagonia* (1768) is said to have been used by his grandson, the poet George Gordon, Lord Byron, in writing *Don Juan*.

Byström, John Niklas (bu'ström), 1783–1848, Swedish sculptor. He spent part of his life in Rome. Byström made colossal statues of kings of Sweden for Stockholm, but he was most successful in portraying women and children.

Bytom (bī'tôm), Ger. *Beuthen*, city (1970 pop. 186,993), SW Poland, in the Katowice mining region. An important industrial center, it has factories producing metal products and furniture. A Polish king built a fortress on the site in the 11th cent., and by the 12th cent. the lead and zinc mines of the region were being exploited. The city was chartered in 1254, and in the late 13th cent. served briefly as the capital of an independent principality that passed under the rule of Bohemia. The Hapsburgs held the city from 1526 until 1742, when it passed to Prussia. In a plebiscite after World War I a majority of the population voted to join Poland, but Germany held onto the city. It was finally incorporated into Poland in 1945. Bytom has an opera house and museum.

Bytown: see OTTAWA, Canada

Byzantine art and architecture include not only works produced in the city of Byzantium after Constantine made it the capital of the Roman Empire (A.D. 330) but also the work done under Byzantine influence, as in Venice, Ravenna, Norman Sicily, and in Syria, Greece, Russia, and other Eastern countries. For more than a thousand years, until the conquest of Constantinople by the Turks in 1453, Byzantine art retained a remarkably conservative orientation, the major phases of its development emerge from a background marked by adherence to classical principles. Artistic activity was temporarily disrupted by the iconoclastic controversy (726–843), which resulted in the wholesale destruction of figurative works of art and the restriction of permissible content to ornamental forms or to symbols like the cross. The pillaging of Constantinople by the Frankish Crusaders in 1204 was perhaps a more serious blow, but it was followed by an impressive late flowering of Byzantine art under the Paleologus dynasty. Byzantine achievements in mosaic decoration brought this art to an unprecedented level of monumentality and expressive power. Mosaics were applied to the domes, half-domes, and other available surfaces of Byzantine churches in an established hierarchical order. The center of the dome was reserved for the representation of the Pantocrator, or Christ as the ruler of the universe, whereas other sacred personages occupied lower spaces in descending order of importance. The entire church thus served as a tangible evocation of the celestial order; this conception was further enhanced by the stylized poses and gestures of the figures, their hieratic gaze, and the luminous shimmer of the gold backgrounds. Because of the destruction of many major monuments in Constantinople proper, large ensembles of mosaic decoration have survived chiefly outside the capital, in such places as Salonica, Nicaea, and Daphni in Greece and Ravenna in Italy. An important aspect of Byzantine artistic activity was the painting of devotional panels, since the cult of icons played a leading part in both religious and secular life. Icon painting usually employed the ENCAUSTIC technique. Little scope was afforded individuality, the effectiveness of the religious image as a vehicle of divine presence was held to depend on its fidelity to an established prototype. A large group of devotional images has been preserved in the monastery of St. Catherine on Mt. Sinai. The development of Byzantine painting may be seen also in manuscript illumination. Among notable examples of Byzantine illumination are a lavishly illustrated 9th-century copy of the Homilies of Gregory Nazianzus and two works believed to date from a 10th-century revival of classicism, the Joshua Rotulus (or Roll) and the Paris Psalter. Enamel, ivory, and metalwork objects of Byzantine workmanship were highly prized throughout the Middle Ages, many such works are found in the treasuries of Western churches. Most of these objects were reliquaries or devotional panels, although an important

series of ivory caskets with pagan subjects has also been preserved. Byzantine silks, the manufacture of which was a state monopoly, were also eagerly sought and treasured as goods of utmost luxury. The architecture of the Byzantine Empire was based on the great legacy of Roman formal and technical achievements. Constantinople had been purposely founded as the Christian counterpart and successor to the leadership of the old pagan city of Rome. The new capital was in close contact with the Hellenized East, and the contribution of Eastern culture, though sometimes overstressed, was an important element in the development of its architectural style. The 5th-century basilica of St John of the Studion, the oldest surviving church in Constantinople, is an early example of Byzantine reliance upon traditional Roman models. The most imposing achievement of Byzantine architecture is the Church of Holy Wisdom (see HAGIA SOPHIA). It was constructed in a short span of five years (532-37) during the reign of Justinian. Hagia Sophia is without a clear antecedent in the architecture of late antiquity, yet it must be accounted as culminating several centuries of experimentation toward the realization of a unified space of monumental dimensions. Throughout the history of Byzantine religious architecture, the centrally planned structure continued in favor. Such structures, which may show considerable variation in plan, have in common the predominance of a central domed space, flanked and partly sustained by smaller domes and half-domes spanning peripheral spaces. Although many of the important buildings of Constantinople have been destroyed, impressive examples are still extant throughout the provinces and on the outer fringes of the empire, notably in Bulgaria, Russia, Armenia, and Sicily. A great Byzantine architectural achievement is the octagonal church of San Vitale (consecrated 547) in Ravenna. The church of St Mark's in Venice was based on a Byzantine prototype, and Byzantine workmen were employed by Arab rulers in the Holy Land and in Ottonian Germany during the 11th cent. Secular architecture in the Byzantine Empire has left fewer traces. Foremost among these are the ruins of the 5th-century walls of the city of Constantinople, consisting of an outer and an inner wall, each originally studded with 96 towers. Some of these can still be seen. See Alexander van Millingen, *Byzantine Churches in Constantinople* (1912), Andre Grabar, *Byzantine Painting* (tr 1953), D Talbot Rice, *Art of Byzantium* (1959) and *Art of the Byzantine Era* (1963), William MacDonald, *Early Christian and Byzantine Architecture* (1963).

Byzantine Empire, successor state to the Roman Empire (see under ROME), also called Eastern Empire and East Roman Empire. It was named after Byzantium, which Emperor Constantine I rebuilt (A.D. 330) as CONSTANTINOPLE and made the capital of the entire Roman Empire. Although not foreseen at the time, a division into Eastern and Western empires became permanent after the accession (395) of HONORIUS in the West and ARCADIVS in the East. Throughout its existence the Byzantine Empire was subject to important changes in its boundaries. The core of the empire consisted of the Balkan Peninsula (i.e., Thrace, Macedonia, Epirus, Greece proper, the Greek isles, and Illyria) and of Asia Minor (present-day Turkey). The empire combined Roman political tradition, Hellenic culture, and Christian beliefs. Greek was the prevalent language, but Latin long continued in official use. The characteristic Oriental influence began with Constantine I, who also introduced Christianity. Orthodoxy triumphed over ARIANISM under Arcadius' predecessor, Theodosius I, but violent religious controversy was chronic. The reigns (395-527) of Arcadius, Theodosius II, Marcian, Leo I, Leo II, Zeno, Anastasius I, and Justin I were marked by the invasions of the Visigoths under ALARIC I, of the Huns of ATTILA, and of the AVARS, the SLAVS, the Bulgars (see BULGARIA), and the Persians. After the Western Empire fell (476) to ODOACER, Italy, Gaul, and Spain were theoretically united under Zeno but were actually dominated by, respectively, the Ostrogoths, the Franks, and the Visigoths, while Africa was under the Vandals. During this period arose the heresies of NESTORIANISM and MONOPHYSITISM and the political parties of BLUES AND GREENS to divide the Byzantines.

An Age of Revival Under the rule (527-65) of JUSTINIAN I and THEODORA, Byzantine power grew. Their great generals, BELISARIUS and NARSES, checked the Persians, repressed political factions, and recovered Italy and Africa, while TRIBONIAN helped the emperor to codify ROMAN LAW. During Justinian's reign a great revival of Hellenism took place in literature,

and Byzantine art and architecture entered their most glorious period. Much was lost again under his successors. The LOMBARDS conquered most of Italy, however, the Pentapolis, Rome, Sardinia, Corsica, Liguria, and the coasts of S Italy and Sicily long remained under Byzantine rule, and at RAVENNA the exarchs governed until 751. The Persians, under KHOSRU I, made great gains against the empire, though Emperor Maurice temporarily checked them in 591. The emperor Heraclius (610-41) defeated the Persians but was barely able to save Constantinople from the Avars. Muslim conquests soon afterward wrested Syria, Palestine, Egypt, Africa, and Sicily from the empire. Heraclius' attempt to reconcile

Monophysitism and orthodoxy merely led to the new heresy of MONOTHELETISM. His military reorganization of the provinces into *themes* proved effective and was continued by Constans II (641-48). Constantine IV (668-85) saved Constantinople from Arab attack. The 7th cent. was marked by increasing Hellenization of the empire, outwardly symbolized by the adoption of the Greek title *Basileus* by the emperors. The church, under the patriarch of Constantinople, became increasingly important in public affairs. Theology, cultivated by emperors and monks alike, was pushed to extremes of subtlety. Literature and art became chiefly religious. Under Justinian II and his successors the empire was again

RULERS OF THE BYZANTINE EMPIRE (including dates of reign)

Constantine I (the Great), 330-37	Romanus I Lecapenus, 919-44
Constantius, 337-61	Constantine VII (restored), 944-59
Julian (the Apostate), 361-63	Romanus II, 959-63
Jovian, 363-64	Basil II Bulgaroktonos, 963
Valens, 364-78	Nicephorus II Phocas, 963-69
Theodosius I (the Great), 379-95	John I Tzimiskes, 969-76
Arcadius, 395-408	Basil II (restored), 976-1025
Theodosius II, 408-50	Constantine VIII, 1025-28
Marcian, 450-57	Zoe and Romanus III Argyrus, 1028-34
Leo I (the Great or the Thracian), 457-74	Zoe and Michael IV (the Paphlagonian), 1034-41
Leo II, 474	Zoe and Michael V Calaphates, 1041-42
Zeno, 474-75	Zoe and Theodora, 1042
Basiliscus, 475-76	Zoe, Theodora, and Constantine IX Monomachus, 1042-50
Zeno (restored), 476-91	Theodora and Constantine IX, 1050-55
Anastasius I, 491-518	Theodora, 1055-56
Justin I, 518-27	Michael VI Stratioticus, 1056-57
Justinian I (the Great), 527-65	Isaac I Comnenus, 1057-59
Justin II, 565-78	Constantine X Ducas, 1059-67
Tiberius II Constantinus, 578-82	Michael VII Ducas (Parapinaces), 1067-68
Maurice, 582-602	Romanus IV Diogenes, 1068-71
Phocas, 602-10	Michael VII Ducas (restored), 1071-78
Heraclius, 610-41	Nicephorus III Botaniates, 1078-81
Constantine III and Heraclionas, 641	Alexius I Comnenus, 1081-1118
Heraclionas, 641	John II Comnenus, 1118-43
Constans II Pogonatus, 641-68	Manuel I Comnenus, 1143-80
Constantine IV, 668-85	Alexius II Comnenus, 1180-83
Justinian II Rhinotmetus, 685-95	Andronicus I Comnenus, 1183-85
Leontius, 695-98	Isaac II Angelus, 1185-95
Tiberius III, 698-705	Alexius III Angelus, 1195-1203
Justinian II (restored), 705-11	Isaac II (restored) and Alexius IV Angelus, 1203-4
Philippicus Bardanes, 711-13	Alexius V Ducas, 1204
Anastasius II, 713-15	Theodore I Lascaris, 1204-22
Theodosius III, 716-17	John III Vatatzes or Ducas, 1222-54
Leo III (the Isaurian or the Syrian), 717-41	Theodore II Lascaris, 1254-58
Constantine V Copronymus, 741-75	John IV Lascaris, 1258-61
Leo IV (the Khazar), 775-80	Michael VIII Palaeologus, 1259-82
Constantine VI, 780-97	Andronicus II Palaeologus, 1282-1328
Irene, 797-802	Andronicus III Palaeologus, 1328-41
Nicephorus I, 802-11	John V Palaeologus, 1341-76
Stauracius, 811	John VI Cantacuzenus (usurper), 1347-55
Michael I, 811-13	Andronicus IV Palaeologus, 1376-79
Leo V (the Armenian), 813-20	John V Palaeologus (restored), 1379-91
Michael II (the Stammerer), 820-29	John VII Palaeologus (usurper), 1390
Theophilus, 829-42	Manuel II Palaeologus, 1391-1425
Michael III (the Drunkard), 842-67	John VII Palaeologus (restored as coemperor), 1399-1412
Basil I (the Macedonian), 867-86	John VIII Palaeologus, 1425-48
Leo VI (the Wise or the Philosopher), 886-912	Constantine XI Palaeologus, 1449-53
Alexander, 912-13	
Constantine VII Porphyrogenitus, 913-19	



Byzantine Empire (c 1000)

Cross references are indicated by small CAPITALS

menaced by Arabs and Bulgars, but the Isaurian emperors Leo III (717–41) and Constantine V stopped the Arab advance and recovered Asia Minor. The grave issue of ICONOCLASM, which they precipitated, led to the loss of Rome. In 800, during the reign of Irene, the Frank CHARLEMAGNE was crowned emperor of the West at Rome. Thus ended even the theoretical primacy of Byzantium over Europe.

The Oriental State The political division of East and West was paralleled by a religious schism, intensified by the patriarch PHOTIUS, between the Roman and the ORTHODOX EASTERN CHURCH, later culminating in a complete break (1054). In all aspects the Byzantine Empire, having lost its claim to universality, became a Greek monarchy, though Constantinople still remained the center of both Greek and Roman civilization. Compared with its intellectuals, artists, writers, and artisans, those of Western Europe were crude and barbarous, though sometimes more vigorous and original. In the empire the administrative machinery was huge, and competition among the courtiers was intense. Complex diplomacy, intrigue, and gross violence marked the course of events, yet moral decay did not prevent such emperors as Basil I, founder of the Macedonian dynasty, and his successors (notably Leo VI, Romanus I, Constantine VII, Nicephorus II, John I, and Basil II) from giving the empire a period of splendor and power (867–1025). The eastern frontier was pushed to the Euphrates River, the Bulgars were subjugated, and the Balkan Peninsula was recovered. Russia, converted to Christianity, became an outpost of Byzantine culture. In the unceasing struggle between the great landowners and the small peasantry, most of the emperors favored the peasants. Economic prosperity was paralleled by a new golden age in science, philosophy, and architecture.

The Ebb of Power With the rule of Zoe (1028–50) anarchy and decline set in. The Seljuk TURKS increased their attacks, and with the defeat (1071) of Romanus IV at Manzikert most of Asia Minor was permanently lost. The Normans under Robert GUISCARD and BOHEMOND I seized Sicily and attacked the Balkans. Venice ruled the Adriatic and challenged Byzantine commercial dominance in the East, and the Bulgars and Serbs reasserted their independence. Alexius I (1081–1118) took advantage of the First Crusade (see CRUSADES) to recover some territory in Asia Minor and to restore Byzantine prestige, but his successors of the COMNENUS dynasty were at best able to postpone the disintegration of the empire. After the death (1180) of Manuel I the Angelus dynasty unwittingly precipitated the cataclysm of the Fourth Crusade. In 1204 the Crusaders and the Venetians sacked Constantinople and set up a new empire (see CONSTANTINOPLE, LATIN EMPIRE OF) in Thrace, Macedonia, and Greece. The remainder of

the empire broke into independent states, notably the empires of NICAIA and of TREBIZOND and the despotate of EPIRUS. In 1261 the Nicaean emperor Michael VIII conquered most of the tottering Latin empire and reestablished the Byzantine Empire under the PALAEOLOGUS family (1261–1453). The reconstructed empire was soon attacked from all sides, notably by CHARLES I of Naples, by Venice, by the Ottoman Turks, by the new kingdoms of Serbia and Bulgaria, and by Catalanian adventurers under Roger de FLOR. At the same time, the empire began to break down from within—the capital was at odds with the provinces, ambitious magnates were greedy for land and privileges, religious orders fought each other vigorously, and church and state were rivals for power. Eventually the Turks encircled the empire and reduced it to Constantinople and its environs. Manuel II and John VIII vainly asked the West for aid, and, in 1453, Constantinople fell to Sultan MUHAMMAD II after a final desperate defense under Constantine XI. This is one of the dates conventionally accepted as the beginning of the modern age. The collapse of the empire opened the way for the vast expansion of the Ottoman Empire to Vienna itself and also enabled IVAN III of Russia, son-in-law of Constantine XI, to claim a theoretical succession to the imperial title. The classic, though biased, work on Byzantine history is Gibbon's *Decline and Fall of the Roman Empire*. More recent standard works are those of J. B. Bury, Charles Diehl, A. A. Vasil'ev, George Ostrogorsky, and N. H. Baynes. See Steven Runciman, *Byzantine Civilization* (1933, repr. 1959), J. M. Hussey, *The Byzantine World* (3d rev. ed. 1967), R. J. H. Jenkins, *Byzantium* (1967), Dimitri Obolensky, *The Byzantine Commonwealth* (1971).

Byzantine music, the music of the Byzantine Empire composed to Greek texts as ceremonial festival or church music. Long thought to be only a further development of ancient Greek music, Byzantine music is now regarded as an independent musical culture, with elements derived from Syrian and Hebrew as well as Greek sources. Its beginnings are dated by some scholars as in the 4th cent., after the founding of the Eastern Empire by Constantine I. Although two Greek instruments, the kithara and the aulos, were used, the principal instrument of Byzantium was the organ. No purely instrumental music is extant, however, and the exact nature of the instrumental accompaniment of vocal music is not certain. The eight Byzantine *echos* (singular *echos*) correspond roughly to the eight *MODES* of plainsong, but they were groups of melodies made of certain definite formulas. The Byzantine music that survives is all sacred, with the exception of some acclamations for the emperor. Byzantine chant was monodic, in free rhythm, and often attempted to depict melodically the meaning of the

words. The language was Greek. The Byzantine hymn, of which there were three types, was the greatest contribution of this culture. The *troparion*, a hymn, was inserted between the verses of the Psalms, and eventually the *troparia* overshadowed the Psalms. The origin of the *kontakion*, a hymn important in the 6th and 9th cent., is ascribed to Romanus, active during the reign of Anastasius I, it consisted of 18 or 24 strophes all in similar meter, with a contrasting introductory strophe. The subject matter was usually biblical. Often an acrostic is formed by the first letter of each stanza. The time of Romanus and of Sergius (fl. early 7th cent.) is called the golden age of Byzantine music. In the 8th cent. the outstanding hymn writers were St. John of Damascus and Cosmas of Jerusalem. The chief type of hymn was the *kanon*, a series of odes, theoretically nine but often only eight in number, referring to the nine canticles of the Old and New Testaments. Until the 9th cent., poet and composer were always one, later, hymns were set to already existing melodies. With the codification of the Greek liturgy in the 11th cent. there was a general decline in hymnody. Musical activity ceased with the fall of Constantinople (1453). Russian chant, the chant of the modern Greek Orthodox Church, and to a small extent Gregorian chant all owe something to Byzantine chant. Byzantine notation was originally only a system of *ekphonic* symbols serving to remind a singer of a melody he already knew. Neumes derived from the *ekphonic* notation were in use from c. 950 until 1200. From 1110 to 1450 a staffless notation indicating the *echos*, starting note, and subsequent intervals of a melody was in use. It is largely decipherable today. Signs were added to it in the centuries that followed, the notation used in the Greek Church today was devised in the 19th cent. by Chrysanthus, a Greek archimandrite, because of the confusion in deciphering the manuscripts of early Byzantine music. See Gustave Reese, *Music in the Middle Ages* (1940), studies of Byzantine music and hymnography by S. I. Savas (1965) and A. L. Burkhalter (1968).

Byzantine rite. see ORTHODOX EASTERN CHURCH

Byzantium (bīzăn'shēəm, -shəm, -tēəm), ancient city of Thrace, on the site of the present-day Istanbul, Turkey. Founded by Greeks from Megara in 667 B.C., it early rose to importance because of its position on the Bosphorus. In the Peloponnesian War it was captured and recaptured by the contending forces. It was taken (A.D. 196) by Roman Emperor Septimius Severus. Constantine I ordered (A.D. 330) a new city built there, this was CONSTANTINOPLE, later the capital of the Byzantine Empire. See Charles Diehl, *Byzantium: Greatness and Decline* (tr. 1957), Michael Maclagan, *The City of Constantinople* (1968).



C, third letter of the ALPHABET. In position and form, but not in meaning, it corresponds to Greek gamma (see G). In English it is pronounced variously, e.g., in *can*, *cent*, *church*, and *loch*. In MUSICAL NOTATION it symbolizes a note in the scale. In chemistry it is the symbol of the element CARBON. The capital letter is the Roman numeral for 100.

Ca, chemical symbol of the element CALCIUM.

Caaba: see KAABA.

Cabal (kabāl'), inner group of advisers to Charles II of England. Their initials form the word (which is, however, of older origin)—Clifford of Chudleigh, Ashley (Lord Shaftesbury), Buckingham (George Villiers), Arlington (Henry Bennet), and Lauderdale (John Maitland). Although they were never a working ministry, one or more of this group dominated court policy from 1667 through 1673. See study by Maurice Lee (1965).

cabala or **cabbala** (both káb'ala) [Heb., =tradition], esoteric system of interpretation of the Scriptures based upon a tradition claimed to have been handed down orally from Abraham. Despite that claimed antiquity, the system appears to have been given its earliest formulation in the 11th cent. in France, and from there spread most notably to Spain. There were undoubtedly precedents, however, cabalistic elements are discernible in Jewish Gnosticism, which has its roots in the early Christian era. Beyond the specifically Jewish notions contained within the cabala, some scholars believe that it reflects a strong Neoplatonic influence, especially in its doctrines of emanation and the transmigration of souls. In the late 15th and 16th cent., Christian thinkers found support in the cabala for their own doctrines, out of which they developed a Christian cabala. Cabalistic interpretation of Scripture was based on the belief that every word, letter, number, and even accent contained mysteries interpretable by those who knew the secret. The names for God were believed to contain miraculous power and each letter of the divine name was considered potent, cabalistic signs and writings were used as amulets and in magical practices. The two principal sources of the cabalists are the *Sefer Yezirah* (tr. *Book of Creation*, 1894) and the *Zohar* (tr. 1949). The first develops, in a series of monologues supposedly delivered by Abraham, the doctrine of the *Sefirot* (the powers emanating from God, through which the world is created and its order sustained), using the primordial numbers of the later Pythagoreans in a system of numerical interpretation. It was probably written in the 3d cent. The *Zohar* is a mystical commentary on the Pentateuch. It was written by Moses de León (13th cent.) but attributed by him to Simon ben Yohai, the great scholar of the 2d cent. Following the expulsion (1492) of the Jews from Spain, cabala became more messianic in its emphasis, as developed by the Lurianic school of mystics at Safed, Palestine. Cabala in this form was widely adopted and created fertile ground for the movement of the pseudo-Messiah SABBATAI ZEVÍ. It was also a major influence in the development of HASIDISM. Cabala still has adherents, especially among Hasidic Jews. See J. F. C. Fuller, *The Secret Wisdom of the Qabalah* (1937); J. L. Blau, *The Christian Interpretation of the Cabala in the Renaissance* (1944, repr. 1965); A. E. Waite, *The Holy Kabbalah* (1960); Gershom Scholem, *Major Trends in Jewish Mysticism* (3d ed. 1954, repr. 1965); and *On the Kabbalah and Its Symbolism* (1965); Herbert Weiner, *Nine and One Half Mystics: the Kabbalah Today* (1969).

Caballé, Montserrat (mönsérat' kabäl'yá'), 1933–, Spanish soprano. After voice study with Eugenia Kemény and Conchita Badia in Barcelona, she made her operatic debut in Basel, Switzerland, singing Mimi in Puccini's *La Bohème*. She became an overnight success with American audiences in 1965 after singing in Donizetti's *Lucrezia Borgia* at Carnegie Hall in New York City. That same year she made her debut at the Metropolitan Opera as Marguerite in Gounod's *Faust*. Her voice is noted for its purity and precise control. Caballé has sung over 40 operatic roles, including the Marchallin in Richard Strauss's *Der Rosenkavalier* and the title role in *Salomé*.

Caballero, Fernán (färnan' kabäl'yä'rö), pseud. of Cecilia Bohl de Faber (thäthē'lya bol dā fabär'), 1796–1877, Spanish novelist and folklorist. Born in Switzerland, she spent most of her adult life in Andalusia, where her novels are set. Although their tone is didactic and their plots sentimental, they successfully reflect contemporary regional life. The first, *La Gaviota* (1849, tr. *The Sea Gull*, 1864), effected the creation of the modern Spanish novel of customs. Others are *Lagrimas* [tears] (1858) and *Clemencia* (1862). Some of her folk tales were translated as *Spanish Fairy Tales* (1920). See biography by P. H. Klippe (1973).

cabbage, leafy garden vegetable of many widely dissimilar varieties, all probably descended from the wild, or sea, cabbage (*Brassica oleracea*) of the family Cruciferae (MUSTARD family), found on the coasts of Europe. It is used for food for man and stock, mostly in Europe and North America. Well-known varieties of the species include the cabbages, BROCCOLI, BRUSSELS SPROUTS, CAULIFLOWER, collards, KALE, and KOHLRABI. All grow best in cool, moist climates. They are attacked mostly by insect pests. The true cabbages (var. *capitata*) include the white and red types and the Savoy type (grown mostly in Europe), with curly, loose leaves. Inexpensive and easily stored, cabbage is important in the diet of many poorer peoples. Popular cabbage dishes include sauerkraut and slaw (raw cabbage). Chinese cabbage, or peitsai, chiefly a salad plant, is a separate species (*B. pekinensis*) grown in many varieties, especially in the Far East. Cabbages with multicolored leaves are becoming popular as ornamental border plants for flower gardens. Cabbages are classified in the division MAGNOLIOPHYTES, class Magnoliopsida, order Capparales, family Cruciferae.

cabbage looper, moth larva, *Trichoplusia ni*, that feeds by night on the leaves of cabbage and related plants and is a serious agricultural pest. Like the inchworms (of another moth family), cabbage loopers lack walking appendages in the middle of the body and progress by drawing the rear end up to the front end and then straightening. A cabbage looper has a smooth green body with a white stripe along each side and reaches a length of 1¼ in. (3.2 cm). It pupates in a cocoon on the underside of a leaf. The adult moth is brown with a white spot on each wing. Cabbage loopers are classified in the phylum ARTHROPODA, class Insecta, order Lepidoptera, family Noctuidae.

cabbala: see CABALA.

Cabbon (kăb'ôn), town, SW Palestine. Joshua 15:40.

Cabell, Branch (James Branch Cabell) (kă'bal), 1879–1958, American novelist, b. Richmond, Va., grad. William and Mary, 1898. After various experiences as a journalist and a coal miner he began writing fiction. His early works, which are sophisticated novels deriding conventional history, include *Galantry* (1907), *Chivalry* (1909), and *The River in Grandfather's Neck* (1915). Many of Cabell's most popular novels are set in the imaginary medieval kingdom of Poictesme, among these are *The Cream of the Jest* (1917), *Jurgen* (1919)—Cabell's most famous work because of its attempted suppression on charges of obscenity—and *The Silver Stallion* (1926). Cabell's novels are usually pointedly anti-realistic, and many of them can be considered moral allegories. Although he was enormously popular in the 1920s, his highly artificial prose style and subject matter lost favor with critics and public alike by the 1930s. His nonfictional writing includes *Beyond Life* (1919), *The St. Johns* (with A. J. Hanna, 1943), and *Here Let Me Lie* (1947). See studies by Joe L. Davis (1962), Desmond Tarrant (1967), Hugh Walpole (1920, repr. 1973), and L. D. Rubin (1959, repr. 1973).

Cabet, Etienne (ätyēn' kabä'), 1788–1856, French utopian socialist. He was elected to the chamber of deputies in 1831, but his bitter attacks on the government resulted in his conviction for treason. He escaped prison by exiling himself to Great Britain (1834–39), where he developed a theory of communism influenced by Robert Owen. Cabet's *Voyage en Icarie* (1840) depicted an ideal society in which

an elected government controlled all economic activity and supervised social affairs, the family remaining the only other independent unit. The book was extremely popular, and Cabet gained many followers. A group of them attempted unsuccessfully (1848) to found an Icarian community on the Red River in Texas. The next year Cabet established a temporary colony at the old Mormon town of Nauvoo, Ill., but serious dissension arose in 1856, and he was not reelected president. He died soon after in St. Louis. Most of the Icarians moved to lands they had purchased near Corning, Iowa, where branch communities survived until 1898. Other works by Cabet include *Histoire populaire de la Révolution française* (4 vol., 1839–40), *Colonie icarienne aux États-Unis d'Amérique* (1856), and *Le vrai Christianisme suivant Jésus Christ* (1846). See Albert Shaw, *Icaria: A Chapter in the History of Communism* (1884); S. A. Piotrowski, *Etienne Cabet and the Voyage en Icarie* (1935).

Cabeza de Vaca, Álar Núñez (al'var nōō'nyāth kabä'tha dā va'ka), c. 1490–c. 1557, Spanish explorer in the American Southwest. Cabeza de Vaca [cow's head] was not actually a surname but a hereditary title in his mother's family; he is frequently called simply Álar Núñez. He came to the New World as treasurer in the expedition of Panfilo de Narváez that left Spain in 1527 and reached Florida (probably Tampa Bay) in 1528. When hardship and Indian hostility caused the end of the expedition, Cabeza de Vaca was one of the survivors whose barges were shipwrecked on an island on the Texas coast. Later scholars have argued extensively over the identification of that island, but Galveston Island and Mustang Island are popular as possibilities. The story is one of the most remarkable in the annals of exploration. After much suffering as slaves of the Indians inhabiting the island, Cabeza de Vaca and three other survivors escaped and started a long journey overland. His companions were Alonso del Castillo Maldonado, Andres Dorantes, and Estevanico (an Arab or possibly a Negro). They gained great repute among the Indians as healers since remarkable cures were attributed to their Christian prayers. Their route westward is disputed as much as the island of the shipwreck, but after much wandering they did reach W. Texas, and then probably New Mexico and Arizona, and possibly (some argue) even California before, turning south in 1536, they arrived in Culiacan in Mexico and told their story to Spaniards there. They were almost certainly the first white men to see the buffalo, and their stories about the Pueblo Indians gave rise to the legend of the Seven Cities of Cibola, later magnified by Fray Marcos de Niza, and brought explorers in search of El Dorado. Cabeza de Vaca's own account, *Los naufragios* [the shipwrecked men] (1542) is the chief document of the startling adventures of his party. An English translation (1851) by Thomas Buckingham Smith was reprinted in F. W. Hodges's *Spanish Explorers in the Southwestern United States* (1907) and in I. R. Blacker and H. M. Rosen's *The Golden Conquistadores* (1960). After returning to Spain, Cabeza de Vaca was appointed governor of the Rio de la Plata region and reached Asuncion after an overland journey from the Brazilian coast in 1542. His South American career was sadly different from that in North America. He got into much trouble with the popular Domingo Martinez de Irala. After he returned from a journey up the Paraná River to Bolivia, he was arrested, accused of high-handed practices, imprisoned for two years, and sent back to Spain. There he was found guilty but was pardoned by the king. Cabeza de Vaca wrote his own account of South American events in his *Comentarios* (1555). See Morris Bishop, *The Odyssey of Cabeza de Vaca* (1933); Cleve Hallenbeck, *Álar Núñez Cabeza de Vaca: The Journal and Route of the First European to Cross the Continent of North America, 1534–1536* (1940); J. U. Terrell, *Journey into Darkness* (1942); M. W. Rodman, *Odyssey of Courage* (1947); Hamel Long, *The Marvellous Adventures of Cabeza de Vaca* (1973).

Cross references are indicated by small CAPITALS.

cabildo (kābēl'dō), autonomous municipal council, the lowest administrative unit in the Spanish government. The institution was especially influential in Spanish America, where it was set up in the early 16th cent in imitation of the Castilian *ayuntamiento*, the name it was at first briefly called. Composed originally of elected administrative officials, usually local landowners, it was the only institution in which creoles could participate. It was presided over by the *alcalde mayor*, the administrator of a provincial division, who was assisted in judicial matters by *alcaldes ordinarios* (see *ALCALDE*). The cabildo exercised considerable executive, legislative, and judicial powers, it distributed lands, imposed taxes, provided for police service, and supervised trade and public facilities such as hospitals and jails. In case of emergency the council could choose a governor, lieutenant governor, or captain general. The cabildo steadily evolved in the course of the 16th and 17th cent into an appointive, proprietary, and hereditary body of generally 4 to 12 councilors. Corruption and inefficiency became common. The degree of local autonomy at first granted by the crown was soon hedged in by the increasing centralization of power in higher authorities, such as the *AUDIENCIA* and *vicerealty*. The cabildo regained importance during the independence movement of the early 19th cent. As the only self-perpetuating organ of local self-government with an ancient tradition of civil autonomy, it served as a convenient rallying place for voicing nationalistic ideas.

Cabinda (kabīn'da), Portuguese exclave (1960 pop 58,547), c.2,800 sq mi (7,300 sq km), W Africa, administered from Angola. The town of Cabinda is the chief population center. The territory is bounded on the N by the Congo Republic, on the E and S by Zaïre, and on the W by the Atlantic Ocean. Cabinda was once geographically part of Angola but was separated from it in 1885 when the Belgian Congo (now Zaïre) acquired a corridor to the sea along the lower Congo River. Largely tropical forest, the region produces hardwoods, coffee, cacao, crude rubber, and palm oil products. Petroleum production began in 1968 and increased dramatically in the early 1970s. In late 1974, Portugal planned to grant Cabinda independence within 2 years at most, but it was not decided whether the territory would become a separate state or remain attached to Angola.

cabinet, group of advisers to the head of the state who themselves are usually the heads of the administrative government departments. The nature of the cabinet differs widely in various countries. In Great Britain, where the cabinet system originated, it was at first a committee of the privy council and rose to its modern status only after the sovereignty of PARLIAMENT had been established by the Glorious Revolution of 1688 and the gradual emergence of party government in the 18th cent. The British cabinet is a body of ministers drawn from the party that possesses a majority in the House of Commons; it is responsible to the Commons for the conduct of the administration. The cabinet is chosen by the PRIME MINISTER, who is guided by the necessity of choosing a group that will represent the disparate elements in his party. The defeat in the Commons of an important ministerial measure or a general election adverse to the government results in the fall of the cabinet. In continental European countries, where the two-party system is not the rule, the coalition cabinet is more common. Cabinet members need not be selected from the majority party nor necessarily from the legislature, and they may speak in either house of the legislature. The US cabinet was not specifically established by the Constitution, it evolved through custom and is now defined by statute law. The members of the cabinet are not members of either house of Congress and are responsible, individually and not as a body, to the President, who appoints them with the approval of the Senate and may remove them at will. The cabinet member may not speak in Congress, though he is often called before congressional committees. As an advisory body, the US cabinet is generally a weak institution and is often overshadowed by a strong President and his staff. The first cabinet appointments (1789) were the secretaries of State, the Treasury, and War. Since then the size and composition of the cabinet has varied considerably. Presently the 11 executive departments whose heads sit in the cabinet are the departments of State, the Treasury, Defense, Justice, the Interior, Agriculture, Commerce, Labor, Health, Education, and Welfare, Housing and Urban Development, and Transportation. See Richard Fenno, Jr., *The President's Cabinet* (1959); Ivor Jennings, *Cabinet Government* (3d ed 1969).

Cabira: see *SIVAS*

Cabiri: see *KABEIROI*

Cable, George Washington, 1844-1925, American author, b New Orleans. He is remembered primarily for his early sketches and novels of Creole life, which established his reputation as an important local-color writer. Cable served as a Confederate soldier in the Civil War and afterwards was a writer and reporter for the New Orleans *Picayune*. His short stories of New Orleans culture began to appear in *Scribner's Monthly* in 1873; they were collected and published as *Old Creole Days* (1879). Among his novels are *The Grandissimes* (1880), *Madame Delphine* (1881), *Dr Sevier* (1884), and *Gideon's Band* (1914). Cable's works depict the picturesque life of Creoles in antebellum Louisiana with charm and freshness. Discernable in some of them is the author's moral opposition to slavery and class distinction. After 1884, Cable lived in Northampton, Mass. His later works, notably the essays collected in *The Silent South* (1885) and *The Negro Question* (1890), reveal his concern with social evils, particularly with the betrayal of the freed Negro. See his letters, ed by L. L. Leffingwell (1928, repr 1967), biographies by Arlin Turner (1956) and L. D. Rubin (1969), study by P. C. Butcher (1959).

cable, usually wire cordage of great strength or heavy metal chain used for hauling, towing, supporting the roadway of a suspension bridge, or securing a large ship to its anchor or mooring. A cable may also be a line used for the transmission of electrical signals. One type of electric cable consists of a core protected by twisted wire strands and suitably insulated, especially when it is used to cross oceans undersea, a message transmitted thus by cable is a cablegram or cable. The insulated wire that conducts electricity from generator to consumer is also called a cable; it often contains multiple conductors and must be of sufficient gauge to carry large currents. Its insulation must withstand high voltages. France and England were first successfully connected by submarine telegraphic cable in 1845. The first permanent transatlantic cable was laid in 1866 by Cyrus West Field, although demonstrations of its possibility had been made in 1858. A coaxial cable was first installed between New York City and Philadelphia in 1935, and in 1936 the first telephone message was transmitted over it. The coaxial cable, which is virtually immune to external electromagnetic noise, consists of a tube made of copper or other conducting material through the center of which extends a wire conductor separated from the outer conductor by an insulator. A number of such conducting units are held together by a covering of insulating material. By means of the coaxial cable a large number of telegraph and telephone messages and also television images can be transmitted simultaneously.

Cabochiens (kabōshyān'), popular faction in Paris in the early 15th cent. Composed largely of small tradespeople and members of the butchers' and skimmers' guilds, it was named after one of the leaders, Simon Leoustellier, called Caboche, a skinner. Opposed to the ruinous and corrupt fiscal practices of the government and the extravagance of the court, the Cabochiens espoused the cause of JOHN THE FEARLESS of Burgundy in the civil war (1411-13) between ARMAGNACS and BURGUNDIANS. In 1413 they rebelled, violently seized the government of Paris, and promulgated the so-called *ordonnance cabochienne*, containing radical reforms. The Cabochiens were soon suppressed by the victorious Armagnacs.

Cabot, George, 1752-1823, American merchant and politician, b Salem, Mass. He went to sea and became captain of one of the ships owned by his brothers John and Andrew Cabot of Beverly, who in 1777 took him into their firm. Cabot also helped develop the family's cotton mills in Beverly. A Federalist, he was (1791-96) one of Alexander Hamilton's most trusted followers in the US Senate. Made a director of the Bank of the United States in 1793, he became president of its Boston branch in 1803. In the Federalist discontent at the beginning of the 19th cent, Cabot was a leader of the ESSEX JUNTO and presided over the HARTFORD CONVENTION. See biography by his grandson, Henry Cabot Lodge (1877).

Cabot, John, fl 1461-98, English explorer, probably b Genoa, Italy. He became a citizen of Venice in 1476 and engaged in the Eastern trade of that city. This experience, it is assumed, was the stimulus of his later explorations. Like Columbus (though there is no evidence that either influenced the other), he apparently believed that the riches of the Far East might be more easily reached by sailing west. He

went to England, probably in the 1480s, and resided chiefly at Bristol, a port then promising as a base for discovery. Under a patent granted by Henry VII (March 5, 1496), Cabot sailed from Bristol in 1497 and discovered the North American coast touching at Cape Breton Island or Newfoundland. In 1498 he again sailed for America to explore the coast. The fate of the expedition is unknown, although there is presumptive evidence that it reached America and that some of its members returned. The English claims in North America were based on his discovery. His son was Sebastian Cabot. See H. P. Biggar, *The Precursors of Jacques Cartier* (1911); J. A. Williamson, *Voyages of the Cabots* (1929); C. R. Beazley, *John and Sebastian Cabot: The Discovery of North America* (1964); Richard C. Howard, *Bristol and the Cabots* (1967).

Cabot, Sebastian, b 1483-85?, d 1557, explorer in English and Spanish service, son of John Cabot. He may well have accompanied his father on the 1497 and 1498 voyages, and he was for many years given the credit for his father's achievements. In the 19th cent, scholars, finding discrepancies in the Sebastian stories, branded him an impostor and applied his accounts to the 1498 voyage of John Cabot. However, recent research indicates that the Sebastian narratives relate to a later voyage (1509) made in search of the Northwest Passage. He may have reached Hudson Bay. In 1512 he entered Spanish service and in 1518 became chief pilot. After the return of Magellan's ship *Victoria*, he sailed (1526) from Sanlúcar de Barrameda with the ostensible purpose of loading spices in the Moluccas. Instead he explored the Rio de la Plata country, spending several years along the Paraguay, Plata, and Parana rivers, but the hostility of the Indians and the scarcity of food forced him to leave the country. He returned to Spain in 1530, a distrusted and discredited man. In 1548 he reentered English service, and in 1553 he became governor of a joint-stock company (later the MUSCOVY COMPANY) organized to seek a Northeast Passage and open trade with China. Under his instructions an expedition sailed the same year under Sir Hugh Willoughby, who was lost in midvoyage and was replaced by Richard CHANCELOR. The expedition reached the White Sea, and a commercial treaty was negotiated with Russia, breaking the monopoly of the Hanseatic League. See J. A. Williamson, *The Voyages of the Cabots* (1929); C. R. Beazley, *John and Sebastian Cabot: The Discovery of North America* (1964); Richard C. Howard, *Bristol and the Cabots* (1967); Richard Biddle, *A Memoir of Sebastian Cabot* (repr 1970).

Cabral, Pedro Alvares (pē'drōō əlvā'rash kabrāl'), c 1467-c 1520, Portuguese navigator. A friend of Vasco da Gama, in 1500 he was sent out by Manuel I as head of a fleet destined for India. Bartolomeu DIAS was one of his officers. Cabral went far west of his course and reached the coast of Brazil, which he claimed for Portugal. Proceeding onward, he reached Madagascar, Mozambique, and the Indian coast. At Calicut, trouble arose over establishing a post for trade and for converting the Muslims. He bombarded the city but had to retreat in order to save his East Indian cargo. The ships returned to Portugal with rich cargoes, but his methods of diplomacy were severely criticized. The old story was that Cabral discovered Brazil because he had been driven off his course by storms. This has been questioned, and it has been urged that even before the Spaniard Vicente Yáñez Pinzón saw the Brazilian coast (Jan., 1500), Portuguese navigators had been there and that Portugal, wishing to obtain the land, had managed to secure a revision of the pope's original demarcation of the world into Spanish and Portuguese zones of exploration. Certainly the Treaty of Tordesillas (1494) adjusted the former line and put Brazil in the Portuguese zone, but the issue is still a subject of debate. See W. B. Greenlee, comp., *The Voyage of Pedro Alvares Cabral to Brazil and India: From Contemporary Documents and Narratives* (tr 1938, repr 1972).

Cabrera, Manuel Estrada: see *ESTRADA CABRERA*

Cabrera, Ramón, conde de Morella (rāmōn' kabrá'rā kōn'dā dā mō'rā'lyā), 1806-77, Spanish Carlist general. Noted for his valor and cruelty during the first Carlist war, he refused to accept the Carlist defeat in 1839 and continued the war in Valencia and Catalonia until driven into France in 1840. After a brief reappearance (1848-49) as the leader of Carlist guerrillas in Catalonia, he returned to France and then went to England. In 1875 he recognized Alfonso XII as king.

Cabrillo, Juan Rodríguez (hwān rōdrē'gāth kabré'lyō), d 1543, Spanish conquistador and discoverer of California, b Portugal. In 1520 he landed

in Mexico with Panfilo de Narváez and joined in the conquests of Mexico and Guatemala. Accompanying Pedro de ALVARADO up the west coast of Mexico, he assumed command of the expedition and continued the voyage after Alvarado's death. He discovered San Diego Bay on Sept. 28, 1542, landing at Point Loma Head, now in Cabrillo National Monument. He then sailed on to Northwest Cape beyond San Francisco Bay, which he did not find. Returning to winter on San Miguel Island off the Santa Barbara coast, he died Jan. 3, 1543.

Cabrillo National Monument: see NATIONAL PARKS AND MONUMENTS (table)

Cabrini, Saint Frances Xavier (zā'vyər kəbrē'nē), 1850-1917, American nun, founder of the Missionary Sisters of the Sacred Heart of Jesus, b. near Lodi, Italy. Founded in Italy in 1880, her order was expressly for charitable and religious work among the very poor. She was sent by Pope Leo XIII to the United States (1889) to aid Italian immigrants arriving there. She lived mainly in New York City and Chicago, directing the establishment of hospitals, orphanages, nurseries, and schools in the United States and in Latin America. Her sanctity, highly regarded in her lifetime, became famous after her death. She was beatified by Pope Pius XI in 1938 and canonized in 1946 by Pius XII. Mother Cabrini was the first U.S. citizen to be canonized. Her principal shrine is the Mother Cabrini High School in New York City, where she is buried. Feast Dec. 22. See Pietro Di Donato, *Immigrant Saint: The Life of Mother Cabrini* (1960).

Cabul (kā'bəl), town, NW Palestine, the modern Kabul (Israel). Joshua 19:27, 1 Kings 9:13.

cacao (kā'kə, -kā'-), tropical tree (*Theobroma cacao*) of the family Sterculiaceae (STERCULIA family), native to South America, where it was first domesticated and was highly prized by the Aztec Indians. It has been extensively cultivated in the Old World since the Spanish conquest. The fruit is a pod containing a sweetish pulp in which are embedded rows of seeds, the cocoa "beans" of commerce. To obtain cocoa, the harvested pods are fermented by naturally occurring bacteria and yeasts to eliminate their bitter, astringent quality. The seeds are then cured and roasted. The clean kernels, called cocoa nibs, are manufactured into various products. Their large percentage of fat, removed by pressure, is the so-called cocoa butter used in fine soaps and cosmetics and in medicine for emollients and suppositories; the residue is ground to a powder (cocoa) and used for beverages and flavoring. CHOCOLATE is a product in which the cocoa butter has been retained. Cacao products have a high food value because of the large proportion of fat, carbohydrates, and protein. Cacao is classified in the division MAGNOLIOPHYTES, class Magnoliopsida, order Malvales, family Sterculiaceae.

Caccini, Giulio (jōō'lyō kat-chē'nē), c. 1546-1618, Italian composer and singer. Some of his songs were included in Peri's *Dafne* (c. 1597), the first known opera. Both he and Peri composed settings of Ottavio Rinuccini's *Euridice* (1600), the earliest operas of which the music is extant. *Nuove musiche* (1601), a collection of his madrigals and arias, is the most important collection among the early examples of monodic style.

Cáceres, Andrés Avelino (andrās' avālē'nō ká'sārās), 1836?-1923, president of Peru (1886-90, 1894). He was a commander in the war with Chile (see PACIFIC WAR OF THE) and continued to wage guerrilla warfare long after Peru had been conquered. Bitterly opposed to the peace made by the government of Miguel Iglesias, Cáceres attempted to seize control in 1884, but failed. Gathering more troops, he entered Lima in 1885 and forced Iglesias to hold an election. Cáceres was chosen president. In 1894 his party forced congress to elect him president, but Nicolás de PIÉROLA soon overthrew the new government. Cáceres later held important diplomatic posts.

Caceres (ka'thārās), city (1970 pop. 56,064), capital of Cáceres prov., W central Spain, in Estremadura. Products of cork, leather, pottery, and cloth are made there. Cáceres was an important Roman colony. It fell to the Moors in the 8th cent. but was recaptured (1229) by Alfonso IX. The old town, on top of a hill and encircled by turreted walls, has many notable structures.

cachalot. see SPERM WHALE

Cachin, Marcel (marsēl' kashān'), 1869-1958, French Communist leader. An early leader of the Socialist party, he was instrumental in bringing many Socialists into the first French Communist party in 1920. Long the leader of the Communists in the

chamber of deputies and editor of the Communist daily *Humanité*, he became the first Communist senator in 1935. He was expelled from his seat after the German-Soviet nonaggression pact in Aug., 1939, and was subsequently arrested. In 1945 he was elected to the national assembly, where he sat until his death.

cacomistle (kāk'əmīs'əl), small New World mammal, genus *Bassariscus*, related to the RACCOON. There are two species, one found in Mexico and the SW United States, the other in Central America. The North American cacomistle, *B. astutus*, also known as ringtail, ring-tailed cat, and coon cat, ranges north to N Colorado and S Oregon and west to E Texas. Its body is slender and squirrellike, its face pointed and foxlike. The head and body are about 15 in. (38 cm) long, the bushy tail is of equal length. The body fur is yellowish gray, the tail ringed with dark brown and white. The face is marked with dark brown and white, but there is no mask like that of the raccoon. Swift, agile, and able climbers, cacomistles prefer regions with trees, but they live in a variety of habitats. They are nocturnally active and are seldom seen. They are usually found in pairs and make dens in hollow trees, caves, rock crevices, or abandoned buildings. Cacomistles feed primarily on small animals but also eat some vegetable matter. They are classified in the phylum CHORDATA, subphylum Vertebrata, class Mammalia, order Carnivora, family Procyonidae.

cactus, any plant of the family Cactaceae, a large group of succulents found almost entirely in the New World. A cactus plant is conspicuous for its fleshy green stem, which performs the functions of leaves (commonly insignificant or absent), and for the spines (not always present) of various colors, shapes, and arrangements. Cactus flowers are notably delicate in appearance although usually large and showy, they are commonly yellow, white, or shades of red and purple. Cactus fruits are berries and the larger ones are sometimes edible. Cacti are sometimes used as a substitute for wood, as stock feed, and for hedges. The plants vary from small round globes to epiphytes, vines, and large treelike forms. The reduced leaf surface, the enlarged fleshy stem, which is well fitted to store water and to retain it, and the ramified and extensive root system (much reduced in cultivated cacti) make the plant particularly adapted to regions of high temperature and long dry periods. Cacti are not restricted to desert regions, however, for in America they range from the tropics into Canada. A cactus plant appears on the coat of arms of Mexico, and the blossom of the giant cactus, or saguaro (*Cereus giganteus*), is the state flower of Arizona. Most cacti bloom in the spring for a very short period, sometimes for only a few hours. The blossoms are noticeably sensitive to light, and often different species blossom only at specific times of the day. One of the most famous of the cacti is the night-blooming cereus usually classified as *Selenicereus* or *C. grandiflora* (several other night-blooming cactus species bear the same common name). Its fragrant blossoms unfold at a visible rate after sunset and last only a single night. In many of its native habitats the flowering of this cactus is celebrated with festivals. The largest cactus genus is *Opuntia*, jointed-stemmed species recognizable by the fleshy stems made up of either cylindrical (in the cane cacti and the chollas) or flattened (in the prickly pears) joints called pads. The large pear-shaped berries of several of these species are edible, e.g., the cultivated varieties of the Indian fig and the tuna. This fruit is common in Mexican markets, the plants have been widely naturalized in the Mediterranean countries, Australia, and elsewhere as a source of food. Most *Opuntias* grow so rapidly to a large and ungainly size that they are unsuitable for cultivation as ornamentals, and in the wild often become weeds. However, the major economic importance of the cactus family is in the florists' trade. Among those cultivated for their showy blossoms are the Christmas cactus (*Zygocactus*) and species of *Echinocereus* and of *Epiphyllum*, the orchid cactus. The pincushion cacti (*Mammillaria*), the golden ball cactus (*Echinocactus*), and the hedgehog cactus (*Echinopsis*) are among the many grown as oddities for their curious appearance. The nopal (*Nopalea coccinellifera*) is the cactus traditionally cultivated as a host for the COCHINEAL insect. The hallucinatory drug PEYOTE comes from a cactus of the same aboriginal name. Cactus is classified in the division MAGNOLIOPHYTES, class Magnoliopsida, order Caryophyllales, family Cactaceae.

Cadalso Vazquez, Jose de (hōsā' dā káthal'sō vath'kāth), 1741-82, Spanish poet, critic, and satirist. Cadalso Vazquez's rhapsodic prose autobiography,

Noches lugubres (1798), probably suggested by Edward Young's *Night Thoughts*, heralded the Spanish romantic movement. However, he is best known for *Los eruditos a la violeta* (1772), a satire on contemporary pedantry, and *Cartas marruecas* [Moroccan letters] (1793), an analysis of Spanish social decadence.

Cadamosto, Luigi da (lōōē'jē da kadamō'stō), 1432?-1488, Venetian navigator in the service of Prince Henry the Navigator of Portugal. He seems to have entered Portuguese service in 1454, and he left a record of a voyage in 1455 that is valuable for the information it gives concerning Portuguese activity in the Canary Islands. He and a Genoese, Antonio de Nola, also in Prince Henry's service, went down the African coast to the Gambia River. In 1456 or 1457, Cadamosto reached the Cape Verde Islands, but the question of discovery of the islands is not settled. They may have been sighted by the Portuguese years before, they may have been discovered just a year before, they may have been first visited by Cadamosto. His name also appears as Alvise da Cadamosto.

cadaverine* see DECAY OF ORGANIC MATTER

Cadbury, Dame Elizabeth, 1858-1935, English social worker and philanthropist, b. Elizabeth Mary Taylor, studied in France and Germany, wife of George Cadbury. She became interested in social service and was active in many organizations working for improvement in education, housing, and peace. She was a member of the Birmingham Education Committee after 1911 and of the International Council of Women and was city councilor of Birmingham (1919-25), president (1925) of the National Council of Evangelical Free Churches, and a justice of the peace (1926). In 1934 she was made Dame Commander of the British Empire.

Cadbury, George, 1839-1922, English manufacturer and social reformer, husband of Elizabeth Mary Cadbury. In 1861, Cadbury and his brother Richard assumed control of their father's Birmingham cocoa and chocolate factory. Interested in housing problems, the brothers moved (1880) the plant to Bournville and laid out a garden village. The successful venture influenced European model housing and GARDEN CITY projects. Agitation for national old-age pensions and insurance was financed by Cadbury, who also worked to eliminate harsh labor conditions. See biography by A. G. Gardiner (1923).

caddis fly, any of various insects of the order Trichoptera, with four hairy wings usually held back rooflike over the abdomen, long antennae, and chewing mouthparts. The aquatic larvae, or caddis worms, which somewhat resemble caterpillars, are food for many freshwater fishes; they are called creepers when used as bait. The larvae build and inhabit underwater cases or nets made from a silken threadlike material they produce, or from materials such as twigs, sand, and leaves. Most larvae feed on plants and debris caught in the cases, among the net-building species some are predacious. Many seal their cases, and spin cocoons and pupate within. Caddis flies are classified in the phylum ARTHROPODA, class Insecta, order Trichoptera.

Caddo (kā'dō), North American Indians whose language belongs to the Caddoan branch of the Hoka-Siouan linguistic stock (see AMERICAN INDIAN LANGUAGES). These people gave their name not only to the linguistic branch but also to the Caddo confederacy, a loose federation of tribes that in prehistoric times occupied lands from the Red River valley in Louisiana to the Brazos River valley in Texas and N into Arkansas and Kansas. Members, besides the Caddo, included the Arikara, the Pawnee, the Wichita, and others. The culture of these loosely knit peoples was similar. Generally they were sedentary, living in villages of conical huts, although they did raise horses. The culture of the Caddo proper was marked by a clearly defined system of social stratification and by a religion that closely regulated daily life. Some 1,000 now reside on a reservation in Oklahoma. See J. T. Hughes, *Prehistory of the Caddoan-Speaking Tribes* (1968).

Cade, Jack, d. 1450, English rebel. Of his life very little is known. He may have been of Irish birth, some of his followers called him John Mortimer and claimed he was a cousin of Richard, duke of York. In 1450 he appeared as the leader of a well-organized uprising in the S of England, principally in Kent, usually known as Jack Cade's Rebellion. The protests were mainly political, not social, although the 14th cent. Statute of Labourers (which attempted to freeze wages and prices) was among the grievances. Others were the loss of royal lands in France, the extravagance of the court, the corrup-

tion of the royal favorites, and the breakdown of the administration of justice. The rebels defeated the royal army at Sevenoaks, entered London, executed Lord Saye and Sele (who was blamed for the losses in France), and sacked several houses. The government then offered pardon to Cade's men and so dispersed them. Cade himself was mortally wounded while resisting arrest. See E. N. Simons, *Lord of London* (1963).

cadence, in music, the ending of a phrase or composition. In singing the voice may be raised or may be lowered, or the singer may execute elaborate variations within the key. In instrumental music, with development of the theory of harmony, the cadence was made completely dependent on the change of chord. If the dominant chord comes before the tonic, the cadence is authentic, if the subdominant chord comes before the tonic, the cadence is plagal. If the dominant chord leads into another harmony, the cadence is called deceptive. The reverse order of tonic to dominant is a half cadence. See Walter Piston, *Harmony* (3d ed. 1962).

Cadillac, Antoine de la Mothe (Fr. *aNtwan' də la mot kadéyak'*), c. 1658–1730, French colonial governor in North America, founder of Detroit. Of the minor Gascon nobility, he came to America in 1683 to seek his fortune and lived for a time at Port Royal (now Annapolis Royal, N.S.) and then on a grant of land in present-day Maine. He became a favorite of Frontenac, the governor of New France, and in 1694 he was placed in charge of the frontier post at Mackinac. In 1699, Cadillac went to France to urge establishment of a post on the Detroit River, which he believed would offer a better strategic position against the English than Mackinac. Receiving a grant of land, trade privileges, and command of the new post, he set out with a band of colonists. Detroit was founded in 1701. Cadillac persuaded many of the Indian tribes to settle near the new colony. In 1711 he was appointed to the governorship of the vast territory of Louisiana. He reached his new post in 1713 to begin an administration that was remarkable only for the frequency and fierceness of internal quarrels. He was recalled in 1716 and spent his last years in Gascony. See biography by A. C. Laut (1931).

Cádiz (ka'déth), city (1970 pop. 135,743), capital of Cádiz prov., SW Spain, in Andalusia, on the Bay of Cádiz. Picturesquely situated on a promontory (joined to the Isla de León, just off the mainland), it is today chiefly a port exporting wines and other agricultural items and importing coal, iron, and foodstuffs. Shipbuilding and fishing are other industries. There is a Spanish naval base in Cádiz and a U.S. naval base at nearby Rota. The Phoenicians founded (c. 1100 B.C.) on the site the port of Gadir, which became a market for tin and the silver of Tarsish. It was taken (c. 500 B.C.) by the Carthaginians and passed late in the 3d cent. B.C. to the Romans, who called it Gades. It flourished until the fall of Rome, but suffered from the barbarian invasions and declined further under the Moors. After its reconquest (1262) by Alfonso X of Castile, its fortifications were rebuilt. The discovery of America revived its prosperity, as many ships from America unloaded their cargoes there. Columbus sailed from Cádiz on his second voyage (1495). In 1587, Sir Francis Drake burned a Spanish fleet in its harbor, and in 1596 the earl of Essex attacked and partly destroyed the city. But it continued to flourish and in 1718, after Seville's port had become partially blocked by a sandbar, Cádiz became the official center for New World trade. After Spain lost its American colonies, the city declined. During the siege by the French—which Cádiz resisted for two years (1810–12) until relieved by Wellington—the Cortes assembled in the city and issued the famous liberal constitution for Spain (March, 1812). The clean, white city has palm-lined promenades and parks. Its 13th-century cathedral, originally Gothic, was rebuilt in Renaissance style; the new cathedral was begun in 1722. Cádiz has several museums and an art gallery with works by Murillo, Alonso Cano, and Zurbarán. In the church of the former Capuchin convent hangs the *Marriage of St. Catherine* by Murillo, who was at work on this painting when he fell from a scaffold to his death. Manuel de Falla is buried in Cádiz.

Cadman, Charles Wakefield, 1881–1946, American composer, b. Johnstown, Pa. Although he is known to the public principally for two songs—*From the Land of the Sky-blue Water*, based on an Indian theme, and *At Dawning*—he composed operas, such as *Shanewis* (1918), *The Sunset Trail* (1925), and, the most successful of these, *A Witch of Salem* (1926). He also wrote orchestral music, including

Hollywood Suite (1932) and *Dark Dancers of the Mardi Gras* (1933), and piano music.

cadmium (kād'mēam) [from *cadmia*, Lat. for calamine, with which cadmium is found associated], metallic chemical element, symbol Cd, at no. 48, at wt. 112.4, m.p. 321°C, b.p. 765°C, sp. gr. 8.65 at 20°C, valence +2. Cadmium is a lustrous, silver-white, ductile, very malleable metal. It belongs to group IIB of the PERIODIC TABLE, and resembles ZINC in its chemical properties. Like zinc, it tarnishes in moist air. Cadmium oxide, a brown powder formed by burning the metal in air, is used in electroplating; it is also made by heating cadmium hydroxide. Cadmium forms a carbonate, a chloride, and several complex ions. Cadmium yellow (the sulfide) is a very durable yellow pigment used in paints. The major use of cadmium is as a coating that is electroplated on iron and steel to prevent corrosion; it is preferable to zinc for protection from alkalies. Cadmium is also used in so-called fusible metals, which are low-melting alloys such as Wood's metal, used in automatic fire sprinklers and alarm systems. Cadmium is used in alkaline nickel-cadmium electric storage cells, which have a greater storage capacity than an equal weight of lead-acid storage cells. It has also found some use in the control of nuclear reactions, since it absorbs neutrons. Cadmium does not occur uncombined in nature; greenochite, a cadmium sulfide mineral found near Greenoch, Scotland, is the only commercial ore. Cadmium is obtained principally as a by-product of the smelting and refining of ores of zinc, especially zinc sulfides, and of lead and copper. The element was discovered in 1817 by Friedrich Stromeyer.

Cadmus, in Greek legend, son of Agenor and founder of Thebes. Misfortune followed his family because he killed the sacred dragon that guarded the spring of Ares. Athena told him to sow the dragon's teeth, and from these sprang the Sparti (sown men), ancestors of the noble families of Thebes. Cadmus married Harmonia, daughter of Ares and Aphrodite. At their wedding he presented her with a sacred robe and necklace, made by Hephaestus, which later brought misfortune to their possessors (see AMPHIARAUS, ALCAEON). They had four daughters—Ino, Semele, Autonoe, and Agave. In their old age Cadmus and Harmonia were turned into serpents by Zeus and sent to live in the Elysian fields.

Cadogan, William Cadogan, 1st Earl (kadū'gan), 1675–1726, British general and diplomat. He is remembered chiefly as the faithful friend and brilliant subordinate of the 1st duke of MARLBOROUGH. In addition to serving (1702–11) as the latter's quartermaster general, he was the able commander of a dragoon regiment known as Cadogan's Horse and played a distinguished part in Marlborough's many victories in the War of the Spanish Succession. When the duke fell from power in 1711, Cadogan went into exile in the Netherlands. He conducted dealings with Hanover for the English Whigs, and after the Hanoverian George I ascended (1714) the British throne, he received new commands and honors. Cadogan helped to suppress the Jacobite uprising of 1715, was created earl in 1718, and was made commander in chief of the army after Marlborough's death in 1722. He also had high diplomatic duties in the settlements among Great Britain, France, the Netherlands, the Holy Roman Empire, and Spain in the years 1714–20.

Cadorna, Luigi (lōō'jē kadōr'na), 1850–1928, Italian field marshal. His father, Raffaele Cadorna, was a general in the wars of the Risorgimento and took Rome in 1870. Luigi Cadorna, a count, became the head of the army general staff and reorganized the Italian army before World War I. Until the Italian defeat at Caporetto in 1917 he was in fact commander of military operations, while King Victor Emmanuel III was nominally commander in chief. Cadorna wrote two military works on World War I and a biography of his father.

Cadoudal, Georges (zhōrzh kadōdāl'), 1771–1804, French royalist conspirator. A commander of the CHOUANS, he led the counterrevolutionists in the VENÉE. He fled to England in 1801 after the failure of an attempted assassination of Napoleon Bonaparte. In 1803 he returned as the leader of another conspiracy against Napoleon. Generals Charles PICHÉGRU and Jean Victor MOREAU were implicated in the plot. Insurrections were planned in Paris and in the provinces, but the conspiracy was uncovered by Joseph FOUCHÉ, the minister of police. Cadoudal was executed, and the duc d'ENGHIEN, unjustifiably linked with the plot, was kidnapped and summarily shot. The conspiracy, exaggerated in report, was used as a pretext to transform the Consulate into Napoleon's empire.

caduceus (kadyō'sēas), wing-topped staff, with two snakes winding about it, carried by Hermes, given to him (according to one legend) by Apollo. The symbol of two intertwined snakes appeared early in Babylonia and is related to other serpent symbols of fertility, wisdom, healing, and of sun gods. This staff of Hermes was carried by Greek heralds and ambassadors and became a Roman symbol for truce, neutrality, and noncombatant status. By regulation, it has since 1902 been the insignia of the medical branch of the U.S. army. The caduceus is much used as a symbol of commerce, postal service, and ambassadorial positions and since the 16th cent. has largely replaced the one-snake symbol of Asclepius as a symbol of medicine.

Cadwaladr or Cadwallader (both kādwal'adār), d. 664?, semilegendary Welsh king, leader of the Celtic resistance against the Anglo-Saxons. Later bards made him a national hero, and Welsh tradition deems him the last Welsh king to wear the crown of Britain.

caecilian (sēs'il'ēan), any of the legless, tailless tropical amphibians of the family Caeciliidae. Most adult caecilians resemble earthworms superficially but have vertebrate characteristics such as jaws and teeth. They range in size from 7 in. to 4.5 ft (18 cm–140 cm), most are about 1 ft (30 cm) long. Their bodies are ringed with grooves, which in some species contain small scales imbedded in the skin, possession of scales is a primitive amphibian trait. There is a groove on either side of the head, each containing a retractable sensory tentacle. The eyes of caecilians are nearly functionless, and some species are eyeless. Caecilians are found in swampy places in most tropical parts of the world, but are seldom seen because of their burrowing behavior. They eat small invertebrates such as termites and earthworms. A few species remain aquatic as adults and resemble eels. There are about 50 species of caecilians, divided into 16 genera. They are classified in the phylum CHORDATA, subphylum Vertebrata, class Amphibia, order Gymnophiona (or Apoda), family Caeciliidae.

Cædmon (kād'man), fl. 670, English poet. He was reputed by Bede to be the author of early English versions of various Old Testament stories. According to Bede, Cædmon was an ignorant herdsman who received his poetic powers through a vision. During his later years he became a lay brother in the abbey of Whitby. In 1655, Franciscus Junius, a Dutch scholar, published the text of several Old English poems, including "Exodus" and "Daniel," and ascribed them to Cædmon; modern scholars dispute this conclusion. See E. V. K. Dobbie, *Cædmon's Hymn and Bede's Death Song* (1937), study by S. H. Curteen (1896, repr. 1969).

Cælian, hill. See *Rome before Augustus* under ROME.

Caen (kaN), city (1968 pop. 114,398), capital of Calvados dept., N France, in Normandy, on the Orne River. It is a busy port, canalized (by Napoleon I) directly to the sea. The commercial center of the rich CALVADOS region, it is highly industrialized, with a thermal power station and extensive steel works along the Orne; the nearby iron-ore mines are the second largest in France. The city's manufactures include automobiles, heavy equipment, electronic gear, and textiles (especially lace). Caen's importance dates from the 11th cent., when it was a favorite residence of William I of England (William the Conqueror). During the French Revolution it was a rallying place for the federalists; Charlotte Corday lived there. The town, an architectural gem, was largely destroyed in the fighting which raged there during the NORMANDY CAMPAIGN of World War II, the 14th-century Church of St. Peter's lost its famous spire, while the castle of William the Conqueror and the town hall (17th cent.) were destroyed beyond repair. However, three outstanding examples of 11th-century NORMAN ARCHITECTURE were preserved: the Abbaye aux Hommes [men's abbey], founded by William the Conqueror, who is buried there, the Abbaye aux Dames [women's abbey], founded by Queen Matilda, and the Church of St. Nicholas. The university (founded 1432 and also destroyed) has been rebuilt; in 1964 its technical institute became the National School of Advanced Electronics and Electromechanic Studies. A school of hydrography is also in Caen.

Caere (sērē), ancient city of Etruria, c. 30 mi. (50 km) N of Rome, Italy, at the site of the modern Cervetri. Although a few miles from the sea, it had ports at Alsum (near modern Palo) and Pyrgi (modern Santa Severa). During the 7th and 6th cent. B.C., Caere reached the period of its greatest prosperity. In recent times the cemeteries have been excavated, and

the monumental tumuli have yielded vases, pottery, and other art objects, revealing much about ETRUSCAN CIVILIZATION

Caerleon (karl'ē'an), urban district (1971 pop 6,235), Monmouthshire, SE Wales, on the Usk River. Militarily important during the Roman period, Caerleon has extensive remains of Isca, a Roman fortress, including an amphitheater, soldiers' quarters, walls, and baths. Stones, bronzes, pottery, and coins are exhibited in the Legionary Museum. Caerleon is also famous for its connection with Arthurian legend; it is often identified with CAMELOT. In 1974, Caerleon became part of the new nonmetropolitan county of Gwent.

Caernarvon (karnar'vən, kar-), municipal borough (1971 pop 9,253), county town of Caernarvonshire, NW Wales, on Menai Strait. Petroleum is imported and slate exported. Tourism is important. The castle, begun by Edward I c 1284, is a fine example of a medieval fortress. The Prince of Wales is invested at Caernarvon. In 1974, the borough became part of the new nonmetropolitan county of Gwynedd.

Caernarvonshire, county (1971 pop 122,852), NW Wales. The county town is Caernarvon. The region is largely mountainous except for the Llyn peninsula, which forms the northern boundary of Cardigan Bay, and a coastal section along Menai Strait in the northwest. Snowdon (3,560 ft/1,085 m) is the highest mountain in England and Wales. The Conway, chief river of the county, flows along Caernarvonshire's eastern boundary, separating it from Denbighshire. Sheep and cattle are raised, and slate quarrying and tourism are significant. There is an aluminum plant at Dolgarrog. Historical remains include evidence of considerable Roman settlement. In 1974, Caernarvonshire became part of the new nonmetropolitan county of Gwynedd.

Caerphilly (karfīl'ē), urban district (1971 pop 40,689), Mid Glamorgan, S Wales. In a coal area, it is also a market center and is noted for its cheese. Its 13th-century castle is the largest in Wales.

Caesalpinus, Andreas (än'drēas sēsālpī'nās), Latinized from **Andrea Cesalpino** (andrē'a chāzālpē'nō), 1519-1603, Italian botanist and physiologist. He was physician to Pope Clement VIII. He described, in part and as a theory only, the circulation of blood. His chief work, *De plantis* (1583), contains the first classification of plants according to their fruits, based on a comparative study of his large collection. Linnaeus considered him the first true systematist.

Caesar (sē'zār), ancient Roman patrician family of the Julian gens. There are separate articles on its two most distinguished members, Julius Caesar and Augustus. Another distinguished member of the family was Lucius Julius Caesar, d. 87 B.C., consul (90 B.C.). He proposed a law extending Roman citizenship to Roman allies that had not joined in the Social War against Rome (90 B.C.). He was killed in the beginning of the civil war by partisans of Marius. His brother Caius Julius Caesar Strabo Vopiscus, d. 87 B.C., is mentioned as an orator in Cicero's *De oratore*. He was killed with his brother. His name also appears as Vopiscus. The son of Lucius Julius Caesar, also named Lucius Julius Caesar, d. after 43 B.C., was one of Julius Caesar's legates in Gaul (52 B.C.). He accompanied the dictator into Italy during the civil war. After the assassination of Julius Caesar he was allied with Marc ANTONY, whose mother, Julia, was his sister. In 43 B.C. he and Antony fell out, and only the pleas of Julia to her son saved her brother in the proscription. When Octavius (later AUGUSTUS) was adopted (44 B.C.) into the Julian gens, he took the name Caesar. His successors as emperors took the name Caesar until HADRIAN, who kept the title Augustus for the emperor and allowed the heir apparent to be called Caesar. This became the custom afterward. The imperial use of the name Caesar was perpetuated in the German *kaizer* and the Russian *czar*.

Caesar, Julius (Caius Julius Caesar), 102? B.C.-44 B.C., Roman statesman and general. Although he was born into the Julian gens, one of the oldest patrician families in Rome, Caesar was always a member of the democratic or popular party, probably as a result of the example and patronage of his uncle by marriage, Caius Marius. In 87 B.C., Marius appointed him flamen Dialis (priest of Jove). Caesar made the most of their relationship, strengthening its political implications when he married (83 B.C.) Cornelia, the wealthy daughter of Lucius Cornelius CINNA, colleague of Marius and enemy of SULLA. In 82 B.C., Sulla ordered Caesar to divorce Cornelia. When he refused, he was proscribed, his property was confiscated, Cornelia's dowry was taken, and he was shorn of his priesthood. He fled from Rome (81

B.C.) and went to Asia to serve in the army. On Sulla's death, Caesar returned (78 B.C.) to Rome and began his political career as a member of the popular party. One of his first acts was to prosecute Cneius Cornelius Dolabella, a senatorial governor, for extortion in Macedonia. The case was unsuccessful, but it gained Caesar popularity with his party and repute for oratory. In 74 B.C. he went into Asia to repulse a Cappadocian army. After his return his role was that of the rising young statesman, agitating for the reform of the government on popular lines and helping to advance the position of POMPEY, who had become virtual head of the popular party. Caesar was made military tribune before 70 B.C. As quaestor in farther Spain in 69 B.C. he helped Pompey to obtain the supreme command for the war in the East. He returned to Rome in 68 B.C. and continued to support the enactment of popular measures and to prosecute senatorial extortionists. In Pompey's absence he was becoming the recognized head of the popular party. At the funerals of his wife, Cornelia, and his aunt (68 B.C.), he extolled Marius, the Julian gens, and Cinna. In 65 B.C. or 64 B.C., when he was curule aedile (superintendent of public works), Caesar had the trophies and statue of Marius set up secretly one night in the Capitol. These two incidents made him popular with the people but earned him the hatred of the senate. In 63 B.C. he was elected pontifex maximus, allegedly by heavy bribes. He then undertook the reform of the CALENDAR with the help of Sosigenes. The result was one of his greatest contributions to history, the Julian calendar. In Dec., 63 B.C., Caesar advocated mercy for CATILINE and the conspirators and thus increased the enmity of the senatorial party and its leaders, CATO THE YOUNGER and Quintus Lutatius Catulus (see CATULUS, family). In 62 B.C., CLAUDIUS and Caesar's second wife, Pompeia, were involved in a scandal concerning the violation of the secret rites of Bona Dea, and Caesar obtained a divorce, saying, "Caesar's wife must be above suspicion." Having served in farther Spain as proconsul in 61 B.C., he returned to Rome in 60 B.C., ambitious for the consulate. Against senatorial opposition he achieved a brilliant stroke—he organized a coalition, known as the First Triumvirate, made up of Pompey, commander in chief of the army, Marcus Licinius Crassus, the wealthiest man in Rome (see CRASSUS, family), and Caesar himself. Pompey and Crassus were jealous of each other, but Caesar by force of personality kept the arrangement going. In 59 B.C. he married CALPURNIA. In the same year, as consul, he secured the passage of an agrarian law providing Campanian lands for 20,000 poor citizens and veterans, in spite of the opposition of his senatorial colleague, Marcus Calpurnius BIBULUS. Caesar also won the support of the wealthy equites by getting a reduction for them in their tax contracts in Asia. This made him the guiding power in a coalition between people and plutocrats. He was assigned the rule of Cisalpine and Transalpine Gaul and Illyricum with four legions for five years (58 B.C.-54 B.C.). The differences between Pompey and Crassus grew, and Caesar again moved (56 B.C.) to patch up matters, arriving at an agreement that both Pompey and Crassus should be consuls in 55 B.C. and that their proconsular provinces should be Spain and Syria respectively. From this arrangement he drew an extension of his command in Gaul to 49 B.C. In the years 58 B.C. to 49 B.C. he firmly established his reputation in the GALIC WARS. In 55 B.C., Caesar made explorations into Britain, and in 54 B.C. he defeated the Britons, led by Cassivellaunus. Caesar met his most serious opposition in Gaul from VERGINGETORIX, whom he defeated in Alesia in 52 B.C. By the end of the wars Caesar had reduced all Gaul to Roman control. These campaigns proved him one of the greatest commanders of all time. In them he revealed his consummate military genius, characterized by quick, sure judgment and indomitable energy. The campaigns also developed the personal devotion of the legions to Caesar. His personal interest in the men (he is reputed to have known them all by name) and his willingness to undergo every hardship made him the idol of the army—a significant element in his later career. In 54 B.C. occurred the death of Caesar's daughter Julia, Pompey's wife since 59 B.C. She had been the principal personal tie between the two men. During the years that Caesar was in Gaul, Pompey had been gradually leaning more and more toward the senatorial party. The tribunate of Clodius (58 B.C.) had aggravated conditions in Rome, and Caesar's military successes could hardly have failed to arouse Pompey's jealousy. Crassus' death (53 B.C.) in Parthia ended the First Triumvirate and set Pompey and

Caesar face to face. The senate began to support Pompey, and in 52 B.C. he was made sole consul. Meanwhile, Caesar had become a military hero as well as a champion of the people. The senate feared him and wanted him to give up his army, knowing that he hoped to be consul when his term in Gaul expired. In Dec., 50 B.C., Caesar, who was in quarters in Ravenna, wrote the senate that he would give up his army if Pompey would give up his. The senate heard the letter with fury and, at the insistence of Quintus Caecilius Metellus Pius Scipio (see SCIPIO, family), demanded that Caesar disband his army at once or be declared an enemy of the people—an illegal bill, for Caesar was entitled to keep his army until his term was up. Two tribunes faithful to Caesar, Marc ANTONY and CASSIUS (Quintus Cassius Longinus), vetoed the bill and were quickly expelled from the senate. They fled to Caesar, who assembled his army and asked for the support of the soldiers against the senate. The army called for action, and on Jan. 19, 49 B.C., Caesar with the words "lacta alea est" [the die is cast] crossed the Rubicon, the stream bounding his province, to enter Italy. Civil war had begun. His march to Rome was a triumphal progress. The senate fled to Capua. Caesar proceeded to Brundisium, where he besieged Pompey until Pompey fled (March, 49 B.C.) with his fleet to Greece. Caesar set out at once for Spain, which Pompey's legates were holding, and pacified that province. Returning to Rome, Caesar held the dictatorship for 11 days in early December, long enough to get himself elected consul, and then set out for Greece in pursuit of Pompey. Caesar collected at Brundisium a small army and fleet—so small, in fact, that Bibulus, waiting with a much larger fleet to prevent his crossing to Epirus, did not yet bother to watch him—and slipped across the strait. He met Pompey at Dyrrhachium but was forced to fall back and begin a long retreat southward, with Pompey in pursuit. Near PHARSALA, Caesar camped in a very strategic location. Pompey, who had a far larger army, attacked Caesar but was routed (48 B.C.) and fled to Egypt, where he was killed. Caesar, having pursued Pompey to Egypt, remained there for some time, living with CLEOPATRA, taking her part against her brother and husband Ptolemy XII, and establishing her firmly on the throne. From Egypt he went to Syria and Pontus, where he defeated (47 B.C.) Pharnaces II with such ease that he reported his victory in the words "Veni, vidi, vici" [I came, I saw, I conquered]. In the same year he personally put down a mutiny of his army and then set out for Africa, where the followers of Pompey had fled, to end their opposition led by Cato. On his return to Rome, where he was now tribune of the people and dictator, he had four great triumphs and pardoned all his enemies. He set about reforming the living conditions of the people by passing agrarian laws and by improving housing accommodations. He also drew up the elaborate plans (which Augustus later used) for consolidating the empire and establishing it securely. In the winter of 46 B.C.-45 B.C. he was in Spain putting down the last of the senatorial party under Caius Pompeius, the son of Pompey. He returned to Rome in Sept., 45 B.C., and was elected to his fifth consulship in 44 B.C. In the same year he became dictator for life and set about planning a campaign against Parthia, the only real menace to Rome's borders. His dictatorial powers had, however, aroused great resentment, and he was bitterly criticized by his enemies, who accused him of all manner of vices. When a conspiracy was formed against him, however, it was made up of his friends and proteges, among them Cimber, Casca, Cassius, and Marcus Junius BRUTUS. On March 15 (the Ides of March), 44 B.C., he was stabbed to death in the senate house. His will left everything to his 18-year-old grandnephew Octavian (later AUGUSTUS). It is curious that Caesar probably knew of the conspiracy but made no attempt to defend himself. Caesar made the Roman Empire possible by uniting the state after a century of disorder, by establishing an autocracy in place of the oligarchy, and by pacifying Italy and the provinces. It should be noted that he had destroyed an oligarchy, not a democracy, to establish his dictatorship. His success in his dealings with other persons is a testimony to his social grace, and even Cicero (who hated him) said that he would rather spend an evening in conversation with Caesar than in any other way. Caesar has always been one of the most controversial characters of history. His admirers have seen in him the defender of the rights of the people against an oligarchy. His detractors have seen him as an ambitious demagogue, who forced his way to dictatorial power and destroyed the republic. That he was gifted and versatile there can be little doubt.

He excelled in war, in statesmanship, and in oratory. His literary works are highly esteemed. Of them his commentaries on the Gallic Wars (seven books) and on the civil war (three books) survive. They are masterpieces of clear, beautiful, concise Latin, and they are among the most reliable histories of antiquity as well as being classic military documents. Caesar wrote poetry, but the only surviving piece is a poem on Terence. A literary classic on Caesar is Shakespeare's tragedy *Julius Caesar*. Plutarch is the most famous ancient source. See biographies by Guglielmo Ferrero (tr 1933, repr 1962), A. L. Duggan (new ed 1966), J. P. V. D. Balsdon (1967), and Michael Grant (1969). T. R. Holmes, *The Roman Republic* (3 vol., 1923, repr 1967), L. R. Taylor, *Party Politics in the Age of Caesar* (1949, repr 1961).

Caesar, Lucius Julius: see under CAESAR, family

Caesarea: see CHERCHEL

Caesarea Libani, ancient city of Lebanon. see AR-RATE

Caesarea Mazaca (mā'zakā), ancient city of Asia Minor, also called Caesarea of Cappadocia. As Mazaca it was the residence of the Cappadocian kings. The city was renamed (c 10 B C) Caesarea by Archelaus, king of Cappadocia. It continued down the ages as a trade center and is the modern KAYSERİ, Turkey.

Caesarean section: see CESAREAN SECTION

Caesarea Palestinae (sēsārē'ā pālīstī'nē, sēzā-, sēzā-), old city, NW Palestine, c 20 mi (32 km) S of Mt Carmel. It was taken (104 B C) by Alexander Jannaeus, leader of the Maccabees, and was made (30 B C) the capital of Herod the Great. The Jewish citizens were massacred by the Romans in A D 66. There have been excavations since 1958.

Caesarea Philippi (fīlīp'ī), ancient city, N Palestine, at the foot of Mt Hermon. It was built by Philip the Tetrarch in the 1st cent. A D. Its site (Paneas) had long been a center for the worship of Pan. Jesus was in the vicinity (Mat 16:13), but there is no proof that he entered the city. The modern name is Banīyas.

Caesarian: see PTOLEMY XIV

Caetano, Marcello (marsē'lōō kāātā'nōō), 1906–, Portuguese lawyer and statesman. He received a doctorate in law (1931) from the Univ of Lisbon, where he taught after 1932, serving as professor (1940–68) and as rector (1959–62). A close associate of Antonio de Oliveira Salazar, he was instrumental in planning the dictator's corporate form of government, the *Estado Novo*, and from the 1930s held various positions in the regime. He served as minister for the colonies (1944–47) and deputy prime minister (1955–58). He became prime minister of Portugal in 1968 after Salazar had been incapacitated by a stroke. While adhering to the basic conservative policies of his predecessor, including retention of the Portuguese overseas colonies, suppression of dissent, and staunch anti-Communism, he initiated modest political and economic reforms. Caetano's government was overthrown by a military coup in April, 1974, and he was exiled to Madeira and later to Brazil, where he settled in a monastery.

cafeteria: see RESTAURANT

Caffa: see FEODOSIYA, USSR

caffeine, odorless, slightly bitter alkaloid found in COFFEE, TEA, kola nuts, ilex plants (the source of the Latin American drink yerba MATÉ), and, in small amounts, in cocoa (see COLA, CACAO). It can also be prepared synthetically from URIC ACID. When used in moderation, caffeine acts as a mild STIMULANT to the nervous system and is harmless to most persons. Caffeine increases the heart rate and rhythm, affects the circulatory system, and increases urination. It also stimulates secretion of stomach acids and is therefore harmful to individuals with ulcers. Excessive intake of caffeine can result in restlessness, insomnia, heart irregularities, and delirium.

Caffieri (Fr. kāfyārē', Ital. kāf-iyārē'), French family of artists. Philippe Caffieri (1634–1716) left Italy to enter the service of Louis XIV at the Gobelins factory. He and a son, Jacques Caffieri (1678–1755), were employed by the architect Le Brun to make adornments for the palace and gardens at Versailles. Philippe is recorded as having made carved wood decorations for the ambassadors' staircase in the palace. Jacques's superb creations were chiefly in the rococo style. He made bronzes for the king's chamber (1738) and for the council room. His son, Philippe Caffieri II (1714–74), worked with him, and together they produced an immense volume of metalwork, including sumptuous ormolu (imitation gold made of brass) mountings for furniture, adornments for several of the royal palaces, e.g., Fontainebleau and Chôisy, and casings for clocks—notably a celebrated

astronomical clock presented to Louis XV. Another son of Jacques, Jean Jacques Caffieri (1725–92), was a sculptor especially noted for statues and portrait busts. His *Père Pingré* is in the Louvre.

Cagayan (kāg'ān, kāgāyān'), river, c 220 mi (350 km) long, rising in the mountains of central Luzon, Philippines, and flowing N to the Pacific Ocean at Aparri. It is navigable to small oceangoing vessels for c 15 mi (20 km) upstream. Tobacco is the chief crop of the basin.

Cage, John, 1912–, American composer, b. Los Angeles, Calif. A controversial figure, Cage is famous for his unorthodox musical theories and experimental compositions. He attended Pomona College and later studied with Arnold Schoenberg, Adolph Weiss, and Henry Cowell. In 1943 he moved to New York City, where his concerts featuring percussion instruments attracted attention. For these performances he invented the "prepared piano," in which objects of such materials as metal, wood, and rubber were attached to a piano's strings, thus altering pitch and tone and producing sounds resembling those of a minuscule percussion group. Cage's *Bacchanale* (1938) and *Sonatas and Interludes* (1946–48) were composed for the "prepared piano." One of Cage's most innovative ideas is his theory of "total soundspace"—the concept that all sound, including nonmusical sound and the absence of sound, can be used in musical composition. *4'33"* (1952), probably his most famous piece, consists of 4 minutes and 33 seconds of silence punctuated only by whatever random environmental sounds happen to occur. Another of Cage's influential ideas is his concept of composition by chance, in which the notes and sounds of a musical composition are determined by such methods as the roll of dice or a consultation of the *I Ching* (see ALLEGORY MUSIC). For example, his famous *Imaginary Landscape No. 4* (1953) is scored for 12 radios tuned at random, whereas *Reunion* (1968) consists of the sounds made by the movement of pieces in a chess game played on an electrified board. For some years associated with Merce Cunningham, Cage has also written music for the dance, to be played independent of the choreography. He has also written several books, among them *Silence* (1961) and *A Year From Monday* (1968).

Cagliari (kā'lyārē'), city (1971 pop. 224,449), capital of Sardinia and of Cagliari prov., S Sardinia, Italy, on the Gulf of Cagliari (an arm of the Mediterranean Sea) and at the mouth of the Mannu River. It is the largest city in Sardinia and is a modern port and an industrial center. A flourishing Carthaginian city, it was taken by Rome in 238 B C. Cagliari endured Arab invasions in the 8th and 9th cent. A D. The city was a Pisan stronghold during the wars with Genoa (11th–14th cent.), its subsequent history is largely that of SARDINIA. Cagliari was the site of a submarine base in World War II and was heavily bombed by the Allies. Noteworthy structures include the Romanesque-Gothic cathedral (13th cent.), the Basilica of San Saturnino (5th cent.), a large Roman amphitheater, and the massive tower of St. Pancras (built by Pisans in 1304).

Cagliostro, Alessandro, Conte (ālēs-sān'drō kōn'-tā kālyō'strō), 1743–95. Italian adventurer, magician, and alchemist, whose real name was Giuseppe Balsamo. After early misadventures in Italy he traveled in Greece, Arabia, Persia, and Egypt. While in Italy, he married Lorenza Feliciani, who became his assistant on his trips to the cities of Europe, where he posed as a physician, alchemist, mesmerist, necromancer, and Freemason. He claimed the secret of the philosopher's stone and of miraculous philters and potions. As the Grand Copt of the order of Egyptian Masonry he organized many lodges. His reputation was amazing, particularly at the court of Louis XVI. Implicated in the Affair of the DIAMOND NECKLACE, he was imprisoned, acquitted, and banished. Cagliostro returned to Rome in 1789, where the Inquisition charged him with heresy and sorcery and condemned him to die. The sentence was commuted to life imprisonment, and he died in a dungeon. Cagliostro has fascinated later generations as well as his contemporaries, and he appears often in literary works. See biographies by Frank King (1929), W. R. H. Trowbridge (new ed 1961), and François Rebadeau Dumas (tr 1968), H. C. Schnur, *Mystic Rebels* (1949, repr 1971).

Cagney, James, 1904–, American movie actor, b. New York City. He worked on Broadway as an actor and dancer before appearing in films. He is best remembered as the brash, sadistic tough guy in such movies as *Public Enemy* (1930) and *The Roaring Twenties* (1939). His many other films include *Angels With Dirty Faces* (1936), *The Fighting Sixty-*

Ninth (1940), *Yankee Doodle Dandy* (1942), *White Heat* (1949), *Come Fill The Cup* (1951), *Love Me or Leave Me* (1955), *Man of a Thousand Faces* (1957), and *One Two Three* (1961).

Caguas (kā'gwās, kā'wās), city (1970 pop. 63,215), E central Puerto Rico. Largest of Puerto Rico's inland cities, Caguas is an industrial center. Sugar refining and varied manufacturing are carried on.

Cahan, Abraham (kān), 1860–1951, Russian-American journalist, Socialist leader, and author, b. Vilnius, Lithuania. He emigrated to New York City in 1882, entered journalism, and helped found the *Jewish Daily Forward* (1897), as editor in chief after 1902, he made it the most influential Jewish daily in America. He was a founder of the Social Democratic party in 1897 and after 1902 supported the Socialist party. Active in spreading socialist teachings among Jewish workers, he encouraged the unionization of East Side garment workers and supported them in their strikes. Cahan's writings in English, particularly *Yekl: A Tale of the New York Ghetto* (1896), *The Imported Bridegroom and Other Stories* (1898), and *The Rise of David Levinsky* (1917), have a high place in immigrant literature. He also wrote, in Yiddish, *Blätter von mein Leben* (5 vol., 1926–31), an autobiography.

Cahokia (kāhō'kēā), village (1970 pop. 20,649), St. Clair co., SW Ill., a residential suburb of East St. Louis, on the Mississippi River, inc. 1927. The first permanent settlement in Illinois, it was named for a tribe of the Illinois Indians. The French established a mission in 1699 and a fur-trading post later. With Kaskaskia, it became a leading center of French influence in the upper Mississippi valley. Cahokia was occupied by the British in 1765 and captured by the Americans under George Rogers Clark in 1778. The town has several buildings dating from the 18th cent. Parks College of Aeronautical Technology, a part of St. Louis Univ., is in the village. Nearby is Cahokia Mounds State Park.

Cahokia Mounds, approximately 85 Indian earthworks in Cahokia State Park, SW Ill., near East St. Louis, largest group of mounds N of Mexico. Monks' Mound, a rectangular, flat-topped earthwork, 100 ft (30 S m) high with a 17-acre (6.9-hectare) base, is the largest mound, it is named for Trappist monks who settled on top of it in the early 19th cent. Excavation has not answered all the questions concerning the people who constructed the mounds. They were village dwellers living in a fertile river-bottom area, their culture flourished from c 1300 to c 1700. The mounds, which were probably bases for temples and houses of the chiefs, constitute a national historic landmark.

Cahors (kāōr'), town (1968 pop. 17,775), capital of Lot dept., S central France, in Quercy, on the Lot River. A commercial center, it has canneries, distilleries, and factories making a great variety of products. It was an important Roman town, an early episcopal see, and the capital of Quercy. It was ruled by its bishops until the 14th cent. and was one of the major banking centers of medieval Europe, the Cahorsin money lenders were among the most famous. The Univ. of Cahors, founded in 1322 by Pope John XXII (who was born there), was united in 1751 with that of Toulouse. The old part of Cahors is of great architectural interest. Part of the medieval fortifications, including a fortified bridge, still stand. The Cathedral of St. Étienne (12th–15th cent.), with Byzantine cupolas, and the palace of John XXII (begun 14th cent., never completed) are among its many edifices.

Caiphas (Joseph Caiaphas) (kā'yāfās), high priest of the Jews, a Sadducee, son-in-law of Annas. He presided at the council that condemned Jesus to death. Later, he joined in the examination of Peter and John. Mat 26:57–68, John 11:47–54, 18:24, Acts 4:6.

Caicos Islands: see TURKS AND CAICOS ISLANDS

Caillaux, Joseph (zhōzēf' kāyō'), 1863–1944, French statesman. Son of a former cabinet minister, he entered the French civil service as inspector of finance. He later became finance minister in the cabinet of René Waldeck-Rousseau (1899–1902) and in the cabinet of Georges Clemenceau (1906–9), winning considerable unpopularity by introducing the income tax. As premier in 1911, he reached a peaceful settlement of the crisis over MOROCCO with Germany. However, he was severely attacked by the nationalists, and his cabinet fell in 1912. In 1913 he again became minister of finance. He resigned in 1914 to defend his wife, who had shot and killed Gaston Calmette, editor of *Le Figaro*, for attacking Caillaux's private life. Mme Caillaux was acquitted. Caillaux expressed pacifist sentiments during World War I and allegedly made contact with the Germans.

to discuss a negotiated peace. He was arrested (1917) and sentenced (1920) to three years imprisonment for involvement with the enemy. After his civil rights were restored under a general amnesty, Caillaux served as finance minister in the cabinets of Paul Painlevé (1925) and Aristide Briand (1926), but after each appointment a hostile chamber of deputies forced his resignation. He was subsequently elected to the senate. See Rudolph Binion, *Defeated Leaders: The Political Fate of Caillaux, Jouvenel, and Tardieu* (1960).

Caillié, René (ranā' kāyā'), 1799-1838, French explorer in Africa. He was the first European to visit Timbuktu and return. The son of poor French peasants, he was obsessed with the idea of seeing Timbuktu. After 11 years of preparation, he reached the desert city, disguised as a Muslim trader, and remained there two weeks. See Galbraith Welch, *The Unveiling of Timbuktu: The Astounding Adventures of Caillié* (1938).

caiman* see ALLIGATOR

Cain (kān) 1 Eldest son of Adam and Eve, a tiller of the soil in jealousy he killed his brother Abel and became a fugitive. Gen. 4:2. City, W. Palestine. Joshua 15:57.

Cain, James M., 1892-, American novelist, b. Annapolis, Md., grad. Washington College, 1910. He taught journalism at St. John's College (1924-25) and wrote political commentaries for the *New York World* (1924-31). His "hard-boiled" novels usually concern middle-class lovers who are driven to crime and violence. His novels include *The Postman Always Rings Twice* (1934), *Double Indemnity* (1936), *Mildred Pierce* (1941), *The Magician's Wife* (1966), and *Rainbow's End* (1974). Several of his novels have been made into successful movies.

Cainan (kā'nān), in the Gospel genealogy 1. The same as KENAN. 2. Son of Arphaxad. Luke 3:36.

Caine, Hall (Sir Thomas Henry Hall Caine), 1853-1931, English novelist. Secretary to Dante Gabriel Rossetti, he lived with him from 1881 until the poet's death and wrote *Recollections of Rossetti* (1882). His enormously popular novels, some of Manx life, others on biblical themes, include *The Shadow of a Crime* (1885), *The Deemster* (1887), *The Manxman* (1894), *The Christian* (1897), *The Prodigal Son* (1904), and *The Master of Man* (1921). See his autobiography, *My Story* (1908), study by C. F. Kenyon (1901, repr. 1974).

cairn, pile of stones, usually conical in shape, raised as a landmark or a memorial. In prehistoric times it was usually erected over a burial. A BARROW is sometimes called a cairn.

Cairnes, John Elliot (kārnz), 1823-75, Irish economist, a follower of John Stuart Mill. His *Slave Power* (1862), a defense of the North in the American Civil War, made a great impression in England. Among his works are *The Character and Logical Method of Political Economy* (1857) and *Some Leading Principles of Political Economy Newly Expounded* (1874). See Adelaide Weinberg, *John Elliot Cairnes and the American Civil War* (1970).

Cairngorms, group of mountains forming part of the Grampian system, central Scotland, between the Dee and the upper Spey rivers, they rise to c. 4,300 ft (1,310 m). The name *cairngorm* is given to an ornamental yellow or brown quartz found in the mountains. The group includes the peaks Ben Macdui, Braeriach, and Cairngorm. The region is being developed for winter sports.

Cairns, city (1971 pop. 30,059), Queensland, NE Australia, on Trinity Bay. It is a principal sugar port of Australia, lumber and other agricultural products are also exported. The city's proximity to the Great Barrier Reef has made it a tourist center.

cairn terrier, breed of small working TERRIER developed on the Isle of Skye in the 19th cent. It stands about 10 in. (25 cm) high at the shoulder and weighs about 14 lb (6.4 kg). The weather-resistant double coat consists of a soft, furry underlayer and a profuse, hard outercoat about 2 in. (5 cm) long. It may be any color except white, often with dark ears, muzzle, and tip of tail. Originally bred to rout fur-bearing vermin from the rocky crags and cliffs of its native island, the cairn was also bred as a water dog to hunt otters. At an early stage in its history it was accepted into the household as a companion and watchdog, the roles for which it is principally raised today. See DOG.

Cairo (kā'rō), Arab. Al Qahirah, city (1970 est. pop. 4,961,000), capital of Egypt and its Cairo governorate, N. Egypt, a port on the Nile River near the head of its delta. The city includes two islands in the Nile, Zamalik (Gazira) and Rawdah (Roda), which are

linked to the mainland by bridges. Cairo has the largest population of any city in the Middle East and Africa. It is Egypt's administrative center and, along with Alexandria, the heart of its economy. Cairo's manufactures include textiles, food products, pharmaceuticals, chemicals, plastics, and metals. The first railroad in Africa (built 1855) linked Cairo with Alexandria, and today Cairo has extensive rail facilities and is also a road hub. Almost directly across the Nile from Cairo was MEMPHIS, an ancient Egyptian capital. Babylon, a Roman fortress city, occupied a part of SE Cairo now known as Old Cairo. Cairo was founded in 969 by the Fatimid general Jauhar Al Rumi to replace nearby Al Qatai (established in the 9th cent. by an Abbasid governor of Egypt) as the capital of Egypt. In the 12th cent. Saladin ended Fatimid rule and established the Ayyubid dynasty (1171-1250). To defend the city against an attack by Crusaders, Saladin erected (c. 1179) the citadel, which still stands, and extended the walls of the city (originally built by Jauhar), parts of which remain. Cairo prospered under the rule of the Mamelukes, who added many buildings of high artistic merit, but the city declined after it was conquered (1517) by the Ottoman Empire. At the time of its capture (1798) by French forces led by Napoleon I, the city had about 250,000 inhabitants. British and Turkish forces ousted the French in 1801, and Cairo was returned to Ottoman control. Under Muhammad Ali (ruled 1805-49), Cairo became the capital of a virtually independent country and increased in commercial importance. Many Europeans settled in the city. During World War II, Cairo was the Allied headquarters and supply center for the Middle East and was the site (1943) of the CAIRO CONFERENCE. From 1958 to 1961 the city was the capital of the United Arab Republic, which joined Egypt and Syria. Today much of Cairo is modern, with wide streets, its famed mosques, palaces, and city gates are found mostly in the older sections. The mosques of Amur (7th cent.), Ibn Tulun (876-79), Hasan (c. 1356), and Qait Bay (1475) are especially noted for their bold design. Khedive Ismail's palace on Zamalik island is a notable 19th-century structure. The Mosque of Al Azhar (970) and adjoining buildings house Al Azhar Univ., considered the world's leading center of Koranic studies. Cairo is also the seat of the American Univ. in Cairo, Cairo Polytechnic Institute, the Higher Institute of Finance and Commerce, the College of Fine Arts, and the Higher Institute of Theatrical Arts. The Univ. of Cairo is nearby, in Al Jizah. Cairo has many museums, the Egyptian National Museum is especially noted for its holdings of ancient Egyptian art. The Nilometer, a graduated column first built in 716 and used to measure the Nile water level, is on Rawdah island, where the infant Moses is believed to have been found in the bulrushes. Cairo is the center of Coptic Christianity in Egypt.

Cairo (kā'rō, kā'rō), city (1970 pop. 6,277), seat of Alexander co., extreme S. Ill., on a levee-protected tongue of land between the Mississippi and Ohio rivers (spanned there by several bridges), inc. 1857. A port of entry, it is a center for shipping by river, rail, and highway and the processing and distributing point for a large and fertile farm area. Manufactures include flour, lumber, cottonseed oil, textiles, woodwork, and silica. The city and surrounding area are popularly called "Egypt" because of the delta-like geographical similarity. Settlement was attempted there in 1818, but permanent settlement did not begin until 1837. Cairo was a strategic point in the Civil War, it was a crowded military camp, a depot for Union supplies, and General Grant's headquarters during much of his Western campaign. The city has often been endangered by floods, but Federal flood control projects have decreased the danger. Fort Defiance State Park, the site of a Civil War fort, on the southern edge of town, offers a magnificent view of the convergence of the Ohio and Mississippi rivers.

Cairo Conference, Nov. 22-26, 1943, World War II meeting of U.S. President Franklin D. Roosevelt, British Prime Minister Winston Churchill, and Generalissimo Chiang Kai-shek of China at Cairo, Egypt. A joint declaration pledged continuation of the war against Japan until unconditional Japanese surrender, forswore territorial ambitions, and promised to strip Japan of all territory acquired since 1895. Korea was to receive independence "in due course." The TEHRAN CONFERENCE was held immediately afterward.

Cairolì, Benedetto (bānādēt'ō kīrō'lē), 1825-89, Italian patriot and premier. One of five brothers all noted as heroes of the Risorgimento, he was the only brother to survive the wars leading to Italian unification. Benedetto took part in the expedition of

Giuseppe GARIBOLDI to Sicily in 1860 and later became a leftist member of parliament, advocating, with Giuseppe MAZZINI, the occupation of Rome. Premier in 1878 and from 1879 to 1881, he resigned his office after failing to prevent the establishment of a French protectorate over TUNISIA, which was a blow to Italian colonial policy.

caisson (kā'sən, -sōn) [Fr., =big box], in engineering, a chamber, usually of steel but sometimes of wood or reinforced concrete, used in the construction of foundations or piers in or near a body of water. There are several types. The open caisson is a cylinder or box, open at the top and bottom, of size and shape to suit the projected foundation and with a cutting edge around the bottom. It is sunk by its own weight and by excavation, then filled with concrete. Pneumatic caissons are usually employed in riverbed work or where quicksand is present. In this type the cylinder or box has an airtight bulkhead high enough above the cutting edge to permit men to work underneath it. The air in the chamber beneath the bulkhead is kept under pressure great enough to prevent the entrance of water, while shafts through the bulkhead permit the passage of men, equipment, and excavated material between the bottom and the surface. At the top of each shaft is an AIR LOCK to permit communication with the outside without altering the air pressure in the working chamber. As the working chamber moves down, the caisson above the bulkhead and about the shafts is filled with concrete, and when a sufficient depth or bedrock is reached, the working chamber itself is filled, so that there is a solid block of concrete from base to top. Workers leaving a pneumatic caisson after hours of labor under high pressure are given special decompression treatment to accustom them to the lower atmospheric pressure and thus to prevent caisson disease (see DECOMPRESSION SICKNESS). A type of caisson often called a camel is used to raise sunken vessels. It consists of a cylinder filled with water, which is sunk, attached to the vessel, and emptied by pump or compressed air, so that its buoyancy can assist in raising the vessel. Caissons are also sometimes used for closing the entrance to dry docks or as a substitute for gates in canal locks.

caisson disease: see DECOMPRESSION SICKNESS

caisson sinking* see SHAFT SINKING

Caithness (kāth'nēs, kāthnēs'), county (1971 pop. 27,754), 686 sq. mi. (1,777 sq. km), NE Scotland, northernmost county of the Scottish mainland. Wick is the county town. The Thurso is the chief river. The northeastern section of Caithness, flat and treeless, contains most of the county's small percentage of arable land. The southwest is barren, with peat moors and sheep runs. Agriculture and fishing are the main occupations; there are growing dairy and glassmaking industries. Britain's first large nuclear breeder reactor was opened at DOUNREAY in 1959. Originally part of the Pictish nation, Caithness was absorbed into the Viking earldom in the 9th cent. and reverted to Scottish rule only in 1202. It was the scene of frequent clan warfare until the end of the 17th cent. In 1975, Caithness became part of the Highland region.

Cajal, Santiago Ramon y. see RAMÓN Y CAJAL

Cajamarca (kahamar'ka), city (1969 est. pop. 28,000), N. Peru. An important commercial center, Cajamarca is situated at an altitude of c. 9,000 ft (2,740 m) and has a cool, dry climate. Most of the population is Indian. Grains and alfalfa are raised in the region, and gold, silver, and copper come from nearby mines. FRANCISCO PIZARRO captured the Inca ruler ATAHUALPA in 1532 at Cajamarca. Inca ruins and nearby thermal springs attract many tourists.

Cajetan, Saint (kā'jātan, ka''yātan'), 1480-1547, Italian churchman and reformer. Son of the count of Thiene, he studied civil and canon law, but abandoned work as a jurist at the papal court to become a priest. He advocated communities of priests who lived in poverty and worked among the people. He was the leader in founding the congregation of the Theatines, formally begun in 1524 and named for a cofounder and first superior, the bishop of Chieti [Lat. = Theate], who was later PAUL IV. Cajetan's vigor in reform made him a notable figure, and the Theatines were very active in the Catholic Reformation. Cajetan was canonized in 1671. Feast: Aug. 7.

Cajetan [Lat. = from Gaeta], 1469?-1534, Italian prelate, cardinal of the Roman Catholic Church, b. Gaeta. His original name was Giacomo de Vio. He joined the Dominicans (c. 1484), became general of his order (1508), and was made a cardinal (1517). He played a leading role at the Fifth Lateran Council as an advocate of reform. As papal legate in Germany

in 1518 and 1519 he attempted to reconcile the differences of Martin Luther with the church. He strongly opposed the divorce of Henry VIII of England from Katharine of Aragon. Cajetan's political skills helped secure the elections of Holy Roman Emperor Charles V and Pope Adrian VI. Always a student, he translated parts of the Bible, and his commentaries are published with the *Summa* of St Thomas Aquinas in the pontifical edition of that work.

Cakchiquel: see QUICHÉ

cake, originally a small mass of dough baked by turning on a spit, in present usage a dessert made of flour, sugar, eggs, seasonings, usually some leavening and liquid besides the eggs, and shortening. This last ingredient is not always used, unshortened cakes depend mainly on beaten eggs for leavening (e.g., spongecake and angel food cake). The early method of making sweet cake was by adding other ingredients to a portion of bread dough. Some cakes, such as fruitcake or poundcake, called for many eggs and for wine, brandy, or sack (an Elizabethan wine), these ingredients supplying the leavening agent. Modern cakes are generally raised with baking powder, baking soda, or beaten eggs.

Calabar (kāl'əbār', kāl'əbār'), city (1969 est. pop. 89,000), SE Nigeria, a port on an estuary of the Gulf of Guinea. Rubber is processed, and palm oil, cacao, rubber, and timber are exported. Calabar, an important Niger delta trading state in the 19th cent., grew as a center of the palm oil trade.

calabash: see GOURD

Calabrese, II. see PRETI, MATTIA

Calabria (kala'brēā), region (1971 pop. 1,962,899), 5,822 sq mi (15,079 sq km), S Italy, a peninsula projecting between the Tyrrhenian Sea and the Ionian Sea, separated from Sicily by the narrow Strait of Messina. It forms the toe of the Italian "boot." CATANZARO is the capital of Calabria, which is divided into Catanzaro, Cosenza, and Reggio di Calabria. The region is generally mountainous, with narrow coastal strips. Farming is the main occupation, olives, plums, grapes, citrus fruit, and wheat are grown, and sheep and goats are raised. Fishing is well developed along the Strait of Messina. The region's few manufactures include processed food, wine, forest products, chemicals, and metal goods. There are several large hydroelectric plants. The ancient BRUTTIUM, the region was named Calabria in the 8th cent., before then Calabria referred to the present S APULIA. Taken in the 11th cent. by ROBERT GUISCARD, Calabria was first part of the Norman kingdom of Sicily and after 1822 became part of the kingdom of Naples (see NAPLES, KINGDOM OF). The region was conquered by Garibaldi in 1860. Feudal landholding patterns prevailed in Calabria until the 20th cent. These, along with malaria, destructive earthquakes (particularly in 1905 and 1908), droughts, and poor transportation facilities, have hindered the economic development of the region and resulted in large-scale emigration (late 19th cent.-20th cent.) to foreign countries and to the industrial cities of N Italy. There is a polytechnic institute at Reggio di Calabria.

caladium (kalā'dēām) see ARUM

Calah (kā'lā) or **Kalakh** (ka'lakh'), ancient city of Assyria, S of Nineveh and therefore S of present Mosul, Iraq. Known as Calah in the Bible, it is the same as the ancient Nimrud, named after a legendary Assyrian hunting hero. Calah emerged as a famous city when Ashurnasirpal II chose (c. 880 B.C.) the site for his capital. Excavations carried on since the mid-19th cent. have revealed remarkable bas-reliefs, ivories, and sculptures. Also discovered were the palaces of Ashurnasirpal II, Shalmaneser III, and Tiglathpileser III. Calah continued to be a royal residence even after Nineveh became the political capital. The famous black obelisk of Shalmaneser III was discovered in Calah by A. H. Layard in 1846. Calah is mentioned in Gen. 10:11,12.

Calahorra (kalaō'rā), town (1970 pop. 16,340), Logroño prov., NE Spain, in Old Castile, on the Cidacos River near its confluence with the Ebro. Calahorra is a farm (cereals and grapes) and manufacturing center. Known in ancient times as Calagurris, it is the place where Pompey unsuccessfully besieged (76-72 B.C.) the rebel Sertorius. An old cathedral (c. 5th cent., restored 15th cent.) and some Roman ruins survive today, and the Casa Santa, where the martyrs Emeterius and Celedonius are said to be buried, is the site of an annual pilgrimage. Quintilian was born in the town.

Calais (kā'lā), city (1968 pop. 74,908), Pas-de-Calais dept., N France, in Picardy, on the Strait of Dover.

An industrial center with a great variety of manufactures, it has been a major commercial seaport and a communications center with England since the Middle Ages. It was fortified (13th cent.) by the counts of Boulogne. In 1347, after a siege of 11 months, Calais fell to Edward III of England. A bronze monument by Rodin commemorates the famous episode of the six burghers who offered their lives to save the town; they were spared when Edward's queen, Philippa, interceded. The city remained in English hands until it was recovered (1558) by the French under François de Lorraine, the duke of Guise. It was the scene of much fighting (1940, 1944) in World War II. A Gothic church survived.

calamander wood: see EBONY

Calamity Jane, c. 1852-1903, American frontier character, b. Princeton, Mo. Her real name was Martha Jane Canary, and the origin of her nickname is obscure. Little is known of her early life beyond the fact that she moved with her parents to Virginia City, Mont., in 1865 and that she grew up in mining camps and rough frontier communities. In 1876 she appeared in Deadwood, S. Dak., dressed in men's clothes and boasting of her marksmanship and her exploits as a pony-express rider and as a scout with Custer's forces. In her later years she toured the West in a burlesque show and appeared at the Pan-American Exposition in Buffalo, N.Y. She died in poverty and obscurity in Deadwood, where she is buried beside Wild Bill Hickock. See biographies by Duncan Aikman (1927) and Mrs. Glenn Clairmonte (1959), R. J. Casey, *The Black Hills and Their Incredible Characters* (1949).

calamus (kāl'āmas) see ARUM

Calamy, Edmund (kāl'āmē), 1600-1666, English Presbyterian preacher. For 10 years he was lecturer at Bury St. Edmunds until in 1636 his opposition to the observance of certain church ceremonies forced him to withdraw and so identify himself with the Puritan party. He was pastor (1639-62) of the Church of St. Mary Aldermanbury in London. A leader among the Presbyterians, Calamy was a member of the Westminster Assembly (1643). He was one of the five authors of the composite work *Smectymnuus*, directed against Bishop Joseph Hall's apology for a moderate episcopacy. Opposed to the execution of Charles I, Calamy was among those sent to meet Charles II in Holland. At the Restoration, he was made a chaplain to the king, but declined a bishopric. Ejected under the Act of Uniformity (1662), he was imprisoned for a short time for having preached after ejection. A number of his sermons were published. His grandson, Edmund Calamy, 1671-1732, nonconformist minister in London, also published many sermons, but he is particularly remembered for his *Account of the Ministers Ejected by the Act for Uniformity* (1702), edited by A. G. Matthews as *Calamy Revised* (1934). His autobiography appeared in 1829.

Calan, Abraham. see CALOVIUS, ABRAHAM

Calatayud (kalatayōōt'), town (1970 pop. 17,217), Zaragoza prov., NE Spain, in Aragon, on the Jalon River. It is in an agricultural area and has sugar refineries. Founded (8th cent.) by the Moors and conquered (1120) by Alfonso I of Aragon, it retains a Moorish castle and the collegiate Church of Santo Sepulcro, once the main church of the Knights Templars in Spain. Near Calatayud stood ancient Irbilis, birthplace of Martial.

Calatrava, Campo de (kampō' thā kalatra'va), region in Ciudad Real prov., central Spain, in New Castile. It gave its name to the Knights of Calatrava, Spain's oldest military order, whose original seat was the fortress of Calatrava la Vieja, now in ruins. Founded (1158) by the Cistercians as a defense against the Moors, the order was very powerful, holding large possessions until the 13th cent., later it declined. In 1499 the title of grand master passed to the Castilian crown and thence to the Spanish crown.

calcareous rock: see LIMESTONE, MARBLE

calcareous soil (kalkār'ēās), soil formed largely by the weathering of calcareous rocks and fossil shell beds. Different varieties usually contain chalk, marl, and limestone and frequently a large amount of phosphates. They are often very fertile, as in the case of the buckshot soils of the S. United States. Sometimes calcareous soils are flinty, thin, and dry. They often form a large part of the soil of deserts, which may prove very fertile when sufficient moisture for crops is applied.

Calcasieu (kāl'kāsōō), river c. 200 mi (320 km) long, rising in W. central La. and flowing S. through Lake

Charles and Calcasieu Lake to the Gulf of Mexico. The river, which is partly navigable, connects the port of Lake Charles city with the Intracoastal Waterway and the Gulf of Mexico.

calceolaria (kāl'sēōlār'ēā) see FIGWORT

Calchas (kāl'kās), in Greek legend, priest whose prophecies aided the Greeks in the TROJAN WAR. In medieval romances, he is the father of Cressida.

calcia: see CALCIUM OXIDE

calciferol: see VITAMIN

calcination (kāl'sənā'shan), in metallurgy, process of heating solid material to drive off volatile chemically combined components, e.g., carbon dioxide. It is sometimes a step in the extraction of metals from ores. Calcination is distinguished from drying, in which mechanically held water is driven off by heating, and from roasting, in which a material is heated in the presence of air to oxidize impurities. Originally calcination meant the method of obtaining lime (calcium oxide) from limestone by heating it to drive off carbon dioxide.

calcite (kāl'sīt), very widely distributed mineral, commonly white or colorless, but appearing in a great variety of colors owing to impurities. Chemically it is calcium carbonate, CaCO₃, but it frequently contains manganese, iron, or magnesium in place of the calcium. It crystallizes in the hexagonal system, its crystals being characterized by highly perfect cleavage. Calcite also occurs in a number of massive forms, in which it may be coarsely to finely granular (as in marble), compact (as in limestone), powdery (as in chalk), or fibrous. One crystalline form, called dogtooth spar because of its dogtooth appearance, exhibits faces of perfect scalene triangles. Another form, satin spar, is finely fibrous and has a satin luster. ICELAND SPAR is clear, transparent calcite. Other important forms of the mineral are LIMESTONE, MARBLE, CHALK, MARL, STALACTITE and STALAGMITE formations, TRAVERTINE, and Oriental ALABASTER. Millions of tons of calcite, in the form of limestone and marble, are mined annually. Besides its use as a building stone, it is the raw material for quicklime and cement, and is used extensively as a flux in smelting and as a soil conditioner.

calcium (kāl'sēām) [Lat., =lime], metallic chemical element, symbol Ca, at no. 20, at wt. 40.08, m.p. about 845°C, b.p. 1487°C, sp. gr. 1.55 at 20°C, valence +2. Calcium is a malleable, ductile, silver-white, relatively soft metal with face-centered, cubic crystalline structure. Chemically it resembles strontium and barium, it is classed with them as an ALKALINE EARTH METAL in group IIa of the PERIODIC TABLE. Calcium is chemically active, it tarnishes rapidly when exposed to air and burns with a bright yellow-red flame when heated, mainly forming the nitride. It reacts directly with water, forming the hydroxide. It combines with other elements, e.g., with oxygen, carbon, hydrogen, chlorine, fluorine, arsenic, phosphorus, and sulfur, forming many compounds. Calcium metal is usually prepared by electrolysis of fused calcium chloride to which a little calcium fluoride has been added. It is used in alloys with other metals, such as aluminum, lead, or copper, in preparation of other metals, such as thorium and uranium, by reduction, and (like barium) in the manufacture of vacuum tubes to remove residual gases. The metal is of little commercial importance compared to its compounds, which are widely and diversely used. The element is a constituent of LIME, chloride of lime (bleaching powder), MORTAR, plaster, cement (see CEMENT, HYDRAULIC), CONCRETE, WHITING, putty, precipitated CHALK, GYPSUM, and plaster of Paris. Tremolite, a form of asbestos, is a naturally occurring compound of calcium, magnesium, silicon, and oxygen. Calcium carbide reacts with water to form acetylene gas, it is also used to prepare calcium cyanamide, which is used as a fertilizer. The phosphate is a major constituent of bone ash. The arsenate and the cyanide are used as insecticides. Generally, calcium compounds show an orange or yellow-red color when held in the Bunsen burner flame. Although calcium is the fifth most abundant element in the earth's crust, of which it constitutes about 3.6%, it is not found uncombined. It is found widely distributed in its compounds, e.g., ICELAND SPAR, MARBLE, LIMESTONE, FELDSPAR, APATITE, CALCITE, DOLOMITE, FLUORITE, GARNET, and LABRADORITE. It is a constituent of most plant and animal matter. Calcium is essential to the formation and maintenance of strong bones and teeth. In the human adult the bone calcium is chiefly in the form of the phosphate and carbonate salts. A sufficient store of vitamin D in the body is necessary for the proper utilization of calcium. Calcium also functions in the regulation of the heart beat and in the conversion of

prothrombin to thrombin, a necessary step in the clotting of blood. Calcium bicarbonate causes temporary hardness in water, calcium sulfate causes permanent hardness. Although **LIME** (calcium oxide) has been known since ancient times, elemental calcium was first isolated by Sir Humphry Davy in 1808.

calcium carbonate, CaCO_3 , white chemical compound that is the most common nonsiliceous mineral. It occurs in two crystal forms, calcite, which is hexagonal, and aragonite, which is rhombohedral. Calcium carbonate is largely insoluble in water but is quite soluble in water containing dissolved carbon dioxide, combining with it to form the bicarbonate $\text{Ca}(\text{HCO}_3)_2$. Such reactions on **LIMESTONE** (which is mainly composed of calcite) account for the formation of stalactites and stalagmites in caves. Iceland spar is a pure form of calcium carbonate and exhibits birefringence, or double **REFRACTION**.

calcium chloride, CaCl_2 , chemical compound that is crystalline, lumpy, or flaky, is usually white, and is very soluble in water. The anhydrous compound is hygroscopic, it rapidly absorbs water and is used to dry gases by passing them through it. Calcium chloride is commercially available usually as the dihydrate, $\text{CaCl}_2 \cdot 2\text{H}_2\text{O}$, it is used to melt ice on roads, to control dust, in brines for refrigeration, and as a preservative in foods. It is also used in the monohydrate and hexahydrate forms. Calcium chloride is a by-product of the **SOLVAY PROCESS** (a major source of the compound) and is present in natural brines.

calcium hydroxide, $\text{Ca}(\text{OH})_2$, colorless crystal or white powder. It is prepared by reacting **CALCIUM OXIDE** (lime) with water, a process called slaking, and is also known as hydrated lime or slaked lime. When heated above 580°C it dehydrates, forming the oxide. Like the oxide, it has many uses, e.g., in **LIMING** soil, in sugar refining, and in preparing other compounds. It is a strong base and is widely used as an inexpensive alkali, often as a suspension in water (milk of lime), it is used in leather tanning to remove hair from hides. It is used in **WHITEWASH**, **MORTAR**, and plaster. It is only slightly soluble in water, about 0.2 grams per 100 cubic centimeters, so its solutions are weakly basic. Limewater is a clear, saturated water solution of calcium hydroxide. It is used in medicine to treat acid burns and as an antacid. Because calcium hydroxide readily reacts with carbon dioxide, CO_2 , to form calcium carbonate, a mixture of gases can be tested for the presence of CO_2 by shaking it with limewater in a clear container, if CO_2 is present, a cloudy calcium carbonate precipitate will form.

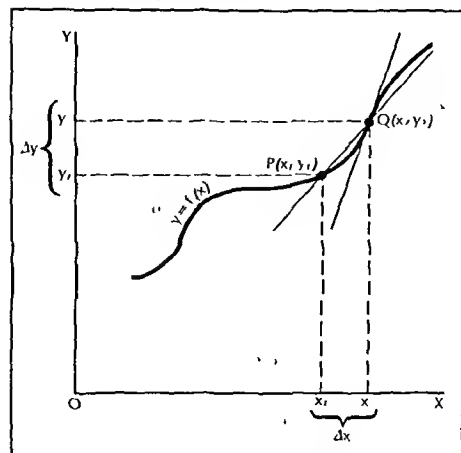
calcium oxide or calcia, chemical compound, CaO , a colorless, cubic crystalline or white amorphous substance. It is also called lime, quicklime, or caustic lime, but commercial lime often contains impurities, e.g., silica, iron, alumina, and magnesia. It is prepared by heating **CALCIUM CARBONATE** (e.g., **LIMESTONE**) in a special lime kiln to about 500°C to 600°C , decomposing it into the oxide and carbon dioxide. Calcium oxide is widely used in industry, e.g., in making porcelain and glass, in purifying sugar, in preparing **BLEACHING POWDER**, calcium carbide, and calcium cyanamide, in water softeners, and in mortars and cements. In agriculture it is used for treating acidic soils (**LIMING**). It is incandescent when heated to high temperatures, the Drummond light, or limelight, provides a brilliant white light by heating a cylinder of lime with the flame of an oxy-hydrogen torch. Calcium oxide is a basic anhydride, reacting with water to form **CALCIUM HYDROXIDE**, during the reaction (slaking) much heat is given off and the solid nearly doubles its volume.

Calcol (kāl'kōl), Judahite 1 Chron 26 Chalcol 1 Kings 4:31

calculating machine, device for performing numerical computations, it may be mechanical, electromechanical, or electronic. The electronic **COMPUTER** is also a calculating machine but performs other functions as well. Early devices used to aid in calculation include the **ABACUS** (still common in the Orient) and the counting rods, or "bones," of the Scottish mathematician John Napier. The **SLIDE RULE**, invented in 1622 by William Oughtred, an English mathematician, is still widely used to make approximate calculations. In 1642, Pascal devised what was probably the first simple adding machine using geared wheels. In 1671 an improved mechanism for performing multiplication by the process of repeated addition was designed by Gottfried W. von Leibniz. A machine using the Leibniz mechanism was the first to be produced successfully on a commercial scale, devised in 1820 by the Frenchman Charles X. Thomas, it could be used for adding, subtracting, multiplying, or dividing. A mechanism permitting the construction of a more compact ma-

chine than the Leibniz mechanism was incorporated into a machine devised late in the 19th cent by the American inventor Frank S. Baldwin. Later the machine was redesigned by Baldwin and another American inventor, Jay R. Monroe. At about the same time, W. T. Odhner of Russia constructed a machine using the same device as Baldwin's. Charles Babbage, an English mathematician, and William S. Burroughs, an American inventor, also made important contributions to the development of the calculating machine. The simple modern adding machine is equipped with a keyboard on which numbers to be added are entered, a lever to actuate the addition process, and an accumulator to display the results. A full keyboard may consist of 10 columns of keys with 9 keys in each column, numbered 1 through 9. Each column can be used to enter a figure in a particular decimal place so that a number up to 10 digits long can be entered, if no key is pressed in a given column, a zero is entered in that decimal place. The lever is pulled in one direction when a number is to be added and in the opposite direction when it is to be subtracted. The accumulator is a set of geared wheels, each corresponding to a decimal place and having the digits 0 through 9 printed on its circumference. When a given wheel makes a complete rotation, the next wheel is advanced by one digit. There are many variations on this basic setup. Some machines provide only 10 keys, numbered 0 through 9, on which to enter numbers. Most modern machines have an electric motor that actuates the addition process when a special key on the machine is depressed, some have a mechanism that prints on a paper tape the individual entries and the totals. With some modifications, printing adding machines can be used as calculators, i.e., machines that can also multiply and divide. Mechanical rotary calculators are more sophisticated devices, designed to provide rapid answers to involved calculations. They normally do not provide printed results. Electronic calculators became available in the early 1960s, and in the early 1970s miniature types, some of them pocket size, were marketed as consumer items. Electronic calculators have 10 keys that can be used to enter numbers into the machine, additional keys are provided to enable the user to perform a range of operations, from basic arithmetic in simple devices to the generation of complex mathematical functions in more advanced types. The results of an operation are either shown on an electronic display or are printed. Some of these machines are actually small computers with limited memory and programming capabilities. Electronic calculators are considered to be superior to mechanical machines because they are generally faster, smaller, quieter, more reliable, and more versatile. See G. R. Brooksphear, *The Fundamental Operations of Calculating and Adding Machines* (1962), A. L. Walker et al., *How to Use Adding and Calculating Machines* (3d ed 1967).

calculus, branch of **MATHEMATICS** that studies continuously changing quantities. The calculus is characterized by the use of infinite processes, involving passage to a **LIMIT**. Two kinds of limit are of particular interest in the calculus. The differential calculus arises from the study of the limit of a quotient, $\Delta y/\Delta x$, as the denominator Δx approaches zero, where x and y are variables, y may be expressed as some function of x , or $f(x)$, and Δy and Δx represent



The derivative $f'(x)$ of the function $f(x)$ at the point Q represents the slope of the tangent line at that point.

corresponding increments, or changes, in y and x . The limit of $\Delta y/\Delta x$ is called the derivative of y with respect to x and is indicated by dy/dx or $D_x y$.

$$\lim_{\Delta x \rightarrow 0} \Delta y/\Delta x = dy/dx = D_x y$$

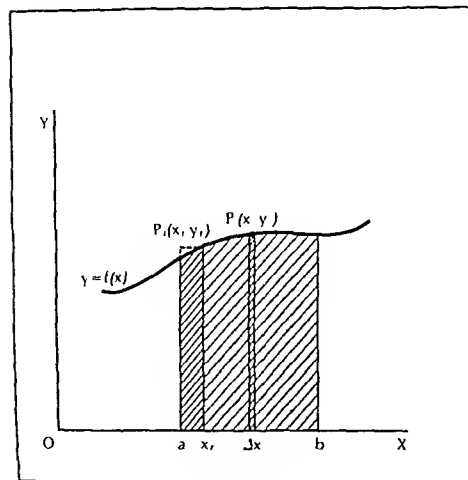
The symbols dy and dx are called differentials (they are single symbols, not products), and the process of finding the derivative of $y = f(x)$ is called differentiation. The derivative $dy/dx = df(x)/dx$ is also denoted by y' , or $f'(x)$. The derivative $f'(x)$ is itself a function of x and may be differentiated, the result being termed the second derivative of y with respect to x and denoted by y'' , $f''(x)$, or d^2y/dx^2 . This process can be continued to yield a third derivative, a fourth derivative, and so on. Although the method of increments used to find the limit of $\Delta y/\Delta x$ can be applied to all differentiation, in practice formulas have been developed for finding the derivatives of all commonly encountered functions. For example, if $y = x^n$, then $y' = nx^{n-1}$, and if $y = \sin x$, then $y' = \cos x$. In general, the derivative of y with respect to x expresses the rate of change in y for a change in x . In physical applications, the independent variable (here x) is frequently time, e.g., if $s = f(t)$ expresses the relationship between distance traveled, s , and time elapsed, t , then $s' = f'(t)$ represents the rate of change of distance with time, i.e., the speed, or velocity. Everyday calculations of velocity usually involve dividing the distance traveled, Δs , by the time elapsed, Δt , during the period in question, this ratio, $\Delta s/\Delta t$, is the average velocity for the time period Δt . The derivative $f'(t) = ds/dt$, however, gives the velocity for any particular value of t , i.e., the instantaneous velocity. Geometrically, the derivative is interpreted as the slope of the line tangent to a curve at a point. If $y = f(x)$ is a real-valued function of a real variable, the ratio $\Delta y/\Delta x = (y_2 - y_1)/(x_2 - x_1)$ represents the slope of a straight line through the two points $P(x_1, y_1)$ and $Q(x_2, y_2)$ on the graph of the function. If P is taken closer to Q , then x_1 will approach x_2 and Δx will approach zero. In the limit where Δx approaches zero, the ratio becomes the derivative $dy/dx = f'(x)$ and represents the slope of a line that touches the curve at the single point Q , i.e., the tangent line. This property of the derivative yields many applications for the calculus, e.g., in the design of optical mirrors and lenses and the determination of projectile paths. The second important kind of limit encountered in the calculus is the limit of a sum of elements when the number of such elements increases without bound while the size of the elements diminishes. For example, consider the problem of determining the area under a given curve $y = f(x)$ between two values of x , say a and b . Let the interval between a and b be divided into n subintervals, from $a = x_0$ through $x_1, x_2, x_3, \dots, x_{n-1}, x_n = b$. The width of a given subinterval is equal to the difference between the adjacent values of x , or $\Delta x_i = x_i - x_{i-1}$, where i designates the typical, or i th, subinterval. On each Δx_i a rectangle can be formed of width Δx_i , height $y_i = f(x_i)$ (the value of the function corresponding to the value of x on the right-hand side of the subinterval), and area $\Delta A_i = f(x_i)\Delta x_i$. In some cases, the rectangle may extend above the curve, while in other cases it may fail to include some of the area under the curve, however, if the areas of all these rectangles are added together, the sum will be an approximation of the area under the curve. This approximation can be improved by increasing n , the number of subintervals, thus decreasing the widths of the Δx 's and the amounts by which the ΔA 's exceed or fall short of the actual area under the curve. In the limit where n approaches infinity (and the largest Δx approaches zero), the sum is equal to the area under the curve.

$$A = \lim_{n \rightarrow \infty} \sum_{i=1}^n \Delta A_i = \lim_{n \rightarrow \infty} \sum_{i=1}^n f(x_i) \Delta x_i = \int_a^b f(x) dx$$

The last expression on the right is called the integral of $f(x)$, and $f(x)$ itself is called the integrand. This method of finding the limit of a sum can be used to determine the lengths of curves, the areas bounded by curves, and the volumes of solids bounded by curved surfaces, and to solve other similar problems. An entirely different consideration of the problem of finding the area under a curve leads to a means of evaluating the integral. It can be shown that if $f(x)$ is a function whose derivative is $f'(x)$, then the area under $f(x)$ between a and b is equal to $F(b) - F(a)$. This connection between the integral and the derivative is known as the Fundamental Theorem of the Calculus. Stated in symbols

$$\int_a^b f(x) dx = F(b) - F(a), \text{ where } F'(x) = f(x)$$

The function $F(x)$, which is equal to the integral of $f(x)$, is sometimes called the antiderivative of $f(x)$, while the process of finding $F(x)$ from $f(x)$ is called



The area under the curve $y = f(x)$ may be found by calculating the sum of the elements of area ΔA , whose width is Δx and whose height is $f(x)$.

integration or antidifferentiation. The branch of calculus concerned with both the integral as the limit of a sum and the integral as the antiderivative of a function is known as the integral calculus. The type of integral just discussed, in which the limits of integration, a and b , are specified, is called a definite integral. If no limits are specified, the expression is an indefinite integral. In such a case, an arbitrary constant C must be added to the function $F(x)$ resulting from integration, since in computing the derivative any constant terms having derivatives equal to zero are lost, the expression for the indefinite integral of $f(x)$ is

$$\int f(x) dx = F(x) + C.$$

The value of the constant C must be determined from various boundary conditions surrounding the particular problem in which the integral occurs. The calculus has been developed to treat not only functions of a single variable, e.g., x or t , but also functions of several variables. For example, if $z = f(x, y)$ is a function of two independent variables, x and y , then two different derivatives can be determined, one with respect to each of the independent variables. These are denoted by $\partial z / \partial x$ and $\partial z / \partial y$ or by $D_x z$ and $D_y z$. Three different second derivatives are possible, $\partial^2 z / \partial x^2$, $\partial^2 z / \partial y^2$, and $\partial^2 z / \partial x \partial y = \partial^2 z / \partial y \partial x$. Such derivatives are called partial derivatives. In any partial differentiation all independent variables other than the one being considered are treated as constants. The calculus and its basic tools of differentiation and integration serve as the foundation for the larger branch of mathematics known as ANALYSIS. The English physicist Isaac Newton and the German mathematician G. W. Leibniz, working independently, developed the calculus during the 17th cent. See Richard Courant and Fritz John, *Introduction to Calculus and Analysis*, Vol. I (1965); Morris Kline, *Calculus: An Intuitive and Physical Approach* (2 vol., 1967); A. W. Goodman, *Modern Calculus with Analytic Geometry* (2 vol., 1967-1968).

calculus of variations, branch of MATHEMATICS concerned with finding maximum or minimum conditions for a relationship between two or more variables that depends not only on the variables themselves, as in the ordinary CALCULUS, but also on an additional arbitrary relation, or constraint, between them. For example, the problem of finding the closed plane curve of given length that will enclose the greatest area is a type of isoperimetric (equal-perimeter) problem that can be treated by the methods of the variational calculus, the solution to this special case is the circle. Another famous problem is the brachistochrone problem, that of finding the curve along which an object will slide to a point not directly below it in the shortest time, the solution is a cycloid curve (a curve traced out by a fixed point on the circumference of a circle as the circle rolls along a straight line). In general, problems in the calculus of variations involve solving the definite integral (single or multiple) of a function of one or more independent variables, x_1, x_2, \dots , one or more dependent variables, y_1, y_2, \dots , and derivatives of these, the object being to determine the de-

pendent variables as functions of the independent variables such that the integral will be a maximum or minimum. The calculus of variations was founded at the end of the 17th cent. and was developed by Jakob and Johann Bernoulli, Isaac Newton, G. W. Leibniz, Leonhard Euler, J. L. Lagrange, and others.

Calcutta (kalkūt'a), city (1971 pop. 3,141,180), capital of West Bengal state, E India, on the Hooghly River. It is the second-largest city in India and one of the largest in the world. Ten of Calcutta's suburbs—Howrah, South Suburban, Bhatpara, South Dum Dum, Kamarhati, Garden Reach, Panihati, Baranagar, Hooghly-Chinsura, and Serampore—have well over 100,000 people. The population of Greater Calcutta in 1971 was 7,005,362. Its area is 228 sq mi (591 sq km). Calcutta is the chief port and major industrial center of E India; jute is milled, and textiles, chemicals, paper, and metal products are manufactured. Calcutta's airport is the busiest in India. Nearly 60 languages are spoken in the city, which suffers from terrible poverty, chronic unemployment, overcrowding, inadequate transportation, and the resultant social unrest. Calcutta was founded c 1690 by the British East India Company. In 1756 the nawab of Bengal, Siraj-ud-daula, captured Calcutta and killed most of its garrison by imprisoning it overnight in a small, stifling room, known as the notorious "black hole." Robert Clive retook the city in 1757. From 1833 to 1912, Calcutta was the capital of India. The Univ. of Calcutta (founded 1857), several unaffiliated colleges, and the Indian Museum, which houses one of the world's outstanding natural history collections, are in the city. The Maidan, a large river-front park surrounded by government buildings, is Calcutta's most attractive section.

Caldara, Antonio (antō'nyō kaldā'ra), 1670-1736, Italian composer. In 1714, Caldara obtained a position at the imperial court in Vienna, where he remained until his death. He composed a large amount of sacred and secular vocal music, as well as chamber works. His canons were especially popular. Franz Joseph Haydn was influenced by Caldara.

Caldecott, Randolph (kōl'dəkat), 1846-86, English artist and illustrator. He is famous for his drawings of contemporary English country life and for his charming and humorous illustrations, including those for Washington Irving's *Old Christmas* and *Bracebridge Hall* and Blackburn's *Breton Folk*. Perhaps his best are the colored illustrations for a series of 16 children's picture books, including *The House that Jack Built* and *The Grand Panjandrum Himself*. The Caldecott Medal for excellence in children's-book illustration is named for him. See memoir by Henry Blackburn (1886, repr. 1969).

Calder, Alexander (kōl dər), 1898-, American sculptor, b. Philadelphia, son of a prominent sculptor, Alexander Stirling Calder. Among the most innovative modern sculptors, Calder was trained as a mechanical engineer. In 1930 he went to Paris and was influenced by the art of Mondrian and Miro. In 1932 he exhibited his first brightly colored constellations, called MOBILES, consisting of painted cut-out shapes connected by wires and set in motion by wind currents. The Museum of Modern Art, New York City, has several examples. These buoyant inventions and his witty wire portraits, his colorful and complex miniature zoo (1925, Whitney Mus., New York City), and his immobile sculptures known as STABLES, have brought Calder world renown. Many of his recent works are huge, heavy, and delicately balanced mobiles produced for public buildings throughout the world. Calder is also noted for his book illustrations and stage sets. He has studios in Roxbury, Conn., and Paris. See his autobiography (1966) and *Mobiles and Stables* (1968), study by J. J. Sweeney (1951), Jean Lipman, ed., *Calder's Circus* (1972).

Caldera, Rafael (rafael' kaldā'ra), 1916-, president of Venezuela (1969-74). A lawyer and professor of sociology, he was first elected to the chamber of deputies in 1941 and was a founder of the center-right Christian Social party in 1946. He was imprisoned several times during the dictatorial regime of Marcos Perez Jimenez, which he opposed. After the dictator's overthrow Caldera in 1958 ran unsuccessfully for the presidency, he served instead as president of the chamber of deputies. In the elections of Dec., 1969, he won the presidency with barely 30% of the vote. Faced with an uncooperative congress, he had difficulty in getting legislation passed. He was awarded a life seat in the senate at the end of his term.

caldera: see CRATER

Calderón Bridge (kaldārōn'), site of a decisive battle in the Mexican revolution against Spain, fought on the Lerma River E of Guadalajara, Jalisco, Mexico. On Jan. 17, 1811, insurgents commanded by HIDALGO Y COSTILLA met the royalists under CALLEJA DEL REY. On the point of victory, Hidalgo's men were panicked by the explosion of an ammunition wagon. Their flight led to the collapse of the independence movement under Hidalgo.

Calderón de la Barca, Pedro (pā'thro kaldārōn' dā la bar'ka), 1600-1681, Spanish dramatist, last important figure of the Spanish Golden Age, b. Madrid. Educated at a Jesuit school and the Univ. of Salamanca, he turned from theology to poetry and became a court poet in 1622. His more than 100 plays were carefully contrived, subtle, and rhetorical. The earlier plays, of the cloak-and-dagger school, include *La dama duende* [the lady fairy] and *Casa con dos puertas mala es de guardar* [the house with two doors is difficult to guard]. His finest work is in his more than 70 autos sacramentales (one-act religious plays), among them *El divino Orfeo* and *A Dios por razón de estado* [to God for reasons of state]. Of his philosophical dramas the best known are *El magico prodigioso* [the wonderful magician] and *La vida es sueño* [life is a dream], one of the masterpieces of the Spanish theater. Calderon took holy orders in 1651 and thereafter wrote few plays except the autos, of which he supplied two a year for the Corpus Christi festival. See studies by Salvador Madariaga (1920, repr. 1965), J. H. Parker and A. M. Fox (1971), Edwin Honig (1972), and Heinz Gerstinger (tr. 1973).

Calderón Guardia, Rafael Ángel (rafael' ang'hēl kaldārōn' gwār'dēa), 1900-1970, president of Costa Rica (1940-44). A practicing physician, he entered politics in 1934, serving successively as vice president and president of congress (1935-39). He was leader of the Republican, or Calderista, party. As president, he brought Costa Rica into World War II on the Allied side and cooperated closely with the United States. He later served (1966-70) as ambassador to Mexico.

Caldwell, Erskine (kōld'wəl), 1903-, American author, b. White Oak, Ga. His realistic and extremely earthy novels of the rural South include *Tobacco Road* (1933), *God's Little Acre* (1933), *This Very Earth* (1948), and *Summertime Island* (1969). Among his volumes of short stories are *Jackpot* (1940) and *Gulf Coast Stories* (1956). With his first wife, Margaret Bourke-White, he published *You Have Seen Their Faces* (1937), about Southern sharecroppers.

Caldwell, Taylor (janet Taylor Caldwell), 1900-, American novelist, b. London, England. Her best-selling works range from romance to satire to fictionalized biography and often reflect her Christian heritage. They include *Dynasty of Death* (1938), *The Devil's Advocate* (1952), *Dear and Glorious Physician* (1959), *The Captain and the Kings* (1972), and *Glory and the Lightning* (1974).

Caldwell, Zoe (zō'ē), 1934-, Australian actress. Caldwell joined the Shakespeare Memorial Theatre Company at Stratford-on-Avon in 1958. Her Broadway debut in *Slapstick* earned her the Antoinette Perry Award, as did her playing of the lead in *The Prime of Miss Jean Brodie* (1963). Her other theatrical performances include *Colette* (1970) and *A Gift to the Nation* (1971).

Caldwell, city (1970 pop. 14,219), seat of Canyon Co., SW Idaho, on the Boise River, inc. 1890. On the site of an Oregon Trail camping ground, the city is now a major processing and distribution center for an agricultural and livestock area. Mobile homes and recreational vehicles are manufactured. It is the seat of an agricultural-experiment station and The College of Idaho.

Caleb (kā'lēb), principal spy sent into Canaan, noted for his faithfulness to God. Num. 13:6, 14, 32:12, Joshua 14:6-14. The name is mentioned elsewhere, apparently in connection with a clan inhabiting S. Palestine. 1 Sam. 30:14, 1 Chron. 2:18, 19, 42:46, 48, 49. Chelubai. 1 Chron. 2:9. The name Caleb-ephraiah (-ē'f'ra) at 1 Chron. 2:24 is a textual error.

Caledonia (kā'lidō'nēa), Roman name for that part of the island of Great Britain that lies N of the firths of Clyde and Forth. The name first occurs in the works of Lucan (1st cent. A.D.) and has been used in modern times rhetorically and poetically to mean all of Scotland or the Scottish Highlands.

Caledonian Canal, waterway, c 60 mi (100 km) long, cutting across Highland region (Inverness-shire), N Scotland, from Moray Firth to Loch Linne by way of the Great Glen. Built in two phases (1803-22 and 1843-47, opened 1822) to save shallow-draft vessels the circuitous route around N Scotland, it is of little use today except for pleasure craft. Of the

waterway, 38 mi (61 km) consists of the natural waters of Lochs Ness, Oich, and Lochy. The canal has 29 locks.

Calef, Robert (kă'lăf), 1648-1719, known primarily as author of *More Wonders of the Invisible World* (1700). A Boston cloth merchant, probably born in England, he bitterly attacked Cotton Mather for his part in the Salem, Mass., WITCHCRAFT trials. The book, published in London because Boston printers would not accept it, generally condemned the view of witchcraft then prevailing and had a salutary effect throughout New England. It is reprinted in S. G. Drake, comp., *The Witchcraft Delusion in New England*, (3 vol., 1866, repr. 1970).

calendar [Lat., from *Kalends*], system of reckoning time for the practical purpose of recording past events and calculating dates for future plans. The calendar is based on noting ordinary and easily observable natural events, the cycle of the sun through the seasons with EQUINOX and SOLSTICE, and the recurrent phases of the moon. The earth completes its orbit about the sun in 365 days 5 hr 48 min 46 sec—the length of the solar year. The moon passes through its phases in about 29½ days, therefore, 12 lunar months (called a lunar year) amount to more than 354 days 8 hr 48 min. The discrepancy between the years is inescapable, and one of the major problems for man since his early days has been to reconcile and harmonize solar and lunar reckonings. Some peoples have simply recorded time by the lunar cycle, but, as skill in calculation developed, the prevailing calculations generally came to depend upon a combination. The fact that months and years cannot be divided exactly by days and that the years cannot be easily divided into months has led to the device of intercalation. The simplest form of this is shown in ancient calendars which have series of months alternating between 30 and 29 days, thus arriving at two mean months of 29½ days each. Similarly four years of about 365¼ days each can be approximated by taking three years of 365 days and a fourth year of 366. This fourth year with its intercalary day is the leap year. If calculations are by the lunar cycle, the surplus of the solar over the lunar year (365 over 354) can be somewhat rectified in three years by adding an extra (intercalary) month of 33 days. Reckoning of day and year was considered necessary by practical peoples to determine sacred days, to arrange plans for the future, and to keep some intelligible record of the past. There were, therefore, various efforts to reconcile the count in solar, lunar, and semilunar calendars, from the Egyptians and the Greeks to the Chinese and the MAYA. The problem was fundamental. So for chroniclers was the establishment of a fixed point in time for calculating years in an ERA.

The Roman Calendar. The prevailing modern method of constructing a calendar in the Christian West came originally from the Egyptians, who worked out a formula for the solar year (12 months of 30 days each, five extra days a year, and an extra day every four years). This was to be adopted later by the Romans. In its most primitive form the Roman calendar had no such refinement. It apparently had 10 months, which were (to use corresponding English terms whenever possible) March (31 days), April (29 days), May (31 days), June (29 days), Quintilis (31 days), Sextilis (29 days), September (29 days), October (31 days), November (29 days), and December (29 days). To fill out the 365 days a number of blank days or occasional intercalary months were used (later, January (29 days) and February (28 days) were added at the end of the year. In the time of the early republic the so-called year of Numa was added. The Romans thus arrived at a cycle of four years: the first year had four months of 31 days, seven of 29, and one, February, of 28; the second year had a February of 23 days and an intercalary month of 27 days; the third year was like the first; the fourth year had a February of 24 days and an intercalary month. The chief trouble with this system was that in a four-year cycle there were four days too many. What was worse, the PONTIFEX MAXIMUS was given the power soon after 200 B.C. to regulate the calendar (which for ordinary civil purposes was expressed in terms of the consulates of whatever men held it). The practice grew up of using the intercalations for the promotion of political ends to lengthen or to shorten an official's term. When Julius Caesar was pontifex maximus, the calendar had been so much abused that January was falling in autumn.

The Julian Calendar. At this point the methods of the Egyptian calendar were borrowed for the Roman. Julius Caesar on the advice of the astronomer Sosigenes added 90 days to the year 46 B.C. (67 days between November and December, 23 at the end of

February). This caused the spring of 45 B.C. to begin in March. To retain this position of the seasons, he changed the length of most of the months. March, May, Quintilis (subsequently named August to honor Augustus), and October he left as they were, he added 2 days each to January and Sextilis (subsequently named July after Julius Caesar himself), February was 28 days long except that in every fourth year a day was inserted between the 23d and the 24th of the month. In Roman computation three days in the month were used for counting the date. These three were the Kalends (1st day of the month), the Nones (the 7th day in March, May, July, and October, the 5th in the other months), and the Ides (the 15th day in March, May, July, and October, the 13th in the other months). The days were counted before, not after, the Kalends, Nones, and Ides. Thus, Jan. 10 was the fourth day before the Ides of January or the fourth day of the Ides of January, because the Romans counted inclusively. Jan. 25 was the eighth of the Kalends of February, Feb. 3 was the third of the Nones of February. Feb. 23 was the seventh of the Kalends of March and remained so when an intercalary day was inserted every fourth year between it and Feb. 24, hence in a leap year there were two days counted as the sixth of the Kalends of March. The leap year was therefore called bissextile [Lat., = sixth twice]. There is a legend that alterations in the length of the months were made later by Augustus to flatter his own vanity, but there seems to be no foundation for this story.

The Gregorian Calendar. The Julian year is 365 days 6 hr, hence a little too long. Therefore, by the 16th cent. the accumulation of surplus time had displaced the vernal equinox to March 11 from March 21, the date set in the 4th cent. In 1582 Pope Gregory XIII rectified this error. He suppressed 10 days in the year 1582 and ordained that thereafter the years ending in hundreds should not be leap years unless they are divisible by 400. The year 1600 was a leap year under both systems, but 1700, 1800, and 1900 were leap years only in the unreformed calendar. The reform was accepted, immediately in most Roman Catholic countries, more gradually in Protestant countries, and in the Eastern Church the Julian calendar was retained until the 20th cent. The present generally accepted calendar is therefore called Gregorian, though it is only a slight modification of the Julian.

Old Style and New Style. The reform was not accepted in England and the British colonies in America until 1752. By that date the English calendar was 11 days different from that of the Continent. For the period before the reform was introduced, the Gregorian style is called the New Style (N.S.), and the Julian the Old Style (O.S.). New Style years begin Jan. 1, but Old Style years began usually March 25. Thus Washington's birthday, which is Feb. 22, 1732 (N.S.) was Feb. 11, 1731 (O.S.). To avoid confusion sometimes both styles are given, thus 1731/32 or 1731/2 or 11 Feb. 1731/22 Feb. 1732.

The Christian Ecclesiastical Calendar. The church calendar with its movable feasts shows an interesting example of a harmony of several different systems. The key to it is the reconciliation of the seven-day week with the Roman calendar (see WEEK). The resurrection of Jesus has always been traditionally reckoned as having taken place on a Sunday (first day of the week), hence the annual feast celebrating the event, EASTER, should fall on a Sunday. The Bible places the Passion with relation to the Passover. Since the Jewish Passover is on the evening of the 14th (eve of the 15th) Nisan (see below), it may fall on any day of the week, hence Easter must fall on a Sunday near the 14th Nisan. In ancient times some Eastern Christians celebrated Easter on the 14th Nisan itself, these were called *Quartodecimans* [Lat., = fourteenth]. In 325 the First Council of Nicaea determined that Easter should fall on the Sunday following the full moon next after the vernal equinox, the full moon being theoretically the 14th day, and Nisan beginning with a new moon in March. The vernal equinox was considered by the church to fall on March 21. The paschal, or Easter, moon is the moon the 14th day of which falls next after (not on) March 21. Today Easter is calculated mathematically according to a system not taking all factors of the lunar period into consideration, hence it nearly always varies somewhat from what it should be according to true astronomical calculation. Several different systems have been used for determining Easter, today some Eastern churches use a different one from that of the West. In the 6th and 7th cent. in England, there was a great dispute between Christians who derived their rite from the Celts and Christians who had been converted as a result of the

mission of St. Augustine. The dispute over Easter arose because the Celts retained a computation for Easter based on a lunar cycle of 84 years, while the Romans had, in the 5th cent., given up the 84 year cycle for a 532-year cycle. The dispute was settled at the Synod of Whitby in favor of the Roman system, which prevailed from that time over the entire West. For a conventional means of computing Easter, see the Anglican Book of Common Prayer.

The Jewish Calendar. The Jewish calendar is today a lunisolar or semilunar calendar, i.e., an adjustment of a lunar calendar to the solar year. The months are Tishri (30), Marheshvan (29 or 30), Kislev (29 or 30), Tebet (29), Sebat or Shebat (30), Adar (29), Nisan (30), Iyar (29), Sivan (30), Tammuz (29), Ab (30), and Elul (29). The intercalary month of 30 days is added after Adar, Nisan being in ancient times the first month, and the intercalation is arranged to take place seven times in 19 years. The common year is referred to as a defective, regular, or perfect year, depending upon whether its length is 353, 354, or 355 days, the leap year may have 383 (defective), 384 (regular), or 385 (perfect) days. The Jewish civil year begins about the autumnal equinox, with the festival of Rosh ha-Shanah (the first of Tishri), which in 1974 fell on Sept. 17-18, marking the start of the Jewish year 5735.

The Muslim Calendar. The Muslim calendar is the only widely used purely lunar calendar, its year varying from 354 to 355 days. Hence the seasons and months have no connection, and there are about 33 Muslim years to every 32 Gregorian years. The months are Muharram (30), Safar (29), 1st Rabi'a (30), 2d Rabi'a (29), 1st Jumada (30), 2d Jumada (29), Rajab (30), Shaban (29), Ramadan (the fast, 30), Shawwal (29), Dhu-l-Kada (30), and Dhu-l-Hijja (month of the pilgrimage, 29 or 30).

Other Calendars. The old Chinese calendar was devised to have six 60-day cycles, each cycle having 10-day periods and three such periods going to make up a month. By the 5th cent. B.C. the solar year was calculated at 365 244/4 solar days and the solar month at 29 53059/59 days. The difference between solar time and the cycles was adjusted by intercalary months and shorter intercalary periods. The years were arranged in major cycles of 60 years with minor cycles of 5 years each. An interesting calendar is that of the MAYA, who used a year of 365 days divided into 18 20-day periods, with a 5 day period at the end. A recurrent series of 20 days was used also, like our week. A remarkable feature was that the year was never readjusted to the error in its length, instead, the feasts and dates were adjusted to the calendar. The AZTEC calendar was very similar. Many attempts have been made to devise new calendars, adjusting the months more regularly to the solar year, discarding the week, making the months equal in length, and the like, but they have never been widely adopted. The most celebrated is the FRENCH REVOLUTIONARY CALENDAR. In the 20th cent. the movement toward calendar reform has been strong, the aim being not to abandon but to refine the intercalary system of the Julian-Gregorian calendar. For the method of computing years from a fixed point (e.g., the birth of Christ and the HEGIRA), see ERA. The adoption of such era systems has made computation of time much easier. The Athenian system of identifying years by archons, the Roman system of identifying them by consuls, and the system used both earlier and later of reckoning by the year of the reign of certain kings offers enormous difficulties, and the establishment of chronology is one of the major problems in ancient and medieval history. The classic work on chronology is that of the Benedictines, first published in 1750, *L'Art de vérifier les dates des faits historiques* [the art of verifying the dates of historical acts]. See P. W. Wilson, *The Romance of the Calendar* (1937), Harold Watkins, *Time Counts: The Story of the Calendar* (1954), K. G. Irwin, *The Three Hundred Sixty-Five Days* (1963).

calendering, a finishing process by which paper, plastics, rubber, or textiles are pressed into sheets and smoothed, glazed, polished, or given a more or less embossed surface. The material is passed through a series of rollers, the resulting surface depends on the pressure exerted by the rollers, on their temperature, composition, and surface designs, and on the type of coating or glaze previously applied to the material to be calendered.

calendula (kalēn'jəla), any species of the genus *Calendula*, Old World plants of the family Compositae (COMPOSITE family). The common calendula (*C. officinalis*), an annual with yellow to deep orange flower heads produced through a long blooming season, was a popular garden flower in Shakespeare's time—his "marigold." Its dried florets have

been used as a food coloring and for flavoring stews and soups (whence the name pot marigold) and have also long been used medicinally. *Calendula* is classified in the division MAGNOLIOPHYTA, class Magnoliopsida, order Asterales, family Compositae.

Calexico (kalék'síkō), city (1970 pop 10,625), Imperial co., S Calif., at the Mexican border, inc. 1908. A port of entry from its adjacent sister city of Mexicali, Mexico, it is also a trade center in the southern part of the fertile Imperial Valley.

calif, golden, idol erected by the Israelites on several occasions. Aaron made one while Moses was on Mt Sinai. Ex 32. Jeroboam placed one at Bethel and another at Dan (1 Kings 12:26-32). Hosea denounced one in Samaria (Hosea 8:5,6). A bull cult was widespread in Canaan at the time of the invasion of the Israelites. The use of such a cult recalls Apis in Egypt and the Minotaur in Crete.

Calgary (käl'garē), city (1971 pop 403,319), S Alta., Canada, at the confluence of the Bow and Elbow rivers. Calgary is a wholesale and processing center for a large agricultural and stock-raising area. It is also the headquarters of many oil and natural gas firms. The city began (1875) as a fort of the Northwest Mounted Police. It is the site of the Univ. of Calgary. The Calgary Stampede, inaugurated 1912, is an annual rodeo.

Calgary, University of, at Calgary, Alta., Canada, coeducational, provincially supported, founded 1945 as a branch of the Univ. of Alberta. It gained full autonomy in 1966. It has faculties of arts and science, fine arts, business, education, engineering, environmental design, medicine, and graduate studies, as well as schools of nursing, physical education, and social welfare. The Banff School of Fine Arts is affiliated with the university.

Calhoun, John Caldwell (käl'hōon'), 1782-1850, American statesman and political philosopher, b. near Abbeville, S.C., grad. Yale, 1804. He studied law under Tapping Reeve at Litchfield, Conn., and began (1808) his public career in the South Carolina legislature. Frontier born, he acquired a large plantation by marrying (1811) his cousin, Floride Calhoun. Later he came to represent the interests of the Southern planter aristocracy. A Congressman (1811-17) and acting chairman of the House Committee on Foreign Affairs, Calhoun was one of the leading "war hawks," who whipped up enthusiasm for the War of 1812. He remained a nationalist for some time after the war, speaking for a strong army and navy, for encouragement of manufacturing, for internal improvements, and for a national bank, many of these causes he later opposed. Calhoun was an efficient Secretary of War (1817-25) under President Monroe and was Vice President (1825-29) under John Quincy Adams. Throughout Adams's administration he opposed the President and aligned himself with the supporters of Andrew Jackson. An able constitutional lawyer, he made an imposing figure skillfully presiding over the Senate. When the Jacksonians finally triumphed in 1828, Calhoun was again elected Vice President, and it was widely assumed that he would succeed Jackson in office. But relations between the two men soon cooled. Calhoun, prodded by his wife and his supporters, offended the President in the Eaton affair (see O'NEIL, MARGARET). Jackson finally became furious when he discovered that years before Calhoun had privately denounced Jackson's conduct in Florida while publicly giving the impression that he had supported the general. Primarily, however, Jackson and Calhoun had come to disagree on the nature of the Union. As the pre-eminent spokesman for the South, Calhoun tried to reconcile the preservation of the Union with the fact that under the Union the South's dominant agricultural economy was being neglected and even injured at the expense of the ever-increasing commercial and industrial power of the North. When a still higher tariff replaced (1832) the Tariff of Abominations of 1828, Calhoun maintained that the Constitution, rightly interpreted, gave a state the power to nullify Federal legislation inimical to its interests. He returned to South Carolina, had a state convention called, and directed the passage of the famous ordinance of NULLIFICATION. In Dec., 1832, he quit the vice presidency after being elected to the Senate, where he eloquently defended his STATES' RIGHTS principles in dramatic debates with Daniel Webster. The firmness of Andrew Jackson and the compromise tariff proposed by Henry CLAY resolved the nullification crisis in 1833, but the larger issue of states' rights persisted, leading ultimately to SECESSION and the Civil War. Meanwhile, Martin VAN BUREN, Calhoun's bitter political enemy, held the vice presidency in Jackson's second term and went on to suc-

ceed Jackson in the office Calhoun had coveted for many years. As the abolitionists grew stronger in the North, Calhoun became an outspoken apologist for slavery and bent every effort to maintain the delicate balance between North and South in the Senate by opposing the prohibition of slavery in newly admitted states. Thus, while serving briefly (1844-45) as Secretary of State under John Tyler, he completed negotiations for the admission of Texas as a slave state, but later tried to avert war with Mexico. Again (1845-50) in the Senate, he advocated compromise in the Oregon boundary dispute but opposed the admission of California as a free state in the debates over the COMPROMISE OF 1850. In rejecting the Wilmot Proviso, Calhoun set forth the theory that all territories were held in common by the states and that the Federal government merely served as a trustee of the lands. His *Disquisition on Government and Dis-course on the Constitution and Government of the United States*, both published posthumously, crystallized his political philosophy. The Constitution, he stated, established a government of concurrent majorities composed of two elements—the state governments and the Federal government. Hence the states enjoy the power of veto, or nullification, and the right of secession results necessarily from the origin of the Union as a compact among the sovereign parties. His theories attempted to formulate democracy in terms of protection for a minority, specifically, the South, and they were later embodied in the Confederate constitution. Because his ideas are associated with an institution—slavery—offensive to the idealism of most Americans, Calhoun has never been a popular figure in U.S. history. He was, however, the intellectual giant of political life in his day. Calhoun's plantation, with his house, Fort Hill, is now the campus of Clemson Univ. See his works (ed. by R. K. Cralle, 6 vol., 1851-55), his papers (ed. by R. L. Meriwether and W. E. Hemphill, Vol. I-VII, 1959-1973), biographies by C. M. Wiltse (3 vol., 1944-51), M. L. Coit (1950), and G. M. Capers (1968).

Cali (ka'lā), city (1971 est. pop. 950,500), capital of Valle del Cauca dept., W Colombia, on the Cali River. It is an industrial and commercial center of the upper Cauca valley. Livestock, minerals, lumber, and farm products are shipped through the city, and tires, tobacco products, textiles, paper, chemicals, and building materials are manufactured. Cali is also a tourist center. The city was founded in 1536, but its growth is relatively recent, with the population more than doubling in the 1950s. In the city are two universities and the headquarters of the Cauca valley development project, which is modeled after the Tennessee Valley Authority. Cali's landmarks include an aqueduct and a cathedral.

Caliari, Paolo: see VERONESE, PAOLO

calico, plain weave cotton fabric in one or more colors. Calico, named for Calicut, India, where the fabric originated, was mentioned by historians before the Christian era and praised by early travelers for its fine texture and beautiful colors. Block-printed cottons from Calicut imported into England c. 1630 were called calicuts. The name calico was soon applied to all Oriental cottons having an equal number of warp and weft threads, then to all plain weave cottons. In the latter part of the 18th cent. calico became an important item in England's growing textile industry.

calico cat: see CAT

Calicut (kāl'likat) or **Kozhikode** (kō'zhəkōd'), city (1971 pop. 333,980), Kerala state, SW India, on the Malabar coast of the Arabian Sea. Once the leading port of S India, it declined in the 19th cent. but remains the center of India's timber trade. Cashew nuts, spices, tea, and coffee are exported. Calicut was (1498) Vasco da Gama's first Indian port of call, and the city soon became a center for European traders. The term *calico* was first applied to Calicut cotton cloth, which was then an important manufacture. Calicut passed to British rule in 1792.

California, state (1970 pop. 19,953,134), 158,693 sq mi (411,014 sq km), W United States, admitted as the 31st state of the Union in 1850. The capital is SACRAMENTO. The largest cities and major seaports are LOS ANGELES, SAN FRANCISCO, OAKLAND, and SAN DIEGO. California is bounded on the N by Oregon, on the E by Nevada and Arizona (from which it is separated by the Colorado River), on the S by Mexico, and on the W by the Pacific Ocean. Ranking first among the U.S. states in population and third in area, California has a diverse topography and climate. A series of low mountains known as the Coast Ranges extends along the 1,200-mi (1,930-km) coast. The region from Point Arena, N of San Francisco, to the south-

ern part of the state is subject to tremors and sometimes to severe earthquakes caused by the San Andreas fault. The Coast Ranges receive heavy rainfall



in the north, where the giant cathedral-like redwood forests prevail, but the climate of these mountains is considerably drier in S California, and S of the Golden Gate no major rivers reach the ocean. Behind the coastal ranges in central California lies the great Central Valley, a long alluvial valley drained by the Sacramento and San Joaquin rivers. In the southeast lie vast wastelands, notably the Mojave Desert, site of Joshua Tree National Monument. Rising as an almost impenetrable granite barrier E of the Central Valley is the Sierra Nevada range, which includes Mt. Whitney, Kings Canyon National Park, Sequoia National Park, and Yosemite National Park. The Cascade Range, the northern continuation of the Sierra Nevada, includes Lassen Volcanic National Park. Death Valley National Monument is E of the S Sierra Nevada. Although agriculture is second to industry as the basis of the state's economy, California is a leading state in the production of fruits and vegetables and is the largest producer in the United States of many crops, including tomatoes, carrots, lettuce, asparagus, broccoli, spinach, and strawberries. The state's most valuable crops are hay, grapes, tomatoes, and cotton. Cattle and dairy products also contribute a major share of farm income. The state produces the major share of U.S. domestically produced wine. California's farms are highly productive as a result of good soil, a long growing season, and the use of modern agricultural methods. Irrigation is widely used. The gathering and packing of crops is done largely by seasonal migrant labor (including thousands of Mexicans), and one of California's major social problems is the improvement of the farm workers' condition. Fishing is another important industry. California leads the nation in commercial fishing. Much of the state's manufacturing depends on the processing of farm produce and upon such local natural resources as mineral deposits and forests. Petroleum is the state's most valuable mineral, and in the late 1960s California ranked third in the country in oil production. Other important products are natural gas, cement, and sand and gravel. Since World War II heavy industry in the state has increased enormously, notably in the manufacture of transportation equipment, electronic equipment, machinery, and metal products. Defense-contract industries, particularly in S California, represent a major base of the region's economy and have contributed to the growing wealth and population of the area. California has long been a major U.S. center for motion-picture and television film production, but in the late 1960s its position became threatened by a trend toward on-location filming. One of the state's most acute problems is the need for an adequate water supply. The once fertile Owens valley is now arid, its waters tapped by Los Angeles 175 mi (282 km) away, and water is piped to the coast across the Mojave Desert from the Colorado River 200 mi (322 km) away. In the lush, fruit-growing Imperial Valley, irrigation is controlled by the All-American Canal, which also draws from the Colorado. To the N in the Central Valley the water problem is one of bad distribution, an

imbalance lessened by the vast CENTRAL VALLEY PROJECT California's pleasant climate and natural beauty have attracted many retired persons, and senior-citizen communities have sprung up in the state. Tourism is an important source of income. Disneyland, San Francisco and the Golden Gate Bridge, the giant Sequoia (among the oldest living things on earth), many national parks and forests, and beautiful beaches are among California's numerous attractions. The first voyage (1542) to Alta California (Upper California), as the region N of Baja California (Lower California) came to be known, was commanded by the Spanish explorer Juan Rodriguez Cabrillo, who discovered San Diego Bay and explored farther north along the coast. In 1579 an English expedition headed by Sir Francis Drake landed near Point Reyes, N of San Francisco, and claimed the region for Queen Elizabeth I. In 1602, Sebastian Vizcaino, another Spaniard, explored the coast and discovered Monterey Bay. Colonization was slow, but finally in 1769 Gaspar de Portola, governor of the Californias, led an expedition up the Pacific coast and established a colony on San Diego Bay. The following year he explored the area around Monterey Bay and later returned to establish a presidio there. Soon afterward Monterey became the capital of Alta California. Accompanying Portola's expedition was Father Junipero Serra, a Franciscan missionary who founded a mission at San Diego. Franciscans later founded several missions that extended as far N as Sonoma, N of San Francisco. The missionaries sought to Christianize the Indians but also forced them to work as manual laborers, helping to build the missions into vital agricultural communities. Cattle raising was of primary importance, and hides and tallow were exported. The missions have been preserved and are now open to visitors. In 1776, Juan Bautista de Anza founded San Francisco, where he established a military outpost. The early colonists, called the Californios, lived a pastoral life and for the most part were not interfered with by the central government of New Spain (as the Spanish empire in the Americas was called) or later (1820s) by that of Mexico. The Californios did, however, become involved in local politics, as when Juan Bautista Alvarado led a revolt (1836) and made himself governor of Alta California, a position he later persuaded the Mexicans to let him keep. Under Mexican rule the missions were secularized (1833-34) and the Indians released from their servitude. The degradation of the Indian, which continued under Mexican rule and culminated after U.S. settlers came to the area, was described by Helen Hunt Jackson in her novel *Ramona* (1884). Many mission lands were subsequently given to Californios, who established the great ranchos, vast cattle-raising estates. Colonization of California remained largely Mexican until the 1840s. Russian fur traders had penetrated S to the California coast and established Fort Ross, N of San Francisco, in 1812. Jedediah Strong Smith and other trappers made the first U.S. overland trip to the area in 1826, but U.S. settlement did not become significant until the 1840s. In 1839, Swiss-born John Augustus Sutter arrived and established his "kingdom" of New Helvetia on a vast tract in the Sacramento valley. He did much for the overland American immigrants, who began to arrive in large numbers in 1841. Some newcomers met with tragedy, including the DONNER PARTY, which was stranded in the Sierra Nevada after a heavy snowstorm. Political events in the territory moved swiftly in the next few years. After having briefly asserted the independence of California in 1836, the Californios drove out the last Mexican governor in 1845. Under the influence of the American explorer John C. Fremont, U.S. settlers set up (1846) a republic at Sonoma under their home-styled Bear Flag. The news of war between the United States and Mexico (1846-48) reached California soon afterward. On July 7, 1846, Commodore John D. Sloat captured Monterey, the capital, and claimed California for the United States. The Californios in the north worked with U.S. soldiers, but those in the south resisted U.S. martial law. In 1847, however, U.S. Gen. Stephen W. Kearny defeated the southern Californios. By the Treaty of Guadalupe Hidalgo (1848), Mexico formally ceded the territory to the United States. In the same year a major event in California's history occurred while establishing a sawmill for John Sutter near Coloma, James W. Marshall discovered gold and touched off the California gold rush. The forty-niners, as the gold-rush miners were called, came in droves, spurred by the promise of fabulous riches from the MOTHER LODE. San Francisco rapidly became a boom city, and its bawdy, lawless coastal area, which became known as the

Barbary Coast, gave rise to the vigilantes, extralegal community groups formed to suppress civil disorder. American writers such as Bret Harte and Mark Twain have recorded the local color as well as the violence and human tragedies of the roaring mining camps. With the gold rush came a huge increase in population and a pressing need for civil government. In 1849, Californians sought statehood and, after heated debate in the U.S. Congress arising out of the slavery issue, California entered the Union as a free, non-slavery state by the Compromise of 1850. San Jose became the capital. Monterey, Vallejo, and Benicia each served as the capital before it was finally moved to Sacramento in 1854. In 1853, Congress authorized the survey of a railroad route to link California with the eastern seaboard, but the transcontinental railroad was not completed until 1869. In the meantime communication and transportation depended upon ships, the stage coach, the pony express, and the telegraph. Chinese laborers were imported in great numbers to work on railroad construction. The Burlingame Treaty of 1868 (see BURLINGAME, ANSON) provided, among other things, for unrestricted Chinese immigration. That was at first enthusiastically endorsed by Californians, but after a slump in the state's shaky economy, the white settlers viewed the influx of the lower-paid Chinese laborers as an economic threat. Ensuing bitterness and friction led to the Chinese Exclusion Act of 1882 (see CHINESE EXCLUSION). A railroad-rate war (1884) and a boom in real estate (1885) fostered a new wave of overland immigration. Cattle raising on the ranchos gave way to increased grain production. Vineyards were planted by 1861, and the first trainload of oranges was shipped from Los Angeles in 1886. By the turn of the century the discovery of oil, industrialization resulting from the increase of hydroelectric power, and expanding agricultural development attracted more settlers. Los Angeles grew rapidly in this period and, in population, soon surpassed San Francisco, which suffered greatly after the great earthquake and fire of 1906. Improvements in urban transportation stimulated the growth of both Los Angeles and San Francisco, the advent of the cable car and the electric railway made possible the development of previously inaccessible areas. As industrious Japanese farmers acquired valuable land and a virtual monopoly of California's truck-farming operations, the issue of Oriental immigration again arose. The bitter struggle for the exclusion of Orientals plagued international relations, and in 1913 the California Alien Land Act was passed despite President Woodrow Wilson's attempts to block it. The act provided that persons ineligible for U.S. citizenship could not own agricultural land in California. Successive waves of settlers arrived in California, attracted by a new real-estate boom in the 1920s and by the promise of work in the 1930s. The influx during the 1930s of displaced farm workers, depicted by John Steinbeck in his novel *The Grapes of Wrath*, caused profound dislocation in the state's economy. During World War II the Japanese in California were removed from their homes and placed in relocation centers. Industry in California expanded rapidly during the war, the production of ships and aircraft attracted many workers who later settled in the state. Prosperity and rapid population growth continued after the war. Many Negroes who came during World War II to work in the war industries settled in California. By the 1960s they constituted a sizable minority in the state, and racial tensions reached a climax. In 1964, California voters approved an initiative measure, Proposition 13, allowing racial discrimination in the sale or rental of housing in the state, a measure later declared unconstitutional by the U.S. Supreme Court, and in 1965 riots broke out in Watts, a predominantly black section of Los Angeles. Also in the 1960s migrant farm workers in California formed a union and struck many growers to obtain better pay and working conditions. Unrest also occurred in the state's universities, where student demonstrations and protests in 1964 provoked disorders. In 1970, S. California was struck by the worst brush fire in state history, and in 1971 a severe earthquake hit S. California along the San Andreas fault. The state's first constitution was adopted in 1849. The present constitution dates from 1879 and provides for initiative, referendum, and recall of public officials. The state's executive branch is headed by a governor elected for a four-year term. California's bicameral legislature has a senate with 40 members elected for four-year terms and an assembly with 80 members elected for two years. Local government is carried out on the county and city level. The state elects 2 Senators and 43 Representatives to the U.S. Congress and has 45 electoral votes.

Republicans have played a more dominant role than Democrats in California politics during the 20th cent. Ronald Reagan, a former movie actor and leading conservative Republican, was elected governor in 1966 and reelected in 1970. In 1974, Edmund G. Brown, Jr., a Democrat and the son of a former governor (1959-67), was elected governor. Among the state's more prominent institutions of higher learning are the Univ. of California, with eight campuses, Occidental College and the Univ. of Southern California, at Los Angeles, Stanford Univ. at Stanford, the California Institute of Technology, at Pasadena, Mills College, at Oakland, and the Claremont Colleges, at Claremont. See R. G. Cleland, *From Wilderness to Empire* (rev. ed. by G. S. Dumke, 1959), D. E. Fehrenbacher, *A Basic History of California* (1964), Federal Writers' Project, *California, A Guide to the Golden State* (rev. ed. 1967), L. Pitt, *The Decline of the Californios: A Social History of the Spanish Speaking Californians, 1846-1890* (1967), R. Kirsch, *West of the West: Witnesses to the California Experience, 1542-1906* (1968), R. J. Roske, *Everman's Eden: A History of California* (1968), C. A. Hutchinson, *Frontier Settlement in Mexican California* (1969), A. F. Rolle, *California: A History* (2d ed. 1969), J. W. Caughey, *California* (3d ed. 1970), Walton Bean, *California: An Interpretive History* (2d ed. 1973).

California, Gulf of, arm of the Pacific Ocean, c 700 mi (1,130 km) long and 50 to 130 mi (80-209 km) wide, NW Mexico, separates Baja California from the Mexican mainland. The gulf is part of a depression in the earth's surface that extends inland to the Coachella Valley, S Calif. The Imperial Valley and the Salton Sea, once part of the gulf, have been cut off from it by the growth of the Colorado River delta. The gulf deepens from north to south, its greatest depth is c 8,500 ft (2,590 m). The coastline is irregular, with numerous islands, Tiburon, inhabited by aboriginal tribes, is the largest. Storms and tidal currents hinder navigation in the gulf. Commercial and sport fishing thrive, pearl, sponge, and oyster beds are harvested. The region is a developing tourist center, La Paz, Guaymas, and Mazatlan are major cities. The area was first explored in 1538 by the Spaniard Francisco de Ulloa.

California, Lower. see BAJA CALIFORNIA

California, University of, at nine campuses, main campus at Berkeley, land-grant and state supported, coeducational, the largest state university system in the United States, chartered 1868, opened 1869 when it took over the College of California (est. 1853 at Oakland as Contra Costa Academy). In 1873 it moved to the present Berkeley campus. At Berkeley are the Lawrence Radiation Laboratory, the main library, which houses over 4 million manuscripts and a large number of collections relating to many fields, and an extensive museum system including museums of paleontology, zoology, and anthropology. The Los Angeles campus (est. 1881 as Los Angeles State Normal School, transferred to the university 1919) is known for its theater department. The brain and nuclear medicine institutes are among the several research programs there. At La Jolla is the Scripps Institution of Oceanography (est. 1901, transferred to the university 1912), whose research facilities include several ships and marine laboratories. In the 1950s the institution became the nucleus of the San Diego campus, which added an undergraduate program in 1964. The San Francisco campus (est. 1864 as Toland Medical College, transferred to the university 1934) is employed exclusively by the medical sciences. Other campuses are at Riverside (est. 1907 as the Citrus Experiment Station), Santa Barbara (est. 1891 as a private school, transferred to the university 1944), Davis (opened 1909), Irvine (est. 1960, opened 1965), and Santa Cruz (est. 1965). The university also operates the Los Alamos Scientific Laboratory, the Lick Observatory, numerous agricultural experiment stations, and a statewide extension service.

California Institute of Technology, at Pasadena, Calif., originally for men, became coeducational in 1970, founded 1891 as Throop Polytechnic Institute, called Throop College of Technology, 1913-20. The institute's research facilities, principally in science and engineering, include the Jet Propulsion Laboratory (operated in conjunction with the National Aeronautics and Space Administration), the Hale Observatories (originally the Mount Wilson and Palomar observatories), the Guggenheim Aeronautical Laboratory, and a cosmic ray laboratory.

California Joe, 1829-76, American frontiersman and scout, whose real name was Moses Embree Milner, b. Stanford, Ky. He went to California in the gold rush, later moving into the Oregon country. He was

a sharpshooter for the Union army during the Civil War, after which he became a scout in the Indian campaigns, serving under George A. Custer and Philip H. Sheridan, both commended him in reports. Custer once appointed him chief of scouts, but California Joe got so drunk within a few hours that he had to be demoted. In 1875 he guided the government expedition led by W. P. Jenny to investigate the mineral resources of the Black Hills. He was shot in a private quarrel. See biography by his grandson, J. E. Milner, and E. R. Forrest (1935).

California poppy: see **POPPY**

California State College System, coordinating agency established 1960 by the merging of individual California state colleges, consisting of 19 campuses, 14 of which have university status. It is one of the three California public systems of higher education, the other two being the Univ. of California system (see **CALIFORNIA UNIV. OF**) and the California junior college system. The oldest school in the system (founded 1857) at San Jose was the first institution of public higher education in California. The newest campus was opened at Bakersfield in 1970. The other branches are at Dominguez Hills, Fullerton, Hayward, Long Beach, Los Angeles, San Bernardino, Pomona, San Luis Obispo, Chico, Fresno, Arcata (Humboldt campus), Sacramento, San Diego, Northridge, San Francisco, and Turlock (Stanislaus campus). The university's special programs include an off-campus degree program and weekend colleges. In 1972 the system's official title became the California State University and Colleges.

californium (kāl'fōr'neəm), artificially produced, radioactive metallic chemical element, symbol Cf, at no. 98, mass number of most stable isotope 251, m.p., b.p., and density unknown, valence +3. Californium is a member of the ACTINIDE SERIES of chemical elements, found in group IIIB of the PERIODIC TABLE. Its chemical properties are similar to those of LANTHANUM. Twelve isotopes of californium are known, with half-lives ranging from about 4 min for californium-242 to about 800 years for californium-251, the most stable isotope. Californium-249 (half-life 323 years) is most useful for chemical investigations, it is obtained by the decay of berkelium-249. Four solid compounds of californium have been prepared, they are the trichloride, oxychloride, oxyfluoride, and oxide. Californium-252 (half-life 2.6 years) is produced in nuclear reactors for use as a source of neutrons. Californium was first produced in 1950 by Glenn T. Seaborg, S. G. Thompson, A. Ghiorso, and K. Street in a cyclotron at the Univ. of California at Berkeley by bombarding curium-242 with alpha particles, resulting in californium-245 (half-life 45 min).

Caligula (kalig'yōlā), A.D. 12-A.D. 41, Roman emperor (A.D. 37-A.D. 41), son of GERMANICUS CAESAR and AGRIPPINA I. His real name was Caius Caesar Germanicus. As a small child, he wore military boots, whence his nickname [caligula=little boots]. After the death (A.D. 33) of his brother, Drusus, Caligula and Tiberius' grandson, Tiberius Gemellus, were the heirs apparent. On the death of TIBERIUS the army helped make Caligula emperor. Shortly afterward he became severely ill, it is widely believed that he was thereafter insane. He earned a reputation for ruthless and cruel autocracy, and torture and execution became the order of the day. He was responsible for serious disturbances among the Jews, and he nearly caused a rebellion in Palestine by attempting to erect a statue of himself in their temple. He is reported to have made his horse a consul and a member of a priestly college. His reign ended when Chaerea, a tribune of the Praetorian Guard, assassinated him. CLAUDIUS I succeeded to the throne. See J. P. V. D. Balsdon, *The Emperor Gaius* (1934).

caliphate (kāl'ifāt', -fīt), the rulership of ISLAM. Islam is, theoretically, a theocracy, and its caliph the vicegerent of God. When Muhammad the Prophet died, a caliph (Arabic, =successor) was chosen to rule in his place. The caliph had temporal and spiritual authority but was not permitted prophetic power, this was reserved for Muhammad. The first caliph was ABU BAKR. He was succeeded by UMAYYAD, UTHMAN, and ALI. These are the Orthodox caliphs. After Ali's death there was a division in Islam. MUAWIYA became caliph and founded the Umayyad dynasty, chiefly by force of arms. Its capital was Damascus. The SHITES, however, continued to recognize the descendants of Ali and in 750 won the caliphate for them, massacring the members of the Umayyad family. These Shiite caliphs were of the ABBASID family. Their caliphate is sometimes called the caliphate of Baghdad. One Umayyad, ABD AR-RAHMAN I, escaped the general massacre of his family and fled to Spain, where the emirate of Cordoba was set up in 780. This

later became the caliphate of Cordoba, or the Western caliphate, and persisted until 1031. A third contemporary caliphate was established by the FATIMIDS in Africa and lasted from 909 to 1171. After the fall of Baghdad to the Mongols under Hulagu Khan in 1258, the Abbasids fled to Egypt. After this date the caliphate was virtually nonexistent, since the Abbasids in Egypt had not the slightest power. The Ottomans captured Egypt in 1517, Selim I assumed the title of caliph (by questionable right). The Ottoman sultans, however, kept the title until the last sultan, Muhammad VI, was deposed. He was succeeded briefly by a cousin, but in 1924 the caliphate was abolished altogether. A year later Husayn ibn Ali, king of Arabia, proclaimed himself caliph, but he was forced to abdicate by Ibn Saud. Since then several pan-Islamic congresses have attempted to establish a rightful caliph. See William Muir, *The Caliphate* (1898, repr. 1964), Alfred von Kremer, *Orient under the Caliphs* (tr. 1920), T. W. Arnold, *The Caliphate* (1924, repr. 1966), A. S. Tritton, *The Caliphs and their Non-Muslim Subjects* (1930, repr. 1970), Muhammad Ali, *Early Caliphate* (tr. 1947), S. Khuda Bakhsh, *The Caliphate* (1954), P. K. Hitti, *History of the Arabs* (10th ed. 1970).

Calisher, Hortense (kāl'ishər), 1911-, American author, b. New York City, grad. Barnard, 1932. Her novels are difficult to categorize, blending character analysis with complex story lines. Written in careful yet constantly fresh prose, they have been compared to works by Dickens and James. Among her works are *Extreme Magic* (1964), a short-story collection, and the novels *False Entry* (1961), *Textures of Life* (1963), *The New Yorkers* (1969), *Queenie* (1971), and *Standard Dreaming* (1972). See Calisher's *Herself* (1972).

calisthenics: see **GYMNASTICS**

Calixtines: see **HUSITES**

Calixtus I, Calixtus I (both kəl'ik'stəs), or **Callistus I**, **Saint** (kəl'is'təs), c. 160-c. 222, pope (217-222), a Roman, successor of St. Zephyrinus. As archdeacon to Zephyrinus he established the famous Calixtus Cemetery, where all the popes of the 3d cent. except Calixtus himself are buried. His election to the papacy was opposed by HIPPOLYTUS (later antipope), who accused him of monarchianism and of laxness in disciplining repentant sinners. Calixtus in fact excommunicated the chief monarchianist, SABELLIUS. His other important action, to grant absolution under conditions of true contrition to certain classes of sinners (apostates, murderers, adulterers), considered by many as unforgivable, was important in the development of the church's doctrine of penance. Calixtus died in the reign of Alexander Severus and may have been a martyr. He was succeeded by St. Urban I. Feast Oct. 14.

Calixtus II, Calixtus II, or **Callistus II**, d. 1124, pope (1119-24), a Burgundian named Guy, successor of Gelasius II. He was archbishop of Vienne during the investiture controversy with Holy Roman Emperor HENRY V. When Gelasius died while in exile in France, Calixtus was consecrated pope at Vienne. He immediately summoned a large council at Rheims (1119) that proceeded to anathematize the emperor and the antipope that Henry had installed (1118). Gregory VIII. Public reaction sided with the pope and the antipope was imprisoned. Henry, confronted by a church united against him, submitted. He signed (1122) the famous Concordat (see **WORMS CONCORDAT**) guaranteeing the freedom of the church in its elections. Thus was the investiture controversy ended and the reform program of Gregory VII realized. Calixtus then called to Rome (1123) the first great ecumenical council of the West (see **LATERAN COUNCIL, FIRST**) to ratify the achievements of the Hildebrandine reform. He was succeeded by Honorius II.

Calixtus III, Calixtus III, or **Callistus III**, 1378-1458, pope (1455-58), a Spaniard (b. Jativa) named Alonso de Borja or, in Italian, Alfonso Borgia, successor of Nicholas V. He acted as arbitrator between his friend Alfonso V of Aragon and the papacy, and for this he was made a cardinal (1444). Calixtus was elected soon after the fall of Constantinople, and he promptly proclaimed a crusade against the Turks. He spared nothing to aid John HUNYADI, who won a victory with St. John Capistrano at Belgrade (1456). In 1457, Calixtus turned to SCANDERBEG, in Albania, sent him money, and named him captain general of the crusade. Calixtus' reign was embittered by a quarrel with Alfonso, who expected returns, notably the march of Ancona, for his friendship. The pope would not give away church lands and resented Alfonso's failure to help the crusade. Calixtus' nepotism gave the Borgia family its position in Italy. Ca-

lixus was, like other Borgias, an able administrator. He was succeeded by Pius II.

Calixtus, Georgius (jór'jēəs), 1586-1656, German theologian, whose original name was Georg Callisen. He extended the influence of MELANCHTHON, advocating syncretism, and sought a basis, such as the Apostles' Creed, for uniting Christian churches. Because he tended to minimize the differences in doctrine and to emphasize the importance of Christian living, he was charged by some of the Lutherans with favoring Roman Catholic dogmas and by others with pro-Calvinism. He failed to win the Lutherans to his support at the Conference of Thorn (1645).

call, in securities trading, contract allowing the holder to purchase a given stock at a specific price within a designated period of time. It is the opposite of a put, which is a contract allowing the holder to sell a given stock at a specific price within a designated period of time. Puts and calls are both types of privileges, or options, that add flexibility to the securities market. In return for his use of a put or call, the investor must pay a fee to the securities seller (the maker), who, in turn, pays a commission to the broker who brought the two parties together. Calls are generally used by investors who want to profit from a rise in stock prices but, at the same time, want to avoid sharp losses. Thus, an investor holding a call chooses one of two options. If the market advances he can buy the designated security at the lower price quoted in the call, and then sell the stock at a profit. If the market declines, he can simply exercise his option not to buy the stock, thereby avoiding a major loss, the only expense being the cost of the option. Unlike a call, a put is used by investors seeking to profit from a fall in stock prices. For example, an investor holding a put for a stock that declines in price is able to sell the stock at the higher price quoted in the put, thereby profiting by the amount the stock declines from the put price, if the stock price rises the investor can lose only the money used to purchase the put option. Puts and calls are generally written for one, two, three, or six months, although any period over 21 days is accepted by the New York Stock Exchange. A straddle and a spread are combinations of puts and calls occasionally used by sophisticated investors. In a more generalized sense, the term *call* may refer to any demand for payment. See L. T. Al- verson, *How to Write Puts and Calls* (1968), Paul Sarnoff, *Puts and Calls: The Complete Guide* (1970), Louis Engel, *How to Buy Stocks* (5th ed. 1971).

calla or calla lily: see **ARUM**

Callaghan, Morley (Morley Edward Callaghan), 1903-, Canadian novelist. During the 1920s he spent time in Paris, where he became friends with Ernest Hemingway, whose influence can be detected in Callaghan's spare literary style. Callaghan's novels and short stories are marked by a Christian view of life. They often concern individuals whose essential characteristic is a strong, and often unintentional, sense of self. Among his best-known novels are *Such Is My Beloved* (1934) and *The Many Colored Coat* (1960). Callaghan's other works include the novels *Strange Fugitive* (1928) and *A Passion in Rome* (1961) and such story collections as *Native Argosy* (1929) and *Stories* (1967). His years in Paris are recalled in *That Summer in Paris: Memories of Tangled Friendships with Hemingway, Fitzgerald and Some Others* (1963).

Callao (käl'yo'), city (1970 est. pop. 335,400), capital of Lima dept., W. Peru, on Callao Bay of the Pacific Ocean. It is Peru's major seaport. The harbor, which is sheltered by an island and a small peninsula, handles more than three fifths of the nation's imports and exports. Callao was founded in 1537, at the same time that Francisco PIZARRO founded Lima. As the gateway to Lima it was frequently attacked. The English navigator Sir Francis Drake sacked the city in 1578. It was held by Spanish loyalists until 1826, even though Peru achieved independence in 1821. Later, during the War of the Pacific (see **PACIFIC WAR OF THE**), Callao was occupied (1881-83) by Chile. Subjected to earthquakes and tidal waves, the city was completely destroyed in 1746 and was severely damaged in 1940. Several landmarks from the colonial period survive.

Callas, Maria Meneghini (mār'ē mēnēg'ēnē käl-lās), 1923-, Greek-American soprano, b. New York City. At 13, Callas moved to Greece, where she studied at the Royal Conservatory in Athens. Her professional debut took place in 1947 at Verona. In 1949, Callas married the Italian industrialist Giovanni Battista Meneghini; they separated in 1959. She first appeared at La Scala (Milan) in 1950 at Covent Garden

(London) in 1952, and at the Metropolitan Opera in 1956. Callas is celebrated for her dramatic intensity and versatility. Her acting in Pasolini's film *Medea* (1970) was widely acclaimed.

Calleja del Rey, Félix María (fā'lēks marē'a kalyā'-ha dēl rā), 1750-1826, Spanish general, viceroy of New Spain (1813-16), conde de Calderón. In command of the post of San Luis Potosí when the revolution under HIDALGO y COSTILLA broke out, he led a large force into the field and defeated Hidalgo at Aculco and at Calderón Bridge and besieged MORELOS y PAVÓN in Cuautla (1812). As viceroy, Calleja continued to repress revolution, and by the time he left Mexico most of the insurrectionists were defeated. After his return to Spain, he held several high posts.

Calles, Plutarco Elias (plō'tar'kō ālē'as ka'yās), 1877-1945, Mexican statesman, president (1924-28). In 1913 he left schoolteaching to fight with Álvaro OBREGÓN and Venustiano CARRANZA against Victoriano HUERTA. In 1920 he joined Obregon and Adolfo de la HUERTA in the rebellion against Carranza. After Obregon's term as president, Calles, who had been a cabinet member, became the presidential nominee. Adolfo de la Huerta, claiming election fraud, revolted (Dec., 1923), but Obregon and Calles established their supremacy by force (1924), Calles became president. His administration was noted for its revolutionary zeal, which often precipitated violence. At the outset agrarian reform was pursued vigorously but recklessly. Many rural schools were built, although teachers were still scarce and underpaid. Material improvements were given special attention, vast road-building and irrigation projects were undertaken. The struggle between church and state reached a new level of bitterness. In 1926 the enforcement of anticlerical legislation provoked violence, in 1926-27 the *cristeros*, terrorists whose slogan was "Viva Cristo Rey" [long live Christ the King] took up arms in the states of Colima, Jalisco, and Michoacán. Military chieftains reciprocated by victimizing innocent Roman Catholics, and government officials used the strife to political advantage. At the same time legislation over land and petroleum rights brought about a serious dispute with the United States, relations between the two countries improved when Dwight W. MORROW was appointed (1927) ambassador, and the oil question was temporarily settled. Calles created and directed a powerful national army and dissolved the private militia that threatened internal peace. He unified the government and molded the National Revolutionary party into the dominant force in Mexican politics. Calles rapidly lost his radicalism when he gained power and became a landowner and financier, he moved toward dictatorship. Already in control of the labor movement, he made himself the force behind the Callistas, a circle of financiers and industrialists who dominated the country's economy and politics. Thus he became undisputed *Jefe Máximo*, or political chieftain, of Mexico. When Obregon was assassinated (1928) after his reelection to the presidency, Calles appointed Emilio Portes Gil. In 1930 he declared the agrarian reform program a failure. In the same year he engineered the election of Pascual Ortiz Rubio. Two years later he removed him to appoint Gen. Abelardo Luján Rodríguez. The mighty labor union, CROM (see LOMBARDO TOLEDANO, VICENTE), was smashed. The conflict with the church, temporarily subdued (1929) by Morrow, was resumed, priests were openly persecuted. Communist unions, previously used by Calles in his campaign against the CROM, were ruthlessly suppressed, and a Callista-backed fascist organization, the Gold Shirts, harassed minority groups. As the new champion of conservatism, Calles in 1935 openly opposed the policies of his former protégé, Lázaro CÁRDENAS, but was defeated in the contest, in 1936 he was exiled. He was allowed to return under an amnesty in 1941. See study by R. H. Murray (1927), biography (in Spanish) by R. J. Zevada (1971).

Calley, William L. see MY LAI INCIDENT

Callias (kāl'ēās), fl. 449 B.C., Athenian statesman, he was related to Cimon and also to Aristides. He distinguished himself at the battle of Marathon (490 B.C.) and was a three-time winner of the Olympic chariot races. Callias was sent to Susa to negotiate for peace c. 449 B.C. The result of his work was an agreement usually called the Peace of Callias (or Treaty of Callias), by it ARTAXERXES I agreed to respect the independence of the Delian League and its members and to send no warships into Greek waters, in return Athens agreed not to interfere with Persian "influence" in Asia Minor, Cyprus, and Egypt. There is doubt that such a treaty was actually ever drawn up, however, peace did exist between

Persia and the cities of Greece until the end of the century. According to ancient historians, when Callias returned to Athens he was fined 50 talents for betraying the city. Callias was also supposed to have been one of the negotiators of a treaty between Athens and Sparta (446-445 B.C.) that resulted in 30 years of peace.

Callias, d. c. 370 B.C., Athenian leader, one of the generals of the Peloponnesian War. In his old age Callias was one of the ambassadors sent to Sparta with Callistratus to negotiate a peace treaty in 371 B.C. The treaty was ineffective, and friction between EPAMINONDAS of Thebes and AGESILAUS II of Sparta became acute. Callias was a rich man and his wealth was ridiculed by his contemporaries, including Aristophanes. His house is the scene of Xenophon's *Symposium* and Plato's *Protagoras*.

Callicrates (kalī'krā'tēs), 5th cent. B.C., Greek architect. In association with Ictinus he built (447-432 B.C.) the Parthenon at Athens. At Athens also he designed (c. 427) the Temple of Nike.

calligraphy (kalī'grā'fē) [Gr., =beautiful writing], skilled penmanship practiced as a fine art. In Europe two sorts of handwriting came into being very early. Cursive script was used for letters and records, while far more polished writing styles, called uncials, were used for literary works. Both styles can be seen in Papyrus fragments from the 4th cent. B.C. After the first cent. A.D., the development of the half uncial or minuscule letter from the Roman capital gave rise to an extraordinarily beautiful and long-lasting calligraphy. As tools and materials of high quality came into use, masterpieces of calligraphic art were produced, e.g., the Irish Book of Kells (8th cent., Trinity College, Dublin, see under KELLS) and the English Lindisfarne Gospels (8th cent., British Mus., see HOLY ISLAND). Carolingian minuscule script and its splendid and complex derivative, known as Gothic, were the principal calligraphic styles from the 9th to the 14th cent. The humanistic handwriting style of the Renaissance, a deliberate imitation of Carolingian minuscule, was both aesthetically pleasing and extremely legible. The Italian manuscript copyists of the middle to late 15th cent. produced many glorious calligraphic works. Among the best known of these masters were Matteo Contugi, Gianrinaldo Menzio, and Pierantonio Sallando. Alphabet design became a subject of study, and several technical treatises were published on writing styles. By the late 16th cent., with the secure establishment of the printing press, the art of calligraphy declined generally throughout Europe. Penmanship of a relatively inferior sort was taught in elementary schools in England and in the United States until the late 19th cent. The 20th cent. has experienced a revival of interest in the art, influenced by the work of Owen Jones and William MORRIS. Fine calligraphy is currently taught in art and craft schools and is exhibited in museums. In the East calligraphy has been consistently practiced as a major aesthetic expression. In China, from the 5th cent. B.C., when it was first used, calligraphy has always been considered equal, or even superior, to painting. Chinese calligraphy began with a simplified seal script, known as "chancery script," in which the width of the strokes varies and the edges and ends are sharp. The perfection of the brush in the 1st cent. A.D. made possible the stylization of chancery script into "regular script," distinguished by its straight strokes of varying width, and clear, sharp corners, and a cursive "running hand." The Japanese value calligraphy as highly as do the Chinese. They began to practice it only in the 7th cent. A.D., with the introduction of Buddhist manuscripts from China. KUKAI, c. 800, invented the syllabic script which was based on Chinese characters. This art is also practiced with the limited letter alphabet of Arabic. Because the Muslim faith discourages pictorial representation and reveres the Koran, the Islamic peoples esteem calligraphy as highly as do those of the Far East. The earliest Islamic calligraphy is found in the beautiful Korans, written with black ink or gold leaf on parchment or paper in formal, angular script. Begun by the 8th cent., this script was fully developed by the 10th. Elaborations, such as foliation, interfacing, and other complexities were invented later, but they are used only for decorative work. Korans continued to be copied in austere and monumental letters. In the 12th cent., rounded cursive style was invented and spread throughout Islam. Many different cursive scripts developed thereafter. In Islam calligraphy decorates mosques, pottery, metalwork, and textiles, as well as books. See INSCRIPTION, PALEOGRAPHY. See Georg Schwander, *Calligraphy* (1959), Heather Child, *Calligraphy Today* (1964), Dorothy

Miner, ed., *2,000 Years of Calligraphy* (1965, repr. 1972), Arthur Baker, *Calligraphy* (1973).

Callimachus (kalīm'akās), fl. 2d half of 5th cent. B.C., Greek sculptor from Athens. He was famous as the maker of the gold lamp in the Erechtheum and a seated image of Hera for a temple at Plataea. There are several Roman copies of his works, one is *Pan and the Three Graces* (Capitoline Mus., Rome). He reputedly originated the Corinthian capital and invented the running drill used for simulating the folds of drapery in marble.

Callimachus, fl. c. 265 B.C., Hellenistic Greek poet and critic, b. Cyrene. Educated at Athens, he taught school at Eleusis, a suburb of Alexandria, before obtaining work in the Alexandrian library. There he drew up a catalogue, with such copious notes that it constituted a full literary history. He also wrote criticism and other works in prose, but is most notable as a poet. His works were extraordinarily numerous, it is said that he wrote more than 800 different pieces. Of these, six hymns (meant only for reading, with no religious use), a number of epigrams, and fragments of other poems survive. His greatest work was the *Aetia*, a collection of legends strung together. Other longer poems of which fragments survive are *The Lock of Berenice*, *Hecale*, and *Iambi*. Callimachus' poetry is notable for brevity, polish, wit, learning, and inventiveness in form. His literary quarrel with Apollonius of Rhodes over whether well-crafted short poems were superior to long poems is well known.

Callinus (kalī'nās), fl. 7th cent. B.C., Greek poet. He is the earliest of the known elegiac poets. An excerpt from a patriotic exhortation to his fellow Ephesians is the longest of the few fragments of his poetry that survive.

Calliope (kalī'ōpē) see MUSES ORPHEUS

calliope, in music, an instrument also called steam organ or steam piano in which steam is forced through a series of whistles controlled by a key board. It is usually played mechanically, and its shrill music is a familiar accompaniment of circus parades. It is named for the Muse of Eloquence.

calliopsis (kalī'ēōp'sis) see COREOPSIS

Callirrhoe (kalī'rōē) see ALCAEON

Callisthenes (kalīs'thēnēs), c. 360-c. 327 B.C., Greek historian of Olynthus, nephew of Aristotle. He accompanied Alexander the Great into Asia as the historian of the expedition. At first he compared Alexander to a god, but later he became one of the principal critics of the orientalizing manners of the court. He was suspected of complicity in a conspiracy against Alexander and put to death, and this turned the Peripatetics, Aristotle's followers, against Alexander. Callisthenes' histories of contemporary affairs in Greece are lost. In medieval times he was believed to be the author of the standard biography of Alexander, a work that actually was written much later than Callisthenes' lifetime.

Callisto (kalīs'tō), in Greek mythology, an attendant of Artemis. Because she forsook her chastity and bore a son, Arcas, to Zeus, she was transformed into a bear by Artemis. According to another legend she was changed into a bear by the jealous Hera. Arcas, while out hunting, was about to kill her when Zeus intervened and transferred them both to the heavens, Callisto becoming the constellation Ursa Major [great bear] and Arcas becoming Arcturus.

Callisto, in astronomy, one of the 12 known moons, or natural satellites, of JUPITER.

Callistratus (kalīs'tratās), d. c. 360 B.C., Athenian statesman and orator. Believing Thebes to be more dangerous to Athens than Sparta, he favored a peace with Sparta. He and CALLIAS in 371 B.C. were the delegates to negotiations on an ineffective peace treaty. His failure to check Thebes led to his impeachment in 366 B.C., but he saved himself with his brilliant defense—an oration that is supposed to have inspired Demosthenes to study rhetoric. After new failure he fled Athens and was condemned in absentia for having urged Athens to allow Thebes to occupy Oropus in Boetia. When he returned he was put to death.

Callistus see CALIXTUS

Calixtus see CALIXTUS

Calloc'h, Jean Pierre (zhaN pyēr kalōkh'), 1688-1917, Breton poet. Important in the revival of Breton literature, he wrote in the Vannes dialect of Brittany. His lyrical verse displays a love for the sea and a fascination with death, his chief work, *Ar en deulin* [on both knees] (1925), celebrates the life of Breton fishermen. Calloc'h, who died in World War I, is often regarded as Brittany's finest poet. He sometimes wrote under the pseudonym Bleimor.

Callot, Jacques (zhāk kalō'), c 1592–1635, French etcher and engraver, b Nancy. Callot was an influential innovator and a brilliant observer of his time. In 1612 he went to Florence where he learned to etch and where he developed and introduced the use of a hard varnish ground that allowed both greater flexibility and finesse. In the service of Cosimo II de' Medici, he created many works: the *Capricci*, small, vivacious figure groups, gay scenes of Medici court life, the vast *Fair at Impruneta* (1620), and sparkling illustrations of the theater, among them his *Commedia dell'arte* group, which was reproduced in his *Balli* (1621). On Cosimo's death in 1621, Callot returned to Nancy and, under the patronage of the ducal court, gained a considerable reputation. He became known for his fantasies, grotesques, beggars, and caricatures, then much in vogue. He was commissioned in 1627 by the Infanta Isabella of Brussels to engrave the siege of Breda, and by Louis XIII to etch the sieges of Rochelle and the island of Re and a series, *Views of Paris*. Too independent for court favor and deeply affected by the scenes of carnage he had witnessed, he retired to Nancy, where he executed in 1633 his masterwork, the two series entitled *Miseries of War*. These studies of human brutality and suffering were the first dispassionate, unromanticized treatment of the horror of war, they were used as source material by Goya for his war etchings. Callot produced nearly 1,500 plates and 2,000 drawings in a wide variety of styles and subjects. The grandeur and brilliance of his work profoundly influenced many major masters, including Rembrandt and Watteau. His technical innovations established important procedures for subsequent etchers. See the complete illustrated catalog with the definitive study by J. Lieure (5 vol., 1924–29, in French), studies by Edwin Bechtel (1955) and Brown Univ. Art Dept. (1970).

callus see CORNS AND CALLUSES

Calmar see KALMAR, Sweden

Calmet, Augustin (ōgüstān' kalmā'), 1672–1757, French biblical scholar, a Benedictine abbot at Nancy and Sens. His critical commentaries were widely studied until the 19th cent when the higher criticism changed the technique of biblical criticism. He also wrote a valuable history of Lorraine.

Calmette, Léon Charles Albert (lāōn' sharl albē' kalmē't'), 1863–1933, French physician and bacteriologist. He was founder and director of the Pasteur Institutes at Saigon and at Lille. From 1917 he was affiliated with the Pasteur Institute in Paris. He discovered a serum for snake bite, studied bubonic plague at Oporto, and with Alphonse Guérin introduced BCG, a tuberculosis vaccine. He wrote *Recherches expérimentales sur la tuberculose* (1907–14), *Tuberculose chez l'homme et chez les animaux* (1920, tr 1923), and *La Vaccination préventive par le BCG* (1927).

Calneh (kāl'nē) 1 Place, in S Babylonia, founded by Nimrod with other cities, the word may mean "all of them." Gen 10:10. 2 Unidentified city, possibly in N Syria. Amos 6:2. It is perhaps the same as Calno, named with Carchemish. Isa 10:9. Some identify it with Canneh.

Calonne, Charles Alexandre de (sharl ālēksān'dra da kalōn'), 1734–1802, French statesman, controller general of finances (1783–87). Faced with a huge public debt and a steadily deteriorating financial situation, Calonne adopted a spending policy to inspire confidence in the nation's financial position. Brief prosperity was followed by a ruinous collapse. He then proposed a direct land tax and the calling of provincial assemblies to apportion it, a stamp tax, and the reduction of some privileges of the nobles and clergy. To gain support, Calonne had King Louis XVI call an Assembly of Notables, but the Assembly (1787) refused to consider Calonne's proposals and criticized him bitterly. Dismissed and replaced by Étienne Charles LOMÉNIÉ DE BRIENNE, Calonne fled (1787) to England, where he stayed until 1802. Many of Calonne's official papers have been published and two general works on politics have been translated into English, *Considerations on the Present and Future State of France* (1791) and *The Political State of Europe* (1796).

calorie, abbr cal, unit of HEAT energy in the metric system. The measurement of heat is called CALORIMETRY. The calorie, or gram calorie, is the quantity of heat required to raise the temperature of 1 gram of pure water 1°C. The kilocalorie, or kilogram calorie, is the quantity of heat required to raise the temperature of 1 kg of pure water 1°C, it is equal to 1,000 cal. The kilocalorie is used in dietetics for stating the heat content of a food, i.e., the amount of heat energy that the food can yield as it passes through the

body, in this context, the kilocalorie is usually called simply the calorie. The amount of heat energy needed to effect a 1°C temperature increase in 1 gram of water varies with temperature (see HEAT CAPACITY), thus the temperature range over which the heating takes place must be stated to define the calorie precisely. The 15° calorie, or normal calorie, is widely used in chemistry and physics, it is measured by heating a 1-gram water sample from 14.5°C to 15.5°C at 1 atmosphere pressure. The 4° calorie, also called the small calorie or therm, is measured from 3.5°C to 4.5°C (water is most dense at 3.98°C), the large calorie, or Calorie, is equivalent to 1,000 small calories. The average value of the calorie in the range 0°C to 100°C is called the mean calorie, it is 1/100 of the energy needed to heat 1 gram of water from its melting point to its boiling point. The calorie may also be defined by expressing its value in some other energy units. The 15° calorie is equivalent to 4.185 JOULES (J), 1.162 × 10⁻⁶ kilowatt-hours, 3.968 × 10⁻³ British thermal units, and 3.087 foot-pounds, the 4° calorie equals 4.204 J, and the mean calorie equals 4.190 J. Two other calories sometimes used are the International Steam Table calorie, equal to 4.187 J, and the thermochemical calorie, equal to 4.184 J. When the calorie is used for precision measurement of heat energy, the particular calorie being used must be specified.

calorimeter: see CALORIMETRY

calorimetry, measurement of HEAT and the determination of HEAT CAPACITY. Heat is evolved in exothermic processes and absorbed in endothermic processes, such processes include chemical reactions, transitions between the states of matter, and the mixing of two substances to form a solution (see THERMODYNAMICS). A number of different units are used in heat measurement, e.g., the CALORIE, the BRITISH THERMAL UNIT (Btu), and the JOULE. The apparatus used in heat measurement is called a calorimeter. The measurement given by the most common type of calorimeter depends upon the temperature change in a fixed quantity of water (or some other liquid whose heat capacity is known) when heat is transferred between the water and an exothermic or endothermic process. If the temperature change is not too large, then the heat transferred is equal to the heat capacity of the water times the mass of the water times the change in temperature. The accuracy of this method of heat measurement depends on the assumption that all the heat transferred in the process passes into or out of the water in which the temperature change is measured, no heat being lost to the environment and none being absorbed by the walls of the container. The amount of heat given off by the combustion of a fuel can be determined very accurately in the so-called bomb calorimeter, which consists of a combustion chamber (the "bomb") set in another chamber filled with water. Heat generated by combustion of the fuel is transmitted to the water, raising its temperature. The calorie content of food is tested this way.

Calovius, Abraham (kalō'vēās), 1612–86, German Lutheran theologian, whose original name was Kalan or Calan. He was (1637–43) a professor of theology at Königsberg, then pastor at Danzig, and after 1650 teacher, general superintendent, and finally dean of the theological faculty at Wittenberg. In his many tracts he defended the strict orthodox party against Catholic, Socinian, Arminian, and other views. He particularly attacked the syncretistic doctrines of Georgius CALIXTUS.

Calpe (kāl'pē), ancient name, possibly Phoenician in origin, of GIBRALTAR. It is one of the PILLARS OF HERCULES, at the eastern end of the Strait of Gibraltar.

Calpurnia (kāl'pūr'nēa), d. after 44 B.C., Roman matron. The daughter of Lucius Calpurnius Piso Caesoninus (see under PISO, family), she was married to Julius Caesar in 59 B.C. She was loyal to him despite his many infidelities and his neglect. The picture of her in Shakespeare's *Julius Caesar* is drawn mainly from Plutarch.

Calpurnius (Titus Calpurnius Siculus) (kāl'pūr'nēās), fl 1st cent A.D., Roman poet. His *Eclogues* (seven pastorals) imitate Vergil with grace and charm.

Caltagirone (kal'tājērō'nā), city (1971 pop 37,458), SE Sicily, Italy. An agricultural and sulfur-mining center, it has been famous for its majolica ware since the Arab occupation (9th cent.).

Caltanissetta (kāl'tānēs-sēt'ta), city (1971 pop 60,072), capital of Caltanissetta prov., central Sicily, Italy. It is an agricultural center and an important sulfur-producing center. Of note are the Church of Santa Maria degli Angeli (14th cent.) and a 16th-century cathedral.

Calumet (kāl'yōōmēt'), industrial region of NW Ind and NE Ill., along the south shore of Lake Michigan. It has one of the world's greatest concentrations of heavy industry, especially steel manufacturing. The chief cities of the region are Gary, East Chicago, and Hammond (all in Indiana).

calumet [Fr. = reed], name given by the French in Canada to the peace pipe of the North American Indians, it consisted of a long, feathered stem, with or without pipe bowl. Such pipes were considered sacred, offering communion with the animate powers of the universe and embodying the honor and the source of power of the Indians who possessed them. Every aspect of their fashioning and decoration was symbolic and varied from tribe to tribe. Calumets were particularly used at the conclusion of peace treaties and in ceremonies of adoption. They served as ambassadors' credentials and were passports of safe-conduct wherever recognized. To refuse to smoke the calumet when invited was considered an extreme insult. The pipes were principally used by the Siouan and Algonquian peoples of the Great Plains and in the SE United States. However, pipes were used throughout most of North America, and communal smoking, wherever found, usually carried the guarantees of amity, granted with food sharing. In the Middle West PIPESTONE was much used in making them.

Calumet City, city (1970 pop 32,956), Cook co., NE Ill., an industrial suburb in the greater Chicago metropolitan area, near the Ind. line, settled 1868, inc 1911. It has steelworks and chemical and meat-packing industries. Formerly called West Hammond, it grew as a suburb of Hammond, Ind.

Calumet Harbor, artificial harbor on Lake Michigan, at the mouth of the Calumet River, NE Ill., in S Chicago. The harbor, dredged to 27 ft (8 m), is formed behind a breakwater extending c 2 mi (3.2 km) into Lake Michigan. It is the fastest developing unit of the Port of Chicago and the principal terminal for shipping on the Great Lakes and the St. Lawrence Seaway. The chief products handled there are the raw materials for steelmaking, finished iron and steel products, and grain. The dredged and dock-lined Calumet River (c 8 mi/13 km long) connects the harbor with Lake Calumet (c 2 sq mi/5 sq km) in S Chicago. Once a shallow body of water with marshy shores, the lake has been transformed into a modern deepwater port. Heavy industries, huge grain storage bins, and warehouses surround it. Canals connect the lake with the Calumet region of Indiana and with the Illinois Waterway.

Calumet Park, village (1970 pop 10,069), Cook co., NE Ill., a residential suburb of Chicago, inc 1912.

Calvados (kalvadōs'), department (1968 pop 519,695), in Normandy, N France, on the English Channel. CAEN is the capital.

Calvaert, Denis or Denys (both dānē' kāl'vart), 1540–1619, Flemish mannerist painter in Italy, where he was known as Il Fiammingo. He studied in Antwerp and later in Bologna under Prospero Fontana. While a student he assisted in the execution of frescoes in the Vatican. On returning to Bologna he established a school, where he taught Guido Reni and Domenichino. Most of Calvaert's carefully drawn works, painted in smooth enamel-like colors, are in the churches and national museum of Bologna.

Calvary (kāl'vārē) [Lat. = a skull] or **Golgotha** (gōl'gatha) [Heb. = a skull], place, where Jesus was crucified, outside the wall of Jerusalem. Its location is not certainly known. Mat 27:33, Mark 15:22, Luke 23:33, John 19:17–20. The traditional identification of the site of Calvary was made by St. Helena, when she found (327) what was believed to be a relic of the Cross (see CROSS). The spot is within the Church of the HOLY SEPULCHER. In the 19th cent. Charles G. Gordon proposed a site near the Damascus Gate, this is called the Garden Tomb or Gordon's Calvary.

Calve, Emma (kāl'vā'), 1858–1942, French operatic soprano, pupil of Mme Marchesi. She sang in the principal opera houses of Europe and between 1893 and 1904 sang often at the Metropolitan Opera, New York City, where her portrayal of Carmen was especially acclaimed. See her autobiography (1922).

Calverley, Charles Stuart, 1831–84, English poet and translator. Expelled from Oxford for a youthful prank, he earned academic honors at Cambridge. He became famous for the wit and erudition of his light verse, particularly his parodies (published under the initials C. S. C.). A barrister, he suffered an injury in 1867 that resulted in a brain concussion and curtailed his legal career. His published works include *Translations into English and Latin* (1866) and *Fly Leaves* (1872).

Calvert, Cecilius, 2d Baron Baltimore, c 1605–1675, first proprietor of the colony of MARYLAND. He received the province in 1632 as a grant from the king, in place of his father, George Calvert, who died as the charter was being issued. Cecilius Calvert never visited the province himself, but governed it by deputies until his death, his last deputy being his only son, Charles Calvert, who succeeded to his title. See W. H. Brown, *George Calvert and Cecilius Calvert* (1890), C. C. Hall, *The Lords Baltimore and the Maryland Palatinate* (1902).

Calvert, Charles, 3d Baron Baltimore, 1637–1715, second proprietor of Maryland. He was sent over as deputy governor of that province in 1661 by his father, Cecilius Calvert, 2d Baron Baltimore, and at his father's death in 1675 succeeded to the proprietorship. A Roman Catholic faced by an overwhelming Protestant population, he ruled arbitrarily, restricting the suffrage, and filling the offices with his partisans. He became involved in a bitter dispute with William PENN over the northern boundary of his grant and in 1684 went to England to defend himself in this dispute and to answer charges of favoring Catholics and obstructing customs collection. He never returned. His charter was overthrown by a Protestant revolt in 1689, and in 1692 a royal government was established. See C. C. Hall, *The Lords Baltimore and the Maryland Palatinate* (1902).

Calvert, Edward, 1799–1883, English painter and engraver. A great admirer of William Blake, Calvert, along with several of his contemporaries, formed a group around Blake called the Brotherhood of the Ancients. Calvert's art celebrated the life of primitive society. In his later work he was deeply influenced by a visit in 1844 to Greece. See Laurence Binyon, *The Followers of William Blake* (1925).

Calvert, George, 1st Baron Baltimore, c 1580–1632, colonizer. In 1606 he became private secretary to Sir Robert Cecil, then a secretary of state. His advance was rapid. In 1609 he became a member of Parliament, in 1613 clerk of the privy council, and in 1619 secretary of state and a member of the privy council. He defended the measures of James I in the House until his resignation in 1625, when he declared himself a Roman Catholic. The king then created him Baron Baltimore. Calvert had been a member of the Virginia Company and a member of the council of the New England Company, but, wishing to found his own colony, he was granted in 1623 the peninsula of Avalon in Newfoundland. He spent much money on a colony that was established there, but it did not prosper, and in 1629 Baltimore petitioned for a grant farther south where the weather was less severe. In 1632 the king granted him the territory N of the Potomac River that became the province of Maryland. Baltimore prepared the charter of his proposed colony but died before it could be accepted. The grant passed to his son, Cecilius Calvert. See C. C. Hall, *The Lords Baltimore and the Maryland Palatinate* (1902).

Calvin, John, 1509–64, French Protestant theologian of the Reformation, b. Noyon, Picardy. Calvin early prepared for an ecclesiastical career, from 1523 to 1528 he studied in Paris. His opinions gradually turned to disagreement with the Roman position, and a demonstrated ability at disputation led him in 1528, at his father's instance, to study law at Orleans and Bourges. After his father's death in 1531 he returned to Paris, where he pursued his own predilection—the study of the classics and Hebrew. He came under the humanist influence and became interested in the growing rebellion against conservative theology. He experienced c 1533 what he later described as a "sudden conversion," and he turned all his attention to the cause of the Reformation. As a persecuted Protestant, Calvin found it necessary to travel from place to place, and at Angoulême in 1534 he began the work of systematizing Protestant thought in his *Institutes of the Christian Religion*, considered one of the most influential theological works of all time. Completed at Basel in 1536 and later frequently revised and supplemented, the original work contained the basic Calvinist theology. In the *Institutes* Calvin diverged from Catholic doctrine in the rejection of papal authority and in acceptance of justification by faith alone, but many of his other positions, including the fundamental doctrine of predestination, had been foreshadowed by Catholic reformers and by the Protestant thought of Martin Luther and Martin Bucer. In 1536, Calvin was persuaded by Guillaume Farel to devote himself to the work of the Reformation at Geneva, and there Calvin instituted the most thoroughgoing development of his doctrine. At first the Genevans were unable to accept the austere reforms and departures

from established church customs, and in 1538 the opposition succeeded in banishing Farel and Calvin from the city. Calvin went to Basel and then to Strasbourg, where he spent three fruitful years preaching and writing. By 1541 the Genevans welcomed Calvin, and he immediately set himself to the task of constructing a government based on the subordination of the state to the church. Once the Bible is accepted as the sole source of God's law, the duty of man is to interpret it and preserve the orderly world that God has ordained. This goal Calvin set out to achieve through the establishment of ecclesiastical discipline, in which the magistrates had the task of enforcing the religious teachings of the church as set forth by the synod. The Genevan laws and constitution were recodified, regulation of conduct was extended to all areas of life. Ecclesiastical discipline was supplemented by a systematized theology, with the sacraments of baptism and the Lord's Supper given to unite man into the fellowship of Christ. Calvin wrote extensively on all theological and practical matters. He was involved in many controversies. Among them were his violent opposition to the Anabaptists, his disagreement with the Lutherans over the LORD'S SUPPER, which resulted in the separation of the Evangelical Church into Lutheran and Reformed, and his condemnation of the anti-Trinitarian views of Michael SERVETUS, which ended in the notorious trial and burning of Servetus in 1553. The extension of Calvinism to all spheres of human activity was extremely important to a world emerging from an agrarian, medieval economy into a commercial, industrial era. Unlike Luther, who desired a return to primitive simplicity, Calvin accepted the newborn capitalism and encouraged trade and production, at the same time opposing the abuses of exploitation and self-indulgence. Industrialization was stimulated by the concepts of thrift, industry, sobriety, and responsibility that Calvin preached as essential to the achievement of the reign of God on earth. The influence of Calvinism spread throughout the entire Western world, realizing its purest forms through the work of John KNOX in Scotland and through the clergymen and laymen of the civil war period in England and the Puritan moralists in New England. See selections from his writings, ed. by John Dillenberger (1971), Quirinus Breen, *John Calvin* (1931, repr 1968), Georgia Harkness, *John Calvin: The Man and His Ethics* (1931), W. C. Northcott, *John Calvin* (1946), A. T. Davies, *John Calvin and the Influence of Protestantism on National Life and Character* (1946), A. M. Schmidt, *John Calvin and the Calvinist Tradition* (tr 1960), Kilian McDonnell, *John Calvin, the Church, and the Eucharist* (1967).

Calvin, Melvin, 1911–, American organic chemist and educator, b. St. Paul, Minn., grad. Michigan College of Mining and Technology, 1931, Ph.D. Univ. of Minnesota, 1935. In 1937 he joined the faculty at the Univ. of California, where he became director (1946) of the bioorganic division of the Lawrence Radiation Laboratory (which became the Laboratory of Chemical Biodynamics in 1960) and professor (1947) of chemistry. For his work in determining the chemical reactions that occur when a plant assimilates carbon dioxide, Calvin was awarded the 1961 Nobel Prize in Chemistry. His writings include *The Photosynthesis of Carbon Compounds* (with J. A. Bassham, 1962) and *Chemical Evolution* (1969).

Calvinism, term used in several different senses. It may indicate the teachings expressed by John Calvin himself, it may be extended to include all that developed from his doctrine and practice in Protestant countries in social, political, and ethical, as well as theological, aspects of life and thought, or it may be employed as the name of that system of doctrine accepted by the Reformed churches (see PRESBYTERIANISM), i.e., the Protestant churches called Reformed in distinction from those professing Lutheran doctrines (see also REFORMED CHURCHES). Early Calvinism differed from Lutheranism in its rejection of consubstantiation regarding the sacrament of the Lord's Supper, in its rigid doctrine of predestination, in its notion of grace as irresistible, and in its theocratic view of the state. Luther believed in the political subordination of the church to the state, Calvinism produced the church-dominated societies of Geneva and Puritan New England. Calvinism, stressing the absolute sovereignty of God's will, held that only those whom God specifically elects are saved, that this election is irresistible, and that man can do nothing to effect this salvation. This strict Calvinism was challenged by Jacobus ARMINIUS, whose more moderate views were adopted by the Methodists and the BAPTISTS. Calvinism challenged Lutheranism throughout Europe, spread to Scotland, influenced

the Puritans of England, and received its expression in the United States in the modified New England theology of the elder Jonathan EDWARDS. The doctrinal aspects of Calvinism receded under the rationalism of the 18th and 19th cent. In more recent times, however, in the Reformed theology of Karl BARTH the Calvinist stress on the sovereignty of God has found new and vital expression. See J. T. McNeill, *The History and Character of Calvinism* (1954, repr 1967), B. G. Armstrong, *Calvinism and the Amyraut Heresy* (1969).

Calvinistic Methodist Church, Protestant Christian denomination, closely allied to PRESBYTERIANISM. It originated in Wales (1735–36) with the evangelistic preaching of Howell Harris, Daniel Rowlands, and others. In Wales it is considered to be the only denomination distinctly Welsh in origin, and it has developed into the most important of the Welsh nonconformist churches. The Methodist societies that evolved under the Welsh revivalists were so organized as to prevent any break with the Established (i.e., Anglican) Church. They were for a time associated with the Methodists of England, for some six years, from c 1742, George WHITEFIELD was the leader of the Welsh Calvinists. Those in England who accepted his views, as opposed to the Arminian doctrines taught by John WESLEY, either remained within the Church of England, joined the Connexion of the countess of HUNTINGDON, or in time became affiliated with the Congregationalists or Independents. The Welsh Calvinistic Methodists, however, held their own vigorously and grew in numbers. Thomas CHARLES of Bala, who joined them in 1784, was a leader of wide influence in religious and educational work. In 1811 they separated from the Established Church and set up a new church, Presbyterian in polity. In 1823 a confession of faith was adopted. Later, theological schools were founded at Bala and at Trevecca. The church was formally guaranteed autonomy in 1933. The Calvinistic Methodist Church was introduced (c 1826) into the United States by Welsh settlers in central New York state. In 1920 it united with the Presbyterian Church in the United States.

Calvo, Carlos (kar'lös käl'vō), 1824–1906, Argentine diplomat and historian. He spent much of his life in diplomatic service abroad. He edited a collection of Latin American treaties and did other historical work but was most important as a writer on international law. Although he was influenced by Henry Wheaton, his development of international doctrines broke new paths. His best-known work is *De-recho internacional teórico y práctico de Europa y América* (Paris, 1868, greatly expanded in subsequent editions, which were published in French). In this book he expressed the principle known as the Calvo Doctrine, which would prohibit the use of diplomatic intervention as a method of enforcing private claims before local remedies have been exhausted. It is wider in scope than the DRAGO DOCTRINE, which grew out of it. The Calvo Clause, found in constitutions, treaties, statutes, and contracts, is the concrete application of the doctrine. Used chiefly in concession contracts, the clause attempts to give local courts final jurisdiction and to obviate any appeal to diplomatic intervention.

Calvus: see under LICINIUS, Roman gens.

calycanthus, any plant of the genus *Calycanthus*, aromatic shrubs of N. North America, Asia, and Australia. An American type, the Carolina allspice, is cultivated for the aromatic fragrance of its flowers. *Calycanthus* is classified in the division MAGNOLIOPHYTES, class Magnoliopsida, order Magnoliales, family Calycanthaceae.

Calypso (kalip'sō), nymph, daughter of Atlas, in Homer's *Odyssey*. She lived on the island of Ogygia and there entertained Odysseus for seven years. Although she offered to make him immortal if he would remain, Odysseus spurned the offer and continued his journey.

calyx (kāl'iks) see SEPAL.

cam, mechanical device for converting a rotating motion into a reciprocating, or back-and-forth, motion, or for changing a simple motion into a complex one. A simple form of cam is a circular disk set eccentrically on a shaft in order to induce (when the shaft rotates) a rising and falling motion in a rod or some other moving part held against its edge. There are cams of many diverse shapes, e.g., oval, elliptical, and scalloped-edged, each shape being designed to induce the particular kind of motion required in a moving part. Cams are widely used in many different kinds of machines.

Camacho, Manuel Ávila: see ÁVILA CAMACHO MANUEL.

Camagüey (kāmāgwā', kāmāwā'), province (1970 pop 813,204), E Cuba CAMAGÜEY is the capital. The area is a vast prairie, surrounded on three sides by extensive coastal plains. The major economic activities are cattle raising (practiced there since the early colonial period) and the cultivation of sugarcane. Meat-packing, pineapple canning, and other agricultural processing industries are carried on.

Camagüey, city (1970 pop 196,854), capital of Camagüey prov., E Cuba. The island's third most populous city, Camagüey, is a leading hub of rail, road, and air transport as well as an important commercial center. The economy is based on agriculture and cattle raising. Industries (mainly meat-packing and dairy processing) are mostly related to agriculture. Founded in 1514 as Santa María del Puerto Príncipe, the city was moved to its present site in 1528 and renamed for the Indian village that previously occupied that site. During the colonial period Camagüey produced salted beef for the Spanish fleets and was often sacked by English, French, and Dutch pirates. The city, which has retained much of its Spanish colonial atmosphere, is noted for its churches, mansions, and narrow twisting streets.

Camargue (kāmārg'), island, c 215 sq mi (560 sq km), Bouches-du-Rhône dept., SE France, in the Rhône delta. Formed by sedimentation, the marshy island has numerous shallow lagoons cut off from the sea by sandbars. The northern part of the island has been partially reclaimed and is used for cattle raising (the cowboys are called *gardians*). There are reed-covered swamps in the south.

Camarillo (kā'marē'yō), city (1970 pop 19,219), Ventura co., S Calif., inc. 1964. It is the center of a fertile farm area where citrus fruits and flowers are grown. Camarillo also has electronic and aerospace industries and plants that manufacture magnetic tape and containers. St. John's College and a state mental hospital are located there.

camass or **camas** (both kām'ās), any species of the genus *Camassia* (or *Quamasia*), hardy North American plants of the family Liliaceae (LILY family), chiefly of moist places in the far West, where their abundance has given rise to various place names. The bulbs of the common camass (*C. quamash*) were a staple food of Northwestern Indians; it is now cultivated as an ornamental for its showy blue to white blossoms. Camass, or quamash, was the Indian name. An eastern camass is called wild hyacinth. The death camass (*Zygadenus venenosus*), with leaves poisonous to sheep, is similar in appearance but distinguishable by having three styles instead of six. Camass is classified in the division MAGNOLIOPHYTES, class Liliatae, order Liliales, family Liliaceae.

Cambacérés, Jean Jacques Régis de (zhāN zhāk rāzhēs' də kāNbāsārēs'), 1753-1824, French revolutionary and legislator. He was deputy to the National Convention, member of the Committee of Public Safety and of the Council of Five Hundred, second consul under Napoleon (1799-1804), and archchancellor of the empire. Throughout his career, his chief interest was in developing the principles of revolutionary jurisprudence. He played a major part in the preparation of the CODE NAPOLEON. In 1808, Cambacérés was made duke of Parma. Minister of justice in the HUNDRED DAYS (1815), he was exiled after the restoration of the monarchy until 1818.

Cambay (kāmbā'), town (1971 pop 62,133), Gujarat state, W India, on the Mahi River estuary. The industries of Cambay include textile weaving and carpet making. Oil and natural gas are found nearby at Lunj. Once a great port under the Muslim rulers of Gujarat (14th-15th cent.), Cambay lost its importance when the harbor silted up. Until 1948 the town was the capital of the former princely state of Cambay. The Gulf of Cambay, a shallow arm of the Arabian Sea, lies between Kathiawar peninsula and Gujarat.

Cambert, Robert (rōbēr' kāNbēr'), c 1628-1677, French composer, pupil of Chambonnières. His *Pastorale d'Issy* (1659) and other works are among the first real French operas. With the librettist Pierre Perrin (1625-75) he created French RECITATIVE in operas, including *Pomone* (1671), which contains all the elements of later French opera such as short symphonies, airs, and dialogues. Both men founded the first French opera company in 1669, but after losing control of this venture to Jean Baptiste Lully, Cambert settled in London where he was murdered.

Cambiaso, Luca (lōō'kā kāmbyā'zō), 1527-85, leading Italian painter and sculptor of the Genoese school, known also as Luchetto da Genova, son and

pupil of Giovanni Cambiaso, a fresco painter. His inventiveness and facile execution in both oil and fresco won him early recognition. His best works are in churches and palaces of Genoa and vicinity. In 1583 he went to Spain, where he worked on the decoration of the Escorial.

Cambio, Arnolfo di: see ARNOLFO DI CAMBIO

cambium (kām'bēām), thin layer of reproductive tissue lying between the bark and the wood of a stem, most active in woody plants. The cambium produces new layers of phloem on the outside and of xylem (WOOD) on the inside, thus increasing the diameter of the STEM. In herbaceous plants the cambium is almost inactive; in monocotyledonous plants it is usually absent. In regions where there are alternating seasons, each year's growth laid down by the cambium is discernible because of the contrast between the large wood elements produced in the spring and the smaller ones produced in the summer. These are the annual rings, by which the age of a tree can be established. A tree dies when it is "ringed," or girdled, i.e., cut through the cambium layer. The cork cambium, which lies outside the phloem layer, produces the cork cells of BARK.

Cambodia (kāmbō'dēā), officially Khmer Republic, republic (1973 est. pop 7,200,000), 69,898 sq mi (181,035 sq km), SE Asia. PHNOM PENH is the capital. Cambodia is bordered by Laos on the north, by South Vietnam on the east, by the Gulf of Siam on the south, and by Thailand on the west and north. The heart of the country is a saucer-shaped, gently rolling alluvial plain drained by the Mekong River and shut off by mountain ranges, the Dangrek Mts. form the frontier with Thailand in the northwest and the Cardamom Mts. are in the southwest. About half the land is tropical forest. In general, Cambodia has a tropical monsoon climate, with the wet southwest monsoon occurring between November and April and the dry northeast monsoon the remainder of the year. During the rainy season the Mekong swells and backs into the Tonle Sap (Great Lake), increasing the size of the lake almost threefold. The seasonal rise of the Mekong floods almost 400,000 acres (162,000 hectares) around the lake, leaving rich silt when the waters recede. Conditions are ideal for the cultivation of rice, by far the country's chief crop. Livestock raising (cattle, buffalo, poultry, and hogs) and extensive fishing supplement the diet. Corn, vegetables, fruits, peanuts, tobacco, cotton, and sugar palms are also raised. Pepper is grown in the south, and great amounts of rubber are produced on large plantations. In the early 1970s, however, heavy fighting in the countryside put almost all of the rubber plantations out of operation. Rice and rubber are traditionally the principal exports of Cambodia, but exports have fallen sharply since the onset (1970) of the civil war. Inadequate transportation hampers exploitation of the country's vast forests. Mineral resources are limited, phosphate rock, limestone, semiprecious stones, and salt are extracted. The country's industries are based primarily on the processing of agricultural, fish, and timber products. Cambodian industry has relied on considerable foreign capital, the People's Republic of China financed the construction of textile, plywood, paper, glass, and cement factories, and Czechoslovakia supplied a sugar refinery and tire and tractor-assembly plants. In the early 1970s, Cambodia accepted foreign aid from the United States as well as from Japan, Australia, New Zealand, Great Britain, Thailand, and Malaysia. Enormous amounts of U.S. military and economic aid financed the government's fight against insurgency. A major U.S. peacetime project was the construction of a four-lane highway linking Phnom Penh with the new seaport (completed 1960) of Kompong Som (formerly Sihanoukville) on the Gulf of Siam. Cambodia is connected by road systems with Thailand, Laos, and South Vietnam, waterways are an important supplement to the roads. The country has two rail lines, one extending from Phnom Penh to the Thai border and the other from Phnom Penh to Kompong Som. One of the few underpopulated countries of SE Asia, Cambodia is inhabited by Cambodians (or Khmers), who comprise about 85% of the population. There are large minorities of Vietnamese and Chinese, other ethnic groups include the Cham-Malays and the hill tribesmen. Hinayana Buddhism is the state religion and about 90% of the people are Buddhists, the Cham-Malays are Muslims. Khmer is the national language, but French is widely used. **History.** The Funan empire was established in what is now Cambodia in the 1st cent. A.D. By the 3d cent. the Funanese, under the leadership of Fan Shih-man (reigned 205-25), had conquered their neighbors and extended their sway to the lower Mekong River

In the 4th cent., according to Chinese records, an Indian Brahman extended his rule over Funan, introducing Hindu customs, the Indian legal code, and



the alphabet of central India. In the 6th cent. Khmers from the rival Chen-la state to the north overran Funan. With the rise of the KHMER EMPIRE, Cambodia became dominant in SE Asia. After the fall of the empire (15th cent.), however, Cambodia was the prey of stronger neighbors. To pressure from Siam on the western frontier was added in the 17th cent. pressure from ANNAM on the east, the kings of Siam and the lords of Hue alike asserted overlordship and claims to tribute. In the 18th cent. Cambodia lost three western provinces to Siam and the region of COCHIN CHINA to the Annamese. Intrigue and wars on Cambodian soil continued into the 19th cent., and in 1854 the king of Cambodia appealed for French intervention. A French protectorate was formally established in 1863, and French influence was consolidated by a treaty in 1884. Cambodia became part of the Union of INDOCHINA in 1887. In 1907 a French-Siamese treaty restored Cambodia's western provinces. In World War II, under Japanese occupation, Cambodia again briefly lost those provinces to Siam. In Jan., 1946, France granted Cambodia self-government within the French Union, a constitution was promulgated in May, 1947. A treaty signed in 1949 raised the country's status to that of an associated state in the French Union, but limitations on the country's sovereignty persisted. King Norodom Sihanouk campaigned for complete independence, which was finally granted in 1953. Early in 1954, Communist VIET MINH troops from Vietnam invaded Cambodia. The GENEVA CONFERENCE of 1954 led to an armistice providing for the withdrawal of all foreign forces from Cambodia. An agreement between France and Cambodia (Dec., 1954) severed the last vestige of French control over Cambodian policy. Cambodia withdrew from the French Union in 1955 and was admitted into the United Nations later that year. King Norodom Sihanouk abdicated in March, 1955, in order to enter politics, his father, Norodom Suramarit, succeeded him as monarch. Sihanouk subsequently formed the Popular Socialist party and served as premier. After Suramarit's death in 1960, the monarchy was represented by Sihanouk's mother, Queen Kossamak Nearireak. Sihanouk was installed in the new office of chief of state. Throughout the 1960s, Sihanouk struggled to keep Cambodia neutral as the neighboring countries of Laos and South Vietnam came under increasing Communist attack (see VIETNAM WAR). Sihanouk permitted the use of Cambodian territory as a supply base and refuge by North Vietnamese and VIET CONG troops while accepting military aid from the United States to strengthen his forces against Communist infiltration. In 1963, Sihanouk accused the United States of supporting antigovernment activities and renounced all U.S. aid. Following a series of border incidents involving South Vietnamese troops, Cambodia in 1965 severed diplomatic relations with the United States. Sihanouk remained on friendly terms with the Communist countries, especially Communist China, and established close relations with France. Economic conditions deteriorated after the renunciation of U.S. aid, and North Vietnamese and Viet Cong troops continued to infiltrate. In the spring of 1969 the United States instituted aerial attacks against Communist strongholds in Cambodia, these bomb-

ings, carefully kept secret from the American people, later became an important issue in US politics. As Communist infiltration increased, Sihanouk began to turn more toward the West, and in July, 1969, diplomatic ties with the United States were restored. Relations with South Vietnam and Thailand, after years of border disputes and incidents, began to improve. In Aug., 1969, Lt. Gen. Lon Nol, the defense minister and supreme commander of the army, became premier, with Sihanouk delegating considerable power to him. Sihanouk began negotiating for the removal of Viet Cong and North Vietnamese troops, who now numbered over 50,000 and occupied large areas of Cambodia. His actions, however, were not enough to ease the growing concern of many army leaders. Discontent with Sihanouk's rule was further heightened by rising inflation, ruinous financial policies, and governmental corruption and mismanagement. On March 18, 1970, while Sihanouk was in Moscow seeking help against further North Vietnamese incursions, premier Lon Nol led a right-wing coup deposing Sihanouk as chief of state. Sihanouk subsequently set up a government-in-exile in Peking. Soon after the coup, Cambodian troops began engaging Communist forces on Cambodian soil. In April, 1970, US and South Vietnamese troops entered Cambodia to attack Communist bases and supply lines. US ground forces were withdrawn by June 30, but South Vietnamese troops remained, occupying heavily populated areas. The actions of the South Vietnamese troops in Cambodia and the resumption of heavy US air bombings in their support, with the inevitable destruction of villages and killing of civilians, alienated many Cambodians and may have created considerable sympathy for the Communists. The number of Cambodian Communists (known as the Khmer Rouge) increased from about 3,000 in March, 1970, to over 30,000 within a few years. Most of the North Vietnamese and Viet Cong troops were able to withdraw, leaving in progress a raging civil war fought by Cambodians but financed by the United States, North Vietnam, and Communist China. On Oct. 9, 1970, the national assembly declared Cambodia a republic and changed the country's name to the Khmer Republic. By that time, however, the national government controlled less than one third of Cambodia's total land area. Phnom Penh, most of the provincial capitals, and the central plain S of Tonle Sap. Despite extensive US military aid, the insurgents retained firm control of the northeast provinces and most of the countryside. In Feb., 1971, Lon Nol suffered a paralytic stroke and vice premier Sisowath Sirik Matak assumed power (although Lon Nol technically remained premier). Fighting between government and insurgent forces became increasingly savage and bitter, culminating in a major government defeat (Dec., 1971) on a highway N of Phnom Penh, after which most of Cambodian territory E of the Mekong River fell to the insurgents. In 1972 student agitation in Phnom Penh for the removal of Sisowath Sirik Matak from power led to the resignation (March 10) of chief of state Cheng Heng, who transferred his post to the ailing Lon Nol. Two days later Lon Nol dissolved the government and declared himself president as well as chief of state and commander in chief. A new constitution providing for a presidency was approved by popular referendum in April, and Lon Nol was formally elected president in June, 1972, the defeated candidates charged irregularities in the election. Meanwhile, more and more territory fell into Communist hands, despite intensive US bombing attacks which persisted until the halt imposed by the US Congress in Aug., 1973. The government's military position became desperate, with government forces concentrating primarily on keeping communications open with an increasingly beleaguered Phnom Penh. In Sept., 1972, severe food shortages in Phnom Penh sparked two days of rioting and large-scale looting, in which government troops participated. Lon Nol, aided by his brother Lon Non, exerted an increasingly oppressive rule, with massive political arrests and newspaper seizures. US pressure for a more representative government finally resulted (April, 1973) in the appointment of a member of the opposition party, In Tam, to the premiership, but the experiment was short-lived. In Tam resigned in Dec., 1973 and was succeeded by Long Boret of the ruling party. The Khmer Rouge insurgents launched a large-scale attack against Cambodia's third largest city, Kompong Cham, in Sept., 1973, and shelled Phnom Penh in 1974 and early 1975, inflicting heavy civilian casualties. Before the country was torn by civil war the government had made great strides in expanding educational facilities. Cambodia has

about ten institutions of higher learning, including the National Univ. of Phnom Penh, the Univ. of Fine Arts, and the Technical Univ., all in Phnom Penh, and technical universities in Battambang, Kompong Cham, and Takeo. See M. F. Herz, *A Short History of Cambodia* (1958), D. J. Steinberg et al., *Cambodia* (1959), R. M. Smith, *Cambodia's Foreign Policy* (1965), Michael Leifer, *Cambodia, The Search for Security* (1967), F. P. Munson et al., *Area Handbook for Cambodia* (1968), Milton Osborne, *The French Presence in Cochinchina and Cambodia* (1969), Maslyn Williams, *The Land in Between: The Cambodian Dilemma* (1970).

Cambodian art and architecture: see ANGKOR and KHMER EMPIRE

Cambon, Jules Martin (zhul martān' kaNbōN'), 1845-1935, French diplomat, brother of Pierre Paul Cambon. He served (1891-96) as governor general of Algeria, where he pursued a conciliatory policy and was largely responsible for the decree (1896) establishing administrative autonomy for Algeria. In 1897 he was made ambassador to the United States, and he mediated the peace preliminaries of the Spanish-American War. He was ambassador at Madrid (1902-7) and at Berlin (1907-14), and from 1920 to 1922 he was chairman of the Council of Ambassadors, the group charged with overseeing the enforcement of the Treaty of Versailles (1919). His political works include *The Diplomatist* (tr. 1931). See biography by Genevieve Tabouis (tr. 1938).

Cambon, Pierre Joseph (pyēr zhōzēf'), b. 1754 or 1756, d. 1820, French financier and revolutionary. A merchant of Montpellier, he became a member of the Legislative Assembly and the Convention, and he guided the financial policy of the Revolution from Oct., 1791, to April, 1795. He refunded the debt, calling in all old government bonds (both royal and revolutionary), and issuing new certificates at 5%, that put a halt to wild speculation in bonds. His measure also freed the government temporarily from repaying the principal on the debt. Advocating war to "free" Europe, he advanced the policy of exploiting conquered territory. His fiscal program, which failed to halt inflation, was attacked by Maximilien ROBESPIERRE, whose fall was partly caused by Cambon's countercharges. Cambon was distrusted by the Thermidorians, and his career ended after his brief triumph. He was exiled after the Bourbon restoration.

Cambon, Pierre Paul (pōl), 1843-1924, French diplomat, brother of Jules Martin Cambon. Named resident minister to Tunis in 1882, he conceived and organized the new Tunisian protectorate under the bey. As ambassador to Great Britain (1898-1920), he helped to create the Entente Cordiale (1904) and the Anglo-Russian agreement of 1907, and he encouraged Great Britain to enter World War I (see TRIPLE ALLIANCE and TRIPLE ENTENTE). He was one of the most able diplomats in French history.

Camborne-Redruth (kām'bōrn, -būrn, rēd'rōth), urban district (1971 pop. 42,029), Cornwall, SW England. The neighboring urban districts of Camborne and Redruth were combined in 1934. Tin and copper mines in the area have been greatly depleted, but rock drills and mining machinery are made in the district, and the School of Metalliferous Mining is in Camborne. John Wesley preached to outdoor gatherings near the present mines. At the summit of Carn Brea hill are prehistoric remains.

Cambrai (kaNbrā'), city (1968 pop. 39,922), Nord dept., N France, a port on the Escaut (Scheldt) River. It has long been known for its fine textiles and gave its name to cambric, first manufactured there. Clay, metal, and wood products are also manufactured in Cambrai. An episcopal see since the 4th cent., and seat of an archdiocese since the 16th cent., Cambrai and the surrounding county of Cambresis were ruled by the bishops under the Holy Roman Empire until they were seized by Spain (1595) and by France (1677). Fenelon was archbishop from 1695 to 1715. The original cathedral was destroyed in 1793. Cambrai suffered devastation in both world wars, it was occupied by the Germans from 1914 to 1918 and from 1940 to 1944.

Cambrai, League of, 1508-10, alliance formed by Holy Roman Emperor Maximilian I, King Louis XII of France, Pope Julius II, King Ferdinand V of Aragon, and several Italian city-states against the republic of Venice to check its territorial expansion. The republic was soon on the verge of ruin. Its army was defeated by the French at Agnadello (1509), most of the territories it had occupied were lost, and Maximilian entered Venetia. The republic had to make concessions to the pope and to Ferdinand. In 1510 the pope became reconciled to Venice and began

forming the HOLY LEAGUE against France. The republic emerged from the war having suffered serious losses but by no means crushed.

Cambrai, Treaty of, called the **Ladies' Peace**, treaty negotiated and signed in 1529 by Louise of Savoy, representing her son Francis I of France, and Margaret of Austria, representing her nephew Holy Roman Emperor Charles V. The treaty renewed the Treaty of Madrid (see FRANCIS I), except that it did not exact the surrender of Burgundy to Charles.

Cambria (kām'brēā) [Latinized form of Welsh *Cymry*=Welshmen], ancient name of Wales.

Cambrian Mountains (kām'brēān), rugged upland plateau occupying most of Wales, Aran Fawddwy (2,970 ft/905 m) is the highest point in the mountains. The area has deep lakes and is cut by numerous river valleys, the Wye and Severn rivers rise there. Sheep grazing is the principal economic activity.

Cambrian period [Lat. *Cambria*=Wales], first period of the Paleozoic geologic era (see GEOLOGIC ERAS, table). It was named by the English geologist Adam Sedgwick, who first studied (1831-35) in NW Wales the great sequence of rocks characteristic of the period. Comprising mainly sedimentary rock, i.e., conglomerate, sandstone, shale, and limestone, they were formed in shallow seas that covered large areas of North America, Europe, and Asia. In the United States, Lower Cambrian, or Waucobian, formations are found chiefly in the Appalachian and Cordilleran geosynclines, or downward thrusts of the earth's crust, which were then arms of a sea, the most notable deposits are the sandstone near Waucoba Springs, S Calif., and the thick strata, or layers, of conglomerate and sandstone in Georgia, Tennessee, and North Carolina. Middle Cambrian, or Albertan, formations are rare in the Appalachian region, which was above water in the Middle Cambrian, but they are found in New Brunswick, near Brantree, Mass., and throughout the Cordilleran region. In the Upper Cambrian, or Croixian, epoch, the shallow seas spread over a great part of the continent, depositing, among other formations, the St. Croix sandstone of Wisconsin and the upper Mississippi valley, some of the Arbuckle limestone of Oklahoma, and the Potsdam sandstone on the northern slope of the Adirondacks and elsewhere. In the USSR the Cambrian beds are remarkable in that they comprise mostly undisturbed and unconsolidated sand and clay despite their great age. The Cambrian rocks are notable as the first to contain many easily recognizable fossils. The known Cambrian fauna—all marine—includes every phylum of invertebrates, the possibility that vertebrate fossils may be found cannot be excluded. The dominant animal was the trilobite, and the various rock series are distinguished according to the different genera of trilobites they contain. Brachiopods, snails, and sponges were also common. The seemingly abrupt appearance of such a highly developed and diversified fauna is best explained by the assumption that more primitive forms flourished during the interval between the close of the Precambrian era and the beginning of the Cambrian, of which all geologic record has been destroyed by erosion.

Cambridge (kām'brīj), municipal borough (1971 pop. 98,519), county town of Cambridgeshire and Isle of Ely, E central England, on the Cam River. It is an ancient market town, and although light industries such as the manufacture of agricultural tools, precision instruments, radios, and cement have developed on the outskirts, the town is most famous as the site of CAMBRIDGE UNIV. Originally the site of a Roman fort, the town was an administrative and trading center in Anglo-Saxon times. William I built a fort and mint there. Two monastic establishments were built in early medieval times. The university was founded in the 13th cent. The present town still maintains much of its medieval atmosphere and appearance. There are many old inns, hostels, houses, winding streets, and narrow passages that have not altered greatly with time. Cambridge abounds in medieval churches, the most important of which are St. Benet's or Benet's, the oldest, dating back to the late Saxon period, St. Edward's (begun 12th cent.), where Hugh Latimer preached, St. Mary the Great (1478), the university church, and the Church of the Holy Sepulchre, one of the four Norman round churches in England. In 1974, the borough became part of the newly reorganized nonmetropolitan county of Cambridgeshire.

Cambridge, 1 City (1970 pop. 11,595), seat of Dorchester co., E Md., Eastern Shore, a port of entry on the Choptank River at its mouth on Chesapeake Bay, founded 1684, inc. as a city 1884. The state's second largest deepwater port (after Baltimore), it is a fish

ing and yachting center. The city has shipyards, sea-food and vegetable canneries, and electronic, clothing, and printing industries. The Meredith house (1760) there is headquarters for the county historical society. Nearby Old Trinity Church (c 1675, restored 1960) is said to be the oldest church in the United States still in use. 2 City (1970 pop 100,361), seat of Middlesex co., E Mass., across the Charles River from Boston, settled 1630 as New Towne, inc. as a city 1846. A famous educational and research center, it is the seat of Harvard Univ. (founded 1636), Radcliffe College, Massachusetts Institute of Technology, Lesley College, and several theological seminaries. It is also an industrial city; its manufactures include electrical machinery, scientific instruments, rubber goods, glass, wire cables, and machine shop products. Its printing and publishing industry dates from about 1639, when Stephen Daye established the first printing press in America. Cambridge was a gathering place for colonial troops, there, on July 3, 1775, Washington took command. It was the first seat of the Massachusetts constitutional convention of 1780. Craigie House (1759), which served as Washington's headquarters (1775-76), was the home of Longfellow from 1837 until his death in 1882. Other historic structures are Elmwood (1767), the birthplace and home of James Russell Lowell, the Cooper-Frost-Austin house (c 1657), and the Episcopal church (1761). Lowell, Longfellow, Mary Baker Eddy, and many other notable people are buried in Mt Auburn Cemetery. 3 Industrial city (1970 pop 13,656), seat of Guernsey co., E central Ohio, in a farm, coal, natural gas, and clay area, settled 1798 by immigrants from the Isle of Guernsey, inc. 1837. It is the trade and manufacturing center for a dairy and livestock area. Lakes and parks surround the city, and the large Salt Fork State Park is nearby. Muskingum College is to the west, in New Concord.

Cambridge Bay, Canadian government post and weather station, on the southeast shore of Victoria Island, Franklin district, Northwest Territories.

Cambridge Platform, declaration of principles of church government and discipline, forming in fact a constitution of the Congregational churches. It was adopted (1648) by a church synod at Cambridge, Mass., and remains the basis of the temporal government of the churches. It had little to do with matters of doctrine and belief. The Congregationalists of Connecticut later subscribed (1708), in the Saybrook Platform, to a more centralized church government, resembling Presbyterianism. See also CONGREGATIONALISM.

Cambridge Platonists, group of English philosophers, centered at Cambridge Univ. in the latter half of the 17th cent. In reaction to the mechanical philosophy of Thomas Hobbes this school revived certain Platonic and Neoplatonic ideas. Chief among these was a mystical conception of the soul's relation to God and the belief that moral ideas are innate in man. Although tending toward mysticism, the school also stressed the importance of reason, maintaining that faith and reason differ only in degree. The assertion of the founder of the school, Benjamin Whichcote, that "the spirit in man is the cradle of the Lord" became the motto for the entire movement. Other leading members were Ralph CUDWORTH, Henry MORE, and John SMITH. See G. R. Cragg, ed., *The Cambridge Platonists* (1968); Ernst Cassirer, *The Platonic Renaissance in England* (tr 1953, repr 1970).

Cambridgeshire and Isle of Ely, county (1971 pop 302,507), E central England. The county town is CAMBRIDGE. Most of the area is alluvial fenland, rising to the low, chalky East Anglian Hills in the south, with the Gogmagog Hills near Cambridge the most conspicuous feature. The main rivers are the Ouse, with its tributaries, and the Nene. Efforts to reclaim the fens date back to the days of Roman occupation, but in the subsequent periods of invasion by Danes, Saxons, and Normans they were abandoned. The fens were finally drained in the 17th cent. Cornelius Vermuyden, a Dutchman, completed a vast drainage project in 1653. Agriculture predominates in the county. Wheat, barley, potatoes, sugar beets, and fruits are raised, and there is market gardening. Food processing is an important industry. Among other industries are radio engineering and the manufacture of cement, bricks, and scientific instruments. The urban district of Ely has been an ecclesiastical center for centuries. Cambridge Univ. dates from the early 13th cent. In 1974, Cambridgeshire and Isle of Ely became part of the new nonmetropolitan county of Cambridgeshire.

Cambridge University, at Cambridge, England. Originating in the early 12th cent. (legend places its

origin even earlier than that of OXFORD UNIV.), Cambridge was organized into residential colleges, like those of Oxford, by the end of the 13th cent. Its colleges, with their dates of founding, are Peterhouse, or St Peter's (1284), Clare (1326), Pembroke (1347), Gonville (1348, refounded as Gonville and Caius, 1558), Trinity Hall (1350), Corpus Christi (1352), King's (1441), Queens' (1448), St Catharine's (1473), Jesus (1496), Christ's (1505), St John's (1511), Magdalene (1542, pronounced mōd'līn), Trinity (1546), Emmanuel (1584), Sidney Sussex (1596), Downing (1800), Selwyn (1882), Churchill (1960), and Fitzwilliam College (founded 1887 as a noncollegiate society, became a college 1968). The women's colleges are Girton (1869), Newnham (1873), and New Hall (1954). Girton and Newnham were pioneers in university education for women. Although women took university examinations in the 1880s and after 1921 were awarded degrees, their colleges were not admitted to full university status until 1948. Hughes Hall (1885) and St Edmund's Hall (1896) are noncollegiate institutions for undergraduates. Darwin College (1964), Wolfson College (1965, founded as University College, renamed 1973), Lucy Cavendish Collegiate Society (1965), and Clare Hall (1966) are graduate institutions. Cambridge was a center of the new learning of the Renaissance and of the theology of the Reformation, in modern times it has excelled in science. Its faculties include classics, divinity, English, architecture and history of art, modern and medieval languages, Oriental studies, music, economics and politics, history, law, philosophy, engineering, geography and geology, mathematics, biology, archaeology and anthropology, and medicine. Its famous Cavendish Laboratory of experimental physics was opened in 1873; the Cavendish professors have been outstanding names in physics. The chapel of King's College (1446), the Fitzwilliam Museum, and the botanic gardens are notable features of the university. Instruction at Cambridge is similar to the system at Oxford, except that tutors are called supervisors and the degree examination is known as the tripos. Until 1948, Cambridge Univ. sent two representatives to Parliament. The Cambridge Univ. Press dates from the 16th cent. See Edmund Vale, *Cambridge and Its Colleges* (1959), F. A. Reeve, *Cambridge* (1964), C. R. Benstead, *Portrait of Cambridge* (1968).

Cambuluc see PEKING, China.

Cambyes (kām'bī'sēz), two kings of the Achaemenid dynasty of Persia. Cambyes I was king (c 600 B.C.) of Anshan, ruling as a vassal of Media. According to Herodotus he married the daughter of the Median king Astyages, some scholars dispute this. Cambyes' son was CYRUS THE GREAT. Cambyes II, d. 521 B.C., was the son and successor of Cyrus the Great and ruled as king of ancient Persia (529-521 B.C.). He disposed of his brother SMERDIS in order to gain unchallenged rule. He invaded Egypt, defeating (525 B.C.) Psamtik at Pelusium and sacking Memphis. His further plans of conquest in Africa were frustrated, and at home an impostor claiming to be Smerdis raised a revolt. Cambyes died, possibly by suicide, when he was putting down the insurrection. Darius I succeeded him.

Camden, Charles Pratt, 1st Earl: see PRATT, CHARLES, 1ST EARL CAMDEN.

Camden, John Jeffreys Pratt, 2d Earl and 1st Marquess: see under PRATT, CHARLES, 1ST EARL CAMDEN.

Camden, William, 1551-1623, English scholar, chief historian and antiquary of Elizabethan times. His two chief works are *Britannia* (1586) and *Annales rerum Anglicarum et Hibernicarum regnante Elizabetha* [annals of affairs in England and Ireland in the reign of Elizabeth]. He was a conscientious scholar in editing old manuscripts and in collecting materials of antiquarian interest. He was also a teacher (1575-97) and headmaster (1593-97) at Westminster School and helped to revive the study of Anglo-Saxon. He wrote a Greek grammar long popular in English secondary schools and aided Sir Robert COTTON in collecting materials.

Camden, borough (1971 pop 200,784) of Greater London, SE England. Camden was created in 1965 by the merger of the metropolitan London boroughs of Hampstead, Holborn, and St Pancras. Hampstead is a residential district popular with writers and artists. John Keats, John Constable, George Du Maurier, and Kate Greenaway, as well as Karl Marx, lived there. It is also known as a piano-making center. Highgate Cemetery in Hampstead contains the graves of George Eliot, Michael Faraday, Herbert Spencer, Christina Rossetti, and Karl Marx. Within Holborn is part of Bloomsbury, another artists and writers area. Holborn also houses the BRITISH MU-

SEUM, the Univ. of London, Gray's Inn and Lincoln's Inn (see INNS OF COURT), law courts, the Royal College of Surgeons, and Hatton Garden, known for its trade. Benjamin Disraeli was born in Holborn, which is also the site of London's tallest building, the Post Office Tower. St Pancras has three famous railroad stations: Euston, King's Cross, and St Pancras.

Camden, 1 City (1970 pop 15,147), seat of Ouachita co., 5 Ark., on the Ouachita River, inc. 1847. It is a railroad and river shipping point. Its manufactures include paper, pottery, furniture, air conditioners, and house trailers. 2 Industrial city (1970 pop 102,551), seat of Camden co., W N J., a port of entry on the Delaware River opposite Philadelphia, settled 1681, inc. 1828. The arrival of the Camden and Amboy RR in 1834 spurred the city's growth as a commercial, shipbuilding, and manufacturing center. Some of its present large industries had their beginnings in the 19th cent. Richard Esterbrook in 1858 opened a steel-pen factory, and the Campbell canned-foods company originated in 1869. Other manufactures are electric and electronic goods, and paper and wood products. Walt Whitman's home is preserved, and the poet is buried in the city, where he lived from 1873. Of interest are the Campbell Museum and the county historical society's museum in Charles 5 Boyer Memorial Hall (formerly the Joseph Cooper house, built 1726). Access to Philadelphia is via the Walt Whitman Bridge (1957) and the Benjamin Franklin Bridge (1926). Rutgers Univ. at Camden is there.

camel, hoofed ruminant of the family Camelidae. The family consists of three genera, the true camels of Asia (genus *Camelus*), the wild GUANACO and the domesticated ALPACA and llama, all of South America (genus *Lama*), and the VICUNA, also of South America (genus *Vicugna*). The two species of true camel are the single-humped Arabian camel, or dromedary, *Camelus dromedarius*, a domesticated animal used in Arabia and North Africa, and the two-humped Bactrian camel (*C. bactrianus*) of central Asia. Some wild Bactrian camels exist in Turkistan and Mongolia. The humps are storage places for fat. Camels range in color from dirty white to dark brown and have long necks, small ears, tough-skinned lips, and powerful teeth, some of which are sharply pointed. The camel uses the mouth in fighting. Adaptations to desert life include broad, flat, thick-soled cloven hoofs that do not sink into the sand, the ability to go without drinking for several days—or longer if juicy plants are available, and valvular nostrils lined with hairs for protection against flying sand. Horny pads help to protect the chest, knees, and thigh joints against injury from the hard surfaces on which the camel sleeps. Strong camels usually carry from 500 to 600 lb (230 to 270 kg) and cover about 30 mi (48 km) a day. Some Bactrian camels can transport 1,000 lb (450 kg). A light, fleet breed of dromedary is used for riding and not for bearing heavy loads. The name dromedary was formerly applied to any swift riding camel. Geologic findings indicate that the camel originated in North America, that one group migrated to Asia and the other to South America, and that both became extinct in North America probably after the glacial period. Camels are classified in the phylum CHORDATA, subphylum Vertebrata, class Mammalia, order Artiodactyla, family Camelidae.

camellia (kām'ē'ya) [for G. J. Kamel], any plant of the genus *Camellia*, evergreen shrubs or small trees native to Asia but now cultivated extensively in warm climates and in greenhouses for their showy white, red, or variegated blossoms and glossy, dark-green foliage. Camellias are closely related to the tea plant, both being members of the family Theaceae (TEA family). Several species yield oil from the seeds, e.g., the widely cultivated *C. japonica* (commonly called japonica) and, especially, the Asiatic *C. sasanqua*, the source of tea-seed oil used in textile and soap manufacture and, when suitably refined, for cooking. Camellias are classified in the division MAGNOLIOPHYTES, class Magnoliopsida, order Theales, family Theaceae.

Camelot (kām'əlōt), in ARTHURIAN LEGEND, the seat of King Arthur's court. The origin of the name is unknown. It has been variously located at Cadbury Camp, Somerset, Winchester, Camelford, and Caerleon.

Camembert cheese (kām'ēmbâr, Fr. kamaNbër), unpreserved rennet cheese, drained on straw mats and ripened with a penicillium mold to a creamy consistency. Made since the late 18th cent. near Camembert village, NW France, it is exported in considerable quantity.

Camēnae (kamē'nē), in Roman mythology, water nymphs gifted in prophecy. At Rome they had a sacred spring from which the vestals drew water for their rites. In later myth they were identified with the Greek Muses.

cameo (kām'ēō), small relief carving, usually on striated precious or semiprecious stones or on shell. The design, often a portrait head, is commonly cut in the light-colored vein, and the dark one is left as the background. Glass of two colors in layers may be cameo-cut, a famous Roman example is the PORTLAND VASE. The art originated in Asia as a decoration on the reverse side of seals. The Greeks were noted for their exquisite designs and cutting on jewelry and on decorations for jewel caskets, vases, cups, and candelabra. The Romans were adept cutters, and Rome remains a center of experts in this art. The art was revived during the Renaissance, and cameo jewelry was a vogue of the Victorian era.

cameo cat: see CAT

camera, lightproof box or container, usually fitted with a lens, through which an image of the scene being viewed is focused and recorded on film or some other light-sensitive material contained within. The original concept of the camera dates from Grecian times, when Aristotle referred to the principle of the *camera obscura* [Lat., =dark chamber] which was literally a dark box—sometimes large enough for the viewer to stand inside—with a small hole, or aperture, in one side. (A lens was not employed for focusing until the Middle Ages.) An inverted image of a scene was formed on an interior screen, it could then be traced by an artist. The first diagram of a camera obscura appeared in a manuscript by Leonardo da Vinci in 1519, but he did not claim its invention. The recording of a negative image on a light-sensitive material was first achieved by the Frenchman Joseph Nicéphore Niépce in

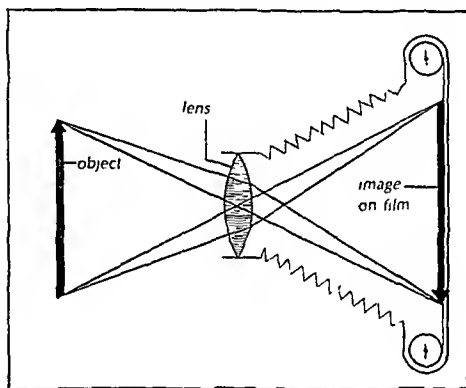


Image formed by a camera

1826, he coated a piece of paper with asphalt and exposed it inside the camera obscura for eight hours. Today there are many different types of camera in use, all of them more or less sophisticated versions of the ancient camera obscura. Nearly all of them are made up of the same basic parts: body, lens, shutter, viewfinder, and focusing mechanism. Except for pinhole cameras, which focus the image on the film through a tiny hole, all other cameras use a lens for focusing. The focal length of a lens, i.e., the distance between the rear of the lens (when focused on infinity) and the film, determines the angle of view and the size of objects as they appear on the film. The speed of a lens is indicated by reference to its maximum opening, or aperture, through which light enters the camera. This aperture, or *f-stop*, is controlled by an iris diaphragm (a series of overlapping metal blades that form a circle with a hole in the center whose diameter can be increased or decreased as desired) inside the lens. The higher the *f-stop* number, the smaller the aperture, and vice versa. A shutter controls the time during which light is permitted to enter the camera. There are two basic types of shutter—leaf-type and focal-plane. The leaf-type shutter employs a ring of overlapping metal blades similar to those of the iris diaphragm, that may be closed or opened to the desired degree. It is normally located between the lens elements but occasionally is placed behind or in front of the lens. The focal-plane shutter is located just in front of the film plane, and has one or two cloth or metal curtains that travel vertically or horizontally across the film frame. By adjusting the shutter speed in conjunction with the width of aperture, the proper amount of light (determined by using a light meter

and influenced by the relative sensitivity of the film being used) for a good exposure can be obtained. The image is focused on the film by adjusting the distance between the lens and the film. In most 35-mm cameras (among the most widely used of modern cameras) this is done by rotating the lens, thus moving it closer to or farther from the film. With twin-lens reflex and larger view cameras, the whole lens and the panel to which it is attached is moved toward or away from the film. To view the subject for composing (and, usually, to help bring it into focus) nearly every camera has some kind of viewfinder. One of the simplest types, employed in most view cameras, is a screen that is placed on the back of the camera and replaced by the film in making the exposure. This time-consuming procedure is avoided in the modern 35-mm single-lens (and other) reflex cameras by placing the screen in a special housing on top of the camera. Inside the camera, in front of the film plane, there is a movable mirror that bounces the image from the lens to the screen for viewing and focusing, and then flips out of the way when the shutter is tripped, so that the image hits the film instead of the mirror. The mirror returns automatically to place after the exposure has been made. In rangefinder cameras the subject is generally viewed by means of two separate windows, one of which views the scene directly and the other of which contains an adjustable optical mirror device. When this device is adjusted by rotating the lens, the image entering through the lens can be brought into register, at the eyepiece, with the image from the direct view, thereby focusing the subject on the film. Most of today's 35-mm cameras, both rangefinder and reflex models, incorporate a rapid film-transport mechanism, lens interchangeability (whereby lenses of many focal lengths, such as wide-angle and telephoto, may be used with the same camera body), and a built-in light meter. Many also have an automatic exposure device whereby either the shutter speed or the aperture is regulated automatically (by means of a very sophisticated solid-state electronics system) to produce the "correct" exposure. Simple box cameras, which are no longer manufactured, and most of the cameras of the Eastman Kodak Instamatic type are fixed-focus cameras with limited or no control over exposure. Twin-lens reflex cameras use one lens solely for viewing, while the other focuses the image on the film. Also very popular today are the new, compact, 35-mm rangefinder cameras, 126 cartridge cameras, and the subminiature cameras, including the new 110 "pocket" variation of the Instamatic type and the sophisticated Minox, which uses 9.5-mm film. Other categories in use include roll- and sheet-film single-lens reflex (SLR) cameras that use 120 and larger size films, self-processing Polaroid cameras (see LAND, EDWIN H.), press cameras and view cameras that use $2\frac{1}{4} \times 3\frac{1}{4}$ in., 4×5 in., 5×7 in., 8×10 in., and 11×14 in. film sizes, stereo cameras, the double slides from which require a special viewer, and various special types such as the super wide-angle and the panoramic cameras. (The numbers 110, 120, and 126 are film-size designations from the manufacturer and do not refer to actual measurements.) See PHOTOGRAPHY, STILL. The motion picture camera comes in a variety of sizes, from 8 mm to 35 mm, but all operate on the same basic principles. Exposures are usually made at a rate of 18 or 24 frames per second (fps), which means that as the film goes through the camera it stops for a very brief moment to expose each frame. This is accomplished in nearly all movie cameras by a device called a rotary shutter—basically a half-circle of metal that spins, alternately opening and closing an aperture, behind which is located the film. To make the film travel along its path and hold still for the exposure of each frame, a device called the claw is required. This is another small piece of metal that alternately pops into the sprocket holes or perforations in the film, pulls the film down, then retracts to release the film while the frame is being exposed, and finally returns to the top of the channel in which it moves to grasp the next frame. The movement of the shutter and claw are synchronized, so that the shutter is closed while the claw is pulling the frame downward and open for the instant that the frame is motionless in its own channel or gate. Motion picture film comes in spools or cartridges. The spool type, employed mostly in 16- and 35-mm camera systems, must be threaded through the camera and attached to the take-up spool by hand, whereas a film cartridge—available for most of today's popular super-8-mm systems—avoids this procedure. In all modern movie cameras the film is driven by a tiny electric motor that is powered by batteries. Lenses for movie

cameras also come in "normal," wide-angle, and long focal lengths. Some older cameras had a turret on which were mounted all three lens types. The desired lens could be fixed into position by simply rotating the turret. Many modern super-8 cameras come with a single zoom lens, incorporating many focal lengths that are controlled by moving a certain group of lens elements toward or away from the film. Most of these cameras have an automatic exposure device that regulates the *f-stop* according to the reading made by a built-in electric eye. Movie camera lenses are focused in the same way as are still cameras lenses. For viewing purposes, most of today's super-8's use a beam splitter—a partially silvered reflector that diverts a small percentage of the light to a ground-glass viewfinder, while allowing most of the light to reach the film. Other cameras have a mirror-shutter system which transmits all the light, at intervals, alternately to film and viewfinder. Many of the super-8 cameras also contain some kind of rangefinder, built into the focusing screen, for precise focusing. Although various kinds of devices for making pictures in rapid succession had been employed as early as the 1860s, the first practical motion picture camera—made feasible by the invention of the first flexible (paper base) films—was built in 1887 by E. J. Marey, a Frenchman. Two years later Thomas Edison invented the first commercially successful camera. However, cinematography was not accessible to amateurs until 1923, when Eastman Kodak produced the first 16-mm reversal safety film, and Bell & Howell introduced cameras and projectors with which to use it. Systems using 8 mm film were introduced in 1923, super-8, with its smaller sprocket holes and larger frame size, appeared in 1965. See MOTION PICTURE PHOTOGRAPHY. See *The Encyclopedia of Photography* (1971), *The Focal Encyclopedia of Photography* (rev. ed. 1972), David MacLoud, *Peterson's Guide to Movie Making* (1973).

Camerarius, Rudolph Jacob (kāmarār'ēas, Ger. rōō'dōlf ya'kōp kamara'rēōōs), 1665–1721, German botanist and physician. The first to present a clear and definite picture of sex in plants, Camerarius based his conclusions on careful experiments and observations. He described the stamen as the male organ and the ovary as the female organ and emphasized their relationship to the formation of seeds. He became a professor at the Univ. of Tübingen in 1688.

Cameron, Andrew Carr, 1834–90, American labor leader, b. Berwick-on-Tweed, England. He worked as a printer in Chicago, where he became interested in the labor movement. In the *Workingmen's Advocate*, which he edited from 1864 to 1877, he strongly advocated independent political action by labor. Cameron helped found the National Labor Union in 1866 and was its delegate to the convention of the International Workingmen's Association in Basel in 1869. He was president of the Chicago Trades Assembly, the Grand Eight Hour League, and the Illinois State Labor Association.

Cameron, John, c. 1579–1625, Scottish scholar and theologian. As teacher, lecturer, and preacher at Bordeaux, Saumur, and other cities on the Continent, he came to be celebrated for his learning and ability. He was appointed (1622) principal of the Univ. of Glasgow by James I of England, but his belief in the divine right of kings and his stand for passive obedience made it impossible for him to remain in this post long. Returning to France after less than a year, he became (1624) professor of divinity at Montauban. Not long afterward he was attacked by an enemy of the doctrine of passive obedience and died. His writings, in Latin and French, were largely concerned with his views on man's free will and the grace of God. Those who held the same opinions were sometimes known as Camerionites and practiced a moderate form of Calvinism. His collected works were published in 1642, with a memoir by Louis Cappel.

Cameron, Julia Margaret, 1815–79, English pioneer photographer, b. Calcutta. Born and married into the high ranks of the British Civil Service, Cameron became an intimate of many of the most famous people of her day. In 1864 she became an ardent amateur photographer, demanding long, arduous sittings from her illustrious friends. She sought to illuminate the inner person of her subject, and her celebrated portraits, including those of Tennyson, Carlyle, Ellen Terry, and Longfellow, are remarkably spontaneous. Some of her works were published as *Victorian Photographs of Famous Men and Fair Women* (rev. ed. 1973). See biographies by Helmut Gernsheim (2d ed. 1969) and Brian Hill (1973).

Cameron, Richard, 1648–1680, Scottish leader of the Cameronians, an extreme group of COVENANTERS. In 1672, under the influence of the open-air preacher John Welch, he became a Covenanter preacher and was known for his eloquence. Strongly opposing the measures aimed at reestablishing the Episcopal Church in Scotland, and objecting to any state control of the church, he led a small company who, in the Sanguhar Declaration (1680), disowned the royal authority of Charles II. A price was set on Cameron's head and within a short time he and a little band of supporters were overtaken by royal troops. Cameron and many of his group were killed. Later (1743) the Cameronians, growing in numbers, formed a presbytery, taking the name Reformed Presbyterians. This denomination is still represented by congregations in Scotland, the north of Ireland, and North America, but the greater number united (1876) with the Free Church of Scotland, which, in 1929, incorporated them in the reunited Church of Scotland. A body of Cameronians formed the nucleus (1689) of the celebrated Cameronian regiment of the British army. See biography by John Herkless (1896).

Cameron, Simon, 1799–1889, American politician and financier, b. Lancaster co., Pa. From humble beginnings he rose to be a newspaper publisher and with considerable success branched out into canal and road construction, railroad promotion, banking, and iron and steel manufacturing. His private wealth brought him influence in the Democratic party, he played a major role in winning the vice presidential nomination for Martin Van Buren in 1832 and in James Buchanan's election to the Senate the following year. Cameron was elected (1845) to Buchanan's vacated seat in the U.S. Senate but, defeated for reelection, served only until 1849. Having joined the new Republican party in 1856, he was returned (1857) to the Senate when three Democratic legislators also voted for him. In the Senate, Cameron bitterly attacked the pro-Southern policies of his former friend President Buchanan. At the Republican national convention in Chicago in 1860 he was a candidate for the presidential nomination but after the first ballot supported Abraham Lincoln, first exacting from Lincoln's managers, however, the promise of a cabinet post. Lincoln reluctantly recognized the bargain, made without his knowledge, and Cameron resigned from the Senate to serve (March, 1861–Jan., 1862) as Secretary of War. The President's worst fears were realized as notorious corruption in army contracts and appointments aroused the nation. Lincoln eased him out gracefully by appointing him minister to Russia, but Cameron resigned that post in Nov., 1862. The House of Representatives passed (April, 1862) a resolution of censure against him, but Cameron bounced back in 1867, when, in defeating Andrew H. Curtin for the Senate, he became absolute Republican boss of Pennsylvania. He retired from the Senate and from active participation in politics in 1877 but only after making sure that his son, James Donald Cameron, succeeded him in the Senate. The machine he created, later run by his son, Matthew S. QUAY, Boies PENROSE, William S. VARE, and Joseph R. Grundy successively, so dominated Pennsylvania that it was not until Franklin Delano Roosevelt's victory in 1936 that the Democrats carried the state in a national election. See biography by E. S. Bradley (1966), L. F. Crippen, *Simon Cameron: Ante-Bellum Years* (1942, repr. 1972).

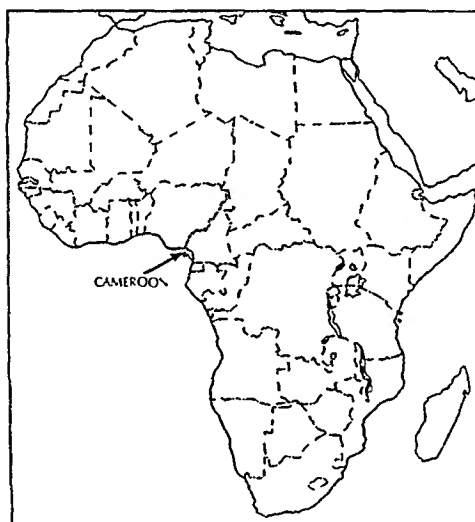
Cameron, Thomas Fairfax, 3d Baron Fairfax of. See FAIRFAX OF CAMERON, THOMAS FAIRFAX, 3d BARON.

Cameron, Verney Lovett, 1844–94, English traveler in Africa. A naval officer, he served (1868) in the British expedition against Ethiopia and assisted in the suppression of the East African slave trade. He was sent (1873) by the Royal Geographical Society to relieve Livingstone but, finding him dead, recovered his papers, explored and mapped Lake Tanganyika, and proceeded to the Atlantic, the first European to cross equatorial Africa. His expedition was recorded in *Across Africa* (1877). In 1882 he explored the Gold Coast with Sir Richard Burton and was coauthor with him of *To the Gold Coast for Gold* (1883).

Cameron of Lochiel, Donald (lòkh-ēl'), 1695?–1748, Scottish clan chieftain, known as the Gentle Lochiel, grandson of Sir Ewen Cameron. He was the first of the major chieftains to join Charles Edward Stuart, the Young Pretender, in the unsuccessful Jacobite uprising in 1745. He was wounded in the battles of Falkirk and Culloden (1746) and escaped to France with the pretender.

Cameron of Lochiel, Sir Ewen or Evan, 1629–1719, chief of the Scottish highland clan of Cameron after 1647. On behalf of Charles II he led his clan in an uprising against the Commonwealth in 1653, and only in 1658 did he submit to the Puritan general George MONCK. He accompanied Monck to London in 1660 and was received at the court of the restored Charles II. He was knighted in 1681. A supporter of James II, he took part in the Jacobite victory over the forces of William III at Killiecrankie in 1689 and sent his clan to aid the Jacobite rebellion of 1715. Lochiel was a romantic warrior of great strength, and from one of his feats Sir Walter Scott drew his description of the fight between Roderick Dhu and Fitz James in *The Lady of the Lake*.

Cameroon, United Republic of, republic (1973 est. pop. 6,100,000), 183,568 sq mi (475,442 sq km), W central Africa. It is bordered on the W by the Gulf of Guinea, on the NW by Nigeria, on the NE by Chad, on the E by the Central African Republic, on the S by the Congo Republic, Gabon, and Equatorial Guinea, and on the SW by the Bight of Biafra. YAOUNDE is the capital, and DOUALA is the largest city and main port. Cameroon is triangular in shape. A coastal strip 10 to 50 mi (16–80 km) wide in the southwest is covered with swamps and dense, tropical rain forests; it has one of the wettest climates in the world, with an average annual rainfall of 152 in (386 cm). Near the coast are volcanic peaks, dominated by Cameroon Mt. (13,354 ft/4,070 m), the highest point in the country. Beyond the coastal marshes and plains, the land rises to a densely forested plateau c. 1,000 ft (300 m) above sea level. The



interior of the country is a plateau c. 2,500 to 4,000 ft (760–1,220 m) high, where forests give way to savanna. This plateau forms a barrier between the agricultural south and the pastoral north. The extreme northern regions, near Lake Chad, are dry, thorn-bush lands. Among the many rivers that drain Cameroon are the Benue, the Wouri, the Sanaga, and the Nyong. The country consists of the former French Cameroons and the southern portion of the former British Cameroons. The French, or eastern, section constitutes four fifths of the country and supports the bulk of the population. With more than 150 ethnic groups, Cameroon has one of the most diverse populations in Africa. Bantu-speaking peoples, such as the Douala, predominate along the southern coast and in the forested areas. In the highlands are the Bamileke. Important northern groups include the Fulani and the Kirdi. Islam is the dominant religion of the northern, Arabic-influenced regions, most of the southerners are animists, although Christianity has made some converts. The north, where cattle raising is the chief occupation, is the least economically developed part of Cameroon, whose regional disparities pose a major problem for the government. Agriculture is the mainstay of the country's economy. Cameroon is one of the world's leading cocoa producers, coffee, bananas, palm products, tobacco, peanuts, and rubber, all grown mainly on plantations, are also important. Cotton production is centered in the Benue River valley. Only about 10% of the country's land is cultivated. The principal subsistence crops are bananas, cassava, plantains, peanuts, millet, sorghum, and manioc. Fishing and forestry follow agriculture as leading occupations, but the vast timber reserves remain largely untapped. Cameroon's mineral resources in-

clude gold, diamonds, bauxite, tin, and mica. Prospecting for oil and natural gas is under way. The Edea Dam on the Sanaga River provides the bulk of the country's electricity and powers a large aluminum smelter; all the finished aluminum is exported. The country's other industries are focused around agricultural processing and the manufacture of light consumer goods, an inadequate transportation system has hampered further industrialization. Cameroon's exports consist mainly of agricultural products, France being the major trading partner, followed by other members of the European Common Market. The official languages of Cameroon are French and English. Throughout history the region witnessed numerous invasions and migrations, especially by the Fulani, Hausa, Fang, and Kanuri. Contact with Europeans began in 1472, when the Portuguese reached the Wouri River estuary, and a large-scale slave trade ensued, carried on by Portuguese, Spanish, Dutch, French, and English traders. In the 19th cent., palm oil and ivory became the main items of commerce. The British established commercial hegemony over the coast in the early 19th cent., and British trading and missionary outposts appeared in the 1850s, but the English were supplanted by the Germans, who in 1884 signed a treaty with the Douala people along the Wouri estuary and proclaimed the area a protectorate. The Germans began constructing the port of Douala and then advanced into the interior, where they developed plantations and built roads and bridges. An additional area was acquired from France in 1911 as compensation for the surrender of German rights in Morocco. Two years later, German control over the Muslim north was consolidated. French and British troops occupied the region during World War I. After the war the area ceded in 1911 was rejoined to French Equatorial Africa, and in 1919 the remainder of Cameroon was divided into French and British zones, which became League of Nations mandates. Little social or political progress was made in either area, and French labor practices were severely criticized. Both mandates, however, remained loyal to the Allies in World War II. In 1946 they became United Nations trust territories. In the 1950s guerrilla warfare raged in the French Cameroons instigated by the radical nationalist Union of the Peoples of the Cameroons, which demanded immediate independence and union with the British Cameroons. France granted self-government to the French Cameroons in 1957 and internal autonomy in 1959. On Jan. 1, 1960, the territory became independent, with Ahmadou Ahidjo as its first president. The British-administered territory was divided into two zones, both administratively linked with Nigeria. In a UN-sponsored plebiscite in early 1961, the northern zone voted for union with Nigeria, and the southern zone voted for incorporation into Cameroon, which was subsequently reconstituted as a federal republic with two prime ministers and legislatures but a single president. National integration proceeded gradually. In 1966 the dominant political parties in the east and west merged into the Cameroon National Union (CNU). In 1972 the population voted favorably on a national referendum to adopt a new constitution setting up a unitary state to replace the federation. A presidential form of government was retained. Cameroon is a one-party state, with the CNU in control. There is a 120-member national assembly. See W. R. Johnson, *The Cameroon Federation* (1970), V. T. LeVine, *The Cameroon Federal Republic* (1971), N. N. Rubin, *Cameroon* (1972).

Cameroon Mountain (kām'arōn), active volcano, 13,354 ft (4,070 m) high, in the Cameroon Highlands, W Cameroon, highest point in W Africa. The western side of the mountain receives an average annual rainfall of more than 400 in (1,016 cm) and is covered with tropical rain forest. Cocoa, banana, rubber, and tea plantations are found on the lower slopes.

Cameroons, fr. *Cameroon*, Ger. *Kamerun*, former German colony, W Africa, on the Gulf of Guinea and extending N to Lake Chad. Germany's penetration of the area began in 1884 and by 1902 its possession was recognized. A portion of French Equatorial Africa was added in 1911 in return for the surrender of German rights in Morocco. In World War I, French and British troops occupied the Cameroons. After the war the territory ceded in 1911 was rejoined to French Equatorial Africa, and in 1919 the remainder of the Cameroons was divided into French and British zones, which became mandates under the League of Nations. In 1946 the mandates were made trust territories of the United Nations. British Cameroons consisted of two noncontiguous

sections lying on the eastern border of Nigeria, the more southerly extended to the coast. French Cameroons was administered as a separate territory with the capital at Yaounde. In 1960, French Cameroons became the Cameroon Republic, in 1961 the southern section of British Cameroons was joined to the Cameroon Republic to form the Federal Republic of Cameroon (United Republic of Cameroon after 1972), while the northern section passed to Nigeria.

Camillus (Marcus Furius Camillus) (kāmīl'ās), d. 365? B.C., Roman hero. He was a patrician who, the Roman historians say, was elected dictator five times (396, 390, 386, 368, 367 B.C.) and on each occasion won a signal victory. He captured Veii, saved Rome from the Gauls, defeated the Aequi and Volscians, took Praeneste (the modern Palestrina), and defeated the Gauls at Alba Longa. Modern historians do not accept in full the traditional account of Camillus' victories.

Camisards (kām'isardz, Fr. kamēsar'), Protestant peasants of the Cévennes region of France who in 1702 rebelled against the persecutions that followed the revocation (1685) of the Edict of Nantes (see NANTES, EDICT OF). The name was probably given them because of the shirts they wore in night raids. Led by the young Jean CAVALIER and Roland LAPORTE, the Camisards met the ravages of the royal army with guerrilla methods and withstood superior forces in several battles. In 1704, Marshal Villars, the royal commander, offered Cavalier vague concessions to the Protestants and the promise of a command in the royal army. Cavalier's acceptance broke the revolt, although others, including Laporte, refused to submit unless the Edict of Nantes was restored, scattered fighting went on until 1710. See A. E. Bray, *The Revolt of the Protestants of the Cévennes* (1870), H. M. Baird, *Huguenots and the Revocation of the Edict of Nantes* (1895).

Cammaerts, Émile (āmēl' kāmarts), 1878-1953, Belgian poet. In 1908 he settled in England, becoming a professor at the Univ. of London in 1933. His poetry of World War I, which appeared in French, was translated and collected in *Belgian Poems* (1915) and *New Belgian Poems* (1916). Later works, in English, include *Upon This Rock* (1943), a poignant character sketch of a son killed in the war, and volumes on Belgian history and culture.

Camões or Camoens, Luís de (both lōōēsh' dī kāmōiNsh'), 1524?-1580, Portuguese poet, the greatest figure in Portuguese literature. Born of a poor family, Camões gained wide familiarity with classic literature at the Univ. of Coimbra. It is thought that he fell in love with a lady of the Lisbon court, Dona Caterina de Ataíde, who became the inspiration for his fiery love poems. Banished from court in 1546 because of this romance, he served as a soldier in a Moroccan campaign, where he lost an eye. After his return from Africa he was imprisoned in 1552 for wounding a minor court aide in a street fight. He was released the next year after consenting to serve in India. Apparently he had already begun his most celebrated work, *The Lusads* [Port. *Os Lusíadas*=sons of Lusus, i.e., the Portuguese] (1572), but this journey may have caused him to make Vasco da Gama's voyage over the same route the central theme of his epic. After fighting in India, Camões was given an official post at Macao in China. In 1558 charges were brought against him for maladministration at Macao, and he was put aboard a ship for Goa in India. The ship was wrecked, but he managed to save his manuscript for *The Lusads*, and he returned to Portugal in 1570 by way of Mozambique. The publication of his epic won him a meager royal pension. Camões's last years were spent in poverty, and in 1580 he died in obscurity, although his work had begun to enjoy world fame. By 1655 it had appeared in English in a version by Sir Richard Fanshawe. Although modeled on Vergil and showing the influence of Ariosto, it is imitative of neither and is a great epic in its own right. The beauty of its poetry is enlivened by a vigorous and realistic narrative that embraces not only the voyage of Vasco da Gama but also much of Portuguese history. Apart from *The Lusads*, however, Camões's flawlessly crafted sonnets and lyrics would have won him lasting fame. See J. D. M. Ford's edition of *The Lusads* with English notes to accompany the Portuguese text (1946), study by H. H. Hart (1962).

camomile: see CHAMOMILE

Camon (kām'ōn), unidentified place. Judges 10:5

Camorra (kāmōr'a), Italian secret criminal association in Naples. Of controversial origin, it first came to light in 1830. Its activities spread by intimidation, blackmail, and bribery until Naples was controlled by the hierarchical organization, which even sold its

electoral backing and had its own parliamentary deputies. The Camorra appears to have been used by the Bourbon rulers of Naples as a quasi-police network to crush opposition. Efforts to break the power of the Camorra, begun in the 1880s, culminated in the 1911 murder trial at which numerous members were convicted. The Camorra was suppressed after Benito Mussolini's takeover in 1922.

camouflage (kām'āflazh), in warfare, the disguising of objects with artificial aids, especially for the purpose of making them blend into their surroundings or of deceiving the observer as to the location of strategic points. The principle, of course, is observed in the world of nature (see PROTECTIVE COLORATION) and has long been used by man. Scientific camouflage was greatly developed in World War I, when the French, in particular, used elaborate devices to conceal military objectives and industrial plants. False landscapes were created, using wire screens as a foundation for foliage, and ships were dazzle-painted to conceal their course by distortion of perspective. In World War II camouflage was further developed and was used on a large scale by all belligerents. With the development of RADAR and AERIAL PHOTOGRAPHY during that war, camouflage diminished greatly in utility, however, camouflage again became important, particularly in the guerrilla campaigns of the Vietnam War.

Camp, Walter Chauncey, 1859-1925, American football expert, b. New Britain, Conn., grad. Yale, 1880. He was a prominent athlete at Yale, where he was football coach after 1888, later, Camp became athletic director. Often called the father of American football, he had a leading role in developing the game and shaping its rules. Camp originated (1889), with Caspar W. Whitney, the practice of choosing an All-American football team. In World War I he adapted for use in training camps the calisthenics known as the daily dozen. He wrote more than 30 books on football and physical fitness.

Campagna di Roma (kampa'nyā dē rō'mā), low-lying region surrounding the city of Rome, c. 800 sq. mi. (2,070 sq. km), Campania, central Italy. A favorite residential area in Roman times, it was later largely abandoned for centuries because of the prevalence of malaria and the lack of sufficient water for cultivation. Much of the region was reclaimed in the 19th and 20th cent. It is now used to grow crops and to pasture cattle, new settlements have been founded. There are remains of Roman aqueducts and tombs.

Campagnola, Domenico (dōmē'nēkō kampa'nyō-lā), 1500?-c. 1564, painter and engraver. Although Campagnola worked exclusively in Italy, there are documents indicating that he was of German origin. He was a pupil and the adopted son of Giulio Campagnola, and he may have assisted Titian in the decorating of the Scuola del Santo. He painted chiefly in the churches of Padua. His best-known works are three frescoes in the Scuola del Carmine, Padua, *Four Prophets* (Academy, Venice), and *Holy Family* (Pitti Palace, Florence). His composition and warmth of color indicate his debt to Titian. Campagnola is celebrated also for his engravings, woodcuts, and masterly pen-and-ink drawings, which resemble Titian's closely in their clear linear quality and deep shading. Examples are in the Uffizi and in the British Museum.

Campagnola, Giulio (jōō'lyō), b. c. 1482, d. after 1513, Italian painter and engraver. He painted miniatures and altarpieces but is best known for his finely executed engravings, many of them after the works of Giovanni Bellini and Giorgione.

campaign, political, organized effort to secure nomination and election of candidates for government offices. In the United States, the most important political campaigns are those for the nomination and election of candidates for the offices of President and Vice President. In each political party such nominations are made at a national CONVENTION preceding the presidential election. The contending parties are organized with a national chairman at the head of an elaborate system of national, state, and local committees. The committees have campaigns to run at all levels, but nothing else approaches the effort made in presidential campaigns. The costs have become enormous, political advertising, especially television, being the greatest expense. As a result, parties and candidates need to raise many millions of dollars. Financial contributions by corporations, individuals, and Federal employees, as well as expenditures by the parties' national committees have been restricted by law. Closer regulation of contributions was established

by Congress in 1972 and again in 1974, when a measure of public financing was allowed for. In Great Britain the system of parliamentary government permits the overthrow of the cabinet by a vote of no confidence at any time, and, compared with U.S. congressional elections, this results in a more unified party campaign. British parliamentary and local elections are never held concurrently, campaigns are short and intensive, and party expenditures are comparatively very moderate and are fixed by law. See V. O. Key, *Politics, Parties and Pressure Groups* (5th ed. 1964), N. W. Polsky, *Presidential Elections* (3d ed. 1971), D. D. Dunn, *Financing Presidential Elections* (1972), H. E. Alexander, *Money in Politics* (1972).

Campan, Jeanne Louise Henriette (zhān lwēz aNreēt' kaNpāN'), 1752-1822, French educator and author. She served as a reader to Louis XV's daughters and as lady-in-waiting to Marie Antoinette. In 1792 she founded a school for girls at Saint-Germain, which Hortense de Beauharnais attended, and directed it until her appointment (1806) as principal of the academy established by Napoleon at Écouen. She retired in 1814. Among her works, published posthumously, are *Memoires sur la vie privée de Marie Antoinette* (1823), *Journal anecdotique* (1824), and *Correspondance inédite avec la reine Hortense* (1835).

Campana, Pedro: see KEMPENER, PIETER DE

Campanella, Tommaso (tōm-ma'zō kāmpanēllā), 1568-1639, Italian Renaissance philosopher and writer. He entered the Dominican order at the age of 15, and although he was frequently in trouble with the authorities, he never left the church. Imprisoned in 1599 on the grounds that he was plotting against the Spanish rule of Naples, he was released in 1626 on the representation of Pope Urban VIII. His best-known work is *Civitas solis* (1623, tr. *The City of the Sun*), an account of a utopian society that closely follows the pattern of Plato's *Republic*. Although he retained much of scholasticism and insisted on the preeminence of faith in matters of theology, he emphasized perception and experiment as the media of science. His importance, like that of Francis Bacon and Bruno, depends largely on his anticipation of what came to be the scientific attitude of empiricism. For his *Civitas solis*, see Henry Morley, ed., *Ideal Commonwealths* (1890). See biography by B. M. Bonansea (1969).

Campania (kampa'nyā), region (1971 pop. 5,054,822), 5,249 sq. mi. (13,595 sq. km), central Italy, extending from the Apennines W to the Tyrrhenian Sea and from the Garigliano River S to the Gulf of Policastro. It includes the islands of Capri, Ischia, and Procida. NAPLES is the capital of Campania, which is divided into Benevento, Caserta, Naples, and Salerno provs. (named for their capitals). The central coast of the region is mostly high and rocky, with volcanic ridges and the crater of Vesuvius. However, the northern and southern coastal areas are fertile plains, famous since ancient times for their agricultural output. The interior of Campania is mountainous. Farm products of the region include grapes, citrus fruit, olives, apricots, grain, and vegetables. Industry is mostly clustered along the shore of the Bay of Naples; manufactures include textiles, shoes, chemicals, pharmaceuticals, refined petroleum, metal goods, wine, and motor vehicles. There is also a thriving tourist industry. Various Italic tribes, Greek colonists, Etruscans, and Samnites lived in the region before it was conquered (4th-2d cent. B.C.) by Rome. In Roman times the term *Campania* referred mainly to Naples and its surrounding area. After the fall of Rome the Goths and the Byzantines occupied the region, it later became part of the Lombard duchy of Benevento (except Naples and Amalfi, which were independent republics). In the 11th cent. the Normans conquered Campania, and in the 12th cent. it became part of the kingdom of Sicily. Naples soon rose to prominence, and after the SICILIAN VESPERS revolt (1282) it was made the capital of a separate kingdom. For the later history of Campania, see NAPLES KINGDOM OF and TWO SICILIES KINGDOM OF THE. In World War II there was heavy fighting around Naples after the Allied landing (Sept., 1943) at SALERNO. There is a university at Naples.

campanile (kāmpanē'lē, Ital. kampa'nē'lā), Italian form of bell tower, constructed chiefly during the Middle Ages. Built in connection with a church or a town hall, it served as a belfry and watch tower and often functioned as a civic or commemorative monument. The campanile generally stands as a detached unit. At the top is the bell platform, where the main architectural emphasis, generally a group

of arched openings, is concentrated. Originating in the 6th cent., the campaniles were the earliest church towers in Europe and were generally circular in shape, examples of this type remain at Ravenna. Beginning with the 8th cent., the square plan became most common, being constructed in all parts of Italy. The Lombardy section produced the richest development of the campanile. Brick is the material most used, often combined with stone for the cornices and string courses, the latter surrounding the tower at each story level in the Roman examples. The celebrated campanile of Florence, known as Giotto's campanile (1334), is entirely faced in marble and ornamented with sculptures. Also of marble is the leaning tower at PISA.

campanula (kämpän'yala) see BELLFLOWER

Campbell, Scottish noble family, the head of which is the duke of Argyll. The Campbells of Lochow (Lochawe) rose to power in W Scotland in the later Middle Ages. In 1445, Sir Duncan Campbell of Lochow (d 1453) received the title of Baron Campbell, and his grandson Colin Campbell (d 1493), 2d Baron Campbell, was created 1st earl of Argyll in 1457. In the succeeding century the earls of Argyll played an ever more prominent role in Scottish affairs. Archibald Campbell (d 1558), 4th earl of Argyll, became one of the leading Protestant lords of the congregation. Even more important, however, was his son Archibald Campbell, 5th earl of ARGYLL, also a lord of the congregation, who was deeply involved in the upheavals of the reign of Mary Queen of Scots. He was succeeded by his half-brother, Colin Campbell (d 1584), 6th earl of Argyll, who was in turn succeeded by his son Archibald Campbell (1575-1638), 7th earl of Argyll. The 7th earl became a Roman Catholic and in 1619 surrendered management of his estates to his son Archibald Campbell, 8th earl and 1st marquess of ARGYLL. The 8th earl and his son Archibald Campbell, 9th earl of ARGYLL, were the most powerful Presbyterian nobles in Scotland during the tumultuous events of the 17th cent., both were executed for treason. Archibald Campbell, the 10th earl, finally managed to regain the family estates and was created (1701) 1st duke of ARGYLL. He and, more especially, his kinsman John Campbell, 1st earl of BREADALBANE, have been blamed (possibly unjustly) for the massacre (1692) of the MacDonalds of Glencoe by Campbell soldiers. John Campbell, 2d duke of ARGYLL, and his brother Archibald Campbell, 3d duke of ARGYLL, kept the family in the forefront of Scottish affairs. The 3d duke, however, died without legitimate issue, and the succession passed to a cadet branch of the family, the Campbells of Ma-more. Of subsequent holders of the title the most prominent were George Douglas Campbell (1823-1900), 8th duke of Argyll, who held a series of cabinet positions, the most important as secretary of state for India in William Gladstone's first ministry (1868-74), and John Douglas Sutherland Campbell (1845-1914), 9th duke of Argyll, who married Princess Louise, daughter of Queen Victoria, and was governor general of Canada (1878-83).

Campbell, Alexander, 1788-1866, clergyman, co-founder with his father, Thomas Campbell (1763-1854), of the DISCIPLES OF CHRIST. Of Scottish lineage, both were born in Ireland and educated at the Univ of Glasgow. Both were Anti-Burgher Presbyterians, a division opposed to the discipline of the main church. In 1807 the father went to America, where he was welcomed among the Scotch-Irish in SW Pennsylvania. His habit of asking all Presbyterians to join his church members in the communion service was contrary to a ruling of the Anti-Burgher synod in which he was preaching, and his action was condemned by his presbytery. Although his synod upheld him, the atmosphere remained so hostile that he and his followers, who were popularly called Campbellites, withdrew. In 1809 they formed the Christian Association of Washington, Pa., setting forth its purposes in a "Declaration and Address" that is considered the most important document of the Disciples body. In that year Campbell was joined in America by his son, Alexander, and the other members of his family. In c 1812, having accepted the doctrine of immersion, the Campbells and their followers were invited to join the Baptists. Until c 1827 they were nominally Baptists, but there were differences which caused trouble. Alexander Campbell, who had by this time assumed the leadership, advocated a return to scriptural simplicity in organization and doctrine, his followers became known as Reformers. He founded (1823) the *Christian Baptist* to promote his views and traveled throughout the new Western states, addressing large audiences. He edited (from 1830) the *Millennial*

Harbinger, wrote *The Christian System* (1839), and in 1840 founded Bethany College in West Virginia and became its president. Meanwhile, the Reformers had seceded from or been forced out of many Baptist churches, and Campbell suggested that they form congregations and call themselves Disciples of Christ. Many of the "Christians," led chiefly by Barton Warren STONE, joined congregations of the Disciples, in 1832 the two leaders agreed to unite their efforts. See Robert Richardson, *Memoirs of Alexander Campbell* (2 vol, 1868-70), D R Lindley, *Apostle of Freedom* (1957), S M Eames, *The Philosophy of Alexander Campbell* (1966), E J Wrather, *Creative Freedom in Action* (1968).

Campbell, Colin, d 1729, Scottish architect, who, in England, became one of the initiators of the Neo-Palladian movement. Campbell's most important contribution to this revival of classicizing architecture was his publication of *Vitruvius Britannicus* (3 vol, 1715, 1717, 1725). These volumes consisted of engravings of classical buildings in England—at first mainly those of Inigo Jones, but the later volumes presented designs by Campbell and other contemporary architects. Campbell's major buildings were Wanstead House, Essex (1715-20, destroyed), which incorporated what Campbell claimed to be England's first classical portico, the remodeling of Burlington House, London (c 1717), and Mereworth Castle, Kent (1723). They derive from obvious Palladian precedents. Through his writings and his executed buildings, Campbell's influence on English architecture was great.

Campbell, Colin, Baron Clyde, 1792-1863, British general. He commanded troops in China (1842-46) and India (1847-54) and in the famous victory at BALAKLAVA (1854) in the Crimean War. For his services in India in suppressing the Indian Mutiny (1857) he was created baron in 1858. He was made a field marshal in 1862. See biography by Lawrence Shadwell (1881).

Campbell, Donald Malcolm, 1921-67, British automobile and boat racer. The son of Sir Malcolm Campbell, from whom he inherited his passion for assaulting speed records and his mechanical inclinations, he helped to design a hull that would not disintegrate at speeds over 200 mi (322 km) per hr on water. His work attracted the attention of numerous British engineering firms and government departments. Campbell was killed in his jet-powered boat *Bluebird* as he tried to reach a speed of 300 mi (483 km) per hr. At the time of his death he held the world's speed record on water, 276.33 mi (444.89 km) per hr and had driven at an average speed of 403.1 mi (648.9 km) per hr on land. See biography by Douglas Young-James (1968).

Campbell, John, 1653-1728, American editor, b Scotland. After emigrating to Boston, he was postmaster of the city from 1702 to 1718 and wrote newsletters for regular patrons. In 1704 he started printing these newsletters as a weekly half sheet, devoted mostly to foreign news, entitled the *Boston News-Letter*. Sold to Bartholomew Green in 1722, it was the first successfully established paper to appear in colonial America.

Campbell, John Francis, 1822-85, Scottish Gaelic scholar. He is known for *Popular Tales of the West Highlands* (4 vol, 1860-62) and *Leabhar na Feinne* (1872), a collection of Gaelic folk ballads. A meteorologist also, he invented an instrument to record the intensity of the sun's rays.

Campbell, John, 1st Baron Campbell, 1779-1861, British jurist. He was a member of the Whig party in the House of Commons from 1830 and in the Lords from 1841. Ambitious legally rather than politically, he became attorney general (1834-41), lord chief justice (1850), and lord chancellor (1859). Campbell was associated with legal reforms in the areas of real estate and local government, but his role was that of organizing the investigating commissions and guiding the bills through Parliament. He was more directly responsible for the Libel Act (1843), the Copyright Act (1846), and the Obscene Publications Act (1857). He wrote *Lives of the Lord Chancellors* (1845-47) and *Lives of the Chief Justices* (1849-57).

Campbell, Sir Malcolm, 1885-1949, English automobile and speedboat racer. A racing enthusiast from boyhood, Campbell set many speed records for motorcycles, airplanes, automobiles, and motorboats and in 1931 was knighted for his accomplishments. Driving his famed automobile *Bluebird* at Bonneville Flats, Utah, in 1935, Sir Malcolm was the first to reach the 300 mi (483 km) per hr mark. He then turned to speedboat racing and in 1939 set a new record of 141 mi per hr. His son Donald Campbell (1921-67) raised the water speed record to more

than 300 mi per hr before his boat, also known as *Bluebird*, exploded in the water, killing him.

Campbell, Mrs. Patrick, 1865-1940, English actress, whose maiden name was Beatrice Stella Tanner. Remembered today for her association with G B Shaw, she was an actress of great beauty and wit. She made her debut in 1888 but achieved her first London success in 1893 in the title role of Pinero's *Second Mrs Tanqueray*. In 1901 she made the first of her numerous tours to the United States, in 1912 she met Shaw at whose request she created the role of Eliza Doolittle in *Pygmalion*. See her *My Life and Some Letters* (1922, repr 1969) and her correspondence with Shaw (ed by Alan Dent, 1952). Jerome Kilty's play *Dear Liar* (1960) is based on the Campbell-Shaw correspondence.

Campbell, Robert: see ROB ROY

Campbell, Robert, 1804-79, American fur trader and merchant, one of the mountain men, b Ireland. He came to the United States c 1824. Having been advised to lead an outdoor life because of a lung ailment, he joined (1825) a fur trapping expedition. He trapped and traded in the Rocky Mts until 1832, when he and William Sublette formed a partnership, which offered competition to the American Fur Company. Suffering reverses, they confined their activities to the mountain territory. The partnership was dissolved in 1842, and Campbell returned to St Louis, where he amassed a fortune in merchandising, real estate, and banking. In 1851 and again in 1869 he served as Indian commissioner.

Campbell, Robert, 1808-94, Canadian fur trader and explorer, b Scotland. Employed as a young man by the Hudson's Bay Company, he was sent in 1834 to the Mackenzie River region, where he remained until 1852. He discovered the Pelly River in 1840, descending it in 1843 to its confluence with the Lewes River to form the Yukon. Here he established Fort Selkirk in 1848. Later (1850-51) he followed the Yukon to its junction with the Porcupine River at Fort Yukon. He worked as a trader for Hudson's Bay until 1871, when he was discharged, and spent his last years as a rancher in Manitoba. He wrote *The Discovery and Exploration of the Pelly River* (1883). See Clifford Wilson, *Campbell of the Yukon* (1970).

Campbell, Roy, 1901-57, South African poet. His persuasive and robust poetry, reminiscent of the 19th-century English romantics, includes *The Flaming Terrapin* (1924), *Mythic Emblems* (1936), and *Flowering Rifle* (1939). A fascist, Campbell fought with Franco's army in the Spanish civil war. During World War II, Campbell served with the British army in Africa. His collected poems were published in 1957. See his autobiography (1952).

Campbell, Thomas, 1763-1854, American clergyman, a founder of the DISCIPLES OF CHRIST. See CAMPBELL ALEXANDER, his more famous son.

Campbell, Thomas, 1777-1844, Scottish poet. He is best known for his war poems "Hohenlinden," "The Battle of the Baltic," and "Ye Mariners of England." Among his other volumes of poetry are *The Pleasure of Hope* (1799), *Gertrude of Wyoming* (1809), and *Theodoric* (1824).

Campbell, William, 1745-81, American Revolutionary soldier, b Augusta co, Va., brother-in-law of Patrick Henry. He fought in Lord Dunmore's War (1774) and helped expel the royal governor from Williamsburg in 1776. Campbell and his group of Virginia riflemen in 1780 joined Sevier and Shelby at Kings Mt (see CAROLINA CAMPAIGN), where he was in command. Later Campbell saw action at Guilford Courthouse, at Eutaw Springs, and in the Yorktown campaign.

Campbell, (William) Wilfred, 1861-1918, Canadian poet, b Kitchener, Ont. Although ordained an Episcopal minister, he spent most of his life as a civil servant. His fame rests mainly on *Lake Lyrics* (1889), a volume of nature poetry. He also wrote historical novels and poetic dramas, and he edited the *Oxford Book of Canadian Verse* (1913). See his *Poetical Works* (1923).

Campbell, 1 City (1970 pop 24,770), Santa Clara co, W Calif., in the fertile Santa Clara valley, founded 1885, inc 1952. A processing center for fruits and vegetables, it has a huge fruit-drying facility. 2 City (1970 pop 12,577), Mahoning co, NE Ohio, on the Mahoning River, adjacent to Youngstown, inc 1908. It has extensive ironworks and steelworks.

Campbell-Bannerman, Sir Henry, 1836-1908, British statesman. Entering Parliament (1868) as a Liberal, he served as secretary to the admiralty (1882-84), secretary of state for Ireland (1884), and secretary of state for war (1886, 1892-95). He was knighted in 1895. In 1899 he was elected leader of

the Liberal party (succeeding Sir William Harcourt) and led opposition to British policy in the South African War (1899-1902). When the Conservative government resigned in 1905, Campbell-Bannerman became prime minister. Before ill-health caused his retirement in 1908 he had furthered many Liberal measures, including that of self-government for the Transvaal and the Orange Free State. See biographies by J. A. Spender (1923) and John Wilson (1974).

Campbellites: see CAMPBELL, ALEXANDER, DISCIPLES OF CHRIST

Campbellton (kām'bāltən), city (1971 pop. 10,335), N N B, Canada, on the Restigouche River near the head of Chaleur Bay. The city has large sawmills and is a shipping port for pulpwood. It is a starting point for canoe, fishing (salmon and trout), and hunting trips into the forested interior.

Camp Borden, large military training establishment, S Ont., Canada, NW of Toronto. It covers an area of 20,000 acres (8,094 hectares) and also includes an armored-vehicle range at Meaford, to the northwest.

Camp David, U.S. presidential retreat, Md. see CATOCTIN MOUNTAIN PARK under NATIONAL PARKS AND MONUMENTS (table)

Campeche (kampā'chā), state (1970 pop. 250,391), 19,672 sq mi (50,950 sq km), SE Mexico, on the Gulf of Campeche. The city of Campeche is the capital. Comprising most of the western half of the YUCATÁN peninsula, the state lies in hot, humid, and unhealthy lowlands. Rainfall in the southwestern sector is heavy. Much of the state is extensively forested, and logwood (called *campeche* in Spanish) is one of the chief exports. Agriculture (especially the growing of sisal hemp) and stock raising are important, and some minerals are exploited. Using Campeche as a base, the Spanish explorer Francisco de Montejo led (1531-35) expeditions against the Maya Indians. The coast was a haunt of pirates from the 17th cent. to the 19th cent. The principal ports are Campeche and Carmen, a small town on an island at the entrance to the Laguna de Terminos.

Campeche (kampā'chā), city (1970 est. pop. 70,000), capital of Campeche state, SE Mexico, on the Yucatan peninsula. It is fortified and surrounded by 18th-century walls. Fish canning is the chief industry. The harbor is shallow, and vessels must anchor far from shore. Campeche, once the site of the pre-Columbian town called Kimpech (whose remains are still observable), was founded in 1540 by the son of the Spanish conquistador Francisco de Montejo. It was sacked frequently by English buccaneers. From 1862 to 1864, French forces blockaded the city. The city has a 16th-century cathedral.

Campeggio, Lorenzo (lōrēnt'sō kampē'djō), 1472?-1539, Italian churchman and diplomat, cardinal of the Roman Catholic Church. He was well known as a jurist before turning to the church (c.1510) upon the death of his wife. He was made bishop in 1512 and cardinal the following year. He was chosen as legate for the most delicate missions. In 1518 he went to England to secure the adherence of HENRY VIII to an alliance against Turkey. He did not succeed, but he received (1524) the bishopric of Salisbury from Henry, which he held *in absentia* until 1534. In 1528, Cardinal Campeggio went again to England to act with Cardinal WOLSEY as judge in the divorce of KATHARINE OF ARAGON. He followed his instructions to temporize and adjourned the hearing. Cardinal Campeggio was sent to Germany in 1524 to attempt a pacification of the Lutherans, but except for a promise from Holy Roman Emperor Charles V to enforce the Edict of Worms he obtained nothing. He ardently supported the reformation of the church, especially of the papal court and of the administration of the Holy See.

Camperdown (kām'pərdoun'), Du. *Kamperduin* [the dune of Kamp], locality near the village of Kamp, North Holland prov., NW Netherlands, on the North Sea. In 1797 the British defeated the Dutch in a naval battle off Camperdown.

Camp Fire Girls, American organization for girls from 6 to 18 years old. It was founded (1910) by Luther Halsey GULICK (1865-1918) and other educators "to perpetuate the spiritual ideals of the home" and "to stimulate and aid in the formation of habits making for health and character." The seven crafts of its program are the home, the creative arts, the outdoors, frontiers (of science), business, sports and games, and citizenship. The Camp Fire members are divided into four age groups—Blue Birds (6 to 8), Camp Fire Girls (9 to 11), Junior Hi Camp Fire Girls (12 to 13), and Horizon Clubs (14 to 18). The official organ of the organization is the *Camp Fire Girl*.

Camp Gagetown, military camp, S central N B, Canada. It was established in 1952 and is the largest (436 sq mi/1,129 sq km) military camp in Canada. **Camphausen, Ludolf** (lōō'dōlf kamp'hōuzən), 1803-90, Prussian statesman and businessman. A leading merchant in Cologne, he headed the liberal ministry appointed by King Frederick William IV of Prussia after the revolutionary outburst of March, 1848. He was forced to resign in June when the Prussian assembly became more liberal and the king more conservative. He was an important figure at the FRANKFURT PARLIAMENT.

camphor, C₁₀H₁₆O, white, crystalline solid KETONE with a characteristic pungent odor and taste. It melts at 176°C and boils at 204°C. The natural variety, Japan camphor, is obtained by steam distillation of the wood of the camphor tree (*Cinnamomum camphora*) native to China, Japan, and Formosa (its chief natural source). Since this source is inadequate, camphor is widely synthesized from α -pinene, which is obtained from oil of turpentine. Camphor is widely used as a plasticizer in the manufacture of celluloid and some lacquers. It is used in medicine as a stimulant, a diaphoretic, and an inhalant. Camphor ice is a mixture, containing principally camphor and wax, used for external application. Camphor is practically insoluble in water but soluble in alcohol, ether, chloroform, and other solvents. The alcoholic solution is known as spirits of camphor.

Campi, Giulio (jōō'lyō kam'pē), c.1500-c.1572, Italian painter and architect, founder of a school of painters at Cremona. He was a pupil of his father, Galeazzo Campi (c.1475-1536), a well-known painter, and of Giulio Romano, and he studied the works of Correggio and Raphael. Giulio produced many excellent altarpieces and frescoes in Milan, Mantua, and Cremona, the frescoes in the Church of Santa Margherita, Cremona, are entirely his work. Among his pupils were his two brothers, Cavaliere Antonio Campi, b. before 1536, d. 1591, painter, architect, and historian of Cremona, and Vincenzo Campi, 1532-91, whose works consist principally of portraits and still-life pieces. Another brother was Bernardino Campi, 1522-c.1590, a painter of great skill with a vigorous and original style, excelling in fresco painting and portraiture. Bernardino's most important work is the series of biblical frescoes in the cupola of San Sigismondo, Cremona, a work of colossal dimensions admirably executed.

Campion, Thomas: see CAMPION, THOMAS

Campin, Robert (kam'pin), 1378-1444, Flemish painter who with the van Eycks ranks as a founder of the Netherlandish school. This artist has been identified as the Master of Flemalle on the basis of three panels in Frankfurt-am-Main said to have come from the abbey of Flemalle near Liege. Campin was active in Tournai, having become a citizen of that city in 1410 and the dean of the painters' guild in 1423. To him have been attributed the *Mérode Altarpiece* in the Cloisters, New York City, a *Nativity* in Dijon, the *Annunciation and Marriage of the Virgin* in Madrid, the *Madonna of Humility* in London, and a number of other panels in various collections. Campin's style matured in the fresh climate of one of the mercantile urban centers of Northern Europe, where artistic taste came increasingly to reflect the values of the rising middle class. His works are characterized by a robust and highly developed realism and concern for the details of daily life, which constituted an important stage in the stylistic evolution leading to the art of Jan van Eyck. It is believed that Roger Van der Weyden was apprenticed in Campin's workshop. See Erwin Panofsky, *Early Netherlandish Painting* (1953), M. S. Frinta, *The Genius of Robert Campin* (1966).

Campina Grande (kampē'na gran'di), city (1970 pop. 195,794), Paraíba state, NE Brazil, on the Borborema plateau. It is an important commercial and financial center and a shipping point for products from the Brazilian interior (hides and skins, cotton, and agave). Industries in the city are linked to agriculture and cattle raising. Textiles, leather goods, cheese, and butter are the principal products. The city was founded in the late 17th cent. and developed rapidly as an important point on the route from the coast to the interior.

Campinas (kampē'nas), city (1970 pop. 376,497), São Paulo state, S Brazil. It is a growing industrial and financial city, the processing and distributing center for a diversified agricultural region, and a major transportation hub. Consumer products, agricultural tools, and railroad equipment are among its manufactures. The city was founded in the 18th cent. Coffee cultivation in the region and the city's location

as the main railroad junction in the state accounted for its prosperity by the late 19th cent. As coffee production moved westward, the economy diversified. Campinas has a famed agronomical-research institute and a state university.

Campion, Saint Edmund (kām'pēən), c.1540-1581, English Jesuit martyr, educated at St. Paul's School and St. John's College, Oxford. As a fellow at Oxford he earned the admiration of his colleagues and his students and the favor of Queen Elizabeth by his brilliance and oratorical ability. He went (1569) to Dublin to help in the proposed restoration of the university there. Although he had reluctantly taken orders as a Protestant, he had open Roman Catholic leanings and fled in disguise (1571) to England and then to the Continent, where he studied at Douai, joined (1573) the Society of Jesus, and was ordained (1578). In 1580 he and another Jesuit, Robert PERSONS, were sent as Jesuit missionaries to England. Campion's travels were marked by many conversions and did much to guarantee the survival of Roman Catholicism in England. Copies of his secretly printed pamphlet, *Decem rationes* [10 reasons], against the Protestants, appeared at Oxford in 1581. The long pursuit by the government ended (July, 1581) with the taking of Campion. He was racked three times, but though his body was broken he conducted debates with Protestant theologians bravely and won more converts. He defended himself ably against trumped-up charges of sedition but was nevertheless condemned and hanged, drawn, and quartered. He was beatified in 1886. In 1970, Campion and the other English and Welsh martyrs of the Reformation were canonized. See biography by Evelyn Waugh (3d ed. 1961).

Campion or Campian, Thomas, 1567-1620, English poet, composer, and lutenist, a physician by profession. Campion wrote lyric poems that he and other composers set to music. His graceful, simple lute songs were published in five *Books of Airs* (1601-1617). He wrote a treatise on English poetry, condemning the use of rhyme, but he used rhyme freely in his own poems. His treatise *A New Way of Making Fowre Parts in Counterpoint* (1613) has often been republished. See study by Edward Lowbury et al. (1970).

campion. see PINK

Camp Lejeune, U.S. marine corps base, 82,969 acres (33,576 hectares), SE N.C., SE of Jacksonville, est. 1941. It is the major East Coast training center and support base for the Atlantic Fleet Marine Force.

camp meeting, outdoor religious meeting, held usually in the summer and lasting for several days. The camp meeting was a prominent institution of the American frontier. It originated under the preaching of James MCGREADY in Kentucky early in the course of a religious revival (c.1800) and spread throughout the United States. Immense crowds flocked to hear the noted revivalist preachers, bringing bedding and provisions in order to camp on the grounds. The meetings were directed by a number of preachers who relieved each other in carrying on the services, sometimes preaching simultaneously in different parts of the camp grounds. Shouting, shaking, and rolling on the ground often accompanied the tremendous emotional release that followed upon "conversion," although these extravagances were opposed and discouraged by conservative ministers. Camp meetings were usually held by evangelical sects, such as the Methodists and Baptists, and by the Cumberland Presbyterians and other newer denominations that developed out of the religious revival. In modified form they continued to be a feature of social and religious life in the region between the Alleghenies and the Mississippi River until comparatively recent times, in a sense, they survive in summer conferences and assemblies, such as the Chautauqua Institution and the Ocean Grove Camp Meeting Association. See C. A. Johnson, *The Frontier Camp Meeting* (1955).

Campoamor, Ramón de (ramōn' dā kampāmōr'), 1817-1901, Spanish poet, the first to break with the romantic tradition of long, tragic, and emotional poetry. One of the most popular Spanish poets of his time, he was noted for his humorous short poems collected in *Doloras* (1846), *Pequeños poemas* (1872-74), and *Humoradas* (1886-88). Less well known are the two long narrative poems, *Colón* [Columbus] (1853) and *El drama universal* (1869). Campoamor's works are no longer generally popular.

Campobasso (kam'pōbas'sō), city (1971 pop. 41,807), capital of Molise and of Campobasso prov., S central Italy. It is an agricultural and industrial center. Manufactures include cement, soap, textiles,

and cutlery. In the city are a 15th-century castle and a museum of archaeology.

Campobello (kām'pōbēl'ō), island, 9 mi (14.5 km) long and 3 mi (4.8 km) wide, in Passamaquoddy Bay, NB, Canada, just off the coast of Maine. The island passed to Canada by the Convention of 1817. President Franklin Delano Roosevelt had a summer home in Welchport, the main settlement, for many years. It is now preserved in Roosevelt-Campobello International Park (see NATIONAL PARKS AND MONUMENTS, table).

Campo Formio, Treaty of (kam'pō fōr'myō), Oct., 1797, peace treaty between France and Austria, signed near Campo Formio, a village near Udine, NE Italy, then in Venetia. It marked the end of the early phases of the FRENCH REVOLUTIONARY WARS. The treaty generally ratified the preliminary Peace of Leoben, signed at the conclusion of Napoleon Bonaparte's Italian campaign (see NAPOLEON I). Bonaparte signed for France, Count Cobenzl for Austria. Austria ceded its possessions in the Low Countries (the present-day Belgium) to France and secretly promised France the left bank of the Rhine. The republic of Venice, invaded despite its attempts to maintain neutrality, was dissolved and partitioned. All Venetia E of the Adige, as well as Istria and Dalmatia, passed to Austria, the present provinces of Bergamo and Brescia went to the newly founded CISALPINE REPUBLIC, the IONIAN ISLANDS went to France.

Campanones, Pedro Rodríguez de, conde de Campanones (pā'thrō rō'thrē'gāth kōn'dā dā kām'pōma'nās), b. 1723, d. 1802 or 1803, Spanish statesman, economist, and author. As minister under Charles III and briefly under Charles IV, he introduced administrative, social, and economic reforms. He wrote on the revival of industry and on the professional education of the working classes.

Campos, Arsenio Martínez de: see MARTÍNEZ DE CAMPOS ARSENIÓ

Campos (kām'pōs), city (1970 pop. 319,112), Rio de Janeiro state, SE Brazil, on the Paraíba River near its mouth. It is the commercial hub of a rich agricultural region and a transportation center. More than half of the state's sugar output is produced in Campos. There are also distilleries in the city. Campos was founded in the early 17th cent. and under the empire was an important slave center.

Campus Martius under ROME see Rome before Augustus, Roman Empire, Renaissance and Modern Rome

Cam Ranh Bay (kam rān), inlet of the South China Sea, 10 mi (16 km) long and 20 mi (32 km) wide, S central South Vietnam. It is an excellent harbor linked to the sea by a strait (1 mi/1.6 km wide). The bay was the site of one of the largest U.S. military facilities (est. 1965) in South Vietnam during the Vietnam War.

Camrose, city (1971 pop. 8,673), central Alta., Canada. It is in a mixed farming area and is a railroad center. Camrose Lutheran College is there.

Camulodunum, England see COLCHESTER

Camus, Albert (al'bēr' kamu'), 1913-60, French writer, b. Algiers. Camus was one of the most important authors and thinkers of the 20th cent. While a student at the Univ. of Algiers, he formed a theater group and adapted, directed, and acted in plays. He became active in social reform and was briefly a member of the Communist party. Shortly after his essay *Noches [weddings]* appeared (1939), he went to Paris as a journalist. In World War II he joined the French resistance and was principal editor of the underground paper *Combat*. Noted for his vigorous, concise, and lucid style, Camus soon gained recognition as a major literary figure. His belief that man's condition is absurd identified him with the existentialists, but he denied allegiance to that group; his works express rather a courageous humanism. The characters in his novels and plays, although keenly aware of the meaninglessness of the human condition, assert their humanity by rebelling against their circumstances. His essay *Le Mythe de Sisyphe* (1942, tr. *The Myth of Sisyphus*, 1955) formulates his theory of the absurd and is the philosophical basis of his novel *L'Étranger* (1942, tr. *The Stranger*, 1946) and of his plays *Le Malentendu* (1944, tr. *Cross Purpose*, 1948) and *Caligula* (1944, tr. 1948). The essay *L'Homme révolté* (1951, tr. *The Rebel*, 1954), dealing with historical, spiritual, and political rebellion, treats themes found in the novels *La Peste* (1947, tr. *The Plague*, 1948) and *La Chute* (1956, tr. *The Fall*, 1957). Other works include the plays *L'État de siège* (1948, tr. *State of Siege*, 1958), and *Les Justes* (1950, tr. *The Just Assassins*, 1958), journalistic essays, and stories. Camus was awarded the 1957 Nobel Prize in Literature. See his *Notebooks* ed. by Philip Thody (2

vol., 1963, 1965), studies by John Cruikshank (1960), Germaine Bree (4th ed. 1972), Donald Lazere (1973), and Lev Braun (1974).

Canā (kā'nā), ancient town of Galilee. Here Jesus performed his first miracle by turning water into wine at a wedding. John 2, 1, 11, 4, 46, 54, 21, 2.

Canaan (kā'nān) 1 Son of Ham and the ancestor for whom the Canaanites were named. Gen. 9:20-27, 10:6, 15:19. 2 Territory, the same as ancient Palestine, lying between the Jordan, the Dead Sea, and the Mediterranean and sometimes including Transjordan. It was the Promised Land of the Israelites, and after their delivery from Egypt they subjugated it. Gen. 12:5, Ex. 3:8, Num. 13:17, 29, 14:45, 21:3, Joshua 22:11, 32, Judges 1. The Canaanites are the inhabitants of Canaan and are probably related to the Amorites. In Mark 3:18 the name signifies one of the Zealots. Chanaan is a variant of Canaan. See UGARIT, ASHERAH, BAAL, PHILISTIA, PHOENICIA.

Canada, country (1971 pop. 21,568,311), 3,851,787 sq mi (9,976,128 sq km), N North America. The capital is OTTAWA. It is a federation of 10 provinces—NEWFOUNDLAND, NOVA SCOTIA, NEW BRUNSWICK, PRINCE EDWARD ISLAND, QUEBEC, ONTARIO, MANITOBA, SASKATCHEWAN, ALBERTA, and BRITISH COLUMBIA—and the YUKON TERRITORY and the NORTHWEST TERRITORIES. Canada occupies all of North America N of the United States (and E of Alaska) except for the French islands of St. Pierre and Miquelon. It is bounded on the E by the Atlantic Ocean, on the N by the Arctic Ocean, and on the W by the Pacific Ocean and Alaska. A transcontinental border, formed in part by the Great Lakes, divides Canada from the United States, Nares and Davis straits separate Canada from Greenland. The ARCTIC ARCHIPELAGO extends far into the Arctic Ocean. Canada has a very long and irregular coastline, Hudson Bay and the Gulf of St. Lawrence indent the east coast and the Inside Passage extends along the west coast. The ice-clogged straits between the islands of N Canada form the Northwest Passage. During the Ice Age all of Canada was covered by a continental ice sheet that scoured and depressed the land surface, leaving a covering of glacial drift, depositional landforms, and innumerable lakes and rivers. Aside from the Great Lakes, which are only partly in the country, the largest lakes of North America—Great Bear, Great Slave, and Winnipeg—are entirely in Canada. The St. Lawrence is the chief river of E Canada. The Saskatchewan, Nelson, Churchill, and Mackenzie river systems drain central Canada, and the Columbia, Fraser, and Yukon rivers drain the western part of the country. Canada has a bowl-shaped geologic structure rimmed by highlands, with Hudson Bay at the lowest point. The country has eight major physiographic regions—the Canadian Shield, the Hudson Bay Lowlands, the Western Cordillera, the Interior Lowlands, the Great Lakes-St. Lawrence Lowlands, the Appalachians, the Arctic Lowlands, and the Innuitians. The exposed portions of the Canadian Shield cover more than half of Canada. This once-mountainous region, which contains the continent's oldest rocks, has been worn low by erosion over the millennia. Its upturned eastern edge is indented by fjords. The Shield is rich in minerals, especially iron and nickel, and in potential sources of hydroelectric power. In the center of the Shield are the Hudson Bay Lowlands, encompassing Hudson Bay and the surrounding marshy land. The Western Cordillera, a geologically young mountain system parallel to the Pacific coast, is composed of a series of north-south trending ranges and valleys that form the highest and most rugged section of the country. Mt. Logan (19,850 ft/6,050 m) is the highest point in Canada. Part of this region is made up of the Rocky Mts. and the Coast Mts., which are separated by plateaus and basins. The islands off W Canada are partially submerged portions of the Coast Mts. The Western Cordillera is also rich in minerals and timber and potential sources of hydroelectric power. Between the Rocky Mts. and the Canadian Shield are the Interior Lowlands, a vast region filled with sediment from the flanking higher lands. The Lowlands are divided into the prairies, the plains, and the Mackenzie Lowlands. The prairies are Canada's granary, while grazing is important on the plains. The smallest and southernmost region is the Great Lakes-St. Lawrence Lowlands, Canada's heartland. Dominated by the St. Lawrence River and the Great Lakes, the region provides a natural corridor into central Canada, and the St. Lawrence Seaway gives the interior cities access to the Atlantic. This section, which is composed of gently rolling surface on sedimentary rocks, is the location of extensive farmlands, large industrial centers, and most of Canada's population. In SE Canada and on New-

foundland is the northern end of the Appalachian Mt. system, an old and geologically complex region with a generally low and rounded relief. The Arctic Lowlands and the Innuitians are the most isolated areas of Canada and are barren and snow covered for most of the year. The Arctic Lowlands comprise much of the Arctic Archipelago and contain sedimentary rocks that may have oil-bearing strata. In the extreme north, mainly on Ellesmere Island, is the Innuitian Mt. system, which rises to c. 10,000 ft (3,050 m). Canada's climate is influenced by latitude and topography. The Interior Lowlands make it possible for polar air masses to move south and for subtropical air masses to move north into Canada. Hudson Bay and the Great Lakes act to modify the climate locally. The Western Cordillera serves as a climatic barrier that prevents polar air masses from reaching the Pacific coast and blocks the moist Pacific winds from reaching into the interior. The Cordillera has a typical highland climate that varies with altitude, the western slopes receive abundant rainfall, and the whole region is forested. The Interior Lowlands are in the rain shadow of the Cordillera, the southern portion has a steppe climate in which grasses predominate. S Canada has a temperate climate, with snow in the winter (especially in the east) and cool summers. Farther to the north, extending to the timberline, is the humid subarctic climate characterized by short summers and a snow cover for about half the year. On the Arctic Archipelago and the northern mainland is the tundra, with its mosses and lichen, permafrost, near year-round snow cover, and ice fields. A noted phenomenon off the coast of E Canada is the persistence of dense fog, which is formed when the warm air over the Gulf Stream passes over the cold Labrador Current as the two currents meet off Newfoundland.

Economy. Manufacturing is Canada's most important economic activity, engaging 22% of the work force. The remainder are employed in service industries (27%), trade (17%), construction (6%), transportation (6%), finance, real estate, and insurance (6%), government (6%), and agriculture (5%). Manufacturing accounts for more than half the value of all Canadian production. The leading products are motor vehicles, pulp and paper, processed meat, petroleum, iron and steel, dairy products, and processed metals. Industries are centered in Ontario, Quebec, and, to a lesser extent, British Columbia. Agriculture contributes about one tenth of the value of production. The sources of the greatest farm income are livestock and dairy products. Among the biggest income-earning crops are wheat, oats, barley, and corn. Canada is one of the world's leading agricultural exporters, especially of wheat. Manitoba, Saskatchewan, and Alberta are the great grain-growing provinces, and, with Ontario, are also the leading sources of beef cattle. The main fruit-growing regions are found in Ontario, British Columbia, Quebec, and Nova Scotia. Apples and peaches are the principal fruits grown in Canada. The fur industry, once so important, but no longer dominant in the nation's economy, is centered in Ontario. Canada is a leading mineral producer. It is the world's largest source of asbestos, nickel, zinc, and silver, and the second largest source of potash, molybdenum, gypsum, uranium, and sulfur. The mineral wealth is located in many areas, some of the most productive regions are Sudbury, Ont. (copper and nickel), Timmins, Ont. (lead, zinc, and silver), and Kimberley, British Columbia (lead, zinc, and silver). Petroleum is found in Alberta and Saskatchewan. Fishing is an important economic activity in Canada. Cod and lobster from the Atlantic and salmon from the Pacific are the principal catches. About two thirds of the take is exported. The United States is Canada's leading trading partner, followed by Great Britain and Japan. Manufactured goods comprise the bulk of the imports, motor vehicles and parts are both the largest import and export. Other important exports are newsprint, wheat, and minerals. A major problem for Canada is that large segments of its economy—notably in manufacturing, petroleum, and mining—are controlled by foreign, especially U.S. interests. This deprives the nation of much of the profits of its industries and makes the economy vulnerable to developments outside Canada.

People. More than 40% of the Canadian population are of British descent, and some 30% are of French origin. Nearly 75% of the total population live in cities, the largest of which are MONTREAL, TORONTO, EDMONTON, VANCOUVER, CALGARY, HAMILTON, and OTTAWA. Canada has complete religious liberty. The country is about equally divided between Roman Catholics and Protestants. The largest Protestant denominations are United Church of Canada, Angli-

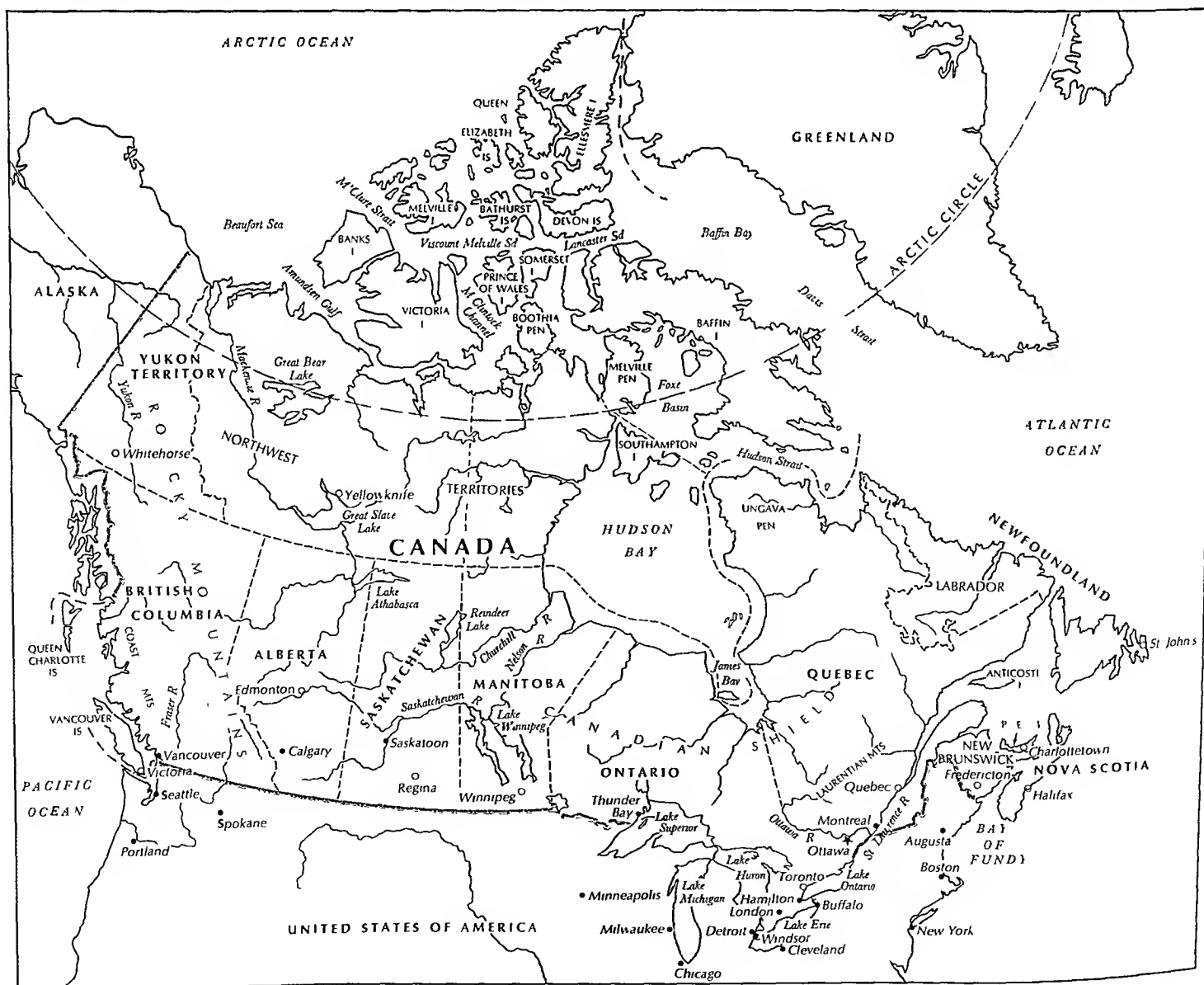
can Church of Canada, and Presbyterian English and French are the official languages, and federal documents are published in both languages

Government Canada is an independent constitutional monarchy and a member of the Commonwealth of Nations. The monarch of Great Britain and Northern Ireland is also the monarch of Canada and is represented in the country by the office of governor general. The basic constitutional document is the British North America Act of 1867. The Canadian federal government has authority in all matters not specifically reserved to the provincial governments. The provincial governments have power in the fields of property, civil rights, education, and local government. They may levy only direct taxes. The federal government may veto any provincial law. Power on the federal level is exercised by the Canadian Parliament and the cabinet of ministers, headed by the prime minister. The Parliament has two houses: the Senate and the House of Commons. There are a maximum of 110 senators, apportioned among the provinces and appointed by the governor general upon the advice of the prime minister. Senators may serve until age 75. Members of the House of Commons are elected, largely from single-member constituencies. After the 1971 census there were 264 members. Elections must be held at least every five years. The Commons may be dissolved and new elections held at the request of the prime minister. There are two main political parties, the Liberal party and the Progressive Conservative (or Conservative) party. Other important parties are the right-wing SOCIAL CREDIT party, the socialist New Democratic party, formerly the CO-OPERATIVE COMMONWEALTH FEDERATION, and the French Canadian nationalist Union Nationale. Canada has an independent judiciary; the highest court is the Supreme Court, with nine members.

Early History and French-British Rivalry An unknown number of Indians and Eskimos inhabited Canada before the white man arrived. The Vikings landed in Canada A.D. c. 1000. John CABOT, sailing under English auspices, touched the east coast in 1497. In 1534, the Frenchman Jacques CARTIER planted a cross on the Gaspé Peninsula. These and many other voyages to the Canadian coast were in search of a northwest passage to Asia. Subsequently, French-English rivalry dominated Canadian history until 1763. The first permanent white settlement in Canada was founded in 1605 by the sieur de MONTS and Samuel de CHAMPLAIN at Port Royal (now ANnapolis Royal, N.S.) in ACADIA. A trading post was established in Quebec in 1608. Meanwhile the English, moving to support their claims under Cabot's discoveries, attacked Port Royal (1614) and captured Quebec (1629). However, the French regained Quebec (1632), and through the Company of New France (Company of One Hundred Associates), began to exploit the fur trade and establish new settlements. The French were primarily interested in fur trading. Between 1608 and 1640, fewer than 300 settlers arrived. The sparse French settlements sharply contrasted with the relatively dense English settlements along the Atlantic coast to the south. Under a policy initiated by Champlain, the French supported the Huron Indians in their warfare against the Iroquois, later in the 17th cent., when the Iroquois crushed the Huron, the French colony came near extinction. Exploration, however, continued. The Company of New France was disbanded (1663) by the French government, and the colony was placed under the rule of a royal governor, an intendant, and a bishop. The power exercised by these authorities may be seen in the careers of Louis de Buade, comte de FRONTENAC, the greatest of the colonial governors, Jean TATON, the first and greatest of the intendants, and François

Xavier de LAVAL, the first bishop of Quebec. There was, however, conflict between the rulers, especially over the treatment of the Indians—the bishop regarding them as potential converts, the governor as means of trade. Meanwhile, both missionaries, such as Jacques MARQUETTE, and traders, such as RADISSON and Groseilliers, were extending French knowledge and influence. The greatest of all the empire builders in the west was Robert Cavelier, sieur de LA SALLE, who descended the Mississippi to its mouth and who envisioned the vast colony in the west that was made a reality by men like Duluth, Bienville, Iberville, and Cadillac. The French, however, did not go unchallenged. The English had claims on Acadia, and the Hudson's Bay Company in 1670 began to vie for the lucrative fur trade of the West. When the long series of wars between Britain and France broke out in Europe, they were paralleled in North America by the FRENCH AND INDIAN WARS. The Peace of Utrecht (1713) gave Britain Acadia, the Hudson Bay area, and Newfoundland. To strengthen their position the French built additional forts in the west (among them Detroit and Niagara). The decisive battle of the entire struggle took place in 1759, when Wolfe defeated Montcalm on the Plains of ABRAHAM, bringing about the fall of Quebec to the British. Montreal fell in 1760. By the Treaty of Paris in 1763, France ceded all its North American possessions to Britain (except Louisiana, which went to Spain).

British North America The French residents of Quebec strongly resented the Royal Proclamation of 1763, which imposed British institutions on them. Many of its provisions, however, were reversed by the QUEBEC ACT (1774), which granted important concessions to the French and extended Quebec's borders westward and southward. This act infuriated the residents of the Thirteen Colonies (the fu



Cross-references are indicated by SMALL CAPITALS

ture United States) In the American Revolution the Canadians remained passively loyal to the British crown, and the effort of the Americans to take Canada failed dismally (see QUEBEC CAMPAIGN). Loyalists from the colonies in revolt (see UNITED EMPIRE LOYALISTS) fled to Canada and settled in large numbers in the Maritime Provinces and Quebec. The result, in Quebec, was sharp antagonism between the deeply rooted, Catholic French Canadians and the newly arrived, Protestant British. To deal with the problem the British passed the Constitutional Act (1791). It divided Quebec into Upper Canada (present-day Ontario), predominantly British and Protestant, and Lower Canada (present-day Quebec), predominantly French and Catholic. Each new province had its own legislature and institutions. This period was one of further exploration. Alexander MACKENZIE made voyages in 1789 to the Arctic Ocean and in 1793 to the Pacific. Mariners also reached the Pacific Northwest, and such men as Capt. James COOK, John Meares, and George VANCOUVER secured for Britain a firm hold on what is now British Columbia. During the War of 1812, Canadian and British soldiers repulsed several American invasions. The New Brunswick boundary (see AROOSTOOK WAR) and the boundary W of the Great Lakes was disputed with the United States for a time, but since the War of 1812 the long border has generally been peaceful. Rivalry between the NORTH WEST COMPANY and the Hudson's Bay Company erupted into bloodshed in the RED RIVER SETTLEMENT and was resolved by amalgamation of the companies in 1821. The new Hudson's Bay Company then held undisputed sway over RUPERT'S LAND and the Pacific West until US immigrants challenged British possession of Oregon and obtained the present boundary (1846). After 1815 thousands of immigrants came to Canada from Scotland and Ireland. Movements for political reform arose. In Upper Canada, William Lyon MACKENZIE struggled against the FAMILY COMPACT. In Lower Canada, Louis J. Papineau led the French Canadian Reform party. There were rebellions in both provinces. The British sent Lord Durham to study the situation, and his famous report (1839) recommended the union of Upper and Lower Canada under responsible government. The two Canadas were made one province by the Act of Union (1841) and became known as Canada West and Canada East. Responsible government was achieved in 1849 (it had been granted to the MARITIME PROVINCES in 1847), largely as a result of the efforts of Robert BALDWIN and Louis H. LAFOURNAISE. The movement for federation of all the Canadian provinces was given impetus in 1860s by the need for common defense, the desire for some central authority to press railroad construction, and the necessity for a solution to the problem posed by Canada West and Canada East, where the British majority and French minority were in conflict. When the Maritime Provinces, which sought union among themselves, met at the Charlottetown Conference of 1864, delegates from the other provinces of Canada attended. Two more conferences were held—the Quebec Conference later in 1864 and the London Conference in 1866 in England—before the British North America Act in 1867 made federation a fact. The four original provinces were Ontario (Canada West), Quebec (Canada East), Nova Scotia, and New Brunswick.

The New Nation The new federation acquired the vast possessions of the Hudson's Bay Company in 1869. The Red River Settlement became the province of Manitoba in 1870. In 1873, Prince Edward Island joined the federation, and Alberta and Saskatchewan were admitted in 1905. Newfoundland joined in 1949. Canada's first prime minister was John A. MACDONALD (served 1867–73 and 1878–91), who sponsored the CANADIAN PACIFIC RAILWAY. In the West, religious tension and objections to lack of political representation and unfair land-grant and survey laws produced rebellions of metis, led by Louis RIEL in 1869–70 and 1884–85. Under the long administration (1896–1911) of Sir Wilfrid LAURIER, rising wheat prices attracted vast numbers of immigrants to the Prairie Provinces. Between 1891 and 1914, more than three million people came to Canada, largely from continental Europe. In the same period, mining operations were begun in the Klondike and the Canadian Shield. Large-scale development of hydroelectric resources helped foster industrialization and urbanization. Under the premiership of Robert L. BORDEN, Canada followed Britain and entered World War I. The struggle over military conscription, however, deepened the cleavage between French Canadians and their fellow citizens. During the depression that began in 1929, the Prairie Provinces were hard hit by droughts that shriveled the

wheat fields. Farmers, who had earlier formed huge cooperatives, sought to press their interests through political movements such as Social Credit and the

CANADIAN PRIME MINISTERS SINCE CONFEDERATION (including party and dates in office)

Sir John A. Macdonald [Conservative] 1867–73
Alexander Mackenzie [Liberal] 1873–78
Sir John A. Macdonald [Conservative] 1878–91
Sir John J. C. Abbott [Conservative] 1891–92
Sir John S. D. Thompson [Conservative] 1892–94
Sir Mackenzie Bowell [Conservative] 1894–96
Sir Charles Tupper [Conservative] 1896
Sir Wilfrid Laurier [Liberal] 1896–1911
Sir Robert L. Borden [Conservative/Unionist] 1911–20
Arthur Meighen [Conservative] 1920–21
W. L. M. King [Liberal] 1921–26
Arthur Meighen [Conservative] 1926
W. L. M. King [Liberal] 1926–30
Richard B. Bennett [Conservative] 1930–35
W. L. M. King [Liberal] 1935–48
Louis St. Laurent [Liberal] 1948–57
John G. Diefenbaker [Progressive/Conservative] 1957–63
Lester B. Pearson [Liberal] 1963–68
Pierre Elliott Trudeau [Liberal] 1968–

Co-Operative Commonwealth Federation Under the premiership of W. L. Mackenzie KING, Canada played a vital role on the Allied side in World War II. Despite economic strain Canada emerged from the war with enhanced prestige and took an active role in the United Nations. Canada joined the North Atlantic Treaty Organization in 1949. Since the war, uranium, iron, and petroleum resources have been exploited, uses of atomic energy have been developed, and hydroelectric and thermal plants have been built to produce electricity for new and expanded industries. King was succeeded by Louis ST. LAURENT, the first French-speaking prime minister. John G. DIEFENBAKER, a Conservative, came to power in 1957. A major problem for Canada in recent decades has been to prevent economic domination by the United States. The St. Lawrence Seaway was opened in 1959. The Liberals returned to office in 1963 under Lester B. PEARSON. After much bitter debate, the Canadian Parliament in 1964 approved a new national flag, with a design of a red maple leaf on a white ground, bordered by two vertical red panels. The new flag symbolized a growing Canadian feeling against emphasizing Canada's ties with Great Britain. The Pearson government enacted a comprehensive social security program. The Montreal international exposition, Expo '67, opened in 1967 and was applauded for displaying a degree of taste and interest far superior to that of most such exhibitions. Pearson was succeeded by Pierre Elliott TRUDEAU, a Liberal, in 1968. The Trudeau government was faced with the increasingly violent separatist movement active in Quebec in the late 1960s and early 70s. In elections in Oct. 1972, Trudeau's Liberal party failed to win a majority, but he continued as prime minister, dependent on the small New Democratic party for votes to pass legislation. In July, 1974, the Liberals reestablished a majority, winning 141 of 264 seats in the House of Commons, and Trudeau remained prime minister.

Bibliography Classic works on early Canada are those of Francis Parkman. See also Edgar McInnis, *Canada, a Political and Social History* (3d ed. 1969), R. R. Kruegel and R. G. Corder, *Canada, a New Geography* (1970), G. M. Wrong, *The Rise and Fall of New France* (2 vol., 1928, repr. 1970), D. G. Creighton, *The Story of Canada* (rev. ed. 1971), National Geographic Society, Washington, D.C., *Exploring Canada from Sea to Sea* (3d ed. 1971), Wilfrid Eggleston, *The Road to Nationhood* (1946, repr. 1972), John MacDougall, *Rural Life in Canada* (1913, repr. 1973), R. C. Brown and Ramsay Cook, *Canada, 1896–1921: A Nation Transformed* (1974). See also the multivolume history *Canadian Centenary Series* (1963–).

Canada balsam, yellow, oily, resinous exudation obtained from the BALSAM FIR. It is an oleoresin (see RESIN) with a pleasant odor but a biting taste. It is a TURPENTINE rather than a true balsam. On standing, the essential oil in Canada balsam evaporates, leaving behind the resin as a hard, transparent varnish. Canada balsam is valued as an optical mounting cement, e.g., for lenses and microscope slides, since it yields, when dissolved in an equal volume of xy-

lene, a noncrystallizing cement with a refractive index nearly equal to that of ordinary glass. It is used also in paints and polishes.

Canada Company, land settlement company chartered in England in 1826. It was initiated by the Scottish novelist John Galt, who proposed that Upper Canada (Ontario) sell government lands in order to raise money to compensate settlers who had suffered losses from the War of 1812. Galt became (1827) the company's representative in Canada. The Canada Company acquired lands along the Lake Huron side of the S. Ontario peninsula and founded Guelph and Goderich. In general the company was one of the most successful colonizing schemes, meeting its charter requirements by 1843. It remained in operation until the 1950s.

Canada First movement, party that appeared in Canada soon after confederation (1867). Its purpose was to encourage the growth of nonpartisan loyalty to the new dominion of Canada. In Toronto, in 1874, it founded the Nation and the National Club and entered the political field as the Canadian National Association, which encouraged immigration and native industry, and a more independent stance for Canada. Although its official career was short-lived, the party's ideals were expressed by Canadian writers and were absorbed by the older political parties. In this way the movement had an effect on the development of Canadian nationalism. See W. S. Wallace, *The Growth of Canadian National Feeling* (1927).

Canada jay: see JAY

Canada rice: see WILD RICE

Canada thistle: see THISTLE

Canaday, John, 1907–, American art critic, b. Fort Scott, Kansas. Canaday is noted for his conservative position in the art world. It is expressed in his column for the *New York Times*, which covers a wide range of art subjects. He is an authority on 19th-century art. His works include *Mainstreams of Modern Art* (1961), *Culture Gulch* (1969), and *Lives of the Painters* (4 vol., 1969). Early in 1974, Canaday began a weekly column of restaurant reviews for the *Times*. He also writes mysteries under the pseudonym Mathew Head.

Canadian, river, 906 mi (1,458 km) long, rising in NE Mex. and flowing E across N Texas and central Okla. into the Arkansas River in E Okla. In the mid-1800s, the Canadian River valley was followed by pioneers going West along the Fort Smith–Santa Fe Trail. Eufaula Reservoir stores the water of the Canadian and North Canadian rivers, its dam generates electricity. Sanford Dam impounds Lake Meredith, which lies over one of the world's largest natural gas fields. The lake is part of Lake Meredith National Recreation Area (see NATIONAL PARKS AND MONUMENTS, table).

Canadian art and architecture Among the outstanding art forms of early colonial Canada was French-Canadian wood carving, chiefly sculptured figures of saints and retables for the churches. This art flourished from 1675 (when Bishop Laval established a school of arts and crafts near Quebec) until c. 1850. The art reached its height after the separation from France when, freed from the French Renaissance tradition, it developed a local character beautifully exemplified in such work as that in the Church of the Holy Family on Orleans Island and in the Provincial Museum at Quebec. The two great Quebec families of carvers were the Levasseurs (18th cent.) and the Baillargés (19th cent.). The colonial period also produced fine embroidery (examples are kept at the Ursuline convent, Quebec) and several outstanding portraits executed in a naive folk-art style. Before 1880 almost the only other paintings and drawings produced in Canada were those by the colonial topographers, many of them English army officers. Most of this work is purely documentary. Paul KANE, who painted Indians, and Cornelius KRUEGHOF, who depicted the life of the settlers, were the earliest genre painters. Thomas Davies produced vibrant landscapes in watercolor in the second half of the 18th cent. J. A. Fraser, known for his scenes of the Rockies, was instrumental in founding the Ontario College of Art at Toronto in 1875. Five years later the Royal Canadian Academy of Arts (at Montreal) and the National Gallery of Canada (at Ottawa) were founded. Since 1910 the National Gallery has played an active part in Canadian life through its traveling exhibits. Its collection is the finest in Canada. Today there are art schools and galleries in all the major Canadian cities. In the late 19th cent. the outstanding artists were the landscapists Daniel Fowler, F. M. Bell-Smith, and Robert Gagen, the portrait painters Rob-

ert Harris, Antoine Palamondon, and Theophile Hamel, and two great cartoonists, J. W. Bengough and Henri Julien. They were followed by a number of celebrated painters, including George A. Reid, Franklin Brownell, Florence Carlyle, F. McG. Knowles, Horatio Walker, M. A. de Foy Suzor Côté, William Brymner, Maurice Cullen, Tom Thomson, and J. W. Morrice, who worked chiefly outside Canada and is perhaps the most celebrated of Canadian landscapists. In 1920, Franklin Carmichael, Lawren Harris, A. Y. Jackson, Franz H. Johnston, Arthur Lismer, J. E. H. MacDonald, and F. Horsman Varley formed the Group of Seven, dedicated to painting the Canadian landscape. Traveling and working all over the dominion, they did much to awaken the interest of the country at large. Their approach, which emphasized flat, strongly colored design, tended toward a poster style. The cultural center of the Seven was Toronto, in Montreal toward the end of World War II a new, radical group was formed, including Alfred Pellan, John Lyman, P. E. Borduas, and J. P. Riopelle. They evolved the automatist movement, influenced by Matisse, Picasso, and Surrealism. Other major painters, working in a wide variety of styles, include David Milne, Emily Carr, Pegi Nicol MacLeod, B. C. Binning, J. L. Shadbolt, and Harold Town. In the late 1960s the OP ART movement flourished in Montreal. Canadian painters currently at work employ a variety of styles and cannot be grouped as a school. After the decline of wood carving, little sculpture was produced until 1900. Philippe Hébert, Suzor-Côté, Alfred Laliberte, Tait McKenzie, and Walter Allward became well-established sculptors. Among the later sculptors, Emanuel Hahn, Louis Archambault, Elizabeth Wyn Wood, and Henri Hebert are notable. The French Canadians have an important tradition in such decorative arts and crafts as metalworking and rug hooking. In the graphic arts Clarence Gagnon, W. J. Phillips, and Albert Dumbuchel are considered among the foremost Canadian print makers of the 20th cent. Canadian architecture adheres in the main to foreign trends, especially in the planning of public buildings. From the 18th to the 20th cent., French Renaissance, English Georgian, regency, and Gothic revival designs were successively dominant. A notable example of Gothic revival is found in the buildings of Parliament Hall, Ottawa (begun 1859), by Thomas Fuller and others. Based on the ideas of H. H. Richardson, well-known structures in the châteaueau style are the Château Frontenac (1890), Quebec City, and the Banff Springs Hotel (1913), Banff, Alberta. Major modern buildings include the Electrical Building and Civic Auditorium, Vancouver, British Columbia, and the Shakespearean Festival Theatre, Stratford, Ont. Church and domestic architecture in Canada have consistently shown originality. Particularly in Quebec during the colonial period, charming rural stone houses and churches were developed—typically low and rectangular, with steep pitched roofs and uptilting eaves. Safdie's remarkable "Habitat," a dynamic and original approach to housing, was erected in Montreal for Expo '67. For a discussion of Canadian Indian art see NORTH AMERICAN INDIAN ART. See studies on Canadian art by Graham McInnes (rev. ed. 1950), J. R. Harper (1966 and 1972), and William Townsend, ed. (1970), on architecture by Alan Gowans (1958) and Pierre Mayrand and John Bland (1971), Dennis Reid, *A Concise History of Canadian Painting* (1974).

Canadian football see under FOOTBALL

Canadian literature, English Although Canadian writing began as an imitative colonial literature, it has steadily developed its own national characteristics. Because of the huge immigrations, first of New England Puritans from 1760 on and later of American Loyalists during the Revolution, Canadian literature followed U.S. models almost until the confederation in 1867. Before 1800 the rigors of pioneering left little time for the writing or the appreciation of literature. The only notable works were journals, such as that of Jacob Bailey, and the recorded travels of explorers, such as Henry Kelsey, Samuel Hearne, and Sir Alexander Mackenzie. The first Canadian novelist of note was John Richardson, whose *Wacousta* (1832) popularized the genre of the national historical novel. With *The Clockmaker* (1836) T. C. Haliburton began his humorous series on Sam Slick, the Yankee peddler. Historical novelists writing c. 1900 included William Kirby, author of *The Golden Dog* (1877), and Sir Gilbert Parker, author of *The Seats of the Mighty* (1896). The novels of Sara Jeannette Duncan, such as *A Social Departure* (1890), were noted for their satire and humor. The Rev. C. W. Gordon (Ralph Connor) produced *Black Rock* (1898), a series of novels on pioneer life in W.

Canada. Animal stories became popular in the works of Ernest Thompson Seton, Sir C. G. D. Roberts, and Margaret Marshall Saunders. Since 1900, Canadian novels have tended toward stricter realism, but have remained predominantly regional. Among the most prominent authors have been Lucy M. Montgomery, author of *Anne of Green Gables* (1908), Mazo de la Roche, well known for her series on the Whiteoaks family of Jalna, Frederick P. Grove, author of *Settlers of the Marsh* (1925), a novel of farm life, and Laura Salverson and Nellie McClung, novelists of immigrant and rural life in W. Canada. Important novelists during and after World War II include Morley Callaghan, Gvethalyn Graham, John Buell, Hugh MacLennan, Mordecai Richler, Malcolm Lowry, Ethel Wilson, Robertson Davies, Brian Moore, Margaret Laurence, and Margaret Atwood. Their novels have focused attention on Canadian city life, social problems, and the large problem of Canadian cultural division. Stephen Leacock is well known for his humorous essays as well as for his scholarship. Other notable essayists include Sir Andrew Macphail, Archibald MacMechan, and Lorne Pierce. Genuinely Canadian poetry was late in developing. In the 18th cent. Puritan hymnists, such as Henry Alline, and refugee Tory satirists, such as Jonathan Odell, took their models from American colonial or English neoclassical literature. Before the confederation of 1867 the only poets of note were Charles Sangster, the first to make use of native material, and Charles Heavysege, whose long poetic drama *Saul* brought him widespread acclaim. Starting c. 1880, the "confederation school"—C. G. D. Roberts, Archibald Lampman, Bliss Carman, and Duncan Campbell Scott—began producing a large body of romantic poetry, describing nature and Canadian rural life. In 1905, long after her death in 1887, Isabella V. Crawford was recognized as an important poet, she was followed by Emily Pauline Johnson and Marjorie Pickthall. Other poets of the early part of the century included Wilfred Campbell, W. H. Drummond, Francis Sherman, John McCrae, and the greatly popular Robert W. Service. In 1926 the prolific E. J. Pratt broke away from the romantic tradition with *The Titans*, his highly original and powerful epics place him among the foremost Canadian poets. Notable contemporary poets in the Pratt tradition include Kenneth Leslie, Earle Birney, W. W. E. Ross, Dorothy Livesay, and Anne Marriott. Other poets sharing the modern cosmopolitan tradition of the United States and W. Europe are F. R. Scott, L. A. Mackay, A. M. Klein, P. K. Page, Irving Layton, Raymond Souster, James Reaney, Margaret Avison, Phyllis Webb, Leonard Cohen, and Margaret Atwood. See bibliography by R. E. Watters (2d ed. 1972), C. F. Klinck, ed., *A Literary History of Canada* (1965), Edmund Wilson, *O Canada* (1965), Norah Story, *The Oxford Companion to Canadian History and Literature* (1967), A. J. M. Smith, ed., *Modern Canadian Verse in English and French* (1967), R. P. Baker, *A History of English Canadian Literature to the Confederation* (1920, repr. 1968).

Canadian literature, French. Except for the narratives of French explorers (such as Samuel de Champlain and Pierre Esprit Radisson) and missionaries, no notable writing was produced before the British conquest of New France in 1759. Since that time the inspiration of most Canadian writing in French has been the passionate concern of French Canadians to preserve their identity in a country dominated by the English language and cultural tradition and by the Protestant religion. There has been little contact between the two literatures. Until the 20th cent. French Canadian literature found its models mainly in writers of France and its themes in nationalism, the simple lives and folkways of the habitants, and the devotion to the Roman Catholic Church. The first artistic expression of this spirit was F. X. Garneau's *Histoire du Canada* (1845–48), still the classic of French Canadian nationalism. Other historians, including Benjamin Sulte, Thomas Chapais, and L. A. Groulx, also placed their emphasis on pride in and protection of their French heritage. This school of thought inspired the first nationalist poet, Octave Crémazie, and the Quebec school of poets, novelists, and historians who began a deliberate effort in 1861 to create a national literature, with such French authors as Hugo and Lamartine as their chief models. The group included Philippe Aubert de Gaspé, J. B. A. Ferland, Louis-Honoré Fréchette, Pamphile LeMay, Abbé H. R. Casgrain, Antoine Gérin-Lajoie, and Nérée Beauchemin. There developed c. 1900 a new group of writers, chiefly in Montreal, who tried to achieve the stricter technique and keener artistic perceptions of the Parnassians of France. These more sophisticated poets included Charles Gill,

René Chopin, and Louis Dantin. Some writers of the new group, such as Émile Nelligan, considered French Canada's first native poetic genius, and Paul Morin, abandoned the national note for exotic subjects, others, such as Albert Lozeau and Albert Ferland, found inspiration in Canadian nature. About this time men of letters, notably Adjutor Rivard, began a movement to preserve the purity of the French language in Canada. Influential critics included Camille Roy, Henri d'Arles, and the poet Louis Dantin. In the novel, a rural romanticism was expressed in the works of Felicité Angers (Laure Conan). A more realistic fiction took impetus from Louis Hémon's *Maria Chapdelaine* (1913), a novel of the peasants of the Lake St. John country. There followed a stream of fiction on habitant life in the backwoods, on the farms, and in the villages, by such native Canadians as Robert Choquette, F. A. Savard, Claude Henri Gignon, Roger Lemelin, and Ringuelet. Although some novels were set in cities and the notable author Robert Charbonneau explored the psychological defeatism of his characters, the realistic regional novel about the simple Catholic community remained dominant until the 1950s. Important poets since 1914 include Clement Marchand, whose inspiration is often religious, Alfred DesRochers, who writes of the life of the soil, and Robert Choquette and Roger Brien, whose romantic lyrics are eloquently individualistic. Following World War II there was evidence of a new, less self-conscious spirit. Poets and novelists, trying to settle the vexing problem of language, declared that pure French should be standard, with the use of Canadianisms accepted wherever these served a purpose. Although it was still possible to detect the influence of France (often with a lag of 30 years), at midcentury much creative writing in Canada, as elsewhere, was characterized by experiment with subject matter and technique. Among the poets of the new trend were Anne Hébert, Alain Grandbois, Saint-Denis-Garneau, Gatien Lapointe, Pierre Trottier, Rina Lasnier, Fernand Ouellette, and Jacques Godbout and Jean Guy Pilon, the last two forming the nucleus of a group in Montreal which started the literary magazine *Liberte* in 1959. In fiction of the 1950s and 60s urban problems replaced rural concerns, and irony and skepticism national pride. Foremost among contemporary novelists are Gabrielle Roy, Yves Thériault, Robert Elie, Roger Lemelin, André Langevin, Jean Simard, Claire Martin, Marie-Claire Blais, and Girard Bessette. See Ian F. Fraser, *The Spirit of French Canada* (1939), Edmund Wilson, *O Canada* (1964), A. J. M. Smith, ed., *Modern Canadian Verse in English and French* (1967), Norah Story, *The Oxford Companion to Canadian History and Literature* (1967).

Canadian Mounted Police: see ROYAL CANADIAN MOUNTED POLICE

Canadian National Railways, government owned but corporately operated transportation system in Canada, extending from coast to coast with many branch lines in each province and in the United States. The system is an amalgamation of five separate railroad enterprises that were unified in 1922. The system also operates telegraph, steamship, and air services.

Canadian Pacific Railway, transcontinental transportation system in Canada and extending into the United States, privately owned and operated. The construction of a railroad crossing the continent in Canadian territory was one of the conditions on which British Columbia entered the confederation in 1871. After many difficulties and a political scandal, intensive work began in 1880. The main line from Montreal to the Pacific coast was completed in 1885.

Canadian Shield or Laurentian Plateau, U-shaped region of ancient rock, the nucleus of North America, stretching N from the Great Lakes to the Arctic Ocean. Covering more than half of Canada, it also includes most of Greenland and extends into the United States as the Adirondack Mts and the Superior Highlands. The first part of North America to be permanently elevated above sea level, it has remained almost wholly untouched by successive encroachments of the sea upon the continent. It is the earth's greatest area of exposed Archaean-age rock, the metamorphic rocks of which it is largely composed were probably formed in the Precambrian era. Repeatedly uplifted and eroded, it is today an area of low relief (c. 1,000–2,000 ft/305–610 m above sea level) with a few monadnocks and low mountain ranges (including the Torngat and Laurentian Mts.) probably eroded from the plateau during the Cenozoic era. During the Pleistocene epoch, continental ice sheets depressed the land surface (see HUDSON BAY), scooped out thousands of lake basins,

and carried away much of the region's soil Drainage is generally very poor on the shield The southern part of the shield has thick forests while the north is covered with tundra The region is largely undeveloped but has great water-power potential and is a source of minerals, timber, and fur-bearing animals

canafistula (kän'yäfīs'chälə) see SENNA

canaigre (kän'igrē) see BUCKWHEAT

Çanakale (chānak'älē) or **Chanakkale** (-kalā), city (1970 pop 27,074), capital of Çanakale prov., NW Turkey, on the Asian shore of the Dardanelles It is famous for its fine pottery and has an important fish-canning industry The city has long been fortified and has a 15th-century fort, which is still used by the Turkish army In World War I the city and fort were bombarded (1915) during the Gallipoli campaign Near Çanakale are the mouth of the historic Aegospotamos River and the ruins of the ancient towns of Abydos and Sestos

Çanakale Boğazi, Turkey see DARDANELLES

Canal, Antonio: see CANALETTO

canal, an artificial waterway constructed for navigation or for the movement of water The digging of canals for irrigation probably dates back to the beginnings of agriculture, and traces of canals have been found in the regions of ancient civilizations Canals are also used to provide municipal and industrial water supplies The drainage of wet lands may be accomplished by means of a canal, by this method the Fens of England and the Zuider Zee in the Netherlands were drained Canals can be used for flood control by diverting water from threatened areas into storage basins or to other outlets In some cases canals are used to generate electricity, the Moscow-Volga Canal is used for such a purpose Navigation canals developed after irrigation canals and for a long time were level, shallow cuts, or had inclined planes up which vessels were hauled from one level to the next, locks (see LOCK, CANAL) developed separately in China (10th cent.) and Europe (Holland, 13th cent.) Over the years canals have been expanded in width and depth in order to accommodate larger craft, and they have, in some cases, been constructed to form bridges or to pass through tunnels to overcome topographic difficulties Movement on canals was long accomplished by animal tows or by poling, in the 20th cent. mechanized tows and self-propelled barges appeared The GRAND CANAL OF CHINA (the longest in the world) was completed in the 13th cent. and is the most notable of the early canals France, Belgium, Holland, and Germany were the first in Europe to develop inland waterway systems by using canals to connect rivers, these countries now have a dense network of waterways (see RHINE CANALS, MIDLAND CANAL) Canal building was widespread in the 18th and 19th cent. During that period England developed an elaborate canal network, and there was also a canal-building boom in the United States in the 19th cent., especially after the completion of the ERIE CANAL However, the rise of railroads brought a decline in the building and use of canals as inland waterways Canals have been built to shorten sea voyages or to make them less hazardous, e.g., the SUEZ CANAL, the PANAMA CANAL, and the KIEL CANAL Canals improve conditions on natural waterways by bypassing falls (the WELLAND SHIP CANAL), shallows, or swift currents (the Sij Canal in the Danube River's Iron Gate gorge) Canals may provide inland cities with direct access to the sea (the MANCHESTER SHIP CANAL), or shorten the distance between cities (the ALBERT CANAL) In the 20th cent. canals regained importance, as modern technology provided the means to overcome greater topographic obstacles and facilitated the construction of larger canals and the expansion of existing ones See T. C. Bridges, *Great Canals* (1936), P. 5 Payne, *The Canal Builders* (1959), H. S. Drago, *Canal Days in America* (1972)

Canal du Midi (känäl' dü mēdē'), canal, c150 mi (240 km) long, linking Sete and Toulouse, S France It was built to carry oceangoing ships between the Atlantic Ocean and the Mediterranean Sea, but because of its size it now carries only barge traffic

Canalejas y Méndez, José (hōsā' kanälā'hās ē män'däth), 1854-1912, Spanish politician After holding several cabinet posts, he became premier in 1910 A democratic radical who hoped to reform the Liberal party, Canalejas advocated curbing the power of the religious orders and breaking up the large estates, but made little progress His firm measures against labor unrest alienated many of his left-wing supporters, and he was assassinated by an anarchist

Canaletto (känälēt'tō), 1697-1768, Venetian painter, whose original name was Antonio Canal He studied with his father, Bernardo Canal, a theatrical scene painter, and spent several years in Rome Returning to Venice, he devoted himself to painting the linear, dramatic, and topographically accurate Venetian scenes upon which his fame chiefly rests From 1746 to 1755 he lived in England and produced many fine landscapes, notably those of Eton College He painted series of picturesque views for English collectors, one of which is in the collection of the Duke of Bedford Canaletto is unsurpassed as an architectural painter His works are finely detailed yet delicate and airy Among his notable works are *View on the Grand Canal and Regatta on the Grand Canal* (National Gall., London), *Church of Santa Maria Della Salute* (Louvre), *View of Venice* (Uffizi), and *The Piazzetta, Venice* (Metropolitan Mus.) He was a master draftsman and produced many superb drawings and etchings that were not preparatory but complete in themselves Toward the end of his life his painting became increasingly mechanical and mannered but in no way less skillful Examples of Canaletto's works are in the major European and American collections His nephew and pupil, Bernardo Bellotto, was also called Canaletto See studies by Vittorio Moschini (tr 1956) and W. G. Constable (1961)

Canal Zone: see PANAMA CANAL ZONE

Cananaean (känänē'an), epithet of St. SIMON

Canandaigua (känändä'gwə), city (1970 pop 10,488), seat of Ontario co., W central N.Y., in the Finger Lakes region, at the northern end of Canandaigua Lake, settled 1789, inc. 1913 It is a resort and farm-trade center, with various industries The county historical-society museum contains a copy of the treaty with the Iroquois Confederacy, signed there in 1794 by Timothy Pickering The courthouse was the scene of Susan B. Anthony's trial (1873) for voting A U.S. veterans' hospital is in Canandaigua

Canandaigua Lake: see FINGER LAKES

Canaris, Constantine: see KANARIS, CONSTANTINE

Canaris, Wilhelm (vil'hēlm kana'ris), 1887-1945, German admiral He occupied various positions in the German navy during and after World War I In 1935 he was made chief of the *Abwehr* [military intelligence] A conservative, Canaris at first welcomed Hitler, but Hitler's methods and the fear that a new war would destroy Germany drove him into the opposition The *Abwehr* became a center of conspiracy against the regime Under Canaris's protection, one of his subordinates, Hans Oster, helped organize opposition to the Nazi regime In April, 1943, many of Oster's co-conspirators were arrested and the *Abwehr* was put under constant surveillance, but Canaris was not dismissed until Feb., 1944 He was arrested shortly after the attempt (July, 1944) on Hitler's life, though he was not directly involved in the plot He was executed by the Gestapo in April, 1945

Canarsee Indians (känārsē), North American Indians whose language belongs to the Algonquian-Wakashan linguistic stock (see AMERICAN INDIAN LANGUAGES) They occupied the western part of Long Island, N.Y., and sold the site of Brooklyn to the Dutch They paid tribute to the Mohawk, and when they stopped paying and defied the Mohawk, they were almost destroyed

canary, common name for a familiar cage bird of the family Ploceidae (Old World FINCH family), descended from either the wild serin finch or from the very similar wild canary, *Serinus canarius*, of the Canary Islands, Madeira, and the Azores and introduced into Europe in the late 15th or early 16th cent. The wild birds are usually gray or green, selective breeding has produced both plain and variegated birds, mostly yellow and buff but sometimes greenish Germany is traditionally the center for training and breeding canaries, the Harz mt. and the St. Andreasberg canaries originated there The birds are trained to sing by exposure to other birds of superior ability or to musical instruments The song of roller canaries is a series of "tours," a complex set of rolling trills delivered with the bill almost closed, choppers sing with the bill open Canaries breed rapidly in captivity and with proper care may live to 15 years or more Canaries are classified in the phylum CHORDATA, subphylum Vertebrata, class Aves, order Passeriformes, family Ploceidae

Canary Islands, Spain *Islas Canarias*, group of seven islands (1970 pop 1,170,224), 2,808 sq mi (7,273 sq km), off Spanish Sahara, in the Atlantic Ocean They constitute two provinces of Spain Santa Cruz de Tenerife (1970 pop 590,514), 1,239 sq mi (3,209 sq km), includes Tenerife, Palma, Gomera, and Hierro

Las Palmas (1970 pop 579,710), 1,569 sq mi (4,064 sq km), includes Grand Canary, Lanzarote, and Fuerteventura Fuerteventura is 67 mi (108 km) from the African coast The islands, of volcanic origin, are rugged, Mt. Teide (12,162 ft/3,707 m) is the highest point in Spain Pliny mentions an expedition to the Canaries c. 40 B.C., and they may have been the Fortunate Islands of later classical writers They were occasionally visited by Arabs and by European travelers in the Middle Ages Jean de Bethencourt, a Norman, settled at Lanzarote in 1402 and, with the support of the kingdom of Castile, became its king in 1404 The Treaty of Alcacovas (1479) between Portugal and Spain recognized Spanish sovereignty over the Canaries, conquest of the Guanches, the indigenous inhabitants of the islands, was completed in 1496 The islands became an important base for voyages to the Americas The Canaries were frequently raided by pirates and privateers, Las Palmas beat off Francis Drake in 1595 but was ravaged by the Dutch in 1599 In the French Revolutionary Wars, Horatio Nelson was repulsed (1797) at Santa Cruz Wine was the main export of the Canaries until the grape blight of 1853, its place was taken by cochineal until aniline dyes came into general use, sugarcane then became the chief commercial crop Today the leading exports are bananas, tomatoes, potatoes, and tobacco, which are grown where irrigation is possible There is fishing on the open seas, and the Canaries, with their warm climate and fine beaches, have become a major tourist center

canary wood or **canary whitewood**, name applied to the timber of the tulip tree (see MAGNOLIA) in some parts of the United States and to an Australian eucalyptus, the Indian mulberry, and to two species of the genus *Persea* of the laurel family

canasta: see RUMMY

Canberra (kän'bərə), city (1971 pop 141,575), capital of Australia, in the Australian Capital Territory, SE Australia The Canberra urban agglomeration (1971 pop 156,334) includes a small area in New South Wales The federal government is the largest employer in Canberra, there are also printing and service industries The site chosen (1908) for the capital city was first settled in 1824 In 1913, Canberra officially became the second capital of the commonwealth (succeeding Melbourne), however, although the Parliament first met there in 1927, the transfer of federal functions was not completed until after World War II The city was planned by the American architect Walter Burley Griffin Canberra is the seat of the Royal Military College, Australian National Univ., Mount Stromlo Observatory, and other research and scientific institutions

Canby, Edward Richard Sprigg, 1817-73, Union general in the Civil War, b. Kentucky, grad. West Point, 1839 He fought in the Seminole War and in the Mexican War In the Civil War, Canby commanded the Dept. of New Mexico, where he thoroughly repelled the Confederate invasion (1862) He was made a brigadier general of volunteers in March, 1862, and was on special duty in the War Dept. in Washington from Jan., 1863, to March, 1864, except for four months as the commander of New York City during the DRAFT RIOTS of 1863 Canby was promoted to major general in May, 1864, and assigned to command the Military Division of West Mississippi He captured Mobile in April, 1865, and in May received the surrender of the last Confederate armies After the war Canby held various commands in the South until 1870, when he was sent to the Dept. of the Columbia on the Pacific coast He was killed during a peace conference with the MO-DOC INDIANS See biography by M. L. Heyman, Jr. (1959)

Canby, Henry Seidel, 1878-1961, American editor and critic, b. Wilmington, Del., grad. Yale, 1899 He taught at Yale for over 20 years, achieving professorial rank in 1922 He established and edited (1920-24) the *Literary Review* of the New York *Evening Post*, afterwards joining with others to found and edit (1924-36) the *Saturday Review of Literature*, *Seven Years' Harvest* (1936) is his intellectual diary culled from its files His critical and literary works include *Classic Americans* (1931), *Thoreau* (1939), *Whitman* (1943), *The Brandywine* (1941), *The Gothic Age of the American College* (1936), and *Turn West, Turn East* Mark Twain and Henry James (1951)

cancan (kän'kän), a lively French dance marked chiefly by high kicking It was developed in Paris in the 1830s and became a popular social dance there By the mid-19th cent. it was incorporated into dance revues and stage productions Jacques Offenbach wrote the best-known cancan music Henri de

Toulouse-Lautrec made celebrated paintings and lithographs of famous cancan dancers

Cancer [Lat., =the crab], in astronomy, CONSTELLATION lying on the ECLIPTIC (the sun's apparent path through the heavens) between Gemini and Leo, it is a constellation of the ZODIAC. It contains the star cluster PRAESEPE, but no bright stars. The tropic of Cancer takes its name from this constellation, in which the summer solstice was located about 2,000 years ago. Now, because of the PRECESSION OF THE EQUINOXES, the summer solstice has moved westward into the constellation Gemini. Cancer reaches its highest point in the evening sky in March.

cancer, common term for NEOPLASMS, or tumors, that are malignant. Like benign tumors, malignant tumors do not respond to body mechanisms that limit growth. Unlike benign growths, malignant tumors show an atypical cell structure, with undifferentiated, rather than functional, specialized cells. Also unlike normal cells, cancer cells growing in laboratory tissue culture do not stop growing when they touch each other on a glass or other solid surface but grow in masses several layers deep, they are said to lack contact inhibition. Loss of contact inhibition accounts for two other characteristics of cancer cells: invasiveness of surrounding tissues, and metastasis, or spreading via the lymph system or blood to other tissues and organs. Cancers are graded as to degree of malignancy on a scale of one through four, often, however, the distinction between even benign and malignant neoplasms is obscure. Virtually all organs and tissues are susceptible to cancer. Cancer tissue, growing without limits, competes with normal tissue for nutrients, eventually killing normal cells by nutritional deprivation. Cancerous tissue also causes secondary effects, with the symptoms of a malignant growth caused by the pressure of the growing tumor against surrounding tissue, or the metastasis of cancer cells and their invasion of other organs. Symptoms are often nonspecific, e.g., weakness, loss of appetite, and weight loss. Sometimes side effects of tumor growth are more severe than the actual effects of the malignancy, for example, some tumors secrete materials such as serotonin and histamine that can cause drastic vascular changes. A tumor of an endocrine gland, such as an adrenal carcinoma, may be responsible for producing enormously increased numbers of hormone-secreting cells. Conversely, cancers that destroy tissue may also have serious effects, e.g., malignant destruction of bone tissue may raise the blood level of calcium. A large proportion of human cancers may be caused, or at least triggered, by various chemical agents. Alkylating agents such as NITROGEN MUSTARD are thought to have a carcinogenic effect because they chemically alter the cell's nucleic acids. Nitrates, common additives in processed meat, react with amines in the stomach to form nitrosoamines, which some authorities believe may be carcinogenic to humans. Other commonly occurring carcinogens are azo dyes, polycyclic hydrocarbons, and urethane. Certain carcinogens present occupational hazards. Asbestos particles, once inhaled, remain in the lung and act as an irritant. In the asbestos and construction industries, workers have a high probability of developing a fatal cancer of the chest lining or abdominal lining 25 to 30 years after the initial inhalation of ASBESTOS. Oral cancer, common in India, is commonly attributed to the chewing of betel nuts. Although the apparently increasing incidence of some types of highly malignant cancers, e.g., certain lung cancers and LEUKEMIAS, may be a result of improvements in disease detection and diagnosis, an increase in cigarette smoking and an increase of atmospheric pollutants are also thought to play a part. Other cancers may be triggered by such changes in the body's internal environment as hormone imbalances. For example, as first reported in 1970, some daughters of mothers who had been given diethylstilbestrol (DES) during pregnancy to prevent miscarriage, developed vaginal adenocarcinomas as young women. There are genetic tendencies for certain types of cancer, e.g., breast or stomach cancer, and certain benign tumors, e.g., certain tumors of the eye, cartilage, and skin, some of which may later become malignant. Physical agents such as X rays and radioactive elements are also carcinogenic, the high incidence of leukemia and other cancers in Japanese survivors of the atomic bombing of Hiroshima and Nagasaki is evidence of this carcinogenic effect. In light-skinned people who spend much time outdoors, sunlight may be carcinogenic. Sometimes irritations and diseases may predispose an individual to cancer, as in the occurrence of cancer of the esophagus associated with frequently swallowing very hot liquids. Increasing

evidence implicates viruses in induction of cancer. In the early 20th cent., Peyton Rous, an American virologist, showed that certain fowl sarcomas could be transmitted by injection of an agent invisible under the microscope and later shown to be an RNA-containing virus. Since then other oncogenic, or tumor-causing, viruses have been identified in experimental animals. Viruses of the herpes group, some of which cause cold sores and chicken pox, have been shown to cause cancer in experimental animals. Recent evidence indicates that other members of the herpes group, such as the virus causing infectious mononucleosis, may cause human cancer. Cancers can often be detected by visual observation, palpation, X-ray study, inspection by various optical probing instruments (endoscopy), and BIOPSY. Cancers caught early, before metastasis, have the best cure rates. Once found, cancers are treated by surgery, chemotherapy, and radiation. Surgery is most effective if the cancer is caught early, while still localized. Some cancers that spread to the lymph system have frequently prompted extensive surgical removal of tissue (see MASTECTOMY). Many cancers formerly treated surgically are now being attacked by other means, e.g., radiation therapy. Use of radioactive elements specific for particular target organs, such as radioactive iodine specific for the thyroid gland, is effective in treating malignancies of those organs. Laser beams are used to treat certain cancers, and certain subatomic particles, i.e., pions, are being used experimentally. Chemotherapeutic agents that are IMMUNOSUPPRESSIVE DRUGS are used to selectively destroy cancer cells. In general they interfere with nucleic acid and protein synthesis, rapidly proliferating cells like cancer cells are most susceptible. Hormones such as ESTROGEN and TESTOSTERONE, which may be carcinogenic under some conditions, are also used in cancer chemotherapy. Unfortunately, currently available chemotherapeutic agents are not usually curative but merely ameliorate the severity of the disease, in addition, they are often toxic to normal rapidly proliferating cells such as bone marrow cells. A chemotherapeutic technique known as isolated perfusion can be used to minimize exposure to many toxic drugs. In this method a pump and two tubes are attached to two places in a network of blood vessels so that the drug only circulates through the part of the system that is malignant. New approaches to cancer therapy, still largely in the experimental stage, include immunological methods such as vaccinating against cancer-causing viruses or injecting sensitized lymphocytes, i.e., antibody-forming cells (see IMMUNITY). Recent research is also directed toward elucidating the cellular events that are manifested as uncontrolled growth and cancer. The fact that there are many ways to interfere with the controls on genes may help to explain why cancer is apparently caused by a diversity of agents, and why agents that interfere with the expression of genetic information, e.g., nitrogen mustard, radiation, and some hormones, are sometimes carcinogenic and sometimes therapeutic. See A. C. Braun, *The Cancer Problem* (1969); Victor Richards, *Cancer: The Wayward Cell* (1972); B. N. Brooke, *Understanding Cancer* (1973); D. M. Prescott, *Cancer: the Misguided Cell* (1973).

Candace (kän'dasē, kändā'sē), title for queens in ancient Ethiopia. One of them made war (c. 22 B.C.) on the Roman governor of Egypt, who defeated her and destroyed Napata, her capital. Another Candace is mentioned in the Bible as the queen of the eunuch converted by Philip (Acts 8:27-39).

Candela, Felix (fä'lēks kändā'la), 1910–, Mexican architect, b. Madrid. Candela studied in Madrid but was forced to flee Spain after his participation in the Spanish civil war. He went to Mexico in 1939 and set up his own construction firm, gaining renown for his design of thin-shelled concrete domes. Among his best-known works are the Cosmic Ray Pavilion (1950-51) for Mexico's University City, the Church of La Virgen Milagrosa (1953), Mexico City, and Los Manantiales restaurant (1958), Xochimilco. See study by Colin Faber (1963).

candela (kändē'la), abbr. cd, official name for the CANDLE, the unit of luminous intensity in the INTERNATIONAL SYSTEM OF UNITS. See PHOTOMETRY.

candelabrum (kän'dəla'brəm), primarily a support for candles, designed in the form of a turned baluster or a tapered column, also a branched candlestick or a lampstand. Though most used and developed during the Renaissance, the candelabrum originated in Etruria and Rome. Candelabra found in Etruscan and Pompeian ruins are usually of bronze. From ancient Rome come the tall and monumental candelabra used in temples and public buildings. Of

bronze or marble, they had triangular pedestals from which rose columnar shafts, finely sculptured and terminating at the top in a bowl used for holding illuminating oil and incense. With these as inspiration, Italian Renaissance artists produced superb candelabra in rich materials for altars, chapels, and processions. In that period the distinctive form of the candelabrum came also to be a ubiquitous decorative motive, used freely in architectural ornament, tapestry borders, stained-glass windows, and furniture. It was even converted (especially in Lombardy) into a definite architectural element, taking the place of a column or colonnette, as in windows of the Certosa at Pavia. See F. W. Robins, *The Story of the Lamp (and the Candle)* (1939).

Candia, Crete. See IRAKLION.

candle, cylinder of wax or tallow containing a wick, used for illumination or for ceremonial purposes. The evidence of ancient writings is not conclusive as to the history of the candle, words translated "candle" may have meant "torch" or "lamp," and the "candlestick" was probably a stand for one of these lights. The candle probably evolved from wood, rushes, or cords dipped in fat or pitch. Candles as well as lamps were used in Roman times, by the Middle Ages candles (tallow for the poor and wax for the wealthier) were quite common in Europe. Tallow, beeswax, and vegetable wax such as bayberry in the American colonies, candleberry in the East, and waxberry in South America were supplemented by spermaceti in the late 18th cent., by stearine c. 1825, and by paraffin c. 1850. Twisted strands for wicks were replaced (c. 1825) by the plaited wick. Candles were commonly made by repeated dipping in melted tallow, by pouring tallow or wax into molds, or by pouring beeswax over the wicks. Most modern candles are machine-made by a molding process, although candle making as an art survives in industrialized countries. In literature, art, and religion the candle has had a wide range of symbolism, it commonly represents joy, reverence for the divine, and sacrifice (since the candle spends itself). Candles have been especially important in Jewish religious services. In the Roman Catholic Church candles are blessed on Candlemas Day. The very large paschal candle stands at the Gospel side of the altar, it is blessed and lighted during the Exultet on the vigil of Easter and is relighted at important ceremonies until Ascension Day.

candle, in weights and measures, unit of luminous intensity, it is defined as 1/60 of the intensity of a BLACK BODY, or ideal radiator, at the temperature at which platinum solidifies (2046°K). The candle is one of the fundamental units of the INTERNATIONAL SYSTEM OF UNITS, its official name is the candela. See PHOTOMETRY.

candleberry: see BAYBERRY.

candlefish: see SMELT.

Candlemas, Feb. 2, Christian festival commemorating the Purification of the Blessed Virgin and the Presentation of Christ in the Temple. The name Candlemas is derived from the procession of candles, inspired by the words of Simeon "a light to lighten the Gentiles" (Luke 2:32). In the Roman Catholic Church the candles for use in the ensuing year are blessed on this day. An old superstition claims that the weather is foretold by the ground hog (see WOODCHUCK) on Candlemas.

candlepower: see PHOTOMETRY.

Candlewood Lake, 8.4 sq mi (21.8 sq km), W. Conn. It is formed behind a power dam S of the Rocky River's junction with the Housatonic River. Along its 65-mi (105-km) shoreline are summer resorts and recreational facilities.

candy: see CONFECTIONERY.

candytuft, any plant of the genus *Iberis* of the family Cruciferae (MUSTARD family), low-growing plants of the Old World. A number of half-hardy annuals and evergreen perennials are cultivated—chiefly in borders and rock gardens—for the flat-topped or elongated clusters of flowers of various colors. Candytufts are classified in the division MAGNOLIOPHYTES, class Magnoliopsida, order Capparales, family Cruciferae.

cane, in botany, name for the hollow or woody, usually slender and jointed stems of plants (particularly RATTAN and other bamboos) and for various tall grasses, e.g., SUGARCANE, sorghum, and also other grasses used in the United States for fodder. The large, or giant, cane (*Arundinaria macrostachya* or *gigantea*), a BAMBOO grass native to the United States, often forms impenetrable thickets 15 to 25 ft (3.6-7.6 m) high—the canebrakes of the South. The stalks are used locally for fishing poles and other

purposes, and the young shoots are sometimes eaten as a potherb

cane, walking stick Probably used first as a weapon, it gradually took on the symbolism of strength and power and eventually authority and social prestige Ancient Egyptian rulers carried the symbolic staff, and in ancient Greece, some gods were represented with a staff in hand In the Middle Ages, the long staff or walking stick was carried by pilgrims and shepherds A scepter carried in the right hand symbolized royal power, carried in the left hand of a king the staff represented justice The church, too, adopted the staff for its officials, the pastoral staff (crosier), which is long and has a crooked handle, symbolizes the bishop's office The word cane was first applied to the walking stick after 1500, when bamboo was first used After 1600 canes became highly fashionable for men Made of ivory, ebony, and whalebone, as well as of wood, they had highly decorated and jeweled knob handles They were often made hollow in order to carry possessions or supplies or, in some cases, to conceal a weapon In the late 17th cent oak sticks were extensively used, especially by the Puritans The cane continued in men's fashions throughout the 18th cent, as with the women's fan certain rules became standard for its use From time to time women adopted the cane, particularly for a short time when Marie Antoinette carried the shepherd's crook In the 19th cent the cane became a mark of the professional man, the gold-headed cane was especially favored See Kurt Stein, *Canes and Walking Sticks* (1973)

Canea, Crete see KHANIA

Canellopoulos, Panayotis: see KANELLOPULOS, PANAYOTIS

cane sugar: see SUCROSE

Caney Fork, river, 144 mi (232 km) long, rising in central Tenn and flowing NW to the Cumberland River On Caney Fork are Great Falls Dam and Center Hill Dam, which provide flood control and power for the surrounding area and impounds a 36-sq mi (93-sq km) lake Caney Fork is part of the Tennessee Valley Authority

Canfield, Dorothy: see FISHER, DOROTHY CANFIELD

Canfield, Richard Albert, 1855-1914, American gambler, b New Bedford, Mass A well-known gambling operator in Providence, R I, Canfield went in the 1880s to New York, where his gambling establishment became famous It was closed in 1904 largely through the efforts of W T JEROME, district attorney Canfield was a noted art collector The solitary game Canfield was named for him See biography by Alexander Gardiner (1930)

Can Grande della Scala: see SCALA, CAN FRANCESCO DELLA

Caniapiscaw: see KANIAPISKAU, river, Canada

Canisius, Peter: see PETER CANISIUS SAINT

Canis Major [Lat, =greater dog], CONSTELLATION lying near the celestial equator, SE of Orion Known as the Large Dog (CANIS MINOR is the Small Dog), it was associated with the figure of a dog by many cultures, the ancient Greeks identified it as one of Orion's hunting dogs, while the Scandinavians called it Sigurd's dog It contains SIRIUS, the brightest star in the heavens, also known as the Dog Star Other bright stars in Canis Major are ADHARA (Epsilon Canis Majoris), Mirzam (Beta Canis Majoris), and Wezen (Delta Canis Majoris) The constellation reaches its highest point in the evening sky in February

Canis Minor [Lat, =lesser dog], small CONSTELLATION lying near the celestial equator, E of Orion and NE of Canis Major, the Large Dog Known as the Small Dog, Canis Minor is traditionally identified as one of Orion's hunting dogs It contains the bright star PROCYON The constellation reaches its highest point in the evening sky in late February

Cankar, Ivan (ĕ'vön tsän'kär), 1876-1918, Slovenian poet Considered one of the great Slovenian literary figures, he was influential in the development of modern satire, symbolic drama, and the psychological novel The struggle of the outcast poor is a theme of his satirical novel *Yemey's Justice* (1907, tr 1926) and many other works Cankar also wrote satires on politics and culture

Canker, small sore on the inside of the mouth A canker appears as a shallow, whitish ulcer surrounded by a thin, red area It is tender, sometimes painful, and may occur singly or as one of a group of sores Cankers develop on the inner surfaces of the lips or cheeks, on the gums, under the tongue, or on the roof of the mouth The cause is unknown, but cankers have been associated with friction, injury, allergy, and viral infection They generally heal by themselves in a few days but can be recurrent

cankerworm, name for two destructive INCHWORMS, or larvae of geometrid moths The spring cankerworm (*Paleacnta vernata*) and the fall cankerworm (*Alsophila pometana*) are named for the seasons at which the adults emerge from underground pupation The spring cankerworm larva overwinters as a pupa, the fall cankerworm as an egg The larvae, dark green to brown and about 1 in (2.5 cm) long, feed on the leaves of orchard and shade trees The spring cankerworm has two pairs of posterior appendages (prolegs), the fall cankerworm has three The wingless female lays her eggs on the bark, and one control method is the placing of bands of sticky paper around the tree trunks to trap the females before laying When alarmed, cankerworms drop and hang suspended in mid-air at the end of a long silken thread secreted from their mouths, they ascend this thread after the danger has passed The English sparrow was originally introduced in the United States to combat the spring cankerworm Cankerworms are classified in the phylum ARTHROPODA, class Insecta, order Lepidoptera, family Geometridae For control methods see bulletins of the U S Dept of Agriculture

canna [Lat, =cane], any plant of the genus *Canna*, tropical and subtropical perennials, grown in temperate regions in parks and gardens for the large foliage and spikelike, usually red or yellow blossoms Today, most cultivated cannas are hybrids, but two species are found wild in the S United States, one called Indian shot because of the hard shotlike seeds *C. edulis*, Queensland arrowroot, is cultivated in the tropics for its rootstock, a commercial ARROWROOT starch *Canna* is classified in the division MAGNOLIOPHYTA, class Liliatae, order Zingiberales, family Cannaceae

cannabis: see HEMP, MARIJUANA

Cannae (kän'ē), ancient village, Apulia, SE Italy, scene in 216 B C of Hannibal's crushing defeat of the Romans Hannibal's troops assumed a crescent-shaped formation to meet the Roman troops, which were especially concentrated in the center As the Romans advanced, Hannibal by brilliant strategy managed to encircle the entire Roman force and cut it to pieces

Cannanore (kän'anör', -nör'), town (1971 pop 55,111), Kerala state, SE India Formerly the capital of the Kolattiri Raja, it traded with Arabia and Persia in the 12th and 13th cent Vasco da Gama visited Cannanore in 1498 at the invitation of the Kolattiri Raja, and it became a Portuguese settlement Control passed to the Dutch in the mid-17th cent, and the British captured Cannanore in 1783 Today it is a military station and a district administrative center Coconut products, rice, pepper, timber products, dried fish, cotton fabrics, and tobacco are traded

Canneh (kän'ē), unidentified city, apparently in N Syria Ezek 27:23 See CALNEH 2

cannel coal: see COAL

Cannes (kän), town (1968 pop 68,021), Alpes-Maritimes dept, SE France An important and fashionable resort on the French Riviera, Cannes also has shipbuilding and textile industries Napoleon I landed nearby on his return (1815) from Elba Churches from the 16th and 17th cent are in the old part of town An international film festival is held in Cannes each spring

cannibalism (kän'tibalizəm) [from Span *canibal*, referring to the Carib Indians], practice of certain peoples of eating human flesh The practice of cannibalism has been noted in such widely divergent places as Africa, South America, the South Pacific islands, and the West Indies According to available anthropological evidence, the partaking of human flesh was almost always a ritual practice Only very rarely, under the pressure of such calamities as famine or isolation by a snowstorm, an airplane crash, or a shipwreck, have human beings resorted to eating other human beings in order to survive Various skeletal prehistoric finds suggest that ancient man practiced HEAD HUNTING and cannibalism, but associated evidence strongly supports the magico-religious theory that victims for these rites were always sought among alien groups Various peoples, however, have been known to eat part of their kinsmen's corpses out of respect for the deceased and in order to absorb some magic powers This aim of life transfer seems to lie behind all cannibalism and head-hunting The two practices rarely occur together, and some anthropologists believe that the latter may have evolved from the former Among a few peoples, which may represent a connecting link, the head of the enemy is preserved and the rest of his body or selected parts of it are eaten See Gary Hogg, *Cannibalism and Human Sacrifice* (1958, repr 1966)

Canning, Charles John Canning, Earl, 1812-62, British statesman, third son of George Canning Succeeding to the peerage conferred on his mother, he took his seat as Viscount Canning in the House of Lords (1837) and served as Sir Robert Peel's under-secretary for foreign affairs (1841-46) and Lord Aberdeen's postmaster general (1853-55). Appointed (1856) governor general of India, he became known as "Clemency Canning" for his efforts to restrain revenge against the Indians during the INDIAN MUTINY In 1858, when the power of government was transferred from the East India Company to the British crown, Canning became the first viceroy of India He was created earl in 1859 and retired in 1862 See H S Cunningham, *Earl Canning and the Transfer of India* (1892)

Canning, George, 1770-1827, British statesman Canning was converted to Toryism by the French Revolution, became a disciple of William Pitt, and was his undersecretary for foreign affairs (1796-99) To bring ridicule upon English radicals and Whigs who favored the Revolution, he contributed numerous articles to the *Anti-Jacobin* (1797-98) During the war against Napoleon I, he served as treasurer of the navy (1804-6) and was foreign minister (1807-9) He exerted great influence in military affairs, planning the seizure of the Danish fleet at Copenhagen (1807) and supporting British intervention in Spain and Portugal (see PENINSULAR WAR) However, he quarreled with Lord CASTLEREAGH, and after a duel, in which Canning was wounded, both resigned from the ministry He later served (1816-20) as president of the board of control for India, resigning in protest against the government's prosecution of Queen Caroline Recalled to the foreign office after Castlereagh's suicide (1822), he reversed previous policy toward the HOLY ALLIANCE, refusing to cooperate in the suppression of European revolutions He protested the decisions of the Congress of VERONA (1822) and, although unable to prevent French intervention in Spain, later sent an army to Portugal to foil absolutist intervention there His policies toward the Spanish colonies in America, whose independence he recognized, led to the promulgation of the MONROE DOCTRINE He arranged the French-Russian-British agreement, which, after his death, resulted in Greek independence After the death of Lord Liverpool, Canning became (April, 1827) prime minister, but he died four months later See biography by Wendy Hinde (1973), studies by D Marshall (1938), C A Petrie (2d ed, 1946), H W V Temperley (1925, repr 1966, and 1905, repr 1968)

Canning, Stratford: see STRATFORD DE REDCLIFFE, STRATFORD CANNING, VISCOUNT

canning, process of hermetically sealing cooked food for future use It was discovered in the early part of the 19th cent by a Frenchman, Nicolas APPERT The process proved moderately successful and was put into practice in other European countries and in the United States A patent was taken out (c 1815) in New England by Ezra Daggett for the canning of seafood, pickles, jams, and sauces In 1820, William Underwood in Boston and Thomas Kensett in New York City began to produce canned foods commercially Because of the food requirements of soldiers during the American Civil War, considerable amounts of canned meats and vegetables were produced The canning of seafood at Eastport, Maine, began in 1843 Salmon from the Columbia River was canned in 1866 and in Alaska in 1872 Glass containers were used at first but proved bulky, costly, and brittle Peter Durand, an Englishman, patented the first tin canister in 1810, and in 1825 the first US patent was obtained Early can-making was slow and expensive, sheets of tin were cut with shears, bent around a block, and the seams heavily soldered A good tinsmith could make only about 60 cans a day The industry began to assume importance with the invention in 1847 of the stamp can A machine for shaping and soldering was exhibited in 1876 at the Centennial Exposition at Philadelphia The open-top can of the 20th cent, with a soldered lock seam and double-seamed ends, permits easy cleaning and filling Cans used for foods that react with metals, causing discoloration (usually harmless), may be coated with a lacquer film Highly specialized machinery, knowledge of bacteriology and food chemistry, and more efficient processes of cooking have combined to make the commercial canning of food an important feature of modern life The range of products now canned has increased enormously and may be grouped as meat and poultry, fruits and vegetables, seafood, milk, and preserves, jams, jellies, pickles, and sauces The general principles of commercial and home canning are the same, but in the factory more accurate con-

trol of procedures is practiced and highly specialized machinery is available. The canning process begins with cleaning or washing the product. During the next steps the edible parts are separated from the inedible parts (just as in ordinary food preparation, e.g., by peeling, trimming, and so forth). Certain foods, especially vegetables, need to be blanched (scalded), to arrest enzyme action that may cause color, flavor, or texture deterioration, or to reduce the size of the product. After the food is put into cans, the can is thermally exhausted in order to release undesirable gases. Once the can is sealed, it is subjected to heat so that any microorganisms inside the can will be destroyed. The canned product is then cooled and labeled.

Cannizzaro, Stanislao (stānēs-lā'ō kăn-nēt-tsa'ō), 1826-1910, Italian chemist. From 1861 he was professor at Palermo and from 1871 at Rome, where he was also a member of the senate and of the council of public instruction. He is known for his discovery of cyanamide, for obtaining alcohols from aldehydes by Cannizzaro's reaction (in which benzaldehyde is converted to benzoic acid and benzyl alcohol, in the presence of a strong alkali), and for distinguishing between molecular and atomic weights. Of fundamental importance was his explanation of how atomic weights may be determined systematically on the basis of Avogadro's law regarding the volumes of gases and vapors, hydrogen is used as a reference standard and, for elements whose compounds are not volatile (do not form vapors by evaporation), the SPECIFIC HEAT is used in the determination of the atomic weight.

Cannock, urban district (1971 pop. 55,873), Staffordshire, W central England. It is a mining town dependent upon the rich coal deposits of Cannock Chase, a nearby moorland. Cannock's other industries are metalworking and brick making.

Cannon, Annie Jump, 1863-1941, American astronomer, b. Dover, Del., grad. Wellesley (B.S., 1884, M.A., 1907). In 1897 she became an assistant in the Harvard College Observatory, where from 1911 to 1938 she was astronomer and curator of astronomical photographs. In the course of her photographic work she discovered 300 variable stars, 5 new stars, 1 spectroscopic binary, and many stars with bright lines or variable spectra. She made a bibliography of variable stars that includes about 200,000 references and completed a catalog of some 300,000 stellar spectra, besides preparing many papers on the subject.

Cannon, George Quayle, 1827-1901, Mormon apostle, b. Liverpool, England. He and his parents were converted to Mormonism in 1840, from the Isle of Man they emigrated to Nauvoo, Ill., in 1842, moving to Utah in 1847. In 1850, Cannon founded a Mormon mission in Hawaii. He became an apostle in 1859 and was assigned to England, where for four years he edited the *Millennial Star* and supervised missionary work. He served as a member of the Utah territorial council and as private secretary to Brigham Young, of whose will he was an executor. In 1867 he became editor of the influential *Deseret News*. Cannon was elected (1872) territorial delegate from Utah to Congress, but in 1882 he was refused his seat, under the Edmunds antipolygamy law. In 1888 he suffered imprisonment for practicing polygamy.

Cannon, Joseph Gurney, 1836-1926, speaker of the U.S. House of Representatives (1903-11), b. Guilford co., N.C. A lawyer in Illinois, Cannon served as a Republican in Congress from 1873 to 1923, except for the years 1891-93 and 1913-15, when first the Populists and then the Progressives were able to defeat him. As speaker he carried the traditional power of his office to appoint all legislative committees to its ultimate arbitrary extremes, dictatorially ruling the House in the interest of his fellow "Old Guard" Republicans and suppressing minority groups. In March, 1910, insurgent Republicans, led by George W. Norris and supported by all the Democrats, passed a resolution that, by providing that the House itself should appoint the important Committee on Rules with the speaker ineligible for membership, broke Cannon's power. See C. R. Atkinson, *The Committee on Rules and the Overthrow of Speaker Cannon* (1911); L. W. Busbey, *Uncle Joe Cannon* (1927, repr. 1971); Blair Bolles, *Tyrant from Illinois* (1951, repr. 1974); W. R. Gwinn, *Uncle Joe Cannon, Archfoe of Insurgency* (1957).

Cannon, Walter Bradford, 1871-1945, American physiologist. While still a medical student at Harvard, Cannon was the first to demonstrate (1897) that bismuth could be utilized as a contrast medium in the roentgenologic examination of the gastroin-

testinal tract. His interest in the physiological effects of emotional stimuli, especially on digestion, led to the publication in 1919 of *Bodily Changes in Pain, Hunger, Fear and Rage*. He later concentrated his attention on the adrenal glands and by 1929 was emphasizing the emergency function of these glands in meeting vital threats to the body and in maintaining the equilibrium of the many processes of the organism. In 1932, while professor of physiology at Harvard, he introduced the important concept of homeostasis.

Cano, Alonso (ālōn'sō ka'nō), 1601-67, Spanish baroque painter, sculptor, and architect. Cano was the outstanding draftsman of the Spanish baroque. He studied under Pacheco and received painting and architecture commissions from King Philip IV. He was named chief architect of the cathedral at Granada. His architectural masterpiece is the design for the cathedral facade (1667), erected after his death. Cano executed both the sculpture and paintings for his monumental altarpieces and did independent religious pictures and portraits for the cathedral. Examples of his paintings are *Descent into Limbo* (Los Angeles County Mus.), *Way to Calvary* (Worcester Art Mus., Mass.), and portrait of an ecclesiastic (Hispanic Society of America, New York City). His sculptures, including statues of saints in Granada Cathedral, are executed with vigor and sensitivity. See study by H. E. Wethey (1955).

Cano, Juan Sebastián del (hwān sābāstyān' dēl), c. 1476-1526, Spanish navigator, the first to circumnavigate the globe. Under Magellan he commanded the *Concepción* and after Magellan's death in the Philippines took command of the expedition. From the Philippines to the Molucca islands Cano sailed new waters, arriving in Spain with the *Victoria* and 18 men on Sept. 6, 1522. He set out in 1525 on a second voyage to the Moluccas by Magellan's route but died while crossing the Pacific.

canoe, long, narrow watercraft with sharp ends originally used by most primitive peoples. It is usually propelled by means of paddles, although sails and, more recently, outboard motors are also used. The canoe varies in material according to locality and in design according to the use made of it. In North America, where horses were not generally used and where the interlocking river systems were unusually favorable, the canoe in its various types was highly developed. Where large logs were available, it took the form of the hollowed-out log, or dugout, especially on the N. Pacific coast, where immense trees grew at the water's edge, where an intricate archipelago invited navigation in ocean waters, and where the tribes came to depend to a large extent upon sea life for their food supply. A semiseafaring culture developed there, and the great canoes of the Haida and Tlingit tribes, with high, decorated prows, capable of carrying 30 to 50 people, began to resemble the boats of Viking culture. On the northern fringe of the American forest where smaller tree trunks were found and rapid rivers and many portages favored a lighter craft, the bark canoe dominated, reaching its highest development in the birchbark canoe. At portages this light canoe could be lifted on one's shoulders and easily transported. A third type of primitive canoe is that made from skins, found where trees are lacking. The bullboat of the Plains Indian, little more than a round tub made of buffalo hides stretched over a circular frame, was its crudest form. A much finer form is the kayak of the Eskimo, made of sealskin stretched over a frame constructed of driftwood or whalebone. In the South Seas, canoes were developed for use on long voyages from island to island, and ingenious outriggers were developed to give stabilization to the canoe under sail. It was the birchbark canoe that carried such explorers as Jacques Marquette, Sir Alexander Mackenzie, and David Thompson on their journeys. It was the canoe that carried fur traders out to trade with the Indians, thus it played an important part in early American history. The double-bladed paddle—used in North America only by the Eskimo—is almost always in use on wide bodies of water affected by wind and tidal currents. The substitution of canvas for birch bark in making canoes is credited to the Oldtown or Penobscot Indians in Maine, the canvas-covered wooden canoe is sometimes called the Oldtown canoe. All-wood canoes made of basswood or cedar, very popular in Canada, are sometimes called Peterborough canoes after a canoe-making center. Plywood canoes made in Canada and elsewhere have also been popular. The majority of canoes made today, however, are manufactured of a tough but light aluminum alloy. This type of canoe contains an air pocket in either

end to ensure flotation. Modern canoes are also made of fiber glass, plastic, and even a hard rubber nonsinkable compound. The sail used on the modern canoe is usually the triangular lug sail known as the lateen. The decked sailing canoe used for racing carries two and sometimes three sails, its navigator uses a sliding seat (sometimes called the monkey seat) on which he balances, frequently out over the water on either side, to prevent his craft from heeling over too far. This canoe, clocked at 16 knots or more, and the Samoan canoe (with an outrigger), exceeding 20 knots, were the fastest watercraft under sail until the advent of the CATAMARAN. See Terence T. Quirke, *Canoes the World Over* (1952).

canoeing, sport of propelling a canoe through water. John MacGregor, an English barnster and founder of the Royal Canoe Club (est. 1865), is generally credited with being the initiator of modern sport canoeing. Between 1849 and 1869, MacGregor wrote a number of highly popular books in which he described his experiences on long canoe trips throughout Europe. Sport canoeing today may either involve recreational journeys or fixed-distance racing. Racing canoes are propelled by either sails or paddles. The International Challenge Cup, one of the oldest existing canoeing trophies, was originally offered by the New York Canoe Club (1885) as a perpetual challenge sailing prize. Canoe racing with paddles first became an official Olympic event at the Berlin games in 1936. The two types of Olympic canoe races are those among kayaks and Canadian canoes. The kayak, a buoyant arctic canoe that is completely covered except for its cockpit(s), is raced by both men and women. The Canadian, the typical North American canoe, is raced only by men. Hunters, fishermen, and outdoorsmen use canoes as combination recreation-transportation vehicles. This type of canoeing is especially popular in the N. United States. White-water canoeing, in which the vessel is navigated through rapids, is quite popular in the W. United States, especially along the Colorado River. See studies by John Malo (1969 and 1971).

canon, in Christendom, term of several meanings. Decrees of church councils are usually called canons, since the Council of Trent the expression has been especially reserved to dogmatic pronouncements of ecumenical councils. The body of ratified conciliar canons is a large part of the legislation of CANON LAW. A canon is also an official list, as in canonization, i.e., enrollment among the saints, and of the names of books of the Bible accepted by the church (see OLD TESTAMENT, NEW TESTAMENT APOCRYPHA PSEUDEPIGRAPHIA). The central, mainly invariable part of the Mass is the canon. The term is also applied in the Western Church to certain types of priests. There are canons regular, priests living in community under a rule but not cloistered like monks, the Augustinian, or Austin, canons and the Premonstratensians are the best known of these. The priests attached to a cathedral or large church are sometimes organized into a group, or college, and called canons secular, a church having such a group is a collegiate church. Cathedral canons often have diocesan charges or pastoral duties apart from the cathedral. Canons of the Church of England are mostly cathedral canons.

canon, in music, a type of counterpoint employing the strictest form of imitation. All the voices of a canon have the same melody, beginning at different times. Successive entrances may be all at the same pitch or at different pitches. Another form of canon is the circle canon, or ROUND, e.g., *SUMMER IS ICMEN IN*. In the 14th and 15th cent. retrograde motion was employed to form what is known as crab canon, or canon cancrizans, wherein the original melody is turned backward to become the second voice. In the 15th and 16th cent. mensuration canons were frequently written, in which the voices sing the same melodic pattern written in different note values, i.e., to be sung at different speeds. Bach made noteworthy use of canon, particularly in the *Goldberg Variations*. Beethoven, Mozart, Haydn, Schumann, and Brahms wrote canons, and Franck used the device in the last movement of his violin sonata. It is an essential device of SERIAL MUSIC.

Canonchet: see KING PHILIP'S WAR.

Canon City (kăn'yān), city (1970 pop. 9,206), seat of Fremont co., S. central Colo., at the mouth of the Grand Canyon of the Arkansas River (see ROYAL GORGE), laid out 1859 on the site of a blockhouse built (1807) by Zebulon M. Pike, inc. 1872. It is a health and tourist resort in a spectacularly scenic area with mineral springs. Marble and limestone are quarried, and a great variety of minerals are found in the region. A restored mining town is nearby.

Canonicus (kānōn'īkas), c 1565–1647, North American Indian chief, who ruled the Narragansett Indians when the Pilgrims landed in New England. He granted (1636) Rhode Island to Roger WILLIAMS and because of William's influence remained friendly to the settlers, despite their aggressive ways. See H. M. Chapin, *Sachems of the Narragansetts* (1931).

canonization (kān''ānīzā'shən), in the Roman Catholic Church, process by which a person is classified as a SAINT. It is now performed at Rome alone, although in the Middle Ages and earlier bishops everywhere used to canonize. Canonization is not necessary for martyrs, who are considered to be enrolled among the saints on their death, but in recent years the church has approved the cult of canonized persons only. The process of canonization is a trial (or cause), at which the saint is said to be defended by the church, a prosecutor is appointed to attack all evidence alleged in favor of canonization. The prosecutor is popularly called *advocatus diaboli* [devil's advocate], his opponent the *advocatus Dei* [God's advocate]. This evidence consists primarily of the proof of four miracles attributable to the saint and proof that the saint's life was exemplary. Beatification, by which a person is called blessed and his cult is approved for localities and orders, requires two miracles. Miracles attributed to saints are considered probable or pious opinions, and Catholics are not required to believe in them. The first solemn canonization seems to have been that of St. Ulrich late in the 10th cent. The method of formal canonization was set by the enactments of Urban VIII that came into force in 1634.

canon law, in the Roman Catholic Church, the body of law based on the legislation of the councils (both ecumenical and local) and the popes, as well as the bishops (for diocesan matters). It is the law of the church courts and is to be distinguished from other parts of ecclesiastical law, such as liturgical law. However, when liturgical law overlaps with canon law, the great body of canon law, promulgated in the *Codex juris canonici* [code of canon law] in 1917 (and effective since 1918), prevails, although exceptions to this rule are noted in the code. The code itself, the culmination of centuries of legal growth, consists of 2,414 canons, with an analytical index (at the beginning) and nine appended documents, it superseded all previous compilations. It does not contain all of canon law, which continues to grow, but it is the base of the present-day law, and the study of canon law consists mainly in mastering the code and its application. It lays down rules for the governance and regulation of the clergy and the church, including such matters as the qualifications, duties, and discipline of the clergy and the administration of the sacraments (more particularly the laws regarding holy orders and the sacrament of marriage). Canon law embraces both general laws applicable in the church universal, such as those on requirements for the priesthood and those on marriage, and local laws applicable only in certain dioceses. The early law grew particularly from the letters of the bishops of Rome that settled matters of ecclesiastical government and discipline from the end of the 1st cent. A.D. Such papal letters and pronouncements are called decretals. Joined to them are the canons of the councils of the church regarding church discipline and governance. From the 4th cent. this legislation grew profuse, and attempts to collect and correlate the laws began early (see *CONSTITUTIONS, APOSTOLIC*). These collections were not always authorized and were sometimes not genuine, as in the case of the *FALSE DECRETALS*. It was not until the middle of the 12th cent. that the great genius of the canon law, GRATIAN, following after IVO OF CHARTRES, applied the methods of Roman law in bringing order out of the chaos of conflicting and uncoordinated legislation. His *Concordantia discordantium canonum* (c 1140) or *Decretum Gratiani*, called in English *Gratian's Decree*, became the basis for future compilations of the law. Important among the later additional works were the collections of decretals under Gregory IX, called the *Extravagantes* or *Extra* because they were outside Gratian's Decree, the collection issued (1298) by Boniface VIII and called *Liber sextus* [the sixth book] because it added to the five books of decretals promulgated by Gregory, the collection promulgated (1317) by John XXII, drawn mostly from the constitutions of Clement V at the Council of Vienne and called the *Clementinae*, the work commonly called *Corpus juris canonici*, which in 1500 combined all the preceding with the *Extravagantes* of John XXII and the *Extravagantes communes* (decretals from Boniface VIII through Sixtus IV) and was to be the fundamental work in canon law for centuries.

The Council of Trent (1545–63, with interruptions) by its decrees concerning the church and church discipline was a landmark in canon law. Legislation in the church continued and had reached considerable confusion by the time that, in 1904, St. Pius X announced the undertaking of the *Codex juris canonici*. This was drafted by a commission of cardinals headed by Cardinal Gasparri, all the resources of the church were used to produce this code. In 1917, when the code was finished, a permanent commission of cardinals was set up to interpret it. In 1959, Pope John XXIII convoked the Second Vatican Council and announced a revision of the code of 1917, in 1963 he appointed a pontifical commission for the revision of the code, which replaced the 1917 commission. Canon law has had a profound influence on the law of countries where the Roman Catholic Church has been the state church. In the Middle Ages the church courts had very wide jurisdiction—e.g., in England, control of the law of personal property—and because they were well regulated, they tended to attract many borderline cases that might have been the business of the developing royal courts (see *BENEFIT OF CLERGY*). Catholics of Eastern rites have their own separate codes of canon law, approved by the Roman Catholic Church. The term "canon law" is also used for ecclesiastical law in churches of the Anglican Communion. The *Anglican Constitutions and Canons Ecclesiastical* (1603) was a collection of rulings, not based on the old canon law, but given equal force with the canon law. See A. G. Cicognani, *Canon Law* (rev. ed. 1949), Stanislaus Woywod, *Practical Commentary on the Code of Canon Law* (rev. ed. 1949), J. A. Abbo and J. D. Hannan, *The Sacred Canons* (2d rev. ed. 1960), Rene Metz, *What is Canon Law?* (1960), T. L. Bouscaren and A. C. Ellis, *Canon Law* (4th rev. ed. 1966), J. E. Biechler, ed., *Law for Liberty* (1967).

Canonsburg, borough (1970 pop. 11,439), Washington co., SW Pa., inc. 1802. It is an industrial center in a coal-mining area. Its varied manufactures include steel and metal products and pottery. A gram of radium produced there was presented to Mme. Curie in 1921 when she visited the town. The Log Cabin School (est. 1777, the first school west of the Alleghenies) is preserved, it was the precursor of Washington and Jefferson College, now in Washington, Pennsylvania. The Black Horse Tavern in Canonsburg was a famous gathering place for leaders of the Whisky Rebellion (1794). Roberts House (1804) is an example of W. Pennsylvania manor architecture. A state school and hospital for the mentally retarded is nearby.

Canopus (kānō'pas), ancient city of N. Egypt, 12 mi (19 km) E of Alexandria. Canopus, the pilot of Menelaus' ship, died there. In Hellenistic times Canopus was known as a pleasure city for the rich. Vases capped with the figure of a human head, called Canopic vases, were used to hold the viscera of embalmed bodies. The Decree of Canopus, issued there in 238 B.C. and found at Tanis, has been of value in studying the ancient Egyptian language. The modern village of ABU QIR is near the ancient ruins.

Canopus, in astronomy, 2d brightest star in the sky, located in the constellation Carina, which is part of the ancient constellation Argo Navis, Bayer designation α Carinae, 1970 position R.A. 6^h23^m3^s, Dec. –52°41'. It has an apparent magnitude of –0.72, second only to Sirius among the bright stars. Canopus is a yellowish-white giant star of spectral class F0 I-II. Its distance is about 100 light-years. It is probably named after the ancient Egyptian city of Canopus.

Canosa di Puglia (kānō'sā dē pōō'lyā), Lat. Canusium, city (1971 pop. 30,059), Apulia, S. Italy, on the Ofanto River. It is a commercial and agricultural center. The city flourished under the Romans and was noted for its wool and its fine vases, many of which have been unearthed in nearby tombs (3d and 4th cent. B.C.). The Romans fled to Canusium after their disastrous defeat by Hannibal at nearby Cannae (216 B.C.). The city was destroyed by the Arabs in the 9th cent. but was resettled by the Normans in the 11th cent. There are other Roman remains, including walls, an amphitheater, and a gate. The city also has an 11th-century Romanesque cathedral and the mausoleum of the Norman leader Bohemond I (d. 1111), which has fine sculptured bronze doors.

Canossa (kānō'sā), village, in Emilia-Romagna, N. central Italy, in the Apennines. There are ruins of the 10th-century castle of the powerful feudal family that took its name from the place. In the 10th and

11th cent. they ruled over much of Tuscany and Emilia. MATILDA, countess of Tuscany, was the last of the family. In Jan. 1077, the castle was the scene of penance done by Emperor HENRY IV to obtain from Pope Gregory VII the withdrawal of the excommunication against him. The pope was Matilda's guest at the castle, and Henry is said to have stood three days barefoot in the snow before being admitted to the pope's presence. Henry was absolved, but the peace between him and the pope was short-lived. The political implications of this episode inspired Bismarck to coin the phrase "to go to Canossa" (i.e., to submit to the demands of the Roman Catholic Church) in the Kulturkampf.

Canova, Antonio (āntō'nōyō kānō'vā), 1757–1822, Italian sculptor. He was a leading exponent of the neoclassical school whose influence on the art of his time was enormous. Canova's monumental statues and bas-reliefs are executed with extreme grace, polish, and purity of contour. His first important commission was the monument (1782–87) to Clement XIV in the Church of the Apostles, Rome, followed by that to Clement XIII (completed 1792) in St. Peter's. He then received numerous major commissions from many countries. An admirer of Napoleon, Canova executed a bust of the emperor from life and several other portraits, including two where Napoleon is represented nude in the guise of a Roman emperor. His statue (1820) of George Washington for the statehouse at Raleigh, N.C. (destroyed), was dressed in Roman armor. Canova's memorabilia, consisting of sketches, casts, a few oil paintings, and a voluminous correspondence, are divided between the Gipsoteca in Possagno, his birthplace, and the Civic Museum in Bassano.

Canovas del Castillo, Antonio (āntō'nōyō kānō'vās dēl kāstēlyō), 1828–97, Spanish conservative politician, historian, and man of letters. He was instrumental in securing the restoration (1875) of Alfonso XII and was premier for six years (with short interruptions in 1875 and 1879) thereafter. To stabilize the monarchy, he worked out a political arrangement that rotated power within a narrow group, and after 1881 he alternated as premier with the Liberal party leader, Sagasta. He was assassinated by an anarchist. The editor of *Historia general de España* (18 vol., 1891–97), he also wrote several historical and critical works.

Canrobert, François Certain (frān'swa' sērtān' kānrōbēr'), 1809–95, marshal of France. After brilliant service in Africa, he returned to Paris and aided Louis Napoleon (later NAPOLEON III) in the coup d'état of 1851. He served in the Crimean War and was for a time commander in chief. Later, he distinguished himself in the Italian War of 1859 and in the Franco-Prussian War (1870–71). He became a senator under the Third Republic.

Canso, town (1971 pop. 1,209), 5 central N.S., Canada, on the Atlantic Ocean, near Cape Canso, the easternmost point of Nova Scotia peninsula proper. The harbor was much used by fishing fleets in colonial times and was fortified by the British in 1720. The Gut, or Strait, of Canso, scarcely 1 mi (1.6 km) wide in places, separates Nova Scotia peninsula from Cape Breton Island.

Cantabrian Mountains (kāntā'briān), N. Spain, extending c. 300 mi (480 km) along the Bay of Biscay from the Pyrenees to Cape Finisterre. Torre de Cerredo (8,687 ft/2,648 m) in the Europa group in the central section is the highest peak. The mountains are rich in minerals, especially coal and iron, the slopes are farmed. The streams on the northern slope are used to generate hydroelectricity. The Ebro River rises on the southeast slope.

Cantacuzene (kān''takyōōzēn') or **Cantacuzino** (kān'tākōōzēnō), noble Rumanian family of Greek origin, tracing its descent from the Byzantine emperor JOHN VI (John Cantacuzene). Under Ottoman rule members of the family were among the Phanariots (see under PHANAR) who governed Walachia and Moldavia. By the mid-17th cent., part of the family had settled in Walachia. A Russian branch of the family held high positions in the army and as governors of Bessarabia. Serban Cantacuzene, 1640–88, hospodar [governor] of Walachia (1678–88), took part in the Turkish siege of Vienna (1683), outwardly on the side of the Turks but in reality supplying intelligence information to the Austrians and conducting secret negotiations with them. He was poisoned, probably because of his pro-Austrian feelings. During his rule Rumanian was substituted for Slavonic as the liturgical language, and the first Rumanian Bible was printed (1688) under his auspices. George Cantacuzene, 1837–1913, the head of the Rumanian Conservative party, held several im-

portant government posts, most notably the premiership (1905-7)

Cantacuzene, John: see JOHN VI, Byzantine emperor

Cantal (kaNtal'), department (1968 pop 169,330), S central France, in Auvergne AURILLAC is the capital

cantaloupe: see GOURD, MELON

cantata (kanta'ta) [Ital, =sung], composite musical form similar to a short unacted opera or brief ORATORIO, developed in Italy in the baroque period. The term was first used in 1620 to refer to strophic variations in the voice part over a recurrent melody in the bass accompaniment. Gradually the cantata came to contain contrasting sections of recitative and aria separated by instrumental passages, often in the current operatic style. In the second half of the 17th cent the secular cantata was standardized by Stradella, Alessandro Scarlatti, and other members of the Neapolitan school into two arias with recitatives. This form was very popular through the 18th cent as a vehicle for virtuoso singing. In France the cantata was adapted by Rameau to contain three arias with recitatives. In Germany the sacred cantata was more popular than the secular. It incorporated extensive choral and instrumental sections. A particular variety, the chorale cantata, utilized the verses of hymns and frequently the hymn tunes in various parts of the cantata. This type, as written by J S Bach, opens with a chorus, which is followed by recitatives and arias for each soloist, and then closes with a harmonized chorale. After Bach the cantata became, in general, a diminutive form of the oratorio.

Canterbury, city (1971 pop 130,334), New South Wales, SE Australia. It is a suburb of Sydney.

Canterbury, county borough (1971 pop 33,157), Kent, SE England, on the Stour River. Economically unimportant except for its tourism, Canterbury is famous as the long-time spiritual center of England. In 597, St Augustine went to England from Rome to convert the island peoples to Christianity. He founded an abbey at Canterbury and became the first archbishop of Canterbury and primate of all England. The early cathedral was burned and rebuilt several times. After the murder (1170) of Thomas a Becket and the penance of Henry II, Canterbury became famous throughout Europe as the object of pilgrimage, and the *Canterbury Tales* of Chaucer relate the stories told by a fictional group of pilgrims. The present cathedral was begun under Archbishop Lanfranc, the first Norman archbishop. Constructed from 1070 to 1180 and from 1379 to 1503, it is a magnificent structure, its architecture embodying the styles of several periods and various architects. Noteworthy are the great 15th-century tower (235 ft/72 m high), the long transepts, the screen separating the raised choir from the Perpendicular nave, the east chapel (called the Corona or Becket's Crown), which contains the marble chair in which the archbishops are enthroned, Trinity Chapel, which held the shrine of St Thomas until 1538, when Henry VIII ordered it destroyed and the accumulated wealth confiscated, the chapel in which French Protestants worshiped in the 16th cent and where services are still held in French, the northwestern transept (where a stone slab commemorates the exact site of Thomas a Becket's murder), and the tombs of Henry IV and Edward the Black Prince. During World War II the cathedral was the object of severe German reprisal raids (June, 1942), which destroyed the library and many other surrounding buildings, but the cathedral itself received no direct hits. The city of Canterbury is also of great historical interest, with a 14th-century gate and remains of the old city walls, St Martin's Church (established before St Augustine's arrival and known as the Mother Church of England), the old pilgrims' hostel called the Hospital of St Thomas, and several fine old inns. Christopher Marlowe was born at Canterbury and educated at King's School (of very ancient origin) there before going to Cambridge. Other schools are the Univ of Kent at Canterbury, and theological, art, and teacher-training colleges. In 1974, the borough became part of the new nonmetropolitan county of Kent.

Canterbury bells: see BELLFLOWER

Canterbury Tales: see CHAUCER, GEOFFREY

cantharides: see BLISTER BEETLE

Can Tho (kân tô, kântô'), city (1968 est pop 88,000), S South Vietnam, a port on the Mekong River delta. Rice and fish are traded. It is the seat of the Univ of Can Tho. The city has a commercial airport.

Canticles, another name for the SONG OF SOLOMON

cantilever (kân'talēvər), beam supported rigidly at one end to carry a load along the free arm or at the

free end. A slanting beam fixed at the base is often used to support the free end, as in a common bracket. The springboard is a simple cantilever beam, and the cantilever design is often used for canopies, balconies, sidewalks outside the trusses of bridges, and large cranes such as those used in shipyards. By the use of cantilever trusses, obstructing columns are eliminated in theaters. The cantilever principle is one of the methods that may be used in constructing a BRIDGE.

Canton, John, 1718-72, English physicist. He is known for his research in magnetism and in electricity, especially his experiments in electrostatic induction. Canton was the first in England to verify Benjamin Franklin's conclusions about lightning. He invented an electroscope and an electrometer and demonstrated the compressibility of water.

Canton (kân'tôn', kân'tôn''), Mandarin *Kuang-chou*, city (1970 est pop of 2,300,000), capital of Kwangtung prov, S China, a major deepwater port on the Pearl River delta. Among the largest cities in the country, Canton is the transportation, industrial, financial, and trade center of S China. It has shipyards, an integrated steel complex, paper mills, a long-established textile industry (silk, cotton, jute, and more recently synthetic fibers), and factories producing tractors, machinery, machine tools, boilers, tires, bicycles, sports equipment, porcelain, cement, and chemicals. The hub of water transportation along the Pearl River, it is the southern terminus of the Canton-Han-k'ou RR. It has a large international airport and is linked with Hong Kong by the Canton-Kowloon RR. Canton is the marketplace for China's world trade, great national trade expositions, held there every spring and fall (since 1957), attract thousands of businessmen from all over the world. Canton became a part of China in the 3d cent B.C. Hindu and Arab merchants reached Canton in the 10th cent., and the city became the first Chinese port regularly visited by European traders. In 1511, Portugal secured a trade monopoly, but it was broken by the British in the late 17th cent., in the 18th cent the French and Dutch were also admitted. Trading, however, was restricted until the Treaty of Nanking (1842) following the Opium War, which opened the city to foreign trade. Following a disturbance, French and British forces occupied Canton in 1856. Later the island of Shameen was ceded to them for business and residential purposes, and this reclaimed sandbank with its broad avenues, gardens, and fine buildings was known for its beauty, it was restored to China in 1946. Canton was the seat of the revolutionary movement under Sun Yat-sen in 1911, the Republic of China was proclaimed there. From Canton the Nationalist armies of Chiang Kai-shek marched northward in the 1920s to establish a government in Nanking. In 1927, Canton was briefly the seat of one of the earliest Communist communes in China. The fall of Canton to the Communist armies in late Oct., 1949, signalled the Communist takeover of all China. Under the Communist government, Canton was developed as an industrial center and a modern port, with a great trade to and from Hong Kong. The city is also a cultural and educational center with several institutions of higher learning, notably Sun Yat-sen Univ and Chinan Univ. Tourist attractions include a large pagoda overlooking the river, now a museum of ceramics, the huge Temple of the Six Banyan Trees, and a park, with pavilions, commemorating the 1927 conflict between the Communists and the KUOMINTANG. Nearby are Ts'ung Hua hot springs and an important army base.

Canton 1 City (1970 pop 14,217), Fulton co., W central Ill., in the corn belt, inc 1849. It is a trade and industrial center for a coal and farm area. Its industries include coal mining and the manufacture of farm equipment and clothing. A junior college is there. 2 Town (1970 pop 17,100), Norfolk co., E Mass., a residential and industrial suburb of Boston, settled 1630, inc 1797. Rubber goods, textiles, plastics, and paper products are manufactured. Paul Revere operated a copper-rolling mill there. The town has a state hospital for the physically handicapped. 3 City (1970 pop 10,503), seat of Madison co., W central Miss., inc 1836. It is a trade and processing center in a cotton, truck farm, and timber area. There are a number of fine old antebellum houses. 4 City (1970 pop 110,053), seat of Stark co., NE Ohio, at the junction of three branches of Nimishillen Creek, inc 1822. It is a steel-processing center in a great iron and steel area. Other manufactures include roller bearings, heavy office equipment, water softeners, and forgings. In Canton are Malone College and a football hall of fame. Walsh College is in suburban North Canton. William McKinley lived in

Canton, his grave and monument are in the McKinley State Memorial. The Stark County Historical Center, adjacent to the memorial, contains a McKinley museum.

Canton or Pearl, Chin *Chu-chiang*, river, 110 mi (177 km) long, S Kwangtung prov., S China. Formed at Canton by the confluence of the Si and Pei rivers, it flows E then S past Canton and Huang-pu island to form a large estuary between Hong Kong and Macao. The river links Canton to Hong Kong and the South China Sea and is one of China's most important waterways. The estuary, called Boca Tigris, is kept open for ocean vessels by dredging.

Canton Island, coral atoll (1967 est pop 130), 3.5 sq mi (9 sq km), central Pacific, largest of the PHOENIX ISLANDS, c 2,000 mi (3,220 km) SE of Honolulu, Hawaii. Annexed by the British at the end of the 19th cent., the island was also claimed by American gun companies. In 1937 the British built a radio station on Canton, but in 1938 the United States formally claimed the island and placed it under the Dept. of the Interior. British and American colonists were brought to Canton in 1938 but were evacuated during World War II. In 1939 both Great Britain and the United States agreed on joint control of Canton and nearby Enderbury Island for 50 years.

Cantor, Eddie, 1892-1964, American entertainer, b New York City, originally named Edward Israel Iskowitz. Cantor became one of the best-known theatrical figures of his day. His style was typified by lively footwork, rolling eyes, and an utterly individual singing voice. On stage from 1907 and a Ziegfeld star from 1916, Cantor had numerous movie successes and a series of his own radio and television shows. See his autobiographical *As I Remember Them* (1963).

Cantor, Georg (gä'örkh kan'tör), 1845-1918, German mathematician, b St Petersburg. He studied under Karl Weierstrass and taught (1869-1913) at the Univ of Halle. He is known for his work on transfinite numbers and on the development of set theory, which is the basis of modern analysis, as well as for his definition of irrational numbers. His approach to the concept of the infinite revolutionized mathematics by challenging the processes of deductive reasoning and led to a critical investigation of the foundations of mathematics.

cantor [Lat, =singer], a singer or chanter, especially one who performs the solo chants of a church service. The office of cantor, at first an honorary one, originated in the Jewish synagogues, in which from early times it was the custom to appoint a lay member to represent the congregation in prayer. The cantillation of prayers, and later of parts of the Scriptures, was transmitted by oral tradition. The notation of the chants was forbidden. In the 6th cent poetic prayer forms were developed, and with them more complicated modes, or music, thus necessitating professional cantors. In the early Christian church, cantors known as *precentors* had charge of the musical part of the service. In modern Roman Catholic and Anglican services cantors sing the opening words of hymns and psalms.

Canosum* see CANOSA DI PUGLIA, Italy

Canute (kändōt', kanyōt'), 995?-1035, king of England, Norway, and Denmark. The younger son of Sweyn of Denmark, Canute accompanied his father on the expedition of 1013 that invaded England and forced Æthelred to flee to Normandy. When Sweyn died (1014), the Danes in England swore fealty to Canute, but on Æthelred's return from Normandy, Canute withdrew to Denmark, where his older brother, Harold, had become king. In 1015, Canute reinvaded England with a powerful army that conquered most of Wessex, harried the Danelaw, and conquered Northumbria. After the Danish victory in the battle of ASSANDUN, Canute divided England with EDMUND IRONSIDE, Æthelred's son. When Edmund died, late in 1016, Canute was accepted as sole king. He gave England peace and strove to continue English traditions by restoring the church to high place and codifying English law. To forestall dynastic quarrels he banished his wife (and their son Sweyn) and married Emma, the widow of Æthelred. His son by Emma was Harthacnut. In 1018 or 1019 he succeeded to the throne of Denmark and was forced to lead several expeditions to assert his rights there and in the Danish provinces in Norway. In 1028, after an uprising had expelled Olaf II of Norway, Canute was recognized as ruler of that kingdom. He made his son Harthacnut king of Denmark, and in 1029 he made his son Sweyn king of Norway, with Sweyn's mother as regent. She and Sweyn were driven out by 1035, and Norway was ruled by Olaf's son Magnus. Canute established

friendly relations with the Holy Roman Empire and attended the coronation of Conrad II in Rome in 1027. At the end of his reign Canute led an army into Scotland to stop Scottish invasions under Malcolm II. Canute was succeeded by his illegitimate son, Harold Harefoot, then by Harthacanute. The name also appears as Cnut or Knut. See biography by L. M. Larson (1912, repr. 1970), F. M. Stenton, *Anglo-Saxon England* (3d ed., 1971).

Canute the Saint, d. 1086, king (1080-86) and patron saint of Denmark. He built churches and cathedrals and raised the bishops to the rank of prince. In 1085 he made an unsuccessful attempt to invade England. He was killed by a mob enraged by the imposition of heavy fines and a tithe. Feast Jan. 19.

canvas, strong, coarse cloth of cotton, flax, hemp, or other fibers, early used as sailcloth. Left in its natural color, bleached, or dyed, it has a wide variety of uses, as for game, duffel, sport, mail and nose bags, tennis shoes, covers, tents, and awnings. Waterproofed with tar, paint, or the like, it is called tarpaulin and used to protect boats, hatches, and machinery. Duck is a fine light quality used for summer clothing, awnings, and sails. Artists' canvas is a light, smooth, single-warp texture, specially treated to receive paint. Art or embroidery canvas is an open-mesh type, usually linen, for working in crewels and for needlepoint.

canvasback: see DUCK.

Canyon de Chelly National Monument [De Chelly, Sp. corruption of Navaho *Tsegi* = rock canyon], 83,840 acres (33,930 hectares), NE Ariz., est. 1931. The area contains the ruins of several hundred prehistoric Indian villages, most of them built A.D. 350-1300. The spectacular cliff dwellings include Mummy Cave, with a three-story tower house. Artifacts have been found, and there are numerous pictographs in rock shelters and on cliff faces. The earliest people living in the region were the BASKET MAKERS, predecessors of the PUEBLO INDIANS. The NAVAHO came to the canyon c. 1700, and it became their chief stronghold. In 1805 a Spanish expedition fought the Navaho in a rock shelter, now called Massacre Cave, in Canyon del Muerto (site of a prehistoric Indian burial ground). In 1864 a U.S. cavalry force under Kit Carson engaged the Navaho in Canyon de Chelly.

Canyonlands National Park, 257,640 acres (104,267 hectares), SE Utah, est. 1964. Located in a desert region, the park contains a maze of deep canyons and many unusual features carved by wind and water, including spires, pinnacles, and arches, surrounding mesas rise more than 7,800 ft (2,377 m). Cataract Canyon, through which the raging waters of the Colorado and Green rivers flow, contains one of the world's largest exposures of red sandstone. Island in the Sky, a plateau overlooking the junction of the Green and Colorado rivers, has walls that drop in giant steps 2,200 ft (671 m) to the canyon floor. Upheaval Dome, pushed upward by the pressure of surrounding rock on underground salt deposits, contains a crater 1 mi (1.6 km) wide and 1,500 ft (457 m) deep. Also found in the park are many Indian petroglyphs drawn on rocks c. 1,000 years ago. Bighorn sheep, mule deer, and beaver live in the park.

canzone (kantsō'nā) or **canzona** (-na), in literature, Italian term meaning lyric or song. It is used to designate such various literary forms as Provençal troubadour poems and the lyrics of Dante, Petrarch, and other Italian poets of the 13th and 14th cent. The term was revived in the 19th cent. by Italian lyric poets, among them Giosuè Carducci.

canzone or **canzona**, in music, a type of instrumental music in Italy in the 16th and 17th cent. The term had previously been given to strophic songs for five or six voices, usually the canzone had three sections. The instrumental canzone was written in imitation of lute or keyboard transcriptions of French chansons. Frescobaldi used it in a series of fugal sections, each a rhythmic variation of the same theme. The thematic unity of his example was adopted by Froberger and other German composers, and this development led to the fugue. The canzone for instrumental ensemble became, in the hands of Giovanni Gabrieli and his followers, a structure consisting of sections of imitation in duple meter alternating with passages in triple meter.

caoutchouc (kou'chōök), natural RUBBER obtained as a LATEX from various tropical plants, e.g., the PARÁ RUBBER TREE. It is much more elastic than BALATA or GUTTA-PERCHA. It is the most familiar and widely used of the natural rubbers. It is usually processed by coagulating the latex and by milling or smoking the solid rubber. It is then further treated, e.g., by VULCANIZATION, to produce useful articles.

cap: see HAT.

Capa, Robert, 1913-54, American photographer of war, b. Hungary. From the early 1930s, Capa recorded with profound concern the spectacle of humanity caught in war. In 1936 he covered the Spanish civil war, making the photograph of a Loyalist at the instant of death that has become a classic. In 18 years he covered five wars, the result is a powerful and very personal indictment. In 1946, Capa helped found Magnum, a select agency for photojournalists. His books include *Death in the Making* (1938) and *Images of War* (1964). Capa was killed at 41 by a North Vietnamese land mine while photographing French combat troops.

Capablanca, José Raúl (hōsā' rāōōl' kăpăblăng'ka), 1888-1942, Cuban chess player, b. Havana. Champion of Cuba at the age of 12, he won the world's championship from Emanuel LASKER in 1921, retaining the title until he was defeated by Alexander ALEKHINE in 1927. His game was almost free from false interpretations of position, and his technique, although facile, was highly refined. See his *My Chess Career* (1920, rev. ed. 1966), *Chess Fundamentals* (1921, repr. 1967), *A Primer of Chess* (1935), and *Capablanca's Last Chess Lectures* (1967), Harry Golombek, ed., *Capablanca's Hundred Best Games of Chess* (1947, repr. 1965).

capacitance, in electricity, capability of a body, system, circuit, or device for storing electric charge. Capacitance is expressed as the ratio of stored charge in coulombs to the impressed potential difference in volts. The resulting unit of capacitance is the FARAD [for Michael Faraday]. In an electric circuit the device designed to store charge is called a CAPACITOR. An ideal capacitor, i.e., one having no resistance or inductance, may be spoken of as a capacitance. When an alternating current flows through a capacitor, the capacitor produces a reactance that resists the current (see IMPEDANCE).

capacitor or **condenser**, device for the storage of electric charge. Simple capacitors usually consist of two plates made of an electrically conducting material (e.g., a metal) and separated by a nonconducting material (e.g., glass, paraffin, mica, oil, or air). The LEYDEN JAR is a simple capacitor. If an electrical potential (voltage) is applied to the plates of a capacitor (e.g., by connecting one plate to the positive and the other to the negative terminal of a storage battery), the plates will become charged, one positively and one negatively. If the externally applied voltage is then removed, the plates of the capacitor remain charged, and the presence of the electric charge induces an electrical potential between the plates. This phenomenon is called electrostatic induction. The capacity of the device for storing electric charge (i.e., its capacitance) can be increased by increasing the area of the plates, by decreasing their separation, or by varying the substance used as an insulator. The property of this insulator (or dielectric) that affects the capacitance of the device is its acceptance of an induced electric field, the dielectric constant is a measure of the increase in capacitance due to a particular substance. Capacitors are used in many electrical and electronic devices. One type of variable capacitor, commonly used in the tuning circuits of radio sets, consists of two sets of semicircular plates, one set fixed and the other mounted on a movable shaft. By rotating the shaft the plates can be moved, increasing or decreasing the overlap of area of the plates, and thus increasing or decreasing the capacitance. For each different value of the capacitance the tuning circuit responds to a different particular frequency, and thus the circuit is able to select stations broadcasting on different frequencies.

Capaneus: see SEVEN AGAINST THEBES.

Cap de la Madeleine (kăp də lă mäd'lēn'), city (1971 pop. 31,463), 5 Que., Canada, at the confluence of the St. Maurice and St. Lawrence rivers. Newsprint and paper products, plywood, aluminum products, and clothing are manufactured there. The shrine and sanctuary of Notre Dame du Cap is in the city.

Cape Breton Highlands National Park (brēt'ən), 367 sq mi (951 sq km), N Cape Breton Island, N.S., Canada, est. 1936. It covers a large tableland and includes sections of the rugged Atlantic coastline.

Cape Breton Island, island (1971 pop. 170,007), 3,970 sq mi (10,282 sq km), forming the northeastern part of N.S., Canada, and separated from the mainland by the narrow Gut, or Strait, of Canso. The easternmost point is called Cape Breton. The center of the island is occupied by the Bras d'Or salt lakes. Gently sloping in the south, the island rises to rug-

ged hills in the wilder northern part. The inhabitants are mainly of Scottish Highlander descent. There are many summer resorts on the lakes and fishing villages on the coast. In the northeast are steelworks dependent on the extensive Sydney coal fields. The Cabot Trail, a scenic road through Cape Breton Highlands National Park, commemorates the discovery of Cape Breton Island in 1497 by John Cabot. The island was a French possession from 1632 to 1763. After the Peace of Utrecht (1713) many Acadians migrated there from mainland Nova Scotia, which was ceded to the English. They renamed the island Île Royale and established the fortress at LOUISBURG. With the final cession of Canada to the British (1763), Cape Breton was attached to Nova Scotia. It was made a separate colony in 1784, with Sydney as its capital, but was rejoined to Nova Scotia in 1820.

cape buffalo, species of short-haired African ungulate, or hoofed mammal, *Syncerus caffer*. The cape, or African, buffalo may reach 7 ft (2.1 m) in length, weigh more than 1,500 lb (670 kg), and reach a height of 5 ft (1.5 m) at the shoulder. Coat color and horn shape seem to vary with the animal's habitat, which ranges from high grass savanna to equatorial forest and extends from Lake Chad south to the Cape of Good Hope and from Senegal, on the Atlantic coast, to Ethiopia, on the Indian Ocean. Cape buffalo gather in herds of up to a thousand animals, they graze and drink in the early morning and evening and rest during the heat of midday and at night. They are aggressive and powerfully built, and can easily fend off the attack of a lion. They mate in January or February, after a gestation period of 11 months the cow gives birth to a single calf. Its life span is about 16 years. Cape buffalo are classified in the phylum CHORDATA, subphylum Vertebrata, class Mammalia, order Artiodactyla, family Bovidae.

Cape Canaveral, low, sandy promontory extending E into the Atlantic Ocean from a barrier island, E Fla., separated from Merritt Island by the Banana River, a lagoon, named (1963) Cape Kennedy in memory of President John F. Kennedy, it reverted to its original name in 1973. The John F. Kennedy Manned Space Flight Center of the National Aeronautics and Space Administration is located at Cape Canaveral. Since 1947 the cape has been the principal U.S. launching site for long-range missiles, earth satellites, and manned space flights. The first U.S. space satellite (Explorer I, 1958), John Glenn, the first American to orbit the earth (1962), and Neil Armstrong (see ASTRONAUTS), the first man on the moon (1969), were launched into space from the cape. The region around Cape Canaveral has attracted many rocket and guided-missile-related industries. Patrick Air Force Base is nearby.

Cape Coast, town (1970 pop. 51,764), capital of Central Region, S Ghana, on the Gulf of Guinea. The town is an export port and fishing center. It grew up around European forts built in the 17th cent. The British made it their headquarters in 1664. It was capital of the Gold Coast until superseded by ACCRA in 1877. Cape Coast is also an educational center.

Cape Cod, narrow peninsula of glacial origin, 399 sq mi (1,033 sq km), SE Mass., extending 65 mi (105 km) E and N into the Atlantic Ocean. It is generally flat, with sand dunes, low hills, and numerous lakes. The cape's familiar hook-shape is a result of the action of winds and ocean currents on the sand and gravel. Bartholomew Gosnold, an English explorer, visited the cape in 1602 and named it for the abundant codfish found in surrounding waters. Fishing, whaling, shipping, and salt making were important until the late 1800s, tourism and cranberry growing (Cape Cod is the nation's largest producer of cranberries) are now the main industries. Candle making and boatbuilding are also carried on. Towns on Cape Cod include Provincetown, site of the Pilgrim's first landing (1620), Barnstable, where the Hyannis home of the Kennedy family is located, Falmouth, location of Woods Hole, an oceanographic center, and Bourne, through which the Cape Cod Canal passes. This lockless canal, 17.5 mi (28.2 km) long, 32 ft (10 m) deep, was built (1910-14) from private funds. It was purchased by the U.S. government in 1927. The canal accommodates oceangoing vessels and cuts the distance between New York City and Boston by 75 mi (121 km). Parts of Cape Cod constitute Cape Cod National Seashore (44,600 acres/18,050 hectares, est. 1961). It contains beaches, sand dunes, heathlands, marshes, fresh-water ponds, and historic sites including the first Marconi Wireless Station in the United States.

Cape Colony: see CAPE PROVINCE.

Cape Dezhnev (dēzh'naf, Russ. dyāsh'nyaf) or **East Cape**, northeasternmost point of Asia, Far Eastern

USSR, on Chukchi Peninsula and on the Bering Strait. It is named after the Russian navigator who discovered it in 1648. It was first called East Cape by Capt. James Cook.

Cape Fear River, 202 mi (325 km) long, formed in E central N.C. by the junction of the Deep and Haw rivers, and flowing southeast to enter the Atlantic Ocean N of Cape Fear, longest river entirely within North Carolina. Dams and locks make the river navigable to Fayetteville, N.C.; its estuary forms part of the Intracoastal Waterway. During the colonial period the river was a main route to the interior.

Cape Girardeau (jīrār'dō, jērardō'), city (1970 pop 31,282), Cape Girardeau co., SE Mo., overlooking the Mississippi River, founded 1793, inc. as a city 1843. It is a transportation, trade, and distribution center with factories that manufacture a variety of products. Its position on the river, near the confluence with the Ohio River, spurred its early growth. During the Civil War it was occupied by Union forces, and four forts were built there. A minor battle occurred on April 26, 1863. Fort D (1861) and other old buildings are among today's points of interest. The city is known for its roses, one display garden has numerous varieties. Southeast Missouri State Univ. is there. *The city is connected with Illinois by a highway bridge.*

Cape jasmine* see MADDER

Čapek, Josef (cha'pěk), 1887-1945, Czech writer and painter. He collaborated with his brother Karel on a number of plays and short stories. On his own he wrote the utopian play *Land of Many Names* (1923, tr. 1926) and several novels. *Poems from a Concentration Camp* (1946) were written in 1895, where he died. As a painter, Josef Čapek developed an original primitivist style. His works of art criticism include *The Humblest Art* (1920).

Čapek, Karel, 1890-1938, Czech playwright, novelist, and essayist. He is best known as the author of two brilliant satirical plays—*R.U.R.* (*Rossum's Universal Robots*, 1921, tr. 1923), which introduced the word robot into the English language, and *The Insect Play*, written with his brother Josef (1921, tr. 1923). These plays embody Čapek's attacks on technological and materialist excesses. Of his other plays *The Makropoulos Secret* (1923, tr. 1925) satirizes man's search for immortality. Janáček used it as the basis for his opera *The Makropoulos Affair* (1925). Čapek's *Power and Glory* (1937, tr. 1938), condemns totalitarianism. He also wrote travel sketches, romances (e.g., *Krakatit*, 1924, tr. 1925), and essays. His three volumes of conversations with Thomas G. Masaryk (1928-35, tr. 1934, 1938) form a political biography. Čapek's three philosophical novels, *Hordubal* (1934, tr. 1934), *Meteor* (1934, tr. 1935), and *An Ordinary Life* (1935, tr. 1936) are mystical in tone and are not closely related to his other works. See study by W. E. Harkins (1962).

Cape Kennedy, see CAPE CANAVERAL, Fla.

Capell, Edward (kā'pəl), 1731-181, English Shakespearean scholar. His 10-volume edition of Shakespeare (1768) was the first to incorporate exact collations of all available old texts. He followed this with a commentary, *Notes and Various Readings to Shakespeare* (3 vol., 1783).

Capella, Martianus (marshēā'nās kăpěl'ə), fl. 5th cent., Latin writer, b. Carthage. His one famous work, *The Marriage of Mercury and Philology*, also called the *Satyricon and Disciplinæ*, is a long allegory about the liberal arts. Its popularity in medieval schools was universal. The author is also known as Felix Capella and may have lived in the 4th cent.

Capella, brightest star in the constellation AURIGA, Bayer designation α Aurigae, 1970 position R.A. 5^h14^m, Dec. +45°58'. Capella is a yellow giant star of SPECTRAL CLASS G8 III and is also a spectroscopic BINARY STAR with a component of spectral class F. Its apparent MAGNITUDE of 0.06 makes it the 6th-brightest star in the sky. Capella is about 45 light-years from the earth. Its name is from the Latin for "little she-goat."

Capelle, Eduard von (ä'dōōart fən kăpěl'ə), 1855-1931, German admiral. As secretary for the navy (1916-18) he reinstituted (1917) unrestricted submarine warfare in World War I.

Capello, Bianca (byang'ka kăpěl'ō), 1548-87, grand duchess of Tuscany (1579-87). Of a noble Venetian family, she eloped (1563) with a Florentine, Pietro Bonaventuri, who was later killed (1569). She was the mistress, then (1579) the wife, of Francesco de' MEDICI. After a banquet the grand duke and his duchess died suddenly, but rumors that they had been poisoned were never substantiated.

Cape Lookout National Seashore: see NATIONAL PARKS AND MONUMENTS (table)

Cape May, city (1970 pop 4,392), Cape May co., S N.J., at the end of Cape May peninsula, on the Atlantic Ocean, settled in the 1600s, inc. 1857. One of the nation's oldest beach resorts, it became popular in the mid-19th cent., when it was known as the "President's Playground", Lincoln, Grant, Arthur, Buchanan, Hayes, and Benjamin Harrison vacationed there. The city's various mansions and Victorian hotels comprise a high concentration of notable 19th-century architecture. **Cape May**, the southern extremity of New Jersey, has a lighthouse on Cape May Point at the entrance to Delaware Bay. The cape is bisected by a canal, c. 3 mi (4.8 km) above the point, which was constructed by the Federal government in 1942-43 as a war emergency measure to provide an alternative to the longer, more hazardous route around the cape. The canal is part of the New Jersey Intracoastal Waterway. In the past few decades erosion has washed away nearly 2 mi (3 km) of the cape in the area of Cape May Point.

Cape Province, formerly **Cape of Good Hope Colony**, province (1970 pop 4,991,224), 278,465 sq mi (721,224 sq km), S Republic of South Africa. The capital and largest city is CAPE TOWN, which is also the country's legislative capital. Other cities include EAST LONDON, KIMBERLEY, PORT ELIZABETH, and Uitenhage. Cape Province has a diversified economy. Grain, fruit, tobacco, and chicory are cultivated, chiefly in the fertile coastal regions, cattle, sheep, and goats are raised in the interior. Marine fishing is pursued, especially in the southwest, and diamonds, iron ore, manganese, asbestos, and copper are mined. Industry is centered in Cape Town, Port Elizabeth, Uitenhage, and East London. Manufactures include textiles, clothing, processed foods, wine and liquor, motor vehicles, refined petroleum, and footwear. The province has an excellent road and rail system. Cape Town, Port Elizabeth, and East London are major seaports. Institutions of higher education include the Univ. of Cape Town, Rhodes Univ. (Grahamstown), and the Univ. of Stellenbosch. Although the Cape of Good Hope was first circumnavigated in 1488 by Bartolomeu Dias and later (1497) by Vasco da Gama, the first European settlement of the region was only in 1652, when Jan van Riebeeck founded a resupply station for the Dutch East India Company on TABLE BAY, the station subsequently became Cape Town. At the time of Van Riebeeck's landing, Cape Province was inhabited by San (Bushmen) and Khoikhoi (Hottentots) in the southern and central areas, and by 8antu-speaking black Africans on the northern and eastern fringes (see BANTU LANGUAGES). The Dutch East India Company brought Dutch settlers to Cape Town, who farmed and raised livestock and were called BOERS [Du., =farmers]. In 1689, French HUGUENOTS began to arrive, they developed the wine industry. The company ruled the Cape until 1795, except for a brief period (1781-84) of French occupation. In 1779 the first of numerous frontier wars (continuing until 1877) between Europeans and the Xhosa (a 8antu-speaking people) erupted. These so-called Kaffir Wars were mainly over land and cattle. During the French Revolutionary and Napoleonic Wars (1792-1815), Britain occupied the Cape from 1795 to 1803, when the Dutch regained control, Holland formally ceded it to Great Britain in 1806. The British named the territory Cape of Good Hope Colony and encouraged immigration from England. The new British settlers soon conflicted with the Boers over anglicization of the courts, control of farm- and pastureland, and slaveholding. Beginning in 1835 many Boers left Cape Colony (see TREK), seeking more land and escape from British rule. The Boers founded a temporary republic in NATAL and longer lasting republics in the TRANSVAAL and ORANGE FREE STATE. In 1850, Cape Colony had about 140,000 residents of European descent. In 1853 the colony was allowed to elect a legislature to advise the governor, and in 1872 it received internal self-government. In 1867 diamonds were discovered in the Kimberley region, which in 1880 was annexed by the Cape. The British and the remaining Boers generally cooperated until the 1890s, when the British, and especially Cecil Rhodes (then prime minister of Cape Colony), sought to unite the Transvaal and the Orange Free State with the Cape and Natal. In 1895-96, L. S. JAMESON staged an unsuccessful raid from Cape Colony into the Transvaal, which greatly increased tension between Britons and Boers. The South African War (1899-1902) followed soon thereafter. In 1910 the Cape Colony joined with Natal, the Transvaal, and the Orange Free State to become a founding province of the Union of South Africa.

capér, common name for members of the Capparidaceae, a family of tropical plants found chiefly in the Old World and closely related to the family Cruciferae (MUSTARD family). *Capparis spinosa* is cultivated in the Mediterranean area for its flower buds—capers—which are pickled and used as a condiment. The spiderflower (*Cleome spinosa*) is a common garden annual. The family also includes a few species indigenous to the United States, e.g., the burro-fat (*Isomers*), a common desert shrub of the Southwest. The caper family is classified in the division MAGNOLIOPHYTES, class Magnoliopsida, order Capparales.

Capernaum or **Capharnaum** (kapūr'nāam, kafār'nāam), town, NE Palestine, on the northwestern shore of the Sea of Galilee, closely associated with Jesus' ministry. John 2:12, 6:59, Mat 11:23, 8:9, Mark 1:2, Luke 4:5. A synagogue of the 3d cent. was excavated on the site (Kefar Nahum, Israel) and partially restored.

Cape Sable Island, 7 mi (11.2 km) long and 3 mi (4.8 km) wide, SW N.S., Canada. It is connected to the mainland by a causeway over Barrington Passage. Clark's Harbour (1971 pop 1,082), a fishing port, is on the west coast.

Capetians (kăpē'shānz), royal house of France that ruled continuously from 987 to 1328, it takes its name from HUGH CAPET. Related branches of the family (see VALOIS, BOURBON) ruled France until the final deposition of the monarchy in the 19th cent. The first historical ancestor was ROBERT THE STRONG, count of Anjou and of Blois. His son, EUDES, count of Paris, was elected (888) king after the deposition of the Carolingian king Charles III (Charles the Fat). From 893 to 987 the crown passed back and forth between CAROLINGIANS and descendants of Robert the Strong. Eudes's brother, ROBERT I, was chosen king in 922 but died in 923. The title, waived by his son, HUGH THE GREAT, passed to Robert's son-in-law, RAOUX, duke of Burgundy. In 987, Hugh's son, Hugh Capet, became king. His direct descendants remained on the throne until the death (1328) of Charles IV, when it passed to the related house of Valois. The successors of Hugh Capet were Robert II, Henry I, Philip I, Louis VI, Louis VII, Philip II, Louis VIII, Louis IX, Philip III, Philip IV, Louis X, John I, Philip V, and Charles IV. Their reign marked the expansion of royal authority, the revival of towns and commerce, and the beginning of the modern French state. See Robert Fawtier, *The Capetian Kings of France* (1941, tr. 1960).

Cape Town or **Capetown**, city (1970 pop 691,296), legislative capital of the Republic of South Africa and capital of its CAPE PROVINCE, a port on the Atlantic Ocean. The city lies at the foot of Table Mt. (c. 3,570 ft/1,090 m) and on the shore of Table Bay. Cape Town is a commercial and industrial center, food processing, wine-making, printing, and the manufacture of clothing and plastic and leather goods are the chief industries. An important port, Cape Town exports mainly gold, diamonds, and fruits. Tourism is of growing economic importance for the city, with its beaches and pleasant climate. The city is linked by road and rail with the rest of South Africa. Cape Town was founded in 1652 by Governor Jan van Riebeeck as a supply station on the Dutch East India Company's sea route to the East. In 1795 the British occupied the city. It was returned to the Dutch in 1803 but recaptured in 1806 by the British, who established Cape of Good Hope Colony with Cape Town as capital. When the Union of South Africa was formed in 1910, Cape Town became its legislative capital and Pretoria its administrative capital. Cape Town's attractions include the Castle, a fortress dating from 1666, the Dutch Reformed church (begun 1699), Old Town House (1755), which contains a museum of 17th-century Flemish and Dutch paintings, and botanical gardens. The Cape Malay section of the city is noted for its old Dutch-style houses and its mosques. Cape College for Advanced Technical Education is in Cape Town, nearby is the Groote Schuur estate, which includes the prime minister's residence and the Univ. of Cape Town.

Cape Verde Islands, Port. *Ilhas do Cabo Verde*, overseas province of Portugal (1970 pop 272,017), c. 1,560 sq mi (4,040 sq km), W Africa, in the Atlantic Ocean about 300 mi (480 km) W of Dakar, Senegal. It is an archipelago made up of 10 islands and 5 islets, which fall into two main groups—the Barlavento, or Windward, in the north, which include Santo Antão, São Vicente, Santa Luzia, São Nicolau, Boa Vista, and Sal, and the Sotaventos, or Leeward, in the south, which include SÃO TIAGO (c. 600 sq mi/1,550 sq km, the largest island), Fogo, Maio, and Bra-

va Praia, located on São Tiago, is the capital, other towns include Mindelo on São Vicente, Ribeira on Santo Antão, Sal Rei on Boa Vista, and Santa Maria on Sal. The islands are mountainous and of volcanic origin, the only active volcano is at the archipelago's highest point, Cano (c 9,300 ft/2,830 m), which is located on Fogo. About 60% of the population is of mixed black African and European descent, and most of the rest are black Africans, there are also a few Portuguese settlers. Most persons are Roman Catholic. Farming, the main economic activity, is severely limited by the small annual rainfall. Occasionally, as in the early 1970s, there are severe droughts. The main crops are maize, bananas, potatoes, tomatoes, pulses, arabica coffee, groundnuts, physic nuts, and sugarcane. Goats, hogs, cattle, and sheep are raised. Tuna and lobster are the main catches of a small, but growing, fishing industry. Puzzolana and salt are the only minerals extracted. The islands' manufactures are limited to processed food, beverages, and tobacco products. Mindelo is an important coaling station for ships, and transatlantic flights are serviced at an airport on Sal. The islands carry on a small foreign trade, mostly with Portugal, the annual cost of imports is usually much higher than the earnings from exports. The main imports are foodstuffs, textiles, and machinery, the leading exports are salt, coffee, and foodstuffs. Many of the islanders work in Portugal, in other Portuguese holdings in Africa, and in the United States, and the money they send home constitutes an important contribution to the islands' economy. The Cape Verde Islands probably were discovered (1456) by Luigi da Cadamosto, a navigator in the service of Prince Henry of Portugal, at that time they were uninhabited. Diogo Gomes, a Portuguese explorer, visited the islands in 1460, and colonists from Portugal began to settle there in 1462. Soon thereafter, black Africans from W Africa were brought to the islands as slaves. Later a Portuguese penal colony was established, and some of the convicts remained after their terms had been completed. Slavery was abolished on the islands in 1876. Portuguese Guinea (now Guinea-Bissau) was administered as part of the Cape Verde Islands until 1879. In 1951 the status of the islands was changed from colony to overseas province. In contrast to Portugal's other African holdings, there was little agitation for independence in the 1960s and early 70s. Although some persons belonged to the outlawed African Party for Independence in Guinea-Bissau and Cape Verde (PAIGC), which advocated the union of the two areas into one nation, the movement was never strong in the islands. Because of important military bases there, Portugal dealt separately with the islands during the negotiations with the PAIGC that led to the independence (Sept., 1974) of Guinea-Bissau, it was decided to let the political future of the Cape Verde Islands be determined by a referendum. See James Duffy, *Portuguese Africa* (1959), T B Duncan, *Atlantic Islands: Madeira, the Azores, and the Cape Verdes in Seventeenth-century Commerce and Navigation* (1972).

Cape York Peninsula, 280 mi (451 km) long, N Queensland, Australia, between the Gulf of Carpentaria and the Coral Sea. It is largely tropical jungle and sparsely populated. Weipa is the largest town.

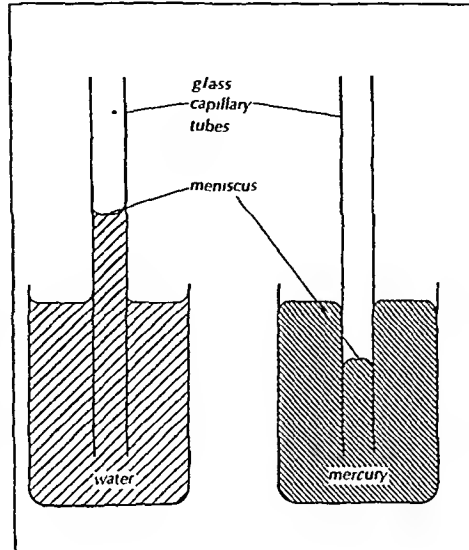
Capgrave, John, 1393-1464, English author and Augustinian friar. One of the most learned men of his day, he was a distinguished theologian, philosopher, and historian. His writings, many of which have been lost, include a chronicle of England up to 1417 and the Latin works *De illustribus Henricis* [on illustrious men named Henry] and *Nova legenda Angliae* [new legends of England], a rewriting of a collection of lives of English saints by a monk of Tynemouth.

Cap-Haïtien (kăp-ä'syā'n'), city (1971 pop. 46,217), N Haiti, on the Atlantic Ocean. Haiti's second largest city, it is a major seaport, commercial center, and tourist attraction. Coffee, cacao, and sugar are exported. Founded by the French c 1670, the city was the capital of colonial Haiti for a century. In 1791, Cap-Haïtien was captured by Toussaint L'Ouverture, leader of a slave rebellion. From 1811 to 1820 it served as capital of the kingdom of Henri Christophe, whose Sans Souci Palace and famous citadel, la Ferrière, still stand. Despite earthquakes (notably in 1842), bombings, and civil strife, Cap-Haïtien retains some picturesque colonial charm. It is also known as Le Cap.

Capharnaum (kəfār'nāam), the same as CAPERNAUM. **Caphtor** (kăf'tôr), home of the Philistines before they went to Canaan. Its inhabitants are called Caphtorim. Gen 2:23, 10:14, Deut 2:23, 1 Chron

1:12, Jer 47:4, Amos 9:7. Caphtor is now generally identified with Crete.

capillarity or **capillary action**, phenomenon in which the surface of a liquid is observed to be elevated or depressed where it comes into contact with a solid. For example, the surface of water in a clean drinking glass is seen to be slightly higher at the edges, where it contacts the glass, than in the middle. Capillarity can be explained by considering the effects of two opposing forces: adhesion, the attractive (or repulsive) force between the molecules of the liquid and those of the container, and cohesion, the attractive force between the molecules of the liquid (see ADHESION AND COHESION). Adhesion



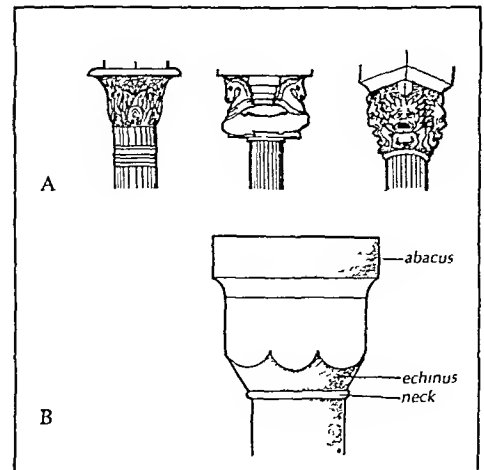
Capillarity. Water wets the walls of a capillary tube and thus rises, causing the upper surface, or meniscus, of the liquid to be concave; mercury does not wet the walls of a capillary tube and thus sinks, producing a convex meniscus.

causes water to wet a glass container and thus causes the water's surface to rise near the container's walls. If there were no forces acting in opposition, the water would creep higher and higher on the walls and eventually overflow the container. The forces of cohesion act to minimize the surface area of the liquid (see SURFACE TENSION), when the cohesive force acting to reduce the surface area becomes equal to the adhesive force acting to increase it (e.g., by pulling water up the walls of a glass), equilibrium is reached and the liquid stops rising where it contacts the solid. In some liquid-solid systems, e.g., mercury and glass or water and polyethylene plastic, the liquid does not wet the solid, and its surface is depressed where it contacts the solid. Capillarity is one of the causes of the upward flow of water in the soil and in plants.

capillary, microscopic blood vessel, smallest unit of the CIRCULATORY SYSTEM. Capillaries form a network of tiny tubes throughout the body, connecting arterioles (smallest ARTERIES) and venules (smallest VEINS). Through the thin capillary walls, which are composed of a single layer of cells, the nutritive material and oxygen in the blood pass into the body tissues, and waste matter and carbon dioxide in turn are absorbed from the tissues into the bloodstream.

capital, in architecture, the crowning member of a column, pilaster, or pier. It acts as the bearing member beneath the lintel or arch supported by the shaft and has a spreading contour appropriate to its function. The most primitive type, of which examples were found in the Beni Hassan tombs, Egypt, consisted of a square block. In later forms the capital had three well-defined parts: the neck, or necking, where it joins the shaft, the echinus, or spreading member above it, and the abacus, or block at the top. In Egypt such types were developed as early as 1500 B.C., papyrus buds, the lotus, and the palm leaf were used as motifs of ornamentation. The Greeks perfected three types belonging to three separate orders of architecture—the DORIC ORDER, the IONIC ORDER, and the CORINTHIAN ORDER—which were also used in slightly modified forms by the Romans. The classic forms of capitals continued in use after the fall of Rome, but the Romanesque and Gothic de-

signers introduced new forms rich in variety: grotesque heads, birds, and animals. In the 15th cent., with the Renaissance, came a return to the classical



A Types of capitals

B Parts of a capital

orders that continued in use until the late 19th and early 20th cent. when the modernists cast out classical decoration.

capital, in economics, the entire stock of goods from which an income is derived. As originally used in business, capital denoted interest-bearing money. In classical economic theory it was one of the three major factors of production, along with land and labor. In the broad sense, all tools, machines, stores of merchandise, houses, means of transportation, lands, and such paper as stocks and bonds—any materials used to extract, transport, create, or alter goods—can be called capital. Marketable intangibles, such as credits, good will, promises, patents, and franchises, are also included by some economists. Capital goods (e.g., tractors) are distinguished from consumer goods (e.g., passenger cars) in that the former provide for future wants, while the latter provide only for the present. Distinction is also made between capital stocks, or circulating capital (e.g., raw materials, goods in process, finished goods, and sometimes wages), and capital instruments, or fixed capital (e.g., machines, tools, railways, and factories). Capital may be classed as specialized, such as railway equipment, or unspecialized, such as lumber or other raw materials having many uses. Economic theorists believe that capital arose out of the need to use the world's limited natural materials efficiently. The scarcity of the earth's resources necessitates the creation of materials (capital) that can act on the resources in such a way as to make more goods available to society than would normally exist. For example, a tractor enables man to coax more corn out of his limited supply of land. Capital is thought to accumulate from savings derived from incomes, presence of monopolies, previous profits, speculation, and recapitalization. See Irving Fisher, *The Nature of Capital and Income* (1906), F. A. von Hayek, *The Pure Theory of Capital* (1941, repr. 1962), B. S. Kerstead, *Capital, Interest, and Profits* (6th ed. 1959), S. S. Kuznets, *Capital in the American Economy* (1961), Donald Dewey, *Modern Capital Theory* (1965), J. F. Childs, *Profit Goals and Capital Management* (1968).

capital gains, see CAPITAL LEVY.

capitalism, economic system characterized by private ownership of property and of the means of production and by well-developed financial institutions. Generally the capitalist system is also thought of as embodying the concepts of freedom of individual initiative, competition, inheritance, and the profit motive. Along with SOCIALISM, it is one of the two major economic systems of the modern world. Capitalism has existed in at least partial form in the economies of all civilizations, but its modern importance dates from the INDUSTRIAL REVOLUTION that began in the 18th cent., when bankers, merchants, and industrialists—the bourgeoisie—began to displace landowners in political, economic, and social importance, particularly in Great Britain. Capitalism stresses freedom of individual economic enterprise, but even when, as in the early 19th cent., the economy was least restricted, the ultimate right of the state to supervise and regulate industry and trade was questioned by few. In the 19th and the early

20th cent., the profit motive called into being vast credit, manufacturing, and distributing institutions, and the social and economic effects of capitalism largely transformed world culture. In the middle of the 20th cent., social and industrial reforms in democratic states and the action of totalitarian governments circumscribed the freedom of economic action in capitalist systems. An epoch-making and extremely detailed analysis of capitalism was made by Karl Marx in *Das Kapital*. See Milton Friedman, *Capitalism and Freedom* (1962), William Ebenstein, *Today's Isms* (6th ed. 1970), Daniel Bell and Irving Kristol, ed., *Capitalism Today* (1971), Fernand Braudel, *Capitalism and Material Life, 1400-1800* (tr. 1973), J. D. Forman, *Capitalism, Economic Individualism to Today's Welfare State* (1973).

capital levy, form of taxation by which the government takes part of the capital of any person or business, as distinguished from a tax on personal or business income. It is usually applied to all capital above a certain minimum and may be set aside for a specific purpose, such as the reduction of the public debt. It was used by several European nations experiencing financial difficulties after World War I, and has been advocated as a measure of social welfare and a deterrent to war profits. Opponents of the capital levy stress its implied penalty on saving. In World War II, Great Britain and the United States resorted to tremendous direct taxation in order to accomplish many of the aims of the capital levy. A special tax on capital gains, at a rate more favorable than the tax rate on earned income, has been a part of the U.S. system since the New Deal. The U.S. capital-gains tax is levied on profits earned by the sale of capital assets, such as stocks. Many other nations also impose taxes on capital gains. See M. J. Bailey, et al., ed., *Taxation of Income From Capital* (1969).

capital punishment, imposition of the death penalty by the state. Capital punishment was widely applied in ancient times; it is found (c. 1750 B.C.) in the Code of Hammurabi. Methods included beheading, stoning, impaling, drowning, and burning. From the fall of Rome to the beginnings of the modern era, capital punishment was practiced throughout Western Europe. Death by burning was carried out in Europe as late as the 18th cent., and in England at the beginning of the 19th cent. over 200 crimes still carried the death penalty. The modern movement for the abolition of capital punishment began in the 18th cent. with the writings of Montesquieu and Voltaire, another strong influence was Cesare BECCARIA, especially his *Essay on Crimes and Punishments* (1764). In Great Britain, Jeremy Bentham was influential in having the number of capital crimes reduced in the 18th and 19th cent. Since then, the movement has continued to gain strength worldwide. By the 1970s only France and Spain in Western Europe still retained the death penalty for crimes. Capital punishment was also practiced in Australia, in Africa, and in most of Asia. On June 29, 1972, the U.S. Supreme Court ruled that capital punishment, because it was being arbitrarily, or inconsistently, imposed, was no longer legal. Although this ruling voided the federal and state death penalty laws then in effect, it left the way open for Congress or state legislatures to enact new capital punishment laws in the future. A number of states enacted such laws soon after the ruling. See John Laurence, *A History of Capital Punishment* (1960), J. A. Joyce, *Capital Punishment: A World View* (1961), H. A. Bedau, ed., *The Death Penalty in America* (2d ed. 1967), J. A. McCafferty, ed., *Capital Punishment* (1972), Michael Meltsner, *Cruel and Unusual* (1973).

Capito, Wolfgang Fabricius (kăp'itō, Ger. völf-gang fabr'itsyōs kă'pētō), 1478-1541, German Protestant reformer, whose original family name was Kopfel. As a well-known humanist, he brought about communication between Erasmus and Luther. Capito worked with Martin BUCER in an attempt to unify the Evangelical churches of Germany, France, and Switzerland.

Capitol, seat of the U.S. government at Washington, D.C. It is the city's dominating monument, built on an elevated site that was chosen by George Washington in consultation with Major Pierre L'ENFANT. The building as it now stands took many years to build and is the result of the work of several architects. In 1792 a competition was held to select an architect, but William THORNTON gained the President's approval with a plan separately submitted and was appointed. In 1793 the President set the cornerstone, with Masonic rites, and the building was begun. Later three additional architects were employed—E. S. HALLET, George Hadfield (d. 1826),

and James HOBAN. In 1814 the uncompleted building was burned by the British, and B. H. LATROBE, who had been appointed (1803) surveyor of public buildings, undertook its restoration. He was succeeded in 1818 by Charles BULFINCH, who brought the design to completion in 1830. The building proved inadequate and was greatly enlarged (1851-65) by T. U. WALTER, who added the extensive House and Senate wings at either end and the imposing dome, c. 288 ft (90 m) in height, which dominates the composition. The building proper is over 750 ft (229 m) long, including approaches c. 350 ft (110 m) wide. In 1960 the east front of the Capitol was extended 32 ft (9.8 m) and the original sandstone facade was replaced by marble. See I. T. Frary, *They Built the Capitol* (1940), L. Aikman, *We, The People* (4th ed. 1966).

Capitol, in Rome. See CAPITOLINE HILL.

Capitoline Hill or **Capitol**, highest of the seven hills of ancient Rome, historic and religious center of the city. The great temple of Jupiter Capitolinus, on its southern summit, was dedicated in 509 B.C., it was foremost among the temples and altars of Rome. Destroyed three times by fire, it was last rebuilt by the emperor Domitian. On the northern summit of the Capitol was the citadel (arx). On the side overlooking the Forum stood the Tabularium, where the state archives were kept. Until the 1st cent. A.D., state criminals were hurled to their death from the Tarpeian Rock, on the steep south face of the hill. In the Middle Ages the Capitol remained the political center of Rome. The center of municipal government in modern Rome is on the same location. In the 16th cent. Michelangelo designed the present plan. A flight of steps leads to the square on top of the hill, on one side of the square is the Palazzo dei Conservatori, on the other, the Capitoline Museum. Both buildings now house collections of antiquities. In the center of the square is the ancient equestrian bronze statue of Emperor Marcus Aurelius.

Capitol Reef National Park: see NATIONAL PARKS AND MONUMENTS (table).

capitularies (kăp'ich'ōlēr'ēz), decrees and written commands of the Carolingian kings of the Franks, so called because they were divided into *capitula*, or chapters. Both legislative and administrative, they were the chief written instrument of royal authority. The ordinances were issued either by the king alone or by the king and his counselors. They also served to amend or extend the GERMANIC LAWS as they applied to the entire Carolingian empire. Several capitularies—such as the exemplary *De villis*—dealt with the administration of the royal domains, others dealt with the church. Most important were the *missi dominici*, addressed by Charlemagne to his envoys. These contained instructions for the administration of the empire and instituted far-reaching reforms. Capitularies issued in the late Carolingian period foreshadowed the feudal system and are collected in the *MONUMENTA GERMANIAE HISTORICA*. The term *capitularies* is applied also to similar documents in other fields.

Capo d'Istria, Giovanni Antonio, Count (ka'pō dē'strēa), Gr. *Ioannes Antonios Kapodistrias* or *Kapodistrias*, 1776-1831, Greek and Russian statesman, b. Corfu. After administrative work in the Ionian Islands he entered (1809) Russian service and was until 1822 a close adviser in foreign affairs to Czar Alexander I, he represented Russia at the Congress of Vienna. After his resignation and retirement to Switzerland in 1822, he actively elicited support for Greek independence. In 1827 the Greek national assembly elected him president of Greece. He was a dedicated reformer, but his autocratic methods, nepotism, factionalism, and Russian affiliations aroused opposition and led to his assassination. See studies by W. P. Kaldis (1963) and C. M. Woodhouse (1973).

Capodistria: see KOPER, Yugoslavia.

Capone, Al (Alfonso or Alphonse Capone) (kăpōn'), 1899-1947, American gangster, b. Naples, Italy. Brought up in New York City, he became connected with organized crime and was involved in murder investigations. In 1920 he moved to Chicago and became a lieutenant to John Torrio, a notorious gang leader. They established numerous speakeasies in Chicago in the prohibition era. After eliminating his opponents "Scarface" Capone took over control from Torrio. He was implicated in brutal murders and received tribute from businessmen and politicians. His crime syndicate—which terrorized Chicago in the 1920s and controlled gambling and prostitution there—was estimated by the Federal Bureau of Internal Revenue to have taken in \$105 million in

1927 alone. Capone was indicted (1931) by a Federal grand jury for evasion of income tax payments and was sentenced to an 11-year prison term. In 1939, physically and mentally shattered by syphilis, Capone was released. See biographies by F. D. Pasley (1930, repr. 1971) and John Kobler (1971), Kenneth Allsop, *The Bootleggers and Their Era* (1970).

Capote, Truman (kapō'tē), 1924-, American author, b. New Orleans. His fictional writings reflect a private but highly imaginative world of grotesque, narcissistic, and strangely innocent people. *Other Voices, Other Rooms* (1948), his first novel, is the story of a young boy's painful search for identity. He has published another novel, *The Grass Harp* (1951), two collections of short stories, *Tree of Night* (1949) and *Breakfast at Tiffany's* (1958), a report of his trip to Russia, *The Muses Are Heard* (1956), *A Christmas Memory* (1966), and a collection of nonfiction pieces, *The Dogs Bark: Public People and Private Places* (1973). He also collaborated on the screenplay for the film *Beat the Devil* (1953). In 1966, Capote published *In Cold Blood*, a chilling, semidocumentary study of a senseless, brutal murder in Kansas, which he called a "nonfiction novel."

Cappadocia (kăpădō'shā), ancient region of Asia Minor, watered by the Halys River (the modern Kizil Irmak), in present E. central Turkey. The name was applied at different times to territories of varying size. At its greatest extent Cappadocia stretched from the Halys valley E. to the Euphrates River, from the Black Sea S. to the heights of the Taurus and Anti-Taurus ranges. Mostly a high plateau, it was famous for its mineral resources, particularly its copper and iron. Cappadocia maintained its local Asian traditions in contrast to the Mediterranean seacoast of Asia Minor, which was dominated by the Aegean culture. Several thousand tablets, written in cuneiform by Assyrian colonists in Cappadocia, have been found at Kültepe (Kanish), they show that a highly developed trade existed between Assyria and Asia Minor before 1800 B.C. At that time Cappadocia was the heart of an old Hittite state. Later the Persians controlled Cappadocia. It did not yield fully to the conquest of Alexander the Great, and during the 3d cent. B.C. it gradually developed as an independent kingdom. PONTUS now became completely separated from Cappadocia. The kings had their capital at Mazaca (later CAESAREA MAZACA), the only other important cities were Tyana and Melitene, though Iconium was at times in Cappadocia. In the 2d and 1st cent. B.C. the Cappadocian dynasty maintained itself largely by siding with Rome. Invaded in 104 B.C. by Mithridates VI and c. 90 B.C. by his son-in-law, Tigranes of Armenia, Cappadocia was restored by Pompey. Antony replaced the king, who had been disloyal to Rome in the Parthian invasion at the time of Julius Caesar, and in A.D. 17 Rome annexed the region as a province. Cappadocia became prosperous. Christianity was introduced early (1st cent. A.D.). The name appears in the Bible, though its importance as a separate region was already declining and later disappeared.

Capponi, Gino, Marchese (jē'nō kap-pō'nē), 1792-1876, Italian politician, historian, and educator. He played an important part in the Risorgimento. His theory of education anticipated the thought of John Dewey. In 1848 he was president of the constitutional government in Tuscany, and he became a senator after the annexation (1860) of Tuscany to the kingdom of Sardinia. Of his historical writings, the history of the Florentine republic (3 vol., 1875) is best known.

Caprera (kaprā'ra), island, 6 sq. mi. (15.5 sq. km), NE Sardinia, Italy, in the Strait of Bonifacio. It was the residence (1856-82) of Garibaldi, who is buried there.

Capri (ka'prē), Lat. *Capreae*, island (1971 pop. 7,725), 4 sq. mi. (10.4 sq. km), Campania, S. Italy, in the Bay of Naples off the tip of the Sorrento Peninsula. It is an international tourist center, celebrated for its striking scenery, delightful climate, and luxurious vegetation. There are two small towns on the island, Capri and Anacapri. The Blue Grotto is the most famous of the many caves along the island's high, precipitous coast. Monte Solaro, the highest point (1,932 ft/589 m), commands a magnificent view. On the island are remains of the 12 fine villas built there by the Roman emperors Augustus and Tiberius. The local architecture has Roman, Norman, and Arabic features.

Capricornus (kăprīkōr'nās) [Lat. = the goat horn], inconspicuous southern CONSTELLATION lying on the ECLIPtic (the sun's apparent path through the heavens) between Sagittarius and Aquarius, it is one of the constellations of the ZODIAC. Known as the Sea

Goat, it has been depicted from earliest times either as a goat or as a figure with its forepart like that of a goat and its hind part like the tail of a fish. The tropic of Capricorn takes its name from this constellation, in which the winter solstice was located about 2,000 years ago. Now, because of the PRECESSION OF THE EQUINOXES, the winter solstice has moved westward into Sagittarius. Capricornus contains a globular STAR CLUSTER that can be seen on a very clear night. The constellation reaches its highest point in the evening sky in late September.

caprifig (kăp'räfīg") see FIG

Caprivi, Leo, Graf von (lä'ō gräf fən kăprē'vê), 1831-99, German chancellor, whose full name was Georg Leo, Graf von Caprivi de Caprara de Montecuculi. A former army officer and head of the admiralty, he succeeded (1890) Bismarck as chancellor. Under him the antisocialist law was abrogated and military service was shortened from three to two years. Favoring industrial over agrarian interests, he negotiated (1892-94) a series of reciprocal trade agreements to stimulate industrial exports. The agreements reduced duties on agricultural products and aroused agrarian opposition to Caprivi, which contributed to his dismissal (1894). Prince Hohenlohe-Schillingsfürst succeeded him as chancellor.

Caprivi Strip (kăprē'vê) or **Caprivi Zipfel** (tsîp'fâl) [Ger. *Zipfel*=tip, point], region, c.300 mi (480 km) long and 50 mi (80 km) wide, NE South West Africa, bordered on the N by Angola and Zambia and on the S by Botswana. It is named for the German chancellor Leo, Graf von Caprivi, who obtained it from Great Britain as part of a general settlement (1890) between the two countries. It gave the former German colony of South West Africa access to the Zambezi River.

Caspian culture see QAFAH, Tunisia

Captain Jack (d. 1873), subchief of the MODOC INDIANS and leader of the hostile group in the MODOC WAR (1872-73). Jack, whose Indian name was Kintpuash, had agreed (1864) to leave his ancestral home and live on a reservation with the Klamath Indians. He found it impossible to live on friendly terms with his former enemies, and after killing a Klamath medicine man, Jack and a group of followers left the reservation. They resisted arrest (Nov. 1872) and fled into the lava beds in California. Their strong defensive position frustrated numerous attempts by U.S. troops to dislodge them. In April, 1873, a peace commission headed by Gen. Edward Richard Sprigg CANBY met with Jack and several of his men. At a prearranged signal, Jack shot Canby dead. The army renewed its efforts to capture them and forced the Modocs to take refuge elsewhere. The Indians, who were tired of fighting, began to give themselves up, and on June 1, Captain Jack was captured. He was taken to Fort Klamath, where on Oct. 3, 1873, he and three of his warriors were hanged for the murder of Canby. See biography by D. P. Payne (1938).

Capua (kă'pwā), town (1971 pop. 17,581), Campania, S Italy, on the Volturno River. It is an agricultural center and occupies the site of ancient CASILINUM. Ancient Capua, situated 3 mi (4.8 km) to the south-east, where Santa Maria Capua Vetere (1968 est. pop. 31,500) now lies, was a Roman town strategically located on the Appian Way. During the second of the PUNIC WARS it went over (216 B.C.) to the side of Hannibal, but was retaken by Rome in 211 B.C. Later it was an important colony under the Roman Empire. After Capua was destroyed (A.D. 841) by the Arabs, its inhabitants moved to Casilinum and founded modern Capua. Strongly fortified to defend nearby Naples, Capua suffered several sieges, including ones by Cesare Borgia (1501) and the Piedmontes (1860). Of note are a Roman bridge, a 9th-century cathedral (frequently restored), an 11th-century castle, and a museum of archaeology and sculpture.

Capuana, Luigi (lōō'e'jē kăpwā'nā), 1839-1915, Italian critic and novelist. His activities included teaching, scientific study, and politics. He wrote in almost every genre, but his reputation rests upon his naturalistic novels and criticism. Among his best works are the short stories in *Paesane* [peasant women] (1894), the novel *Il marchese di Roccaverdina* (1901), and his *Studi della letteratura contemporanea* (1879-82). His stories for children include *Nimble Legs* (1903, tr. 1927) and *Once upon a Time* (1882, tr. 1892). See study by S. E. Scaglia (1952).

Capuchin (kăp'yōōchîn), name for New World MONKEYS of the genus *Cebus*, widely distributed in tropical forests of Central and South America. Medium-sized monkeys, they have a body length of 14 to 24 in. (36-61 cm), with a tail up to 20 in. (50 cm) long,

and weigh 2 to 4 lb (0.9-1.8 kg). The coat is black or brown, with lighter markings on the chest in some species. The flattened face is naked and pink. Members of some species have manes resembling the cowls of capuchin monks. The tail is partially prehensile, that is, it can be used for grasping but not with the dexterity displayed by most New World monkeys. It is usually carried with the end curled in a spiral, hence the alternate name, ringtail monkey. Capuchins travel in groups through the trees, making loud sounds, and rarely descend to the ground. They feed on leaves, fruit, insects, small animals, and bird eggs. Intelligent and friendly, they are easily trained and are well known from circuses and as the classic organ-grinder's monkey. In the wild they use simple tools, such as rocks, for such tasks as cracking the hard shells of fruits. They are classified in the phylum CHORDATA, subphylum Vertebrata, class Mammalia, order Primates, family Cebidae.

Capuchins (kăp'yōōchînz) [Ital. =hooded ones], Roman Catholic religious order of friars, one of the independent orders of FRANCISCANS, officially the Friars Minor Capuchin [Lat. abbr. O.M. Cap.]. The order was founded (1525-28) in central Italy as a reform within the Observants, led by Matteo di Basilio. It is one of the largest orders. Born, like the Jesuits, at the beginning of the Catholic Reformation, the Capuchins became a major force in church activity, especially in preaching and in missions. With the Jesuits they did much to revive Catholicism in the parts of Europe where Protestantism had prevailed. The Capuchins have been very important in foreign missions; they were early arrivals in French Canada. See study by Father Cuthbert (1928, repr. 1971).

Capulin Mountain National Monument: see NATIONAL PARKS AND MONUMENTS (table)

capybara (kăpibār'ā), mammal of Central and much of South America. It is the largest living member of the order Rodentia (the rodents) reaching a length of 4 ft (120 cm) and a weight of 75 to 100 lb (34-45 kg). Its brownish hair flecked with yellow is coarse and scanty, and its tail rudimentary. The feet are partially webbed, and there are four thick-nailed toes on the front feet and three on the hind feet. The capybara is an expert swimmer and diver. It eats vegetation and sometimes damages crops. It is hunted for food; its hide is made into gloves, and its bristles are used in brushes. It is also called water hog and carpincho. Capybaras are classified in the phylum CHORDATA, subphylum Vertebrata, class Mammalia, order Rodentia, family Hydrochoeridae.

Caquetá, river, Colombia. See JAPURA

caracal (kăr'akāl), or Persian lynx, mammal of the family Felidae (cat family), native to Asia and Africa. It is considered by some to be a link between the true cats and the true LYNXES. It is reddish brown with black-tufted ears. Its total length is about 3¼ ft (105 cm). It preys on small deer, hares, birds, and other animals, in some regions it is trained to catch such game for man. Caracals are classified in the phylum CHORDATA, subphylum Vertebrata, class Mammalia, order Carnivora, family Felidae.

Caracalla (kărakāl'ā), 188-217, Roman emperor (211-17), son of Septimius SEVERUS. His real name was Marcus Aurelius Antoninus, and he received his nickname from the caracalla, a Gallic tunic he regularly wore. He was made caesar in 196 and augustus in 198, but he resented having to share these honors with his brother Geta. Early in his career he revealed his ruthless character by bringing about the downfall of his father-in-law, the political leader Plautianus, through false reports. After Septimius Severus died, leaving the empire to his two sons, Caracalla murdered (212) the more popular Geta and ordered a general massacre of Geta's followers and sympathizers (including the jurist Papinian). He thus ushered in a reign infamous for cruelty and bloodshed. Caracalla did, however, pacify the German frontier. He also extended Roman citizenship to all free inhabitants of the empire, presumably not out of generosity but to increase his income from taxes in order to meet staggering expenses. He tried to buy popularity with his soldiers and planned an ambitious campaign to extend his father's conquests into old Persia. When leading an expedition in Asia, Caracalla was murdered by MACRINUS, who succeeded him. The famous Baths of Caracalla were erected in his reign.

caracara (kăr'ākār'ā) see FALCON

Caracas (kărāk'as, kărā'-, Span. kărākās), city (1970 est. metropolitan area pop. 2,175,438), N Venezuela, the capital and largest city of the country, near the Caribbean Sea. Its port is La Guaira. With an elevation of c. 3,100 ft (945 m), Caracas has a pleasant

climate, which contributed to making it rather than Valencia the economic and political center of Spanish colonization in Venezuela. Caracas is the commercial, industrial, and cultural hub of the nation. As a result of the oil boom of the 1950s the city expanded prodigiously. Enormous sums were spent on public works, notably the futuristic University City, school construction, slum clearance projects, a new aqueduct, and an impressive highway cloverleaf, known to Caracans as "the octopus." The symbol of the new Caracas is the twin-towered complex housing government offices known as Centro Bolívar. A colossal shopping center, the Helicoid, was built on a hill outside the city. In addition to oil refining, industries include textile milling, sugar refining, and meat-packing. Caracas was founded in 1567 as Santiago de Leon de Caracas by Diego de Losada. The city was sacked by the English in 1595 and by the French in 1766. Two of South America's great revolutionary leaders, Francisco de Miranda (1750) and Simon Bolívar (1783) were born in the city. Independence from Spain was declared in Caracas in July, 1811. However, the city was almost completely destroyed by an earthquake on March 26, 1812, negating the revolution led by Miranda. Bolívar captured the city in Aug., 1813, but abandoned it after a crushing defeat in June, 1814. Finally, after his victory at Carabobo, he made a triumphal entry in June, 1821.

Caractacus (kărāk'takəs) or **Caradoc** (kărād'ak), fl. A.D. 50, British king, son of Cymbeline. After the Roman invasion of A.D. 43, he led British resistance until defeated in A.D. 50. He was captured and taken to Rome. Emperor Claudius, admiring his courage, spared his life.

Caragiali, Ion Luca (yōn lōō'kă kărājā'li), 1853-1912, Rumanian author and theatrical manager. In 1888 he became director of the Bucharest National Theater. Among his comedies satirizing the modernization of Rumanian society are *The Lost Letter* (1884) and *Carnival Adventures* (1885). His *False Accusation* (1889) is a tragedy. Caragiali also wrote short stories and novels.

Caraglio, Giovanni Jacopo (jōvăn'nê yă'kōpō kărājō'lyō), c. 1500-1565, Italian engraver and designer, known also as Jacobus Parmensis and Jacobus Veronensis. He was a pupil of Raimondo and achieved distinction as an engraver on copper and, later, as a designer of medals and engraver of gems. His plates, about 70 in number, are chiefly reproductions of works of the Italian masters—Raphael, Titian, Michelangelo, and others.

Caraites: see KARAITES

carapace (kăr'apās), shield, or shell covering, found over all or part of the dorsal portion of an animal. In lobsters, shrimps, crayfish, and crabs the carapace is the part of the exoskeleton that covers the head and thorax and protects the dorsal and lateral surfaces. The term carapace is also used to describe the hard, protective covering of the cephalothorax of the horseshoe crab. The carapace of a turtle's shell is composed of expanded ribs and vertebrae overlain by dermal plates and horny scales.

Carausius (kărōsh'ēas), d. 293, Gallo-Roman military commander. He was stationed in Gaul, but Emperor MAXIMIAN suspected him of conspiring with the Germans and condemned him to death. Carausius fled to Britain and established his rule there, defying attempts to conquer him. Diocletian and Maximian finally recognized (c. 289) him as coemperor, and he established his rule in NE Gaul as well as in Britain. In 293, however, Constantius (later Constantine I) defeated him, and he was murdered by one of his own men.

Caravaca (kărāvākā), town (1970 pop. 18,415), Murcia prov., SE Spain, in Murcia, on the Caravaca River. It is a farm center for an area producing cereals, potatoes, fruits, and grapes. It has textile and brandy manufactures. The miraculous Cross of Caravaca was formerly kept in the Church of the Most Holy Cross (1617). Many ancient remains have been found in the area.

Caravaggio, Michelangelo Merisi da (mēkālān'-jālō mărē'zē dă kărāvād'jō) or **Amerigi da Caravaggio** (ă'mărē'jē), 1573-1610, Italian painter. His surname Caravaggio came from his birthplace. After an apprenticeship with a mediocre painter in Milan, he arrived in Rome where he eventually became a pensioner of Cardinal Francesco del Monte for whom he produced several paintings, among them the *Concert of Youths* (Metropolitan Mus.). Most of Caravaggio's genre pieces such as the *Fortune Teller* (Louvre) are products of his early Roman years, but after completing the *Calling of St. Matthew* and the *Martyrdom of St. Matthew* (c. 1598-99, San Luigi de'

Francesi), he devoted himself almost exclusively to religious compositions and portraiture. His violent temper and erratic disposition involved him in several brawls, and in 1606 he fled Rome after killing a young man in a duel. He spent the last four years of his life in Naples, Malta, Syracuse, and Messina. A revolutionary in art, Caravaggio was accused of imitating nature at the expense of ideal beauty. In religious scenes his use of models from the lower walks of life was considered irreverent. He generally worked directly on the canvas, a violation of current artistic procedure. His strong chiaroscuro technique of partially illuminating figures against a dark background was immediately adopted by his contemporaries, and although he had no pupils, the influence of his art was enormous. Its effect can be seen throughout Europe, from Ribera in Spain to Rembrandt in Holland. See study by Bernard Berenson (1954), Walter Friedlaender, *Caravaggio Studies* (1955, repr., 1970).

Caravaggio, Polidoro Caldara da (pōlēdō'rō kal'da'ra), c.1496-1543, Italian painter. His surname Caravaggio came from his birthplace. A student of Raphael, he was responsible for some of the monochrome decorations in the Vatican Stanze as well as for a few of the scenes in the Loggia. After Raphael's death (1520) Polidoro entered upon a career as a decorator of house facades. These chiaroscuro decorations, based on scenes taken from ancient history, survive now mainly through engravings and drawings. Greatly admired in his own time, Polidoro exercised considerable influence on later generations. In 1527 he left Rome, traveling to Naples and Messina. Of his paintings from this period the *Christ on the Way to Calvary* (Naples) is perhaps the most impressive.

caravan, group of travelers or merchants banded together and organized for mutual assistance and defense while traveling through unsettled or hostile country. Caravan trade is associated with the history of the Middle East as far back as the records of ancient civilizations extend and seems to have been well developed before sea commerce began. It is evident that all trade from one fertile area to another in this region had to be organized from the first, since long distances of desert trail separated settled parts and since local governments could not guarantee protection against tribes eager for loot and pillage. Such wares as jewels, spices, perfumes, dyes, metals, rare woods, ivory, oils, and textiles (chiefly silk) are associated with the trade. Camels were the main carriers from Egypt to Mesopotamia and throughout the Arabian peninsula. They were introduced into N. Africa and the Sahara region in the 3d cent. A.D. Donkeys were used in Asia Minor. Trade naturally prospered in the period of the great empires, when the caravan routes could be controlled and protected, and it was to secure control of such routes that many wars were fought and conquests made in ancient times. An empire provided for the establishment of inns, or caravansaries, for the accommodation of travelers along the way. Such improvements facilitated the movement of troops to protect the routes. Cities rose and fell in ancient times in proportion to the rise and fall in the trade of the caravan routes upon which they were located. Basically the caravan system underwent little change until challenged in modern times by the motor truck and the airplane. Travelers having occasion to cross desert spaces usually joined merchant caravans. Since the advent of Islam, the pilgrimage of the devout to Mecca has given rise to the long pilgrim caravans that are a feature of the pilgrimage season each year. The closest approach to caravan trade in the New World was the wagon train commerce that developed over the Santa Fe Trail. See Mikhail Rostovtzev, *Caravan Cities* (1932, repr. 1971), E. W. Bovill, *The Golden Trade of the Moors* (1958).

caravel (kā'rəvēl') or **carvel** (kā'rəvəl), three-masted sailing vessel, generally square-rigged with the aftermast lateen-rigged. It had a roundish hull with a high bow and stern. The term "carvel-built" (see BOAT) was derived from its method of construction. A change from bulkier ships to caravels, with their small displacement, enabled the Portuguese in the 15th cent. to take the lead among Western nations in exploring the African coast, the caravel thereafter was of primary importance in the era of expansion and exploration. Columbus's flagship, the *Santa María*, was a typical caravel.

Caraway, Hattie Wyatt, 1878-1950, U.S. Senator (1932-45), b. near Bakerville, Tenn. In 1932 she was appointed to fill the unexpired Senate term from Arkansas of her late husband, Thaddeus H. Caraway.

With the support of Huey Long, she was elected for a full term later that year, becoming the first woman to be elected to the U.S. Senate. After failing to win renomination in 1944, she was appointed (1945) by President Franklin Delano Roosevelt to the Federal Employees Compensation Commission.

caraway (kā'rəwā), biennial Old World plant (*Carum carvi*) of the family Umbelliferae (CARROT family), cultivated in Europe and North America for its aromatic seeds. They are small and ovate, with a pleasant spicy flavor, and are used as a condiment, as seasoning of pastry and bread doughs, cabbage, sausage, and some kinds of cheese, and as flavoring for certain liqueurs (as kummel). The volatile oil expressed from the seeds is a stimulant and a carminative. Caraway is classified in the division MAGNOLIOPHYTES, class Magnoliopsida, order Umbellales, family Umbelliferae.

carbaryl (kā'rəbəl) see INSECTICIDE

carbide, any one of a group of compounds that contain carbon and one other element that is either a metal, boron, or silicon. Generally, a carbide is prepared by heating a metal, metal oxide, or metal hydride with carbon or a carbon compound. Calcium carbide, CaC_2 , can be made by heating calcium oxide and coke in an electric furnace; it reacts with water to yield acetylene and is an important source of the gas. Barium carbide reacts similarly. Aluminum carbide reacts with water to yield methane. Some carbides are unaffected by water, e.g., chromium carbide and silicon carbide. SILICON CARBIDE, almost as hard as diamond, is used as an abrasive. Tungsten carbide, also very hard, is used for cutting edges of machine tools. Iron carbides are present in steel, cast iron, and some other iron alloys.

Carbo, Cneius Papirius (nē'əs pāpē'ēəs kā'r'bō), d. 82 B.C., Roman political leader. He was consul three times (85 B.C., 84 B.C., 82 B.C.) and one of the leaders of the party of Marius. After the death of Marius he and his colleague, Cinna, gathered (84 B.C.) an army to oppose Sulla in Italy. When Cinna was murdered in a mutiny, Carbo became chief commander. Sulla gathered strength as he moved slowly N. through Italy, and much of Carbo's force deserted. He was defeated at Faventia (present-day Faenza) by Quintus Caecilius Metellus Pius (see under METELLUS) and fled to Africa. He later crossed to Sicily, where he was captured, condemned, and executed by Pompey.

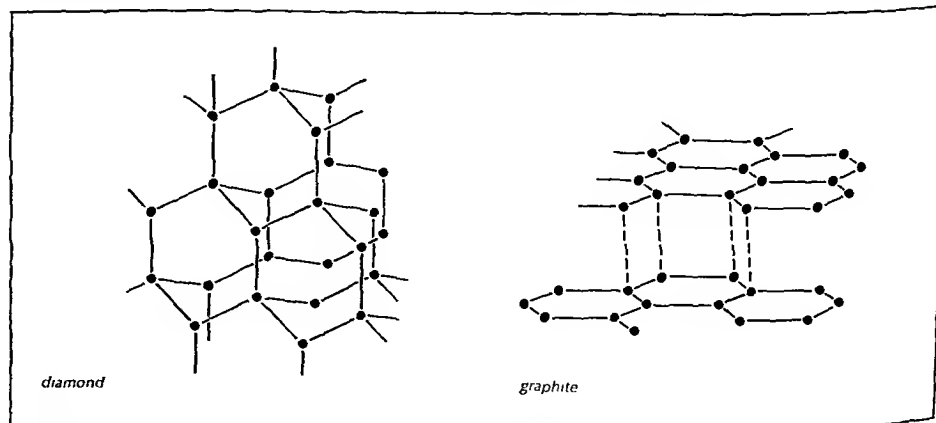
carbohydrate, any member of a large class of chemical compounds that includes sugars, starches, cellulose, and related compounds. These compounds are produced naturally by green plants from carbon dioxide and water (see PHOTOSYNTHESIS). Carbohydrates are important as foods, they supply energy and are used in the production of fats. They are also used in various forms in industry and commerce. There are three main classes of carbohydrates. Monosaccharides are the simple sugars, e.g., FRUCTOSE and GLUCOSE, they have the general formula $(\text{CH}_2\text{O})_n$, in which n is an integer larger than 2. Disaccharides include LACTOSE, MALTOSE, and SUCROSE. Upon hydrolysis, a disaccharide molecule yields two monosaccharide molecules. Most disaccharides have the general formula $\text{C}_n(\text{H}_2\text{O})_{n-1}$, with n larger than 5. Polysaccharides include such substances as CELLULOSE, DEXTRIN, GLYCOGEN, and STARCH, they are polymeric compounds made up of the simple sugars and can be hydrolyzed to yield simple

sugars. The disaccharides are sometimes grouped with the simpler polysaccharides (usually those made up of three or four simple sugar units) to form a class of carbohydrates called the oligosaccharides.

carboloid acid, see PHENOL

carboly (kā'rəbəl) [portmanteau word from carbon and alloy], an alloy containing cobalt, tungsten, and carbon. This alloy is extremely hard, harder than steel, it is used to cut steel, porcelain, quartz, and other materials. Its hardness is little affected by heat, and it retains a sharp cutting edge even at red heat.

carbon [Lat. = charcoal], nonmetallic chemical element, symbol C, at no. 6, at wt. 12.011, m.p. about 3550°C, graphite sublimes about 3375°C, b.p. 4827°C, sp. gr. 1.8-2.1 (amorphous), 1.9-2.3 (graphite), 3.15-3.53 (diamond), valence +2, +3, +4, or -4. Although carbon makes up only 0.32% of the earth's crust, it is very widely distributed and forms a vast number of compounds. There are more carbon compounds than there are compounds of all other elements combined. Carbon exists in the stars, a series of thermonuclear reactions called the carbon cycle (see NUCLEOSYNTHESIS) is a source of energy for some stars. Carbon in the form of diamonds has been found in meteorites. It is found free in nature in at least three distinct forms (see ALLOTROPY). One form, GRAPHITE, is a very soft, dark gray or black, lustrous material with either a hexagonal or rhombohedral crystalline structure. DIAMOND, a second crystalline form, is the hardest substance known. In a third form, the so-called amorphous carbon, the element occurs partly free and partly combined with other elements, CHARCOAL, COAL, COKE, lampblack, PEAT and LIGNITE are some sources of amorphous carbon. A fourth form, "white" carbon, is believed to exist. Carbon has the capacity to act chemically both as a metal and as a nonmetal. It is a constituent of all organic matter. The study of carbon compounds, both natural and synthetic, is called organic chemistry. PLASTICS, foods, TEXTILES, and many other common substances contain carbon. HYDROCARBON fuels (e.g., natural gas), marsh gas, and the gases resulting from the combustion of fuels (e.g., carbon monoxide and carbon dioxide) are compounds of carbon. With oxygen and a metallic element, carbon forms many important carbonates, such as calcium carbonate (limestone) and sodium carbonate (soda). Certain active metals react with it to make industrially important carbides, such as silicon carbide (known as carborundum), calcium carbide, used for producing acetylene gas, and tungsten carbide, an extremely hard substance used for rock drills and metalworking tools. Coke is used as a fuel in the production of iron. Carbon electrodes are widely used in electrical apparatus. The "lead" of the ordinary pencil is graphite mixed with clay. The successful linking in the 1940s of carbon with silicon has led to the development of a vast number of new substances known collectively as the SILICONES. All living organisms contain carbon, the human body is about 18% carbon by weight. In green plants carbon dioxide and water are combined to form simple sugars (CARBOHYDRATES), light from the sun provides the energy for this process (PHOTOSYNTHESIS). The energy from the sun is stored in the chemical bonds of the sugar molecule. Anabolism, the synthesis of complex compounds (such as FATS, PROTEINS, and NUCLEIC ACIDS) from simpler substances, involves the utilization of energy stored by photosynthesis. Catabolism is the release of stored energy by the ox-



The two solid forms of carbon. In the diamond crystal each carbon atom is surrounded symmetrically by four other carbons (at each of the corners of a tetrahedron). In the graphite crystal the atoms bond to three other carbons to form flat sheets.

dative destruction of organic compounds, water and carbon dioxide are two by-products of catabolism. This continuing synthesis and degradation involving carbon dioxide is known as the biological carbon cycle. Seven isotopes of carbon are known. Carbon-12 was chosen by the IUPAC in 1961 as the basis for ATOMIC WEIGHTS; it is assigned an atomic mass of exactly 12 atomic mass units. Carbon-13 is used as a radioactive tracer. Carbon-14, which has a half-life of 5,730 years, is a naturally occurring isotope that can also be produced in a nuclear reactor. It is used extensively as a research tool in tracer studies; a compound synthesized with carbon-14 is said to be "tagged" and can be traced through a chemical or biochemical reaction. Carbon-14 has been used in the study of such problems as utilization of foods in animal nutrition, catalytic petroleum processes, photosynthesis, and the mechanism of aging in steel. It is also used for determining the age of archaeological specimens (see DATING, GEOLOGIC). Carbon has been known to man in its various forms since ancient times. See Isaac Asimov, *The World of Carbon* (rev. ed. 1966), P. L. Walker, Jr., and P. A. Thrower, ed., *Chemistry and Physics of Carbon* (11 vol., 1966-74).

carbonado: see DIAMOND

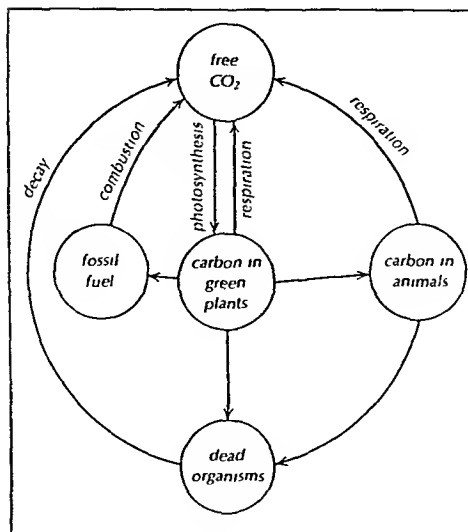
Carbonari (kãrbônã'rã) [Ital., =charcoal burners], members of a secret society that flourished in Italy, Spain, and France early in the 19th cent. Possibly derived from Freemasonry, the society originated in the kingdom of Naples in the reign of Murat (1808-15) and drew its members from all stations of life, particularly from the army. It was closely organized, with a ritual, a symbolic language, and a hierarchy. Beyond advocacy of political freedom its aims were vague. The Carbonari were partially responsible for uprisings in Spain (1820), Naples (1820), and Piedmont (1821). After 1830 the Italian Carbonari gradually were absorbed by the RISORGIMENTO movement, elsewhere they disappeared.

carbonate, chemical compound containing the carbonate RADICAL or ION, CO_3^{2-} . Most familiar carbonates are SALTS that are formed by reacting an inorganic BASE (e.g., a metal HYDROXIDE) with CARBONIC ACID. Normal carbonates are formed when equivalent amounts of acid and base react, bicarbonates, also called acid carbonates or hydrogen carbonates, are formed when the acid is present in excess. SODIUM CARBONATE, Na_2CO_3 , SODIUM BICARBONATE, NaHCO_3 , and POTASSIUM CARBONATE, K_2CO_3 , are widely used. Smelling salts is ammonium carbonate. Calcium carbonate is found in shells of animals and in ICELAND SPAR, LIMESTONE, and MARBLE; it is used in the production of lime (CALCIUM OXIDE). Barium carbonate occurs as the mineral witherite. Magnesium carbonate occurs as MAGNESITE and in DOLOMITE (with calcium carbonate). Iron carbonate is a ferrous compound that occurs in nature as SIDERITE. WHITE LEAD used as a pigment in paints is basic lead carbonate. Only ammonium, potassium, and sodium carbonates are readily soluble in water. Alkali metal carbonates are stable when heated, but other carbonates decompose, releasing CARBON DIOXIDE. Carbonates also give off carbon dioxide when treated with dilute acids, e.g., hydrochloric acid.

carbon black, mixture of partially burned hydrocarbons. Carbon black is produced by partial combustion of NATURAL GAS. It is used as a black pigment for inks and paints, and is used in large amounts by the tire industry in the production of vulcanized rubber. Lampblack resembles carbon black, but is produced by burning liquid hydrocarbons, e.g., kerosene; it is often somewhat oily, is duller than carbon black, and may have a bluish undertone. It is sometimes used in making contact brushes for electrical apparatus.

carbon cycle, in biology, the exchange of carbon between living organisms and the nonliving environment. Living organisms are composed of matter derived from the environment and engage in a continual exchange of matter with their surroundings; as old cells die and their materials return to the environment, new cells are formed of newly incorporated substances. Carbon is the central element in most compounds of which organisms are composed, and it is derived from free carbon dioxide, that found in air (or, in an aquatic environment, in water). The process of incorporating inorganic molecules into the more complex molecules of living matter is called fixation. Nearly all carbon dioxide fixation is accomplished by means of PHOTOSYNTHESIS, in which green plants form carbohydrates from carbon dioxide and water, using the energy of sunlight to drive the chemical reactions involved. A few microorganisms fix insignificant amounts of carbon

dioxide by using other energy sources, such as oxidation of iron. Green plants use carbohydrates to build the other organic molecules that make up



Carbon cycle

their cells, such as cellulose, fats, proteins, and nucleic acids. Some of these compounds require the incorporation of nitrogen (see NITROGEN CYCLE). When carbohydrates are oxidized in cells they release the energy stored in their chemical bonds, and some of that energy is also used by the cell to drive other reactions. In the process of oxidation, or respiration, oxygen from the atmosphere (or from water) is combined with portions of the carbohydrate molecule, producing carbon dioxide and water, the compounds from which the carbohydrates were originally formed. However, not all of the carbon atoms incorporated by the plant can be returned to the atmosphere by its own respiration; some remain fixed in the organic materials that make up its cells. When the plant dies, its tissues are consumed by bacteria and other microorganisms, a process called decay. These microorganisms, which cannot make carbohydrates from carbon dioxide and water, break down the organic molecules of the plant and use them for their own cell-building and energy needs, by their respiration more of the carbon is returned to the atmosphere. Animals, which likewise cannot make their own carbohydrates, feed on plants or on other animals, ultimately their matter and energy are derived from plants. The carbon-containing molecules that an animal derives from other organisms are reorganized to build its own cells or oxidized for energy by respiration, releasing carbon dioxide and water. When the animal dies it too is decayed by microorganisms, resulting in the return of more carbon to the atmosphere. Carbon-containing molecules in wood (or other dry, slow-decaying organic materials) may be oxidized by burning, or combustion, also producing carbon dioxide and water. Under conditions prevailing on earth at certain times, green plants have decayed only partially and have been transformed into fossil fuels—coal, peat, and oil. These materials are made of organic compounds formed by the plants, when burned, they too restore carbon dioxide to the atmosphere.

Carbondale 1 City (1970 pop. 22,816), Jackson co., S Ill., inc. 1869. It is a railroad division point and the retail center of a coal-mining and farming area. Southern Illinois Univ. is the major employer. Memorial Day was inaugurated (1868) in Carbondale by Gen. John A. Logan. Giant City State Park and a wildlife refuge are nearby. 2 Industrial city (1970 pop. 12,808), Lackawanna co., NE Pa., on the Lackawanna River, inc. 1851. Its important activities are anthracite coal mining and the manufacture of mining machinery, machine shop products, chemicals, and clothing. It is also a vacation center in a lake and mountain region. Terence Powderly, the labor leader, was born there.

carbon dioxide, chemical compound, CO_2 , a colorless, odorless, tasteless gas that is about one and one-half times as dense as air under ordinary conditions of temperature and pressure. It does not burn and will not support combustion of ordinary materials. Although it is not a poison, it can cause death by suffocation if inhaled in large amounts. It is a fairly stable compound but decomposes at very high temperatures into carbon and oxygen. It is fairly soluble

in water, one volume of it dissolving in an equal volume of water at room temperature and pressure, the resultant weakly acidic aqueous solution is called CARBONIC ACID. The gas is easily liquefied by compression and cooling. If liquid carbon dioxide is quickly decompressed it rapidly expands and some of it evaporates, removing enough heat so that the rest of it cools into solid carbon dioxide "snow." Carbon dioxide has familiar uses. Formed by the action of yeast or baking powder, it causes the rising of bread dough. It provides the sparkle in carbonated beverages such as soda water. In some fire extinguishers it is expelled through a nozzle and settles on the flame, smothering it. It is a raw material for PHOTOSYNTHESIS in green plants and is a product of animal RESPIRATION. It is also a product of the decay of organic matter. It occurs in nature both free and in combination (e.g., in CARBONATES). It is part of the ATMOSPHERE, making up about 1% of the volume of dry air. Because it is a product of combustion of carbonaceous fuels (e.g., coal, coke, fuel oil, gasoline, and cooking gas), there is usually more of it in city air than in country air. In various parts of the world—notably in Italy, Java, and Yellowstone National Park in the United States—it is formed underground and issues from fissures in the earth. Natural mineral waters such as Vichy water sparkle (effervesce) because excess carbon dioxide that dissolved in them under pressure collects in bubbles and escapes when the pressure is released. The chokedamp (see DAMP) of mines, pits, and old, unused wells is largely carbon dioxide. Carbon dioxide has varied commercial uses. Its greatest use as a chemical is in the production of carbonated beverages; it is also used in water softening, in the manufacture of aspirin and lead paint pigments, and in the SOLVAY PROCESS for the preparation of sodium carbonate. It also has numerous nonchemical uses. It is used as a pressurizing medium and propellant, e.g., in aerosol cans of food, in fire extinguishers, in target pistols, and for inflating life rafts. Because it is relatively inert, it is used to provide a nonreactive atmosphere, e.g., for electric arc welding of steel and for packaging foods, such as coffee, that can be spoiled by oxidation during storage. Solid carbon dioxide, known as dry ice, is used as a refrigerating agent. There are three principal commercial sources for carbon dioxide. High-purity carbon dioxide is produced from some wells. The gas is obtained as a by-product of chemical manufacture, as in the fermentation of grain to make alcohol and the burning of limestone to make lime. It is also manufactured directly by burning carbonaceous fuels. For commercial use it is available as a liquid under high pressure in steel cylinders, as a low-temperature liquid at lower pressures, and as the solid dry ice. A standard test for the presence of carbon dioxide is its reaction with limewater (a saturated water solution of CALCIUM HYDROXIDE) to form a milky-white precipitate of calcium hydroxide.

carbon disulfide, CS_2 , liquid organic compound, it is colorless, foul-smelling, flammable, and poisonous. It can be prepared by direct reaction of carbon, e.g., as charcoal, with sulfur. It is widely used as a solvent, e.g., for rubber, and is used to treat alkali cellulose in the viscose process (a source of rayon and cellophane). Carbon disulfide reacts with chlorine in the presence of a catalyst to form carbon tetrachloride.

carbonic acid, H_2CO_3 , a weak dibasic acid (see ACIDS AND BASES) formed when CARBON DIOXIDE dissolves in water; it exists only in solution. Carbonic acid forms carbonate and bicarbonate (or acid carbonate) salts (see CARBONATE) by reaction with bases. It contributes to the sharp taste of carbonated beverages.

Carboniferous period (kãrbônif'ərəs), fifth period of the PALEOZOIC ERA of geologic time (see GEOLOGIC ERAS, table). The Carboniferous period was marked by vast, coal-forming swamps and a succession of changes in the earth's surface that, continuing into the PERMIAN PERIOD, ended the Paleozoic era. The events of the Carboniferous fall naturally into two divisions, the Mississippian and the Pennsylvanian, in America the break in sequence is so sharp that each division is commonly considered an independent period. In the Lower Carboniferous, or Mississippian, period, the interior of North America was submerged several times by shallow seas in which were formed limestone, shale, and sandstone. In the Appalachian region, especially in Pennsylvania, great deposits of sandstone and shale were laid down by the erosion products from the eastern coastal highlands. In the Far West the Rocky Mt. region was covered by shallow seas which depos-

ited the Madison limestone and the Redwall limestone of the Grand Canyon. The Lower Carboniferous in Europe, as in America, was a period of submergence and was also one of great volcanic activity. In the British Isles and adjacent areas the mountain limestone was formed, E of the Rhine, the culm shale, sandstone, and conglomerate, and in the USSR, the Coal Measures. The close of the Lower Carboniferous was marked by mountain building in New Brunswick, Nova Scotia, the S Appalachian region, the SW United States, and Europe. In the Upper Carboniferous, or Pennsylvanian, period, there was at least one great submergence, however, the sea level oscillated and caused the formation of great marshes with extensive vegetation that was later transformed into coal. In the E United States great deltas of sediments, now represented by the Pottsville conglomerate, were formed during the early Pennsylvanian. In Kansas, Nebraska, Arkansas, and Texas, the Pennsylvanian beds are chiefly shale, sandstone, and coal, over the Cordilleran region, marine limestone, with little coal, on the Pacific coast from California to Alaska, limestone and shale. The Carboniferous coal fields of North America include the anthracite field of E Pennsylvania, the Appalachian field, from Pennsylvania to Alabama, the Michigan field, the eastern interior field, in Indiana, Illinois, and Kentucky, the western interior and southwestern field, stretching from Iowa to Texas, the Rhode Island field, and the Acadian field of SE Canada. In the Upper Carboniferous of Western Europe, the Millstone Grit, equivalent to the Pottsville conglomerate, is followed by the Coal Measures, which include the Welsh, English, Belgian, Westphalian, and Saar Basin fields. In the Mediterranean region and in the USSR, the Upper Carboniferous resembles that of W North America. The Upper Carboniferous was a period of marked crustal disturbances. In Europe the Paleozoic Alps were thrust up, in Asia, the Altai and the Tien Shan, in North America, the Arbuckle and Wichita mts and the ancestral S Rockies. The Indian peninsula became an active site of deposition, in the Himalayan geosyncline and much of China, mountain building was dominant. Crustal movements in the Andean geosyncline of South America affected the pattern of sedimentation over much of the continent. The plant life of the Carboniferous period was extensive and luxuriant, especially in the Pennsylvanian. It included ferns and fernlike trees, giant horsetails, called calamites, club mosses, or lycopods, such as *Lepidodendron* and *Sigillaria*, seed ferns, and cordaites, or primitive conifers. Land animals included primitive amphibians, reptiles (which first appeared in the Upper Carboniferous), spiders, millipedes, land snails, scorpions, enormous dragonflies, and more than 800 kinds of cockroaches. The inland waters were inhabited by fishes, clams, and various crustaceans, the oceans by mollusks, crinoids, sea urchins, and one-celled lime-making foraminifers.

carbonite: see COKE

carbon monoxide, chemical compound, CO, a colorless, odorless, tasteless, extremely poisonous gas that is less dense than air under ordinary conditions. It is very slightly soluble in water and burns in air with a characteristic blue flame, producing carbon dioxide, it is a component of PRODUCER GAS and WATER GAS, which are widely used artificial fuels. It is a reducing agent, removing oxygen from many compounds and is used in the reduction of metals, e.g., IRON (see BLAST FURNACE), from their ores. At high pressures and elevated temperatures it reacts with hydrogen in the presence of a catalyst to form METHANOL. Carbon monoxide is formed by combustion of carbon in oxygen at high temperatures when there is an excess of carbon. It is also formed (with oxygen) by decomposition of carbon dioxide at very high temperatures (above 2000°C). It is present in the exhaust of internal combustion engines (e.g., in automobiles) and is generated in coal stoves, furnaces, and gas appliances that do not get enough air (because of a faulty draft or for other reasons). Carbon monoxide is an extremely poisonous gas. Breathing air that contains as little as 0.1% carbon monoxide by volume can be fatal, a concentration of about 1% can cause death within a few minutes. The gas is especially dangerous because it is not easily detected. Early symptoms of carbon monoxide poisoning include drowsiness and headache, followed by unconsciousness, respiratory failure, and death. First aid for a victim of carbon monoxide poisoning requires getting him to fresh air, administering ARTIFICIAL RESPIRATION and, if available, oxygen, and, as soon as possible, summoning a doctor. When carbon monoxide is inhaled it reacts with hemoglobin, the red blood pigment that normally car-

ries oxygen to all parts of the body. Because carbon monoxide is attracted to the hemoglobin about 210 times as strongly as is oxygen, it takes the place of oxygen in the blood, causing oxygen starvation throughout the body.

carbon-nitrogen-oxygen cycle: see NUCLEOSYNTHESIS

carbon tetrachloride or **tetrachloromethane**, CCl₄, colorless, poisonous, liquid organic compound that boils at 76.8°C. It is toxic when absorbed through the skin or when inhaled. It reacts at high temperatures to form the poisonous gas phosgene. Carbon tetrachloride is used in the production of Freon refrigerants, e.g., Freon-12 (dichlorodifluoromethane). Because it is not flammable and is a good solvent for fats, oils, and greases, it is often used commercially for dry cleaning and for degreasing metals. It is sometimes used in fire extinguishers, since its vapors are denser than air and serve to smother a flame. Its use in the home as a spot remover should be avoided because of its poisonous nature.

carbonyl group (kar'bōnīl), in chemistry, FUNCTIONAL GROUP that consists of an oxygen atom joined by a double bond to a carbon atom. The carbon atom is joined to the remainder of the molecule by two single bonds or one double bond. If the carbonyl group is joined only to ALKYL GROUPS or ARYL GROUPS, the compound is a KETONE, if it is joined to at least one hydrogen atom, the compound is an ALDEHYDE. The chemical reactivity of aldehydes and ketones is primarily due to the difference in ELECTRONEGATIVITY between carbon and oxygen. Because oxygen has the greater affinity for electrons, it acquires a partial negative charge, becoming electron-rich, the carbon atom of the carbonyl group thus becomes electron-deficient, acquiring a partial positive charge. One major type of reaction of aldehydes and ketones involves the addition of an electron-rich chemical species to the electron-deficient carbon atom of the carbonyl group. Another type of reaction is due to the tendency of the electron-deficient carbon atom of the carbonyl group to partially attract electrons from carbon atoms adjacent to it in the molecule, thus increasing the acidity of hydrogen atoms that are bonded to the adjacent carbon.

Carborundum. see SILICON CARBIDE

carboxyl group (kar'bōk'sīl), in chemistry, FUNCTIONAL GROUP that consists of a carbon atom joined to an oxygen atom by a double bond and to a HYDROXYL GROUP, OH, by a single bond. Carboxylic acids are compounds whose molecules contain a carboxyl group that is joined to a hydrogen atom, an ALKYL GROUP, or an ARYL GROUP by a single bond to its carbon atom. Dicarboxylic acids, compounds that contain two carboxyl groups, are important in a number of industrial processes. The four main types of reactions of carboxylic acids are chiefly due to either the weak acidity of the hydroxyl hydrogen or to the difference in ELECTRONEGATIVITY between carbon and oxygen. One type involves cleavage of the hydroxyl oxygen-hydrogen bond, e.g., reaction with an alcohol to form an ESTER or reaction with an alkali to form a water-soluble salt. A second type involves addition of an electron-rich species to the electron-deficient carbon atom of the carboxyl group. A third type is characterized by the joining of a carbon atom directly to the carboxyl group. A fourth type involves the loss of carbon dioxide (decarboxylation). The second and third types are similar to reactions of the CARBONYL GROUP, the carboxyl group may be thought of as a carbonyl group joined to a hydroxyl group.

carboxylic acid. see CARBOXYL GROUP

carbuncle, acute inflammatory nodule of the skin caused by bacterial invasion into the hair follicles or sebaceous gland ducts. It is actually a BOIL, but one that has more than one focus of infection, i.e., involves several follicles or ducts. Carbuncles occur more often in men because of their more extensive body hair growth. The infection is treated by applying antibiotics systemically and directly to the lesion and by incision and drainage at the proper time.

carburetor, part of a gasoline engine in which liquid fuel is converted into a vapor and mixed with a regulated amount of air for combustion in the cylinders. Land vehicles, boats, and light aircraft have a float carburetor, in which a float regulates the fuel level in a reservoir from which the fuel is sucked into the intake manifold at a restriction called a venturi. This venturi metering system controls the flow of a continuous pumped spray into the intake manifold downstream from the carburetor. When there is an individual spray for each cylinder and the injec-

tion is an intermittent, timed spurt, or is metered differently, the device is usually called a fuel injector, not a carburetor.

Carcas (kar'kās), king's chamberlain. Esther 1:10

Carcassonne (karkasōn'), city (1968 pop. 46,329), capital of Aude dept., S France, in Languedoc. The old city, a medieval fortress atop a hill, is one of the architectural marvels of Europe. The new city, across the Aude River, is a farm trade center with rubber, shoe, and textile manufactures. The Romans fortified the hilltop site in the 1st cent. B.C., towers built (c. 6th cent.) by the Visigoths are still intact, and the viscounts of Carcassonne added to the fortifications in the 12th cent. A stronghold of the ALBIGENSES, the fortress was taken by Simon de Montfort in 1209. It yielded to the king in 1247, at which time Louis IX (St. Louis) founded the new city across the river. The outer ramparts of the fortress were constructed during St. Louis's reign, and the work was continued, with intricate defense devices, under Philip III. When completed, the fortress was widely considered impregnable, Edward the Black Prince was stopped at its walls in 1355. However, its usefulness ended in 1659, with the annexation to France of the province of Roussillon. The ramparts were gradually abandoned and fell into disrepair, they were restored by Viollet-le-Duc in the 19th cent.

Carchemish (kar'kīmīsh, karkē'mīsh), ancient city, Turkey, on the Euphrates River, at the Syrian border, c. 35 mi (56 km) SE of Gaziantep. It was an important Neo-Hittite city and was prosperous in the 9th cent. B.C. before it was destroyed by the Assyrians. Even then it continued as an important trade center. There, in 605 B.C., Nebuchadnezzar defeated Necho (2 Chron. 35:20, Jer. 46:2, Isa. 10:9). Among the excavated remains are sculptured neo-Hittite reliefs with hieroglyphic Hittite inscriptions. See British Museum, *Carchemish* (3 vol. in 2, 1914-52).

carcinogen: see CANCER

carcinoma. see NEPLASM

Carco, Francis (fran'sēs' karkō'), 1886-1958, French poet and novelist, b. New Caledonia of Corsican parents. His real name was François Carcopino. The bohemian Parisian life he cherished is portrayed in several of his novels, including *Jesus-la-caille* (1914). Among his verses are *La Bohème et mon cœur* (1912) and *Poèmes en prose* (1948).

cardamom (kar'dāməm) see GINGER

Cardamom Hills, range, c. 4,000 ft (1,220 m) high, c. 1,000 sq mi (2,590 sq km), Kerala state, southern tip of India. Tea, coffee, teak, bamboo, turmeric, and cardamom, which gives the area its name, are grown in the hills.

Cardamom Mountains, Thai *Banthat*, Khmer *Kra vanh*, mountain group extending c. 100 mi (160 km) along the Thai-Cambodian border, E of Chanthaburi, SE Thailand. Ta Det (3,667 ft/1,118 m) is the highest peak. The mountains receive monsoon rains and have a dense vegetation cover.

Cardano, Geronimo (jārō'nēmō karda'nō), 1501-76, Italian physician and mathematician. His works on arithmetic and algebra established his reputation. Barred from official status as a physician because of his illegitimate birth, he practiced as a medical astrologer. His major work, *De subtilitate rerum* (1550), on natural history, is perceptive and implies a grasp of evolutionary principles. His book on games of chance represents the first organized theory of probability. Cardano described a tactile system similar to Braille for teaching the blind and thought it possible to teach the deaf by signs. See his *The Book of my Life* (1643, tr. 1930), studies by Oystein Ore (with a tr. of Cardano's *Book of Games of Chance*, 1965) and Alan Wykes (1969).

Cardenas, García Lopez de (garthē'a lō'pēth dā kar'dānas), fl. 1540, Spanish explorer in the Southwest. A member of the 1540 expedition of Francisco Vazquez de CORONADO, he was selected to lead a party from Cibola (the Zuni country of New Mexico) to find a river of which the Hopi Indians had spoken. After 20 days' march he became the first white man to see the GRAND CANYON of the Colorado River. He was not, however, the discoverer of the Colorado itself, for Hernando de ALARCÓN had explored its lower waters a month earlier.

Cárdenas, Lázaro (la'sarō), 1895-1970, president of Mexico (1934-40). He joined the revolutionary forces in 1913 and rose to become a general. He was governor (1928-32) of his native state, Michoacán, and held other political posts before he was, with the support of Plutarco E. CALLES, elected president. After a bitter conflict Cardenas sent (1936) Calles into exile and organized a vigorous campaign of socialization of industry and agriculture based on the

constitution of 1917. Large land holdings were broken up and distributed to small farmers on the EJIDO system, and many foreign-owned properties, especially oil fields, were expropriated. His policy, founded on his determination to make Mexico a modern democracy, became anathema to large landowners, industrialists, and foreign investors, but—himself a mestizo—he won the support of the Indians and of the Mexican working classes. Cardenas relinquished his office at the end of his term, thus acting in accord with his desire for democratic and orderly constitutional processes. Cardenas was recalled to public service as minister of national defense (1942–45). His political influence as the leader of the Mexican left wing continued in the years after World War II. See study by J. C. Ashby (1967).

Cardenas, city (1970 pop. 55,209), N central Cuba, a port on Cardenas Bay. It processes and exports sugar and sisal and has industries producing tobacco, beer, and soap. A fishing fleet is based at Cardenas, which is also an important commercial center. The city was founded in 1828 as a shipping point for the sugar industry of the surrounding area.

cardiac failure: see CONGESTIVE HEART FAILURE

Cardiff (kar'dif), county borough (1971 pop. 278,221), county town of Glamorganshire, S Wales, on the Taff River near its mouth on the Bristol Channel. Until the early 20th cent. Cardiff was one of the greatest coal-shipping ports in the world. Present industries include shipbuilding and repairing, metal casting, engineering, oil and gasoline distribution, and food processing. There are British Broadcasting Corp. studios in Cardiff. The construction of docks by the 5th marquess of Bute in 1839 stimulated the growth of Cardiff. The Port of Cardiff includes the docks at Penarth and Barry. There is a canal to Merthyr Tydfil (opened 1794), with a branch to Aberdare. Cardiff Castle, the residence of the marquess of Bute until 1947, was first built in 1090 on the site of a Roman fort. Robert, duke of Normandy, was imprisoned (1126–34) in the castle. Owen Glendower partly destroyed it in 1404. In Cathays Park the group of public buildings includes the National Museum of Wales, the law courts, the city hall, Glamorgan county hall, and the University College of South Wales and Monmouthshire (one of the four constituent colleges of the Univ. of Wales). Other schools are City of Cardiff College (teacher training) and Welsh College of Advanced Technology. Llandaff, which has a notable medieval cathedral, has been part of Cardiff county borough since 1922. The parish church of St. John dates partly from the 13th and partly from the 15th cent. In 1974, Cardiff became part of the new nonmetropolitan county of South Glamorgan.

Cardigan, James Thomas Brudenell, 7th earl of, 1797–1868, British general. In the Crimean War he led the disastrous cavalry charge at BALAKLAVA (1854) that Tennyson immortalized in *The Charge of the Light Brigade*. The charge was made on a misunderstood order, and the brigade was destroyed. Quarrels with his officers showed him a vain and contentious man. The Cardigan sweater was named for him. See biography by Piers Compton (1972).

Cardiganshire, county (1971 pop. 54,844), W Wales, on Cardigan Bay. The county town is Cardigan, but ABERYSTWYTH is of greater importance. The region is largely one of pleasant, rolling hills, with fertile valleys and a narrow coastal plain. The chief river is the Teifi. Agriculture predominates but there is also some fishing and the manufacture of woollens. The county long resisted English influence, and the Welsh language and Welsh customs are well preserved. In 1974, Cardiganshire became part of the new nonmetropolitan county of Dyfed.

Cardigan Welsh corgi, breed of short, long-bodied WORKING DOG believed to have been introduced into Wales from Central Europe c. 1200 B.C. It stands about 12 in. (30.5 cm) high at the shoulder and weighs from 15 to 25 lb (6.8–11.3 kg). Its dense, medium-length, straight coat is of harsh texture and may be red, brindle, sable, black and tan, black, or blue-merle in color, often with white markings on the face, chest, neck, feet, and tip of tail. Originally used as a guardian and hunter, the Cardigan later came to be raised as a drover of cattle. Working to the whistled commands of its master, it would nip at the heels of the livestock and then avoid their lethal kicks by dropping to the ground. With the sale and division of the common pastureland and the increasing use of fences, the usefulness of the Cardigans as drovers was eliminated and the breed became scarce. Revived by the diligence of modern breeders, the Cardigan today is raised for show competition and as a family companion. See DOG.

cardinal [Lat., =belonging to the hinge], in the Roman Catholic Church, a member of the highest body of the church below the pope. This, the sacred college of cardinals of the Holy Roman Church, is the electoral college of the PAPACY. Its members are appointed by the pope. There are three classes. Cardinal bishops are the bishops of seven sees around Rome (Ostia, Velletri, Porto and Santa Rufina, Albano, Frascati, Palestrina, and Sabina and Poggio Mirteto) and Eastern rite patriarchs, the first of these in order of creation is dean of the college and ex officio bishop of Ostia in addition to his other see. Cardinal priests are mostly archbishops outside the Roman province, the title "cardinal archbishop"—often applied to these men—simply represents the union of the two dignities in one man. Cardinal deacons are priests with functions in the papal government. Cardinal priests and cardinal deacons have titles corresponding to churches of the Roman diocese. A cardinal's insignia resemble those of a bishop, except for the characteristic red, broad-brimmed, tasseled hat, which is conferred by the pope but not subsequently worn. Cardinals are styled "Eminence." Apart from papal elections, the cardinals have great importance as the privy council of the pope. Hence those who are not bishops away from Rome must live at Rome. They meet with the pope in consistories, public and secret, but most of the business they transact is done in their various jurisdictional capacities. Thus the cardinals in residence at Rome make up a cabinet for the pope, directing the work of the Curia Romana, as the papal administration is called. This is made up of standing committees and courts, the departments of administration divided among them. Since there is no division of powers in the headship of the church, most organs of the Curia have power to judge, to command, and to legislate. The acts of these bodies are validated by papal approbation, and they therefore bind Roman Catholics as direct pontifical acts. Only the pope himself can speak finally in matters of faith and morals (see INFALLIBILITY). The Curia may be divided into Roman congregations, Roman tribunals, curial offices, and secretariats. A Roman congregation consists of a group of cardinals, headed by a prefect, together with two staffs which transact most of the business—the congress of major officials and a staff of minor officials chosen by competitive examination and assigned to less important affairs. The congregation proper, i.e., the cardinals, makes all major decisions. The following are the Roman congregations (founded by Sixtus V in 1588, reorganized by Pius X in 1908, and by Paul VI at the close of the Second Vatican Council). Congregation of the Doctrine of the Faith (formerly, of the Holy Office, see INQUISITION), of which the pope is prefect, concerned with doctrinal orthodoxy, Congregation of the Consistory, of which the pope is prefect, for the preparation of agenda for consistories and the regulation of dioceses of the Western Church not under the Propaganda (see below), Congregation of the Sacraments, for legislation on administration of the sacraments and for dispensations concerning them, Congregation of the Council, for the regulation of councils and of benefices, properties, and the like, for dispensations from the commandments of the church, and for the maintenance of the shrine of Loreto, Congregation of Religious, for all concerns of all seculars and regulars, of both sexes, Congregation for the Propagation of the Faith (the Propaganda), for all concerns of the MISSIONS of the Latin rite, Congregation of the Eastern Church, for all concerns of the Eastern rites in communion with the pope and of every person involved, except for the Russian Catholics, who are under a separate commission, Congregation of Sacred Rites, for all public worship of the Latin rite, for canonizations, liturgical books, and the like, Congregation of the Ceremonial, for liturgical ceremonies involving the pope and the sacred college, Congregation for Extraordinary Ecclesiastical Affairs, virtually a board of assistants to the secretariat of state, Congregation of Seminaries and Universities, for the administration of education, of seminaries, and of ecclesiastical research, Congregation of the Fabric, for the maintenance of St. Peter's Church of the Roman congregations, the two whose influence is felt most deeply throughout the church are probably the Congregation of the Faith and the Propaganda. The Roman tribunals are three secret courts, the highest of the church, each is headed by a cardinal, and its work is handled by trained canonists. They are the Apostolic Penitentiaria, for all cases of conscience appealed by any Catholic to the pope and for the regulation

of indulgences, the Apostolic Signatura, the court of final appeal of the church, considering only cases involving the members of, or appealed from, the Rota, the Sacred Roman Rota, the court of appeal from diocesan courts and the lower court of Vatican City, hearing all cases requiring trial and evidence, except cases of conscience, cases of canonization, and cases involving sovereigns of states (reserved to the pope in person). The curial offices are now to a large extent unimportant and honorary. They are the Apostolic Chancery, to issue bulls of foundations and the like, the Apostolic Dataria, to handle matter concerning candidates for papal benefices, pensions, and the like, the Apostolic Camera, headed by the chamberlain of the Holy Roman Church, to administer the property (except revenue) of the Holy See, notably in the vacancy of the papal see. The secretariats are the secretariat of state, headed by the cardinal secretary of state, who has charge of all matters involving relations with political governments and has for his aid a large staff and the Congregation of Extraordinary Ecclesiastical Affairs, and the secretariat of briefs, in charge of the official Latin correspondence of the pope. A secretariat for promoting Christian unity and another for dealings with non-Christians were established by Paul VI. Besides these permanent departments there are always some special commissions of cardinals, e.g., for the Russian Church, for the revision of the Vulgate, for biblical study, and for sacred art. The term *cardinal* was formerly applied to important clergymen of all sorts and countries, but in the Middle Ages it was officially restricted to the Roman province. The college of cardinals is the modern derivative of the advisory board of clergymen of the ancient diocese of Rome, used by the pope for advice and transaction of business. Pope Sixtus V set the maximum number of cardinals at 70, a tradition maintained for centuries until the pontificate of Pope John XXIII. Following the lead of Pius XII, John XXIII and Paul VI have promoted the international character of the college. In 1973 the number of cardinals was increased to 145. See studies by T. B. Morgan (1946, repr. 1971), G. D. Kittler (1960), and F. B. Thornton (1963).

cardinal or **redbird**, common name for a North American songbird of the family Fringillidae (New World FINCH family). In the eastern cardinal, *Richmondia cardinalis*, the male is bright scarlet with black throat and face, the female is brown with patches of red. Both sexes have crests and red bills. The Arizona, gray-tailed, Louisiana, and San Lucas cardinals frequent the S United States and Mexico. The pyrrhuloxia of the SW United States, gray with red face, crest, breast, and tail, is called gray cardinal or parrotbill. Cup-shaped nests are built by male and female, and the male helps rear the young. Cardinals are essentially monogamous, and are not very gregarious. They are classified in the phylum CHORDATA, subphylum Vertebrata, class Aves, order Passeriformes, family Fringillidae.

cardinal flower: see LOBELIA

carding, process by which fibers are opened, cleaned, and straightened in preparation for spinning. The fingers were first used, then a tool of wood or bone shaped like a hand, then two flat pieces of wood (cards) covered with skin set with thorns or teeth. Primitive cards, rubber-covered and toothed with bent wires, are still employed by Navaho women. Modern carding dates from the use of revolving cylinders patented in 1748 by Lewis Paul. A mechanical apron feed was devised in 1772, and Richard Arkwright added a funnel that contracted the carded fiber into a continuous sliver. See COMBING.

cardiovascular system: see CIRCULATORY SYSTEM

Cardozo, Benjamin Nathan (kardō'zō), 1870–1938, American jurist, Associate Justice of the U.S. Supreme Court (1932–38), b. New York City. He was admitted to the bar (1891) and practiced law until he was elected (1913) to the New York supreme court on a fusion ticket. Cardozo was appointed (1914) to the court of appeals, was elected (1917) for a 14-year term, and in 1927 was elected chief judge of the court, which, largely through his influence, gained international fame. He was prominent in the efforts of the American Law Institute to restate and simplify the law, and he advocated a permanent agency to function between the courts and legislatures to aid in framing effective legislation. He was active in a number of Jewish movements. He was appointed (1932) by President Herbert Hoover to the Supreme Court to succeed Oliver Wendell Holmes. Cardozo was one of the foremost spokesmen on sociological jurisprudence, and his views on the relation of law to social change made him

one of the most influential of U.S. judges. With justices Louis D. Brandeis and Harlan F. Stone, he upheld much New Deal legislation, dissenting from the majority opinion. His philosophy of law and the judicial process was developed in three classics of jurisprudence: *The Nature of the Judicial Process* (1921), *The Growth of the Law* (1924), and *The Paradoxes of Legal Science* (1928). He also wrote *Law and Literature and Other Essays and Addresses* (1931). See the selection of his writings edited by M. E. Hall (1947), biography by J. P. Pollard (1935, repr. 1970), studies by B. H. Levy (rev. ed. 1969) and W. C. Cunningham (1972).

cards, playing. see **PLAYING CARDS**

Cardston, town (1971 pop. 4,130), SW Alta., Canada, near the U.S. boundary. It was founded in 1887 by Mormons from Utah under the leadership of Charles Ora Card, son-in-law of Brigham Young. The chief Mormon temple of Canada is in the town. Nearby is the Blood Indian Reserve, the largest in Canada.

Carducci or **Carducho**, **Bartolomeo** (bartōlōmē'ō kardōō'tchē, kardōō'kō), 1560-1638, Italian painter, sculptor, and architect in Spain. He studied with Federigo Zuccaro, whom he accompanied (1585) to the court of Madrid. He assisted Tibaldi in decorating the library ceiling of the Escorial and executed some of the cloister frescoes. His masterpiece, *Descent from the Cross*, is in San Felipe el Real, Madrid. His brother Vincenzo Carducci, 1576-1638, succeeded him as court painter to Philip III. Vincenzo is the author of the *Diálogos de la pintura* (1633). The paintings of both brothers, though different in style, are marked by sobriety and an insistence upon moral tone.

Carducci, **Giosuè** (jōzōō'ā), 1835-1907, Italian poet and teacher. He was professor of literature at the Univ. of Bologna from 1860 to 1904. He was a scholar, an editor, an orator, a critic, and a patriot, although his defection from republicanism and his anti-Catholicism brought him into disfavor even with his students. He was awarded the 1906 Nobel Prize in Literature. Carducci ranks with the greatest Italian poets; his verse is classic in design, with a deep and wide range of emotion. His chief works include *Rime* (1857), *Inno a Satana* [hymn to Satan] (1865), *Decennali* (1871), *Nuove poesie* (1873), *Odi barbare* (1877, 1882, 1889), *Rime nuove* (1889, tr. New Rhymes, 1916), and *Rime e rime* (1898). See translations by G. L. Bickelsteth (1913), Maud Holland (1927), William Fletcher Smith (1939), and Arthur Burkhard (1947), studies by John Bailey (1926) and S. E. Scaglia (1937).

Carducho, **Bartolomeo** see **CARDUCCI**, **BARTOLOMEO**

Cardwell, **Edward Cardwell**, **Viscount**, 1813-86, British statesman. He entered Parliament (1842) as a supporter of Sir Robert Peel, under whom he was secretary to the treasury (1845-46). He was president of the Board of Trade (1852-55) under Lord Aberdeen and secretary for Ireland (1859-61) and chancellor of the duchy of Lancaster (1861-64) under Lord Palmerston. While colonial secretary (1864-66) he worked toward federation in Canada. As war secretary (1868-74) under Gladstone, he reformed the British army, abolishing the purchase of commissions, shortening the term of enlistment, and creating a reserve.

CARE (Cooperative for American Relief Everywhere), nonprofit, nonsectarian federation of agencies devoted to channeling relief and self-help materials to needy people in foreign countries. Organized (1945) to help war-ravaged Europe, CARE soon expanded its program to include underdeveloped nations in Asia, Africa, and Latin America. Since its founding, CARE has distributed more than \$200 million in supplies including foodstuffs, textiles, books, and agricultural and other tools. In 1962 the Medical International Cooperation Organization (MEDICO), a worldwide medical assistance program founded (1958) by Dr. Thomas Dooley and Dr. Peter Comanduras, became a part of CARE.

Careah (kā're'ā), variant of **KAREAH**

Carême, **Marie Antoine** (marē' aNtwan' karēm'), 1784-1833, celebrated French cook and gastronomist. He was chef for Talleyrand, Czar Alexander I, George IV, and Baron Rothschild. His writings on the culinary art include *L'Art de la cuisine française* (5 vol., 1833-34).

Carew, **George**, **Baron Carew of Clopton** and **earl of Totnes**, 1555-1629, English soldier and statesman. He began his military career in Ireland in 1574 and served (1588-92) as master of the ordnance there. He took part in the naval expeditions to Cadiz

(1596) and the Azores (1597) and in 1598 was an envoy to France. Appointed (1600) lord president of Munster, he aided the lord deputy, Lord Mountjoy, in defeating Hugh O'Neill, earl of TYRONE. Under James I, Carew was unable to save his friend Sir Walter Raleigh from execution, but he himself received honors, including his earldom in 1626. An antiquarian, he collected material on the history of Ireland, used later by his secretary, Sir Thomas Stafford, to prepare the important *Pacata Hibernia*, or, *An Historie of the Late Warres of Ireland* (1633).

Carew, **Thomas**, 1595?-1639?, English author, one of the CAVALIER POETS. Educated at Merton College, Oxford, he had a short diplomatic career on the Continent, then returned to England and became a favorite of Charles I and a court official. He is best known for his courtly, amorous lyrics, such as "Ask me no more where Jove bestows" and "He that loves a rosy cheek," but of equal importance are his "Elegy on the Death of Dr. Donne," and the highly erotic poem, "A Rapture." In his use of metaphysical and classical material, he shows the influence of both John Donne and Ben Jonson. See ed. of his works by Rhodes Dunlap (1949), study by E. I. Selig (1958, repr. 1970).

Carey, **Henry**, 1687-1743, English author. After the first collection of his poems appeared in 1713, he turned to writing for the stage. Primarily a writer of farce comedy, his greatest success was *Chrononhotonthologos* (1734), a burlesque on theatrical bombast. He is best remembered, however, for his songs, in particular the ballad "Sally in Our Alley."

Carey, **Henry Charles**, 1793-1879, American economist, b. Philadelphia, son of Mathew CAREY. In 1835 he retired from publishing, where he had done notable work, to devote himself to economics. His *Principles of Political Economy* (3 vol., 1837-40) and *Principles of Social Science* (3 vol., 1858-59) were among the first important American works in the field. Carey opposed the dominant British political economy of the day, particularly the "pessimism" of Ricardo and Malthus, and led in the theoretical development of American economic nationalism. He advocated the protective tariff but believed generally in laissez-faire. See studies by A. D. H. Kaplan (1931, repr. 1973) and A. W. Green (1951).

Carey, **Mathew**, 1760-1839, American publisher, bookseller, and economist, b. Dublin. In his Dublin journal he violently attacked English rule of Ireland, was imprisoned for a month, fled to France, where he worked in Benjamin Franklin's printing shop at Passy, returned to Ireland, and finally emigrated (1784) to Philadelphia. There a gift from Lafayette enabled him to establish (1785) the *Pennsylvania Herald*. From 1787 to 1792 he edited and published the *American Museum*, making it the leading American magazine of the period. In 1790, Carey began his career as bookseller and publisher on a large scale. In this double capacity he stimulated the growth of American letters. Although many of his own political pamphlets were controversial, the most famous, *The Olive Branch* (1814), was written during the War of 1812 in an effort to unite the Republican and Federalist parties in support of the war. His copious writings advocating the American protective system are interesting documents for the study of American economic history. The economist Henry Charles Carey was his son. See biography by E. L. Bradsher (1912, repr. 1968).

Carey, **William**, 1761-1834, English Baptist missionary and Orientalist, one of the first Protestant missionaries to India. He helped found the Baptist Missionary Society in 1792 and shortly thereafter went to India. Carey did most of the work in publishing the Bible in many Indian vernaculars. He wrote grammars of the vernaculars and several dictionaries. He became a professor of Sanskrit at Fort William College, Calcutta. See biographies by S. P. Carey (8th ed. rev. 1934) and W. B. Davis (1963).

Carey Land Act, sponsored by Sen. Joseph M. Carey and passed by the U.S. Congress in 1894. The act provided for the transfer to Western states of U.S.-owned desert lands on the condition that they be irrigated. Settlers were permitted to buy up to 160 acres (64.7 hectares) of the land at 50¢ per acre plus the cost of water rights. Hopes that the act would hasten reclamation and settlement were disappointed.

Cargill, **Donald**, 1619?-1681, Scottish COVENANTER. He was a minister in Glasgow from c. 1655 until 1662, when he was expelled for denouncing the Restoration and resisting the establishment of the episcopacy in Scotland. After escaping wounded from the battle of Bothwell Bridge (1679), he joined Richard Cameron in the Sanquhar Declaration (1680) against

Charles II. Cargill, having excommunicated the king, the duke of York, and others, was arrested and executed.

cargo cult, native religious movement found in Melanesia, holding that at the millennium the spirits of the dead will return and bring with them cargoes of modern goods for distribution among its adherents. The cult had its beginnings in the 19th cent. and received great impetus from World War II, when the Western armed forces littered the islands with surplus cargo. The cult aims to restore a past time and to regain the good will of ancestors who are being lured into giving cargo to the white foreigners, cargo originally intended for the native Melanesians. Cargo cults are revivalistic, in that the adherents expect the restoration of a golden age in which they will be reunited with their ancestors, and nativistic (see NATIVISM), in that the whites are to be driven away. However, as the cargo is composed principally of European goods, and native goods and rituals are abandoned, both the nativistic and revivalistic aspects of cargo cults are qualified by a strong motive toward ACCULTURATION.

Caria (kā'rēā), ancient region of SW Asia Minor, S of the Maeander River, which separated it from Lydia. The territory is in present SW Asiatic Turkey. The Carians were probably a native people, but their region was settled by both Dorian and Ionian colonists. Caria was a center of the Ionian revolt (c. 499 B.C.) that was a prelude to the Persian Wars. Some of the communities joined (c. 468 B.C.) the Delian League. In the 4th cent. B.C. the region was united under a dynasty of princes, of whom the most celebrated was MAUSOLUS. Alexander the Great conquered Caria, and it changed hands often in the wars after his death. In 125 B.C. it was made a Roman province (part of the province of Asia). Cnidus, Halicarnassus, and Miletus were famous Carian cities.

Carias Andino, **Tiburcio** (tēbōō'syō karē'ās andē'nō), 1876-1969, president of Honduras (1933-49). A strong-handed dictator, his term was twice extended by congress. Some improvements were made in communication and education. After Carias announced his retirement in 1948, presidential elections were held. Juan Manuel Galvez, the government candidate, won easily.

Caribbean Sea (kā'rībē'an, kārīb'ēan), tropical sea, c. 750,000 sq mi (1,942,500 sq km), arm of the Atlantic Ocean, Central America. It is bordered on the N and E by the West Indies archipelago, on the S by South America, and on the W by the Central American isthmus. The Caribbean is linked to the Gulf of Mexico by the Yucatan Channel, to the Atlantic by many straits, of which the Windward Channel and Mona Passage are the most important, and to the Pacific Ocean by the Panama Canal. The Magdalena is the largest river entering the sea. Lake Maracaibo is its largest embayment. Geologically, the Caribbean Sea consists of two main basins separated by a broad, submarine plateau, Bartlett Deep, a trench between Cuba and Jamaica, contains the Caribbean's deepest point (22,788 ft/6,946 m below sea level). The Caribbean's water is clear, warm (75°F/24°C), and less salty than the Atlantic; the basin has a very low tidal range (c. 1 ft/3 m). The Caribbean Sea has a counterclockwise current; water enters through the Lesser Antilles, is warmed, and exits via the Yucatan Channel, where it forms the Gulf Stream. Volcanic activity and earthquakes are common in the Caribbean, as are destructive hurricanes that originate over the sea or in the Atlantic. The Caribbean was discovered by Christopher Columbus in 1493 and was named for the Carib Indians. Spain claimed the area, and its ships searched for treasure. With the discovery of the Pacific Ocean in 1513 the Caribbean became the main route of Spanish expeditions and, later, of convoys. Pirates and warships of rival powers preyed on Spanish ships in the Caribbean. Although Spain controlled most of the sea, Britain, France, Holland, and Denmark established colonies on the islands along the eastern fringe. The 1800s brought U.S. ships into the Caribbean, especially after 1848, when many gold-seekers crossed the sea to reach California via Panama. After unsuccessful French attempts in the late 1800s to build a canal across Panama, the United States, in 1903, assumed control of the project, the 1914 opening of the Panama Canal paved the way for increased U.S. interest and involvement in this strategic sea, sometimes called the "American Mediterranean." Several Caribbean islands have U.S. military bases, many of which were established during World War II as support bases to protect the Panama Canal. The naval base at Guantanamo Bay, Cuba (est. 1899) is the old

est U.S. Caribbean base. U.S. policy since the MONROE DOCTRINE of 1823 has been to exclude foreign powers from the Caribbean, however, in 1959, Cuba became the first country to come under strong foreign (Soviet) influence. U.S. intervention in the affairs of Caribbean countries, most recently in the Cuban missile crisis of 1962 and the landing of U.S. marines at Santo Domingo in 1965, reflects the region's importance in U.S. eyes. Petroleum, iron ore, bauxite, sugar, coffee, and bananas are the main local products moved on the sea. Economically, the region is dependent on U.S. patronage. The Caribbean Sea has also acted as a barrier, isolating the islands and preventing the mingling of peoples on the scale characteristic of Latin America.

Caribbees (kār'ibēz), name sometimes applied to the islands of the Caribbean or even to all the West Indies. More specifically the Caribbees are the Lesser Antilles and include the Leeward Islands, the Windward Islands, and the Virgin Islands.

Carib Indians (kār'ib), native people formerly inhabiting the Lesser Antilles, West Indies. They seem to have overrun the Lesser Antilles and to have driven out the ARAWAK about a century before the arrival of Christopher Columbus. The original name by which the Caribs were known, *Gahri*, was corrupted by the Spanish to Canibal and is the origin of the English word *cannibal*. Extremely warlike and ferocious, they practiced cannibalism and took pride in scarification (ritual cutting of the skin) and fasting. Among these Indians the Carib language was spoken only by the men, while the women spoke Arawak. This was so because Arawak women, captured in raids, were taken as wives by the Carib men. Fishing, agriculture, and basketmaking were the chief domestic activities. The Caribs were expert navigators, crisscrossing a large portion of the Caribbean in their canoes. After European colonization began in the 17th cent., they were all but exterminated. A group remaining on St. Vincent mingled with Negro slaves who escaped from a shipwreck in 1675. This group was transferred (1795) by the British to Roatan island off the coast of Honduras. They have gradually migrated north along the coast into Guatemala. A few Caribs survive on a reservation on the island of Dominica. The Carib, or Cariban, languages are a separate family, believed to have originated in Brazil. Carib-speaking tribes are found in N. Honduras, British Honduras, and N. South America.

Cariboo Mountains (kār'ibōō), range, c. 200 mi (320 km) long, E. British Columbia, Canada, rising to 11,750 ft (3,582 m) at Mt. Sir Wilfrid Laurier. It runs roughly parallel with the main Rocky Mt. range to the northeast, from which it is separated by the Rocky Mt. Trench, there occupied by the Fraser River. In the foothills to the west is the Cariboo dist., scene of the famous Cariboo gold rush of 1860. Many camps sprang up in the region, and much gold was taken out, but after 1866 the diggings declined. Many gold-seekers stayed on in the region, and today there are several thousand who make their living by a combination of mining, hunting, and farming. The Cariboo wagon road, built (1862-65) by the government, facilitated the settlement of the interior of the province. It started from Yale, at the head of navigation on the Fraser River, and ended in the Cariboo dist. nearly 400 mi (640 km) to the north. Bowron Lake and Wells Gray provincial parks are in the Cariboo Mts.

Caribou (kār'ibōō), town (1970 pop. 10,419), Aroostook co., NE Maine, on the Aroostook River, inc. 1859. A processing and shipping hub for a great potato-growing region, it is also a winter sports center.

caribou, name in North America for the genus (*Rangifer*) of deer from which the Old World REINDEER was originally domesticated. Caribou are found in arctic and subarctic regions. They are the only deer in which both sexes have antlers. The broad hooves support the animal (males may weigh over 300 lb/90 kg) on boggy land or snow and have sharp edges that enable it to traverse rocky or frozen surfaces and to dig down to the grass and lichens on which it sometimes feeds. In North America there are two main types: the woodland caribou of the bogs and coniferous forests from Newfoundland to British Columbia, with palmate antlers up to 4 ft (120 cm) wide, and the barren-ground caribou of the tundra of Alaska and N. Canada, which has many-branched, slender antlers and which may undertake mass migrations in search of food. Caribou are classified in the phylum CHORDATA, subphylum Vertebrata, class Mammalia, order Artiodactyla, family Cervidae.

caricature, a satirical drawing, plastic representation, or description which, through gross exaggeration of natural features, makes its subject appear

ridiculous. Although 16th-century Northern painters, such as Holbein, Bruegel, and Bosch, employed certain elements of caricature, no comic tradition was established until the 17th cent. with the work of the Carracci. In the 18th cent. caricature flourished in England in the works of Hogarth, Rowlandson, and Gillray. The genre expanded to include political and social as well as personal satire, developing into the art of the CARTOON. Periodicals of caricature, such as the French *Charivari* (1832), followed by *Punch* in England, *Simplicissimus* in Germany, and *Puck*, *Life*, and *Judge* in the United States, were quite popular in the 19th cent. They featured work by Daumier, George Cruikshank, John Tenniel, Art Young, E. W. Kemble, and Daniel Fitzpatrick. Modern caricaturists of note include David Low, Ronald Searle, Max Beerbohm, Al Hirschfeld, David Levine, and H. L. Block. Sculpture generally lends itself less well to caricature, but an exception exists in the series of heads by Franz Xavier Messerschmidt (1736-83) which represent exaggerated states of emotion and character. In literature, caricature has been a popular form since the ancient Greeks. Through verbal exaggeration and distortion the writer achieves an immediate, comic, often satiric effect. No one has made wider use of the literary caricature than Dickens. See M. D. George, *Hogarth to Cruikshank: Social Change in Graphic Satire* (1967); R. E. Shikes, *The Indignant Eye: The Artist as Social Critic* (1969).

carillon, in music. See BELL.

Carina (karē'na) [Lat. = the keel], southern CONSTELLATION, representing the keel of the ancient constellation Argo Navis, or Ship of the Argonauts. Carina contains CANOPUS, the second brightest star in the sky. It also contains the False Cross, a combination of four stars very similar to the Southern Cross (see CRUX), however, the long axis of the False Cross does not point toward the south celestial pole. In 1843 a nova was observed in Carina. Carina reaches its highest point in the evening sky in March.

Carinthia (kār'in'thēa), Ger. Kärnten, province (1971 pop. 526,000), c. 3,680 sq mi (9,531 sq km), S. Austria. KLAGENFURT is the capital. Predominantly mountainous, it is the southernmost Austrian province, bordering on Italy and Yugoslavia in the south. The GROSSGLOCKNER, the highest point in Austria, rises in the northeast, at the Tyrol province border. Carinthia has mines (lead, zinc, iron, and lignite) and well-developed farms (especially in the fertile Draava, or Drau, plain). Manufactures of the province include forest products, construction materials, chemicals, and metal goods. There is also an active tourist trade, particularly along the Wörther See, a lake near Klagenfurt. In 976, Carinthia, which then included Istria, Carniola, and Styria, was detached from BAVARIA and made an independent duchy. Acquired by Ottocar II of Bohemia in 1269, it fell to RUDOLPH of Hapsburg in 1276 and in 1335 became an Austrian crown land. By the Treaty of Saint-Germain (1919) the province lost some minor territories to Italy and Yugoslavia. The only Austrian province with an appreciable ethnic minority, Carinthia has a Slovene population in the south.

Carinus (Marcus Aurelius Carinus) (kār'inās), d. 285, Roman emperor (283-85). He was the son of CARUS, who left Carinus as ruler in the West when he went to the East on a campaign against the Parthians. On the death of Carus, Carinus succeeded in the West, and his brother Numerianus succeeded in the East. After the murder of Numerianus, DIOCLETIAN was chosen (284) emperor in the East by the soldiers. Carinus set out to defeat the new claimant and met him in battle. At the moment of victory, however, Carinus was murdered by one of his own soldiers, and Diocletian became sole emperor.

Carissimí, Giacomo (jākōmō kārēs'sēmē), 1605-74, Italian composer. Most of his life was spent in Rome, where he wrote chamber cantatas in a style that lasted for over a century. His Latin oratorios, of which *Jephtha* is best known, are among the earliest extant examples of true oratorio. Famous as a teacher, he had among his pupils Alessandro Scarlatti.

Carlén, Emilie Smith Flygare: see FLYGARE-CARLEN.
Carleton, Guy, 1st Baron Dorchester, 1724-1808, governor of Quebec and British commander during the American Revolution. He began his service in America in 1758 and distinguished himself in the French and Indian War. After 1766, as lieutenant governor, acting governor, and governor of Quebec, he proved to be a very able administrator. He fostered the QUEBEC ACT of 1774, which brought about better relations between the British and the French Canadians. The loyalty of the French Canadians to the British in the American Revolution was at least

partly the result of the act. On the other hand, it infuriated the colonists in the present United States and helped bring on revolution. When Thomas Gage resigned as commander in chief of British forces in America, the command was divided—Sir Guy Carleton had command in Canada, and Sir William Howe had command farther south. When the American Revolutionaries launched their QUEBEC CAMPAIGN, Carleton had few men and was forced to abandon Montreal, which fell to the forces under Richard Montgomery. Withdrawing to Quebec, Carleton repelled (Dec. 31, 1775) an attack led by Montgomery and Benedict Arnold and withstood a long winter siege. British reinforcements in the spring enabled him to push the American forces out of Canada to Crown Point, which he took in the autumn of 1776. Disagreements with the British colonial secretary, Lord George Germain, led to his being replaced as commander by Gen. John Burgoyne in 1777. Carleton resigned as governor and left Canada in 1778, when he was succeeded by Sir Frederick Haldimand. In Feb. 1782, after the Yorktown campaign had already effectively ended the American Revolution, Carleton replaced Sir Henry Clinton as commander in chief of the British forces. His delicate task was to suspend hostilities, withdraw the forces from the New York and Vermont frontiers, and protect the Loyalists—both those who were emigrating to Canada and those who were attempting to reestablish themselves in their old homes. He was again governor of Quebec from 1786 to 1796. High-principled and able, Carleton was perhaps the most admirable British colonial commander in America in his time. See biography by A. G. Bradley (new ed. 1926; repr. 1966).

Carleton, Will, 1845-1912, American poet, b. Hudson, Mich. He is best known for his sentimental poems of rural life, the most famous being "Over the Hill to the Poorhouse." Among his works are *Farm Ballads* (1873), *Farm Legends* (1875), and *City Ballads* (1885).

Carleton, William, 1794-1869, Irish author. His *Traits and Stories of Irish Peasantry* (5 vol., 1830-33) realistically depicts his own rural youth. This was followed by *Tales of Ireland* (1834), *Fardorougha the Miser* (1839), and *The Black Prophet* (1847). See study by Benedict Kiely (1947).

Carleton College, at Northfield, Minn., coeducational, chartered 1866 by Congregationalists, presently nonsectarian. It was called Northfield College until 1872, when it was renamed for William Carleton, a benefactor.

Carleton University, at Ottawa, Ont., Canada, nonsectarian, coeducational, founded 1942 as Carleton College. It achieved university status in 1957. It has faculties of arts, science, engineering, and graduate studies, and schools of architecture, commerce, journalism, public administration, social work, and international affairs.

Carl XVI Gustaf: see CHARLES XVI GUSTAVUS.

Carlile, Richard (kār'ilē), 1790-1843, English journalist, reformer, and freethinker. For his radical writings and efforts to secure the freedom of the press, he spent over nine years in prison. He republished suppressed works by Thomas Paine, William Hone, and others, brought out his own *Political Liberator* (1817), and while he was imprisoned kept his weekly, the *Republican*, going (1819-26) with the help of his wife and sister. See biography by G. A. Aldred (1923).

Carlisle, Charles Howard, 1st earl of (kār'ilē), 1629-85, English statesman. A member of the prominent HOWARD family, he held various offices under Oliver Cromwell and remained in favor after the Restoration (1660) of Charles II. He was created earl in 1661 and served on several diplomatic missions. From 1677 to 1681 he was governor of Jamaica.

Carlisle, Frederick Howard, 5th earl of, 1748-1825, British statesman. A member of the distinguished Howard family, he went to the American colonies on an unsuccessful peace mission (1778) and served (1780-82) as lord lieutenant of Ireland. In 1798 he was made guardian of Lord Byron, who ridiculed him in the satirical poem *English Bards and Scotch Reviewers* (1809).

Carlisle, county borough (1971 pop. 71,497), county town of Cumberland, NW England, near the junction of the Caldew, Eden, and Petteril rivers. It is an important rail center and manufactures textiles, biscuits, and metal products. There is also an important livestock auction. Carlisle's location was formerly strategic. The Roman camp Luguvallum stood there, near Hadrian's Wall. The site figured prominently in the border warfare between the English and the

Scots during the Middle Ages. Mary Queen of Scots was imprisoned there in 1568. During the ENGLISH CIVIL WAR parliamentarians captured Carlisle. A technical college is in the borough. In 1974, Carlisle became part of the new nonmetropolitan county of Cumbria.

Carlisle (kar'lil', kar'lil'), industrial borough (1970 pop 18,079), seat of Cumberland co., 5 Pa., inc. 1782. Its manufactures include shoes, rugs, and quartz crystals. In the French and Indian War the Forbes (1758) and the Bouquet (1763) expeditions were organized there. A munitions depot during the Revolution, Carlisle was a headquarters for Washington during the WHISKEY REBELLION in 1794. Molly Pitcher is buried in the Old Graveyard there. The borough was a stop on the Underground Railroad and was attacked during the Civil War by Gen. Fitzhugh Lee. Carlisle is the seat of a U.S. Army War College and Dickinson College. The Carlisle Indian School, founded in 1879 by R. H. Pratt, was there.

Carlisle Indian School, in Carlisle, Pa., the first Federally supported school for Indians to be established off a reservation, it was founded in 1879 by Richard Henry Pratt. Its football team, led by Jim Thorpe and coached by Glenn Warner, brought the school nationwide attention. Pratt, who strenuously opposed the Indian Bureau's efforts to establish schools closer to the reservations, was relieved of his superintendency in 1904. The school was closed in 1918.

Carlists, partisans of Don CARLOS (1788-1855) and his successors, who claimed the Spanish throne under the SALIC LAW of succession, introduced (1713) by Philip V. The law (forced on Philip by the War of the Spanish Succession to avoid a union of the French and Spanish crowns) was abrogated by Ferdinand VII in favor of his daughter, who succeeded him (1833) as ISABELLA II. Ferdinand's brother, Don Carlos, refused to recognize Isabella and claimed the throne. A civil war followed, and in the hope of autonomy, most of the Basque Provs. and much of Catalonia supported Carlos. The Carlists' conservative and clericalist tendencies gave the dynastic conflict a political character, since the upper middle classes profited from the sale of church lands and supported Isabella. In 1839 the Carlist commander Rafael Maroto yielded, but in Catalonia the Carlists under Ramon CABRERA continued the struggle until 1840. After the failure of a peace plan that proposed marriage between Isabella and Don Carlos's son, Don Carlos, conde de Montemolin (1818-61), the latter made an unsuccessful attempt at an uprising in 1860. Montemolin's claims were revived by his nephew, Don Carlos, duque de Madrid (1848-1909), after the deposition (1868) of Isabella. Two insurrections (1869, 1872) failed, but after the abdication (1873) of King AMADEUS and the proclamation of the first republic, the Carlists seized most of the Basque Provs. and parts of Catalonia, Aragon, and Valencia. The ensuing chaos and brutal warfare ended in 1876, over a year after ALFONSO XII, son of Isabella, was proclaimed king. Don Carlos escaped to France. In the next half century many defected from Carlist ranks, and several rival groups formed. Pressure against the church by the second republic (1931-39) helped revive Carlism, and the Carlists embraced the Nationalist cause in the Spanish civil war (1936-39). Under the Franco regime Carlism was for many years an obstacle to plans for restoring the main branch of the Bourbon dynasty, but in 1969, Franco overrode Carlist objections and named the Bourbon prince Juan Carlos as his successor. See Edgar Holt, *Carlist Wars in Spain* (1967).

Carloman, d. 880, king of Bavaria, Carinthia, Pannonia, and Moravia (876-80) and of Italy (877-80), son of LOUIS THE GERMAN and father of Arnulf, emperor of the West. He failed (875) to prevent the assumption of the imperial crown by his uncle, Charles II (Charles the Bald). In 879 he was incapacitated by a paralytic stroke and transferred to his brothers the authority to rule. He was the first German king to become king of Italy.

Carloman, 751-71, son of Pepin the Short. He and his brother, CHARLEMAGNE, shared the succession to their father's kingdom. Carloman ruled the southern portion. Attempts to end rivalry between the brothers failed, and when Carloman died Charlemagne seized his domain. Carloman's wife and children went to the court of DESIDERIUS, who, as an enemy of Charlemagne, supported their claims.

Carloman, d. 884, king of the West Franks (France), son of King LOUIS II (Louis the Stammerer). He became joint ruler with his brother LOUIS III in 879. His reign was disturbed by revolts in Burgundy, by the loss (879) of Provence to Boson, count of Arles, and by an invasion of the Normans. He became sole

ruler at his brother's death (882). He was succeeded as French king by Emperor of the West Charles III (Charles the Fat).

Carloman, d. 754, mayor of the palace in the kingdom of AUSTRIA after the death (741) of his father, Charles Martel. Ruling with his brother, PEPIN THE SHORT, he carried on successful wars against the dukes of Aquitaine, the Saxons, the Swabians, and the Bavarians. The brothers helped St. Boniface reform the Frankish Church, bringing church and state into closer relationship. In 747, Carloman retired to a monastery.

Carlos. For Spanish and Portuguese kings thus named, see CHARLES.

Carlos, 1545-68, prince of the Asturias, son of Philip II of Spain and Maria of Portugal. Don Carlos, who seems to have been mentally unbalanced and subject to fits of homicidal mania, was imprisoned by his father in 1568. When he died shortly afterward, it was rumored (falsely) that Philip had poisoned him. Friedrich von Schiller deliberately idealized his character in his tragedy *Don Carlos*, portraying him as a champion of liberalism, unhappily in love with his stepmother, ELIZABETH OF VALOIS.

Carlos (Carlos María Isidro de Borbon), 1788-1855, second son of Charles IV of Spain. He was the first Carlist pretender. After his father's abdication (1808) he was, with the rest of his family, held a prisoner in France until 1814. A conservative and a devout Catholic, he was supported by the clerical party when he refused to recognize Isabella, daughter of his brother, FERDINAND VII, as successor to the Spanish throne. When his niece became queen (1833) as ISABELLA II, Don Carlos took up arms. Defeated in 1839, he escaped to France and renounced his claim in favor of his son, Don Carlos, conde de Montemolin. See CARLISTS.

Carlotta, Span. *Carlota* (kar'lō'ta), 1840-1927, empress of Mexico, daughter of Leopold I of Belgium, christened Marie Charlotte Amélie. She married MAXIMILIAN, archduke of Austria, on July 27, 1857, and accompanied him when he went to Mexico as emperor (1864). After Napoleon III decided to withdraw the French troops from Mexico and the fate of the empire became apparent, she went to Europe (1866) and sought the aid of Napoleon III and the pope. Her pleas were in vain, and her overwrought mind gave way under the strain. The Mexican empire ended with the execution of Maximilian in 1867, but the unhappy empress survived it by 60 years. See studies by Egon Corti (1928, repr. 1968), Richard O'Connor (1971), and Joan Haslip (1971).

Carlow (kar'lō), county (1971 pop. 34,025), 346 sq mi (896 sq km), SE Republic of Ireland. The chief towns are CARLOW, the county town, 8agenalstown, on the Barrow River, which forms much of the western boundary of the county, and Tullow, on the Slaney River which crosses the county from north to south. The granitic uplands of the Blackstairs Mts. in the southeast are a conspicuous feature in an otherwise fertile lowland region. Wheat, barley, and sugar-beet farming, cattle raising, and dairying are occupations of the region. There are also flour-milling, malting, and sugar-refining industries. Organized as a county in the early 13th cent., Carlow was strategically situated on the southern edge of the English PALE. In the 13th cent. it had palatinate privileges.

Carlow, urban district (1971 pop. 9,384), county town of Co. Carlow, SE Republic of Ireland, on the Barrow River. It is an agricultural market in a dairy region, with sugar refining, flour milling, brewing, and shoe manufacturing. There are ruins of a 12th-century castle. Carlow is the seat of the Roman Catholic diocese of Kildare and Leighlin. Of strategic importance, it was burned in 1405 and in 1577, in 1798 there was a fierce street battle fought by insurgent United Irishmen. St. Patrick's College for priests opened there in 1798.

Carl Sandburg Home National Historic Site see NATIONAL PARKS AND MONUMENTS (table).

Carlsbad see KARLOVY VARY, Czechoslovakia.

Carlsbad (kar'lz'bād), 1. Resort city (1970 pop. 14,944), San Diego co., S Calif., on the Pacific coast, settled in the 1880s, inc. 1952. It has an electronic industry, machine shops, and a crystal silica quarry. Major agricultural products are tomatoes and flowers, the flower fields in bloom are a tourist attraction. The discovery there of mineral springs with waters identical to those at Carlsbad (Karlový Vary), in Bohemia (now part of Czechoslovakia), led to the settlement and naming of the town. There are two lagoons, one freshwater and one tidewater, and many water sports facilities. La Costa resort spa is there. 2. City (1970 pop. 21,297), seat of Eddy co., SE

N Mex., on the Pecos River, in a grazing and irrigated farm area, settled 1888, inc. 1918. Great quantities of potash are mined and refined there. Other industries include agriculture, ranching, and tourism. The climate is mild, and two dammed lakes within the city provide water recreation. The Carlsbad reclamation project, begun in 1906, serves more than 20,000 acres (8,094 hectares). A two-year branch of New Mexico State Univ. is located in Carlsbad. There is a state zoological and botanical park on the city's outskirts, and Carlsbad Caverns National Park is nearby.

Carlsbad Caverns National Park, 46,753 acres (18,921 hectares), SE N Mex., in the Guadalupe Mts., est. as a national park 1930. These limestone caves, with remarkable stalactite and stalagmite formations and huge chambers, began forming 60 million years ago as groundwater started dissolving the rock. The caverns, among the largest in the world, were discovered c. 1900 and still have not been completely explored. The temperature of the caves remains constant at 56°F (13.3°C). Seven miles (11.3 km) of trail are electrically lighted. The Big Room, 754 ft (230 m) below the surface, is the most majestic of the many chambers, its perimeter is c. 1¼ mi (2 km) long. Each evening during the spring, summer and fall, the countless bats that inhabit the cave swarm out to feed on insects.

Carlsbad Decrees, 1819, resolutions adopted by the ministers of German states at a conference at Carlsbad that was convened and dominated by Prince METTERNICH following the murder of August von KOTZEBUE by a student. The decrees provided for uniform press censorship and close supervision of the universities, with the aim of suppressing all liberal agitation against the conservative governments of Germany, particularly by the student organizations (see BÜRSCHENSCHAFT). The resolutions, ratified by the diet of the German Confederation, remained in force until 1848.

Carlskrona: see KARLSKRONA, Sweden.

Carlson, Evans Fordyce, 1896-1947, U.S. marine officer, b. Delaware co., N.Y. Enlisting at 16 in the army, he served in the Philippines and Hawaii and in France during World War I. In the U.S. marine corps after 1922, he saw service in Cuba, Nicaragua, Japan, and especially China, where in 1937 he studied guerrilla warfare intensively. Angered by censorship of his reports, he resigned, but in 1941 he applied for recommissioning. During World War II he organized and commanded Carlson's Raiders, a guerrilla unit that achieved fame by its raids on Makin Island (Aug., 1942) and Guadalcanal (Nov., 1942). In 1946 he was promoted to brigadier general and retired from service. He wrote *The Chinese Army* (1940) and *Twin Stars of China* (1940). See biography by Michael Blackford (1947).

Carlstadt, Karlstadt (both kar'l'shtat), or **Karolstadt** (ka'rōlō'shtat'), c. 1480-1541, German Protestant reformer, whose original name was Andreas Rudolph Bodenstern. As early as 1516, Carlstadt presented theses denying free will and asserting the doctrine of salvation by grace alone. In 1518 he supported Luther against the attacks of Johann Maier von Eck by maintaining the supremacy of Scripture and in 1519 he appeared with Luther against Eck in the public disputation at Leipzig. He soon became known as the most extreme of the Wittenberg reformers. During Luther's stay at the Wartburg (1521-22) he became the leader at Wittenberg and began to put his radical beliefs into effect. His extreme spiritualization of religion tended to undermine the importance of the church and the sacraments. Upon his return Luther accused Carlstadt of betrayal and restored the more orthodox practices. Accused of revolutionary political activity he fled to Switzerland where he was protected by the Zurich preachers and became professor of theology at Basel.

Carlton Club, British political and social club (founded 1832). Located in London, it was long the center of the Conservative party organization. Since World War II the club has been primarily social. See study by Sir C. A. Petrie (1955).

Carlyle, Jane Baillie Welsh, 1801-66, English woman of letters, wife of Thomas Carlyle, whom she married in 1826. She possessed a genius for letter writing, manifest in the volumes of her published correspondence (1883, 1924, 1931). See edition of her letters by Trudy Bliss (1950), biography by E. A. Drew (1928, repr. 1973), study by Lawrence Hanson (1952).

Carlyle, Thomas, 1795-1881, English author, b. Scotland. He studied (1809-14) at the Univ. of Edinburgh, intending to enter the ministry, but left when his doubts became too strong. He taught mathemat-

ics before returning to Edinburgh in 1818 to study law. However, law gave way to reading in German literature. He was strongly influenced by Goethe and the transcendental philosophers and wrote several works interpreting German romantic thought, including a *Life of Schiller* (1825) and a translation (1824) of Goethe's *Wilhelm Meister*. In 1826 he married Jane Baillie Welsh, a well-informed and ambitious woman who did much to further his career. They moved to Jane's farm at Craigenputtock in 1828. There he wrote *Sartor Resartus* (published 1833-34 in *Fraser's Magazine*), in which he told his spiritual autobiography. He saw the material world as mere clothing for the spiritual one. The God of his beliefs was an immanent and friendly ruler of an orderly universe. In denying corporeal reality, Carlyle reflected his revulsion from the materialism of the age. In 1832, Ralph Waldo Emerson went to Craigenputtock, and began a friendship with Carlyle that was continued in their famous correspondence. In 1834 the Carlyles moved to London to be near necessary works of reference for the projected *French Revolution*. Finally completed in 1837 (the first volume had been accidentally burned in 1835), the book was received with great acclaim. Although it vividly re-creates scenes of the Revolution, it is not a factual account but a poetic rendering of an event in history. Carlyle extended his view of the divinity of man, particularly in his portraits of the great leaders of the Revolution. In subsequent works he attacked laissez-faire theory and parliamentary government and affirmed his belief in the necessity for strong, paternalistic government. He was convinced that society does change, but that it must do so intelligently, directed by its best men, its "heroes." His lectures, published as *On Heroes, Hero-Worship, and The Heroic in History* (1841), express his view that the great men of the past have intuitively shaped destiny and have been the spiritual leaders of the world. His other works expanded his ideas—*Chartism* (1840), *Past and Present* (1843), contrasting the disorder of modern society with the feudal order of 12th-century England, *Oliver Cromwell's Letters and Speeches* (1845), *Latter-Day Pamphlets* (1850), *Life of John Sterling* (1851), and a massive biography of a hero-king, Frederick the Great, on which he spent the years 1852-65. In 1866 his wife died, and the loss saddened the rest of his life. One of the most important social critics of his day, Carlyle influenced many men of the younger generation, among them Matthew Arnold and Ruskin. His style, one of the most tortuous yet effective in English literature, was a compound of biblical phrases, colloquialisms, Teutonic twists, and his own coinings, arranged in unexpected sequences. See his *Reminiscences* (1881) and numerous collections of his letters and his wife's, biographies by J. A. Froude (4 vol., 1882-84, repr. 1971) and D. A. Wilson (6 vol., 1923-34, repr. 1971, Vol. VI finished by D. W. MacArthur), studies by Emery Neff (1932, repr. 1968), Eric Bentley (1944), Julian Symonds (1952, repr. 1970), George B. Tennyson (1966), and A. J. LaValley (1968).

Carmagnola, Francesco Bussone da (frānchēs'kō bōōs-sō'nā da karmanyō'la), c. 1380?-1432, Italian condottiere. He fought for Filippo Maria Visconti, duke of Milan, in his wars against Florence and Venice but later fell out with Visconti and entered the service of Venice. After 1425 he commanded Florentine and Venetian forces against Milan. His irresolute conduct of the war led the Venetians to suspect treason, and he was tried and executed.

Carman, Bliss (kar'mən), 1861-1929, Canadian poet, b. Fredericton, N.B. He studied at the universities of New Brunswick and Edinburgh and at Harvard. While at Harvard (1886-88) he began a friendship with Richard Hovey that later resulted in their joint publication of the series *Songs from Vagabondia* (1894, 1896, 1901). Carman's poetry is emotional, optimistic, and impressionistic, filled with vivid, sensuous imagery. Among his numerous volumes of verse are *Behind the Arras* (1895), the series *Pipes of Pan* (1902-5), and *Echoes from Vagabondia* (1912). The best of these and other poems are collected in *Later Poems* (1921) and *Ballads and Lyrics* (1923). His *Talks on Poetry and Life*, lectures on Canadian literature, was published in 1926. See biography by Odell Shepard (1924), study by Donald Stephens (1966).

Carman, Harry James, 1884-1964, American historian and educator, b. Greenfield, Saratoga co., N.Y. He was a grade school teacher and a high school principal before becoming an instructor and then an assistant professor at Syracuse Univ. (1914-17). In 1918 he began teaching at Columbia, where he attained the rank of professor in 1931. From 1925 to

1931 he was assistant to the dean of Columbia College, and from 1943 to 1950 he was dean. He was appointed a member of the Board of Higher Education of New York City in 1938 and served on the New York State Board of Mediation from 1941 to 1955. Among his works are *Social and Economic History of the United States* (2 vol., 1930-34), *Lincoln and the Patronage* (with R. H. Luthin, 1943), *A History of the American People* (with H. C. Syrett, rev. ed. 1962), and *A Short History of New York State* (with others, 1957). He also edited several works concerning early American agriculture, on which he was a leading authority. Jared Eliot's *Essays upon Field Husbandry in New England* (with Rexford G. Tugwell, 1934), *American Husbandry* (1939), and *Jesse Buel, Agricultural Reformer: Selections from His Writings* (1947). Carman was also the editor of a valuable compilation, *A Guide to the Principal Sources for American Civilization, 1800-1900, in the City of New York* (with A. W. Thompson, 2 vol., "Manuscripts," 1960, and "Printed Sources," 1962).

Carmarthen (karmar'thən), municipal borough (1971 pop. 13,072), county town of Carmarthenshire, S. Wales, on the Towy River. It is a port for small vessels, a transportation hub, a cattle market, and a dairy center. In the Middle Ages Carmarthen was an important wool port. Its old castle (now in ruins) was the headquarters of Welsh chieftains. Carmarthen's parish church of St. Peter (14th cent.) is noteworthy. Trinity College is a teacher-training school. Merlin, the wizard of Arthurian legend, was reputedly born in Carmarthen. In 1974, Carmarthen became part of the new nonmetropolitan county of Dyfed.

Carmarthenshire, county (1971 pop. 162,313), 919 sq. mi (2,380 sq. km), S. Wales. The county town is CARMARTHEN. Largest of the Welsh counties, it is hilly, with lower land along the coast of Carmarthen Bay (off the Bristol Channel) and in the fertile valley of the Towy River. The county is generally devoted to agriculture (dairy farming is most important), but part of the great S. Wales coalfield extends into the southeast corner of the county around Llanelly. Metal products, textiles, and lenses are among the manufactured goods. There are remains of prehistoric and Roman settlements. In 1974, Carmarthenshire became part of the new nonmetropolitan county of Dyfed.

Carmathians: see KARMATHIANS

Carmel, Mount [Heb. = garden land], mountain ridge, NW Israel, extending 13 mi (21 km) NW from the plain of Esdraelon to the Mediterranean Sea, where it ends in a promontory marking the southern limit of the Bay of Haifa. Its highest point is 1,792 ft (546 m), and it is one of the most striking physical features of Israel. Long an object of veneration, it was associated in biblical times with the lives of the prophets Elijah and Elisha (Isa. 35:2, Amos 9:3, 1 Kings 18). From the mountainside vineyards comes the renowned Mt. Carmel wine; there are also olive groves. At the foot of Mt. Carmel is the port of Haifa. On its slopes are a Baháist garden shrine, with the tombs of ʿAbd-ʿed-din and of ʿAbdullāh Baha (see BAHÁISM), and a 19th-century Carmelite monastery.

Carmel-by-the-Sea or Carmel (karmēl'), village (1970 pop. 4,525), Monterey co., Calif., at the neck of Monterey peninsula on Carmel Bay, inc. 1916. It is a tourist spot as well as an artists' and writers' community (Jack London and Robinson Jeffers both lived and worked there), art shows and an annual Bach festival are held in the village. The bay, named in 1602 by Carmelite friars in Vizcaino's expedition, is famed for its beauty. Mission San Carlos Borromeo, the burial place of Father Junipero Serra, is nearby.

Carmelites (kar'məlīts), Roman Catholic order of mendicant friars. Originally a group of hermits, apparently European, living on Mt. Carmel, Palestine, their supervision was undertaken (c. 1150) by St. Berthold. In 1238 they moved to Cyprus, and thence to Western Europe. St. Simon Stock (d. 1265), an Englishman, was their second founder. He transformed them into an order of friars resembling Dominicans and Franciscans and founded monasteries at Oxford, Cambridge, Paris, and Bologna. They rapidly became prominent in university life. An enclosed order of Carmelite nuns was established. The Carmelites, like other orders, declined in the 15th cent. They were revived by St. THERESA (of Ávila) and St. JOHN OF THE CROSS in 16th-century Spain. These great contemplatives gave the order a special orientation toward mysticism. Their reformed branch is the Discalced (or Barefoot) Carmelites; it is now more numerous than the Carmelites of the Old Observance. The Discalced Carmelites cultivate the

contemplative life in all aspects, and they have produced many works on mystical theology. St. THERESA (of Lisieux) is a well-known Discalced Carmelite of the 19th cent. In 1790 the first community came to the United States and settled near Port Tobacco, Md. There are presently about 6,900 priests and brothers living in Carmelite communities, with 500 living in the United States. See E. Allison Peers, *Spirit of Flame* (1944, repr. 1961), Peter Rohrbach, *Journey to the Carth* (1966).

Carmen Sylva: see ELIZABETH, queen of Rumania

Carmi (kar'mi): 1. Father of Achan. Joshua 7:1, 18, 1 Chron. 2:7. In spite of textual difficulties this can probably be identified as the Carmi of 1 Chron. 4:1. 2. Reuben's son. Gen. 46:9, Ex. 6:14, Num. 26:6, 1 Chron. 5:3.

Carmichael, uninc. residential city (1970 pop. 37,625), Sacramento co., N. central Calif., on the American River.

carmina burana: see GOLIARDIC SONGS

Carmona, António Oscar de Fragoso (antō'nyō āshkar' dī fragō'sōō karmō'nā), 1869-1951, Portuguese general and political leader. When Gen. Manuel de Oliveira Gomes da Costa overthrew the democratic regime in 1926, Carmona was made foreign minister in the new government. Shortly afterward he deposed Gomes da Costa and served (1926-28) as head of the provisional government. Elected president in 1928, Carmona won (1935, 1942, 1949) each successive election. The regime he established was dictatorial, dominated after 1928 by Antonio de Oliveira SALAZAR.

Carmona (karmō'nā), town (1970 pop. 24,378), Seville prov., SW Spain, in Andalusia. It is a farm center for an area raising cattle, cereals, fruits, and olives. Ferdinand III of Castile took Carmona from the Moors in 1247 after a year-long siege. It has numerous examples of Gothic, Moorish, and baroque architecture, including the imposing ruins of an alcazar. A large Roman necropolis was discovered nearby in 1881.

Carnac (karnak'), town (1968 pop. 3,681), Morbihan dept., NW France, in Brittany, at the foot of the Quiberon peninsula. It is the site of remarkable MEGALITHIC MONUMENTS, particularly the MENHIR. The menhirs, formerly ascribed to the druids, extend along the coast in 11 parallel rows, 1,100 yd (1,006 m) long, some are 20 ft (6.1 m) high. The sea resort of Carnac-Plage is nearby.

Carnaim (kar'nāim): see ASHTEROTH KARNAIM

Carnap, Rudolf, 1891-1970, German-American philosopher. He taught philosophy at the Univ. of Vienna (1926-31), where he became a member of the VIENNA CIRCLE, and at the German Univ. in Prague (1931-35). After going to the United States he taught at the Univ. of Chicago (1936-52) and at the Univ. of California at Los Angeles (1954-62). Carnap was one of the most influential of contemporary philosophers; he is known as a founder of LOGICAL POSITIVISM and made important contributions to logic, semantics, and the philosophy of science. In *Logische Syntax der Sprache* (1934, tr. *The Logical Syntax of Language*, 1937) he defined philosophy as "the logic of the sciences" and considered it a general language whose only legitimate concern could be to describe and criticize the language of the particular sciences. All propositions were held to be either tautological (embodying logical or mathematical systems), scientific (embodying philosophy properly understood), or nonsensical (embodying the non-verifiable propositions of traditional philosophy). Through an analysis of scientific, logical, and mathematical language he revealed the inadequacies of everyday speech. Carnap later modified this extreme view, which rejects almost all of traditional philosophy. His other works include *Introduction to Semantics* (1942), *Meaning and Necessity* (1947, 2d ed. 1956), *Logical Foundations of Probability* (1950), and *Einführung in die symbolische Logik* (1954, tr. *Introduction to Symbolic Logic and its Applications*, 1958). See studies by P. A. Schilpp, ed. (1963) and Richard Butrick (1970).

Carnarvon, George Edward Stanhope Molyneux Herbert, 5th earl of (karnar'vən), 1866-1923, English Egyptologist. With Howard Carter he excavated in the Valley of the Kings in Luxor, Egypt, from 1906 to 1922. The final and most famous of their discoveries was the tomb of Tutankhamen. Lord Carnarvon died before it was thoroughly explored. He collaborated with Howard Carter on the report *Five Years' Explorations at Thebes* (1912).

Carnarvon, Henry Howard Molyneux Herbert, 4th earl of, 1831-90, British statesman. As colonial secretary (1866-67) under the earl of Derby he intro-

duced the British North America Act, which made Canada a confederation. In the same office (1874-78) under Disraeli he was unsuccessful in an attempt to create a federation in South Africa. His policy as lord lieutenant of Ireland (1885-86) was conciliatory but failed to stem Irish nationalism. See correspondence, 1874-1878, ed. by C. W. de Kiewiet (1955), biography by A. H. Hardinge (1925).

Carnatic (karnāt'ik), region, SW India, on the Arabian Sea. The early European settlers sometimes applied the term Carnatic to all of S India. The region was the site of the earliest European settlements in India, those of Portugal. During the 18th cent the Carnatic plains became the arena for the struggle between Great Britain and France for supremacy in India.

carnation· see PINK

carnauba, WAX obtained from the wax palm, or carnauba (*Copernicia cerifera*), of Brazil. It is secreted by the leaves, apparently in defense against the hot winds and droughts of its native habitat, and the resultant coating is removed by drying and flailing. The hardest, highest-melting natural wax known, its many commercial uses include the production of polishes, lubricants, and floor waxes. A similar wax is obtained from the trunk of *Ceroxylon andicola*, the wax palm of the Andes.

Carneades (karnē'adēz), 113-129 B.C., Greek philosopher, b. Cyrene. He studied at Athens under Diogenes the Stoic, but reacted against Stoicism and joined the ACADEMY, where he taught a skepticism similar to that of Pyrrho. While denying the possibility of absolute certainty in knowledge, he held that probable knowledge was available to guide the actions of men. He recognized three degrees of probability, and his work anticipated modern discussions of the nature of empirical knowledge.

Carnegie, Andrew (karnā'gē), 1835-1919, American industrialist and philanthropist, b. Dunfermline, Scotland. His father, a weaver, found it increasingly difficult to get work in Scottish factories and in 1848 brought his family to Allegheny (now Pittsburgh), Pa. Andrew first worked in a cotton mill as a bobbin boy, then advanced himself as a telegrapher, and became (1859) a superintendent for the Pennsylvania RR. He resigned (1865) his railroad position to give personal attention to the investments he had made (1864) in iron manufactures. By 1873 he had recognized America's need for steel and, concentrating on steel production, began his acquisition of firms which were later consolidated into the Carnegie Steel Company. Carnegie's success was due in part to efficient business methods, to his able lieutenants, and to close alliances with railroads. Another factor was his partnership with Henry C. FRICK, Carnegie, concentrating on production rather than stock-market manipulations, further expanded his plants and consolidated his hold in the depression of 1893-97. By 1900 the Carnegie Steel Company was producing one quarter of all the steel in the United States and controlled iron mines, coke ovens, ore ships, and railroads. It was in these circumstances that the U.S. Steel Corp. was formed to buy Carnegie out. He had long been willing to sell—at his own price—and in 1901 he transferred possession for \$250 million in bonds and retired from business. He lived a large part of each year after 1887 in Scotland on his great estate on Dornoch Firth. His essay "The Gospel of Wealth" (1889) set forth his idea that rich men are "trustees" of their wealth and should administer it for the good of the public. Carnegie's benefactions (totaling about \$350 million) included Carnegie Hall (1892) in New York City, the Carnegie Institution of Washington (1902), the Carnegie Hero Fund Commission (1904), the Carnegie Foundation for the Advancement of Teaching (1905), the Carnegie Endowment for International Peace (1910), and over 2,800 libraries. See his autobiography (1920, repr. 1963), biographies by B. J. Hendrick (1932, repr. 1969), A. F. Harlow (1953), and J. F. Wall (1970).

Carnegie, borough (1970 pop. 10,864), Allegheny co., SW Pa., an industrial suburb of Pittsburgh, inc. 1894. A steel town, it also has coal mines and plants making chemicals and electrical equipment. The Neville House was the home of Gen. John Neville, an officer in the French and Indian and Revolutionary Wars. The borough was named for Andrew Carnegie.

Carnegie Corporation of New York, foundation established (1911) to administer Andrew Carnegie's remaining personal fortune for philanthropic purposes. Initially endowed with \$125 million, the foundation received another \$10 million from the residual estate. By 1970 its assets exceeded \$283 mil-

lion. Carnegie directed the foundation's activities until his death in 1919, in accordance with his early interests. He established the policy of grants for free public libraries and church organs. In the years following his death the trustees followed a more general policy leading to "the advancement and diffusion of knowledge and understanding." The foundation has financed many studies in its areas of main interest—U.S. education and underprivileged groups. Since 1917 a small portion of the foundation's income has been used for studies within the British Commonwealth. Andrew Carnegie also established the Carnegie Endowment for International Peace (1910), the Carnegie Foundation for the Advancement of Teaching (1905), and the Carnegie Hero Fund Commission (1904).

Carnegie Institute of Technology: see CARNEGIE-MELLON UNIV.

Carnegie-Mellon University, at Pittsburgh, Pa., est. 1967 through the merger of the Carnegie Institute of Technology (founded 1900, opened 1905) and the Mellon Institute of Industrial Research (founded 1913). The university is made up of six divisions and includes additional facilities for nuclear, computer, and educational research. The university was the first in the United States to offer academic degrees in the field of drama.

carnelian (karnēl'yən) or **cornelian** (kōr-, kar-), variety of red CHALCEDONY, used as a gem. It is distinguished from SARD by the shade of red, carnelian being bright red and sard brownish. The red coloring is apparently caused by iron oxide.

Carniola (karnēō'la), Croatian *Kranj*, historic region, NW Yugoslavia, in Slovenia. The history of this largely mountainous area is closely linked with that of SLOVENIA. The first known inhabitants, a Celtic tribe called the Carni, were displaced by the Romans, who made Carniola part of their province of Pannonia. Slovenes settled Carniola in the 6th cent. Charlemagne later incorporated it into his empire. The region became a march, or margraviate, under Bavarian suzerainty in the 10th cent. and in 1269 was acquired by Bohemia. It passed to the Austrian Hapsburgs in 1282 and was made (1364) a titular duchy. In 1849 its status was raised to a crown land. LJUBLJANA was its chief city. After World War I, Carniola was divided between Italy and Yugoslavia, but the Italian part passed to Yugoslavia in 1947.

Carnion (kar'nēōn)· see ASHTEROH KARNAIM

carnival, communal celebration, especially the religious celebration in Roman Catholic countries that takes place just before LENT. Since early times carnivals have been accompanied by parades, masquerades, pageants, and other forms of revelry that had their origins in pre-Christian pagan rites, particularly fertility rites that were connected with the coming of spring and the rebirth of vegetation. One of the first recorded instances of an annual spring festival is the festival of Osiris in Egypt; it commemorated the renewal of life brought about by the yearly flooding of the Nile. In Athens, during the 6th cent. B.C., a yearly celebration in honor of the god Dionysus featured a float dedicated to him that was wheeled through the city streets to the accompaniment of songs, dances, and ribald merrymaking. This is the first recorded instance of the traditional use of floats for spring festivals. It was during the Roman Empire that carnivals reached an unparalleled peak of civil disorder and licentiousness. Developing out of folk celebrations and the Greek mysteries of Dionysus, the major Roman carnivals were the Bacchanalia, the Saturnalia, and the Lupercalia. In Europe the tradition of spring fertility celebrations persisted well into Christian times, particularly in Teutonic regions, where carnivals reached their peak during the 14th and 15th cent. Because carnivals are deeply rooted in pagan superstitions and the folklore of Europe, the Catholic Church found it impossible to stamp them out and ultimately was driven to the position of having to accept many of them as part of church activity. The immediate consequence of church influence may be seen in the medieval Feast of Fools, which included a mock Mass and a blasphemous impersonation of church officials, and the Feast of the Ass, which retained many pagan rites and was at times very bawdy. Eventually, however, the power of the church made itself felt, and the carnival was stripped of its most offending elements. The church succeeded in dominating the activities of the carnivals, and eventually they became directly related to the coming of Lent. The major celebrations are generally on Shrove Tuesday (see MARDI GRAS), however, in Germany the carnival season, or *Fasching*, begins on the Epiphany (Jan. 6) in Bavaria and on Nov. 11

in the Rhineland. In recent times, the term *carnival* has also been loosely applied to include local festivals, traveling circuses, bazaars, and other celebrations of a joyous nature, regardless of their purpose or their season.

carnivore (kar'nāvōr'), term commonly applied to any animal whose diet consists wholly or largely of animal matter. In animal systematics it refers to members of the mammalian order Carnivora (see CHORDATA). This large order is divided into two suborders, the Fissipedia, or land carnivores, and the Pinnipedia, or fin-footed carnivores. The Fissipedia encompasses two superfamilies: one (Canioidea) includes the DOG, BEAR, RACCOON, and WEASEL families and the other (Feloidea) includes the CAT, CIVET, and HYENA families. The Pinnipedia, often classified as a separate order, includes the SEAL, SEA LION, and WALRUS families. The term *herbivore* refers to animals whose diets consist wholly or largely of plant matter, *omnivore* refers to animals that eat both animal and plant matter. Unlike the term *carnivore*, these terms do not refer to any one group in animal systematics.

carnivorous plants· see BLADDERWORT, PITCHER PLANT, VENUS'S FLYTRAP

Carnot, Hippolyte (ēpōlēt' karnō'), 1801-88, French statesman, son of Lazare Carnot. He shared his father's exile after 1815 and returned to France in 1823. A follower of Claude Henri de SAINT-SIMON, he participated in the July Revolution of 1830. He came to oppose the July Monarchy and was elected three times as an opposition member of the chamber of deputies. He took part in the radical agitation that led to the February Revolution of 1848 and became minister of education in the provisional government. Entering (1864) the *corps législatif*, he joined the liberal opposition to Emperor Napoleon III, after whose downfall he became a member of the constituent assembly (1871) and then a senator for life (1875).

Carnot, Lazare Nicolas Marguerite (lazar' nekōlā' margarēt'), 1753-1823, French revolutionary, known as the organizer of victory for his role in the FRENCH REVOLUTIONARY WARS. A military engineer by training, Carnot became the military genius of the Revolution and was chiefly responsible for the success of the French in the wars. A member of the Legislative Assembly, the Convention, and the Committee of Public Safety, he made himself almost indispensable through his military knowledge. After the fall of Maximilien Robespierre, who was primarily responsible for the Reign of Terror, Carnot managed to avoid punishment for his own part in the Terror and became a member of the DIRECTORY. He was ousted from the Directory in the coup d'état of 18 Fructidor (Sept., 1797) and fled abroad. He returned in 1799 and served as minister of war (1800) and in the tribunate under Napoleon Bonaparte (NAPOLEON I). In the next few years he wrote several works on mathematics and military engineering; in 1810 appeared his masterpiece, *De la défense des places fortes*, long considered the classic work on fortification. Carnot was the best-known advocate of the principle of active defense. In 1814 he returned to active service and conducted the defense of Antwerp. In the Hundred Days he served as minister of the interior. Exiled after the restoration of the monarchy, he died in Magdeburg, Prussia. See biographies by Huntley Dupre (1940) and Marcel Reinhard (2 vol., 1950-52, in French).

Carnot, Nicolas Léonard Sadi (nekōlā' lāōnār' sadē'), 1796-1832, French physicist, a founder of modern thermodynamics, son of Lazare N. M. Carnot. His famous work on the motive power of heat (*Reflexions sur la puissance motrice du feu*, 1824) is concerned with the relation between heat and mechanical energy. Carnot devised an ideal engine in which a gas is allowed to expand to do work, absorbing heat in the process, and is expanded again without transfer of heat but with a temperature drop. The gas is then compressed, heat being given off, and finally it is returned to its original condition by another compression, accompanied by a rise in temperature. This series of operations, known as Carnot's cycle, shows that even under ideal conditions a heat engine cannot convert into mechanical energy all the heat energy supplied to it, some of the heat energy must be rejected. This is an illustration of the second law of thermodynamics. Carnot's work anticipated that of Joule, Kelvin, and others.

Carnot, Sadi (sadē'), 1837-94, French statesman, president of the Third Republic (1887-94), son of Hippolyte Carnot. As minister of public works (1880-85) and of finance (1886), he remained untainted by the financial scandals of the time. He

succeeded Jules Grevy in the presidency, his tenure was disturbed by the agitation for General BOULANGER and by the Panama Canal scandal, concerning bribery of public officials. He was assassinated by an Italian anarchist. Jean Paul Pierre Casimir-Perier succeeded him.

Carnovsky, Morris (karnöv'skē), 1897-, American actor, b. St. Louis, Mo. After his New York City debut in *The God of Vengeance* (1922), he joined the Theatre Guild and later performed with The Group Theatre, of which he was a founding member. He worked as an actor and director for the Actors Laboratory Theatre in Hollywood (1945-50). Carnovsky has concentrated on Shakespearean roles since his first appearance at Stratford, Conn., in 1956. His films include *Cyrano de Bergerac* (1951).

Caro, Annibale (an-nē'balā ka'rō), 1507-66, Italian poet, friend of Cellini, Varchi, and Bembo. He is best known for his translation of the *Aeneid*, for his poems in praise of opposing royal houses, and for his letters, which were among the finest of his age.

Caro or Karo, Joseph ben Ephraim (ka'rō), 1488-1575, eminent Jewish codifier of law, b. Toledo, Spain. He left Spain as a child when the Jews were expelled (1492) and finally settled in Safed, Palestine. His literary works rank among the masterpieces of rabbinical literature. Chief among them are the *Beṭ Yosef* [house of Joseph] and *Shulhan Aruk* [the table set], parts of which are still used as the authoritative code for Orthodox religious and legal disputes. This code owes its fame and popularity as much to the opposition it aroused and the many commentaries it inspired as it does to its merits. Caro was also a noted cabalist (see CABALA) who claimed to have had heavenly visitations. He recorded much of this in a diary later edited to appear as a commentary on the Pentateuch (*Maggid Mesharim*, 1646). See study by R. J. Werblowsky (1962).

carob (kār'ab), leguminous evergreen tree (*Ceratonia siliqua*) of the family Leguminosae (PULSE family), native to Mediterranean regions but cultivated in other warm climates, including Florida and California. The large red pods have been used for food for animal and man since prehistoric times. The pods and their extracted content have numerous common names, e.g., locust bean gum and St. John's-bread—the latter from the belief that they may have been the "locust" eaten by John the Baptist in the wilderness (Mark 1:6). Carob is used also for curing tobacco, in papermaking, and as a stabilizer in food products. It has been claimed that the seeds were the original of the carat, the measure of weight for precious jewels and metals. Carob is classified in the division MAGNOLIOPHYTES, class Magnoliopsida, order Rosales, family Leguminosae.

Carol I, 1839-1914, prince (1866-81) and first king (1881-1914) of Rumania, of the house of Hohenzollern-Sigmaringen. He is also called Charles I. A Prussian officer, he was elected to succeed the deposed Alexander John Cuza as prince of Rumania. He reformed the Rumanian constitution and laid the groundwork for the country's monetary system, military organization, and railroad network. Exploitation of Rumanian oil fields began in his reign. Economic development, however, did not improve the lot of the peasants, and an uprising in 1907 was cruelly suppressed. Carol sided with Russia in the Russo-Turkish War of 1877-78 and obtained at the Congress of Berlin (see BERLIN, CONGRESS OF) full independence for Rumania, which he declared a kingdom in 1881. Carol's wife was Princess ELIZABETH of Wied. He was succeeded by his nephew Ferdinand.

Carol II, 1893-1953, king of Rumania, son of King Ferdinand and Queen Marie. While crown prince, he contracted amorganatic marriage with Zizi La-brino but divorced her to marry (1921) Princess Helen of Greece. He soon formed a liaison with Magda Lupescu, with whom he lived in Paris after being forced (1925) to renounce his right of succession. On the death (1927) of King Ferdinand, Carol's son MICHAEL became king, but Carol, having divorced Queen Helen in 1928, returned to Rumania in 1930, supplanted his son, and had himself proclaimed king de jure since 1927. A turbulent period began (see RUMANIA). In 1938, Carol formed a royal dictatorship. A contest between the king and the fascist IRON GUARD ensued, with assassinations and massacres on both sides. Forced to call on Ion ANTONESCU to form a government (1940), Carol was deposed and fled abroad with Lupescu, whom he finally married in Brazil in 1947. Michael once more became king. Carol died in Portugal.

carol, popular hymn, of joyful nature, in celebration of an occasion such as May Day, Easter, or Christ-

mas. The earliest English carols date from the 15th cent. The carol is characterized by simplicity of thought and expression. Many are thought to be adaptations of pagan songs. Despite the folk-song character of true carols, many Christmas hymns composed in the 19th cent. have been called carols. The oldest printed carol is the *Boar's Head Carol*, printed in 1521 by Wynkyn de Worde. Carols of French origin are called noels. See W. J. Phillips, *Carols, Their Origins, Music and Connection with Mystery-Plays* (1921), R. L. Greene, *The Early English Carols* (1935), Percy Dearmer et al., ed., *The Oxford Book of Carols* (1928, repr. 1964), Edmonstone Duncan, *The Story of the Carol* (1911, repr. 1968).

Carol City, uninc. residential city (1970 pop. 27,361), Dade co., SE Fla., between Miami and Fort Lauderdale and near the Atlantic Ocean.

Carolina campaign, 1780-81, of the American Revolution. After Sir Henry Clinton had captured CHARLESTON, he returned to New York, leaving a British force under Cornwallis to subordinate the Carolinas to British control. Cornwallis swept north and capped his success in the battle of Camden on Aug. 16, 1780. The American force was completely routed, the gallant Baron de Kalb was mortally wounded, and the American commander, Horatio Gates, fled from the field, outdistancing officers and men in retreat. Patriot defense was broken in the Carolinas, where only the swift and secretly moving guerrilla bands of Francis Marion, Thomas Sumter, and Andrew Pickens harassed the invaders. The American cause spurred upward, however, with the remarkable battle of Kings Mt. (Oct. 7, 1780), where bands of frontier riflemen under Isaac Shelby, John Sevier, and William Campbell surrounded a British raiding party under Patrick Ferguson, the British commander fell, and his men surrendered. This victory prefaced the campaign fought in North Carolina by Gen. Nathaniel Greene (who had been appointed to succeed Gates) and his lieutenants, notably Light-Horse Harry Lee and Daniel Morgan. It was Morgan who at the head of a raiding party met and all but annihilated Cornwallis's raiders under Banastre Tarleton at Cowpens (Jan. 17, 1781). Cornwallis pushed north and at Guilford Court-house (March 15, 1781) won a Pyrrhic victory over Greene, the British had technically won but had to retreat to British-held Wilmington, N.C., and then to Virginia. Greene then joined the guerrilla leaders in freeing South Carolina. Again the Americans were defeated—by Lord Rawdon at Hobkirk's Hill (April 25, 1781) and by Col. Alexander Stewart at Eutaw Springs (Sept. 8, 1781)—and again the British had to retreat, returning to Charleston. The campaign was a British failure and was, moreover, a triumph for the patriots because it set the stage for the YORKTOWN CAMPAIGN.

Carolina parakeet, small, long-tailed bird, *Canopus carolinensis*, now believed extinct. The Carolina parakeet was the northernmost representative of the parrot family. It had green plumage with a yellow head and orange cheek patches and forehead. The largest specimens were 13 in. (33 cm) in length, including the tail feathers. It was formerly distributed throughout the SE United States, as far north as Virginia and as far west as Texas, the last specimens were seen in S Florida early in the 20th cent. A fruit eater, the Carolina parakeet was an agricultural pest and was therefore exterminated by farmers. It is classified in the phylum CHORDATA, subphylum Vertebrata, class Aves, order Psittaciformes, family Psittacidae. See PARAKEET.

Caroline, Fort: see FORT CAROLINE

Caroline Affair. In 1837 a group of men led by William Lyon MACKENZIE rebelled in Upper Canada (now Ontario), demanding a more democratic government. There was much sympathy for their cause in the United States, and a small steamer, the *Caroline*, owned by U.S. citizens, carried men and supplies from the U.S. side of the Niagara river to the Canadian rebels on Navy Island just above Niagara Falls. On the night of Dec. 29, 1837, a small group of British and Canadians loyal to the Upper Canadian government crossed the river to the U.S. side where the *Caroline* was moored, loosed her, set fire to her, and sent her over the falls. One American was killed in the incident. Americans on the border were aroused to intense anti-British feeling, and soldiers under Gen. Winfield Scott were rushed to the scene to prevent violent American action. The affair passed over, though it had an aftermath, when one of the men who had taken part in the attack boasted of that fact when he was in the United States and was arrested as a criminal. That matter, too, was smoothed over, but the Caroline Affair and the

Aroostook War helped to make relations with Great Britain very tense in the years before the Webster-Ashburton Treaty.

Caroline Islands, archipelago (1969 est. pop. 66,900), c. 830 sq. mi. (2,150 sq. km), W. Pacific, just north of the equator, included in 1947 in the U.S. Trust Territory of the Pacific Islands (see PACIFIC ISLANDS, TRUST TERRITORY OF THE) under United Nations trusteeship. The Caroline Islands include four of the Trust Territory's six administrative districts: PALAU, YAP, TRUK, and PONAPE. The islands are fertile and rich in minerals. There are deposits of phosphate, guano, bauxite, and iron, coconuts, sugarcane, and tapioca are produced. The chief exports are dried bonito, copra, and tapioca. Most of the inhabitants are Micronesians, but in the eastern islands there are some Polynesians. There is evidence of Chinese contact with the western islands in the 7th cent. A.D. The first Europeans to visit the Carolines were the Spanish in 1526, but the islands did not come under Spain's control until 1886. After the Spanish-American War the islands were sold (1899) to Germany. They were occupied in 1914 by the Japanese, who in 1920 were given a League of Nations mandate over them. Annexed to Japan in 1935, the islands were heavily bombed prior to American occupation during World War II.

Caroline of Ansbach (ans'bak), 1683-1737, queen consort of GEORGE II of England, daughter of the margrave of Brandenburg-Ansbach. She married George in 1705 while he was electoral prince of Hanover and bore him three sons and five daughters. After his accession (1727) she gave active support to Sir Robert WALPOLE. Her political influence over the king lasted until her death. See biographies by R. L. Arkell (1939) and Peter Quennell (1940).

Caroline of Brunswick, 1768-1821, consort of GEORGE IV of England. The daughter of Charles William Ferdinand, duke of Brunswick, she married George (then prince of Wales) in 1795. She bore him one daughter, but the couple separated in 1796 and Caroline, deprived of her child, lived in retirement. An accusation that she had borne an illegitimate child occasioned a commission of inquiry (1806), which found her innocent but imprudent. Caroline went abroad in 1814, but when George became king in 1820 she returned to claim her rights as queen. The government immediately instituted proceedings against her in the House of Lords for divorce on the grounds of adultery. Caroline was probably guilty of the charge, but her persecution by a profligate husband aroused popular sympathy for her and the bill was dropped. See biographies by Joanna Richardson (1960) and E. F. L. Russell (1967), Roger Fulford, *The Trial of Queen Caroline* (1967).

Carolingian architecture and art. In the 8th cent. a gradual change appeared in Western culture and art, reaching its apex under CHARLEMAGNE. The new architecture, inspired by the forms of antiquity, abandoned the small boxlike shapes of the Merovingian period and used instead spacious basilicas often intersected by vast transepts. In some churches, such as Fulda and Cologne, the central nave ended in semicircular apses. An innovation of Carolingian builders, which was to be of incalculable importance for the later Middle Ages, was the emphasis given to the western extremity of the church. The facade, flanked symmetrically by towers, or simply the exterior of a massive complex (westwork), became the focal point of the structure. The function of the westwork is still debated. It had an elevation of several stories, the lowest a vaulted vestibule to the church proper, and above, a room reached by spiral staircases, which may have served as a chapel reserved for high dignitaries. The outstanding structure of the Carolingian period still in existence is the palatine chapel at Aachen, dedicated by Pope Leo III in the year 805. It is centralized in plan and surmounted by an octagonal dome. The throne of the emperor stood overlooking the central space within an upper gallery, which could be reached directly from the imperial apartments. The design of the palatine chapel appears to have been based in part on the 5th-century Church of San Vitale in Ravenna. Other important structures still partly preserved, or known through documentary evidence, include the churches of Saint-Denis, Corbie, Centula (Saint-Riquier), and Reichenau. The best-preserved artistic achievements of the age are works of small dimensions—manuscript illumination, ivory carving, and metalwork. Besides the imperial court, at Aachen, the leading centers of art were the monasteries in Tours, Metz, Saint-Denis, and near Rheims. The earliest liturgical manuscripts of the Carolingian period, such as the Gospel book

signed by the scribe Godescalc (written between 781 and 783), are characterized by a tentative and not always successful fusion of ornamental motifs of chiefly Anglo-Saxon and Irish origin and by figures derived from antiquity. Full-page portraits of the four evangelists were often designed. Later Carolingian miniatures show an increasing familiarity with the heritage of late antiquity and in some instances are perhaps influenced by Byzantine art. The manuscripts owe much of their beauty to the new minuscule form of writing, remarkable for its clarity and form. The most-influential work was the Utrecht Psalter, illustrated in a mode of nervous and flickering intensity quite unparalleled in earlier Western art. Closely allied in style to the miniatures were the ivory carvings, many of them originally part of book covers. Metalwork objects are rarer, although literary evidence shows that goldsmiths and enamel workers were active. The large golden altar of Sant' Ambrogio in Milan (executed in 835), the portable altar of Arnulf (now in Munich), several splendid book covers, and other sumptuously decorated objects provide insight into the artistic accomplishments of the period, which ended in the late 9th cent. See A. K. Porter, *Medieval Architecture: Its Origin and Development* (2 vol., 1909, 1912, repr. 1969), Adolph Goldschmidt, *German Illumination* (Vol. 1. *Carolingian Period*, 1928, repr. 1969), Roger Hinks, *Carolingian Art* (1935, repr. 1962), Howard Saalman, *Medieval Architecture* (1962).

Carolingians (kārālīn'jēanz), dynasty of Frankish rulers, founded in the 7th cent. by PÉPIN OF LANDEN, who, as mayor of the palace, ruled the East Frankish Kingdom of Austrasia for Dagobert I. His descendants, PÉPIN OF HERISTAL, CHARLES MARTEL, CARLOMAN, and PÉPIN THE SHORT, continued to govern the territories under the nominal kingship of the MEROVINGIANS. In 751, PÉPIN the Short deposed the last Merovingian king, Childeric III, and became sole Frankish king. The family was at its height under PÉPIN's son, CHARLEMAGNE, who was crowned emperor of the West in 800. His empire was divided by the Treaty of Verdun (843) after the death of his son, Emperor LOUIS I, among Louis's three sons: LOTHAR I inherited the imperial title and the middle part of the empire; LOUIS THE GERMAN founded a dynasty that ruled in Germany (kingdom of the East Franks) until 911, his successors being CHARLES III (Charles the Fat), ARNULF, and LOUIS THE CHILD. The third son of Louis I, CHARLES II (Charles the Bald), founded the French Carolingian dynasty, which ruled, with interruptions, until 987. Its rulers were LOUIS II (Louis the Stammerer), LOUIS III, CARLOMAN, CHARLES III (Charles the Simple), LOUIS IV (Louis d'Outremer), LOTHAR (941-86), and LOUIS V. In the Carolingian period feudal principles were formulated, and a landed economy was firmly established. The kings and emperors worked closely with church officials; Charlemagne became the pope's protector. See Heinrich Fichtenau, *The Carolingian Empire* (1949, tr. 1957, repr. 1965), E. S. Duckett, *Carolingian Portraits* (1962, repr. 1969), F. L. Ganshof, *The Carolingians and the Frankish Monarchy* (tr. 1971).

Carolus-Duran (karólus'-duran'), 1837-1917, French painter whose original name was Charles Auguste Émile Durand. He was influenced by Courbet and studied in Lille and Paris. In 1861 he won a pension and traveled in Italy and Spain. Best known as the teacher of many famous painters (including Sargent), he became the director of the Académie de France at Rome in 1905. The Louvre has many of his portraits. His study of Mrs. William Astor is in the Metropolitan Museum.

Carondelet, Francisco Luis Hector, baron de (franthēs'kō lōōēs' ēktōr' barōn' dā karōndālēt'), c. 1748-1807, governor of Louisiana (1791-97) and West Florida (1791-95), b. Noyelles, Flanders. He married into the Las Casas family, prominent in Spanish colonial affairs. He came to New Orleans from the governorship of Salvador and was unfortunately not well informed about Louisiana problems. Ignorant of the English language and local customs, and faced with conflicting rumors of American hostility, he became convinced in 1792 that the Americans were planning to invade Louisiana. With unwarranted aggressiveness, he stirred up the Indians of the Southwest, concluding an alliance with four great tribes and establishing Spanish posts in their territory. He revived intrigues with Kentucky frontiersmen looking toward the establishment of an independent state in the West. Relations between Spain and the United States were severely taxed. After Carondelet was replaced by Manuel Gayoso de Lemos, he was made president of the audiencia and governor general of Quito (1799-1807). See A. P.

Whitaker, *The Spanish-American Frontier, 1783-1795* (1927, repr. 1969).

Carossa, Hans (hāns karōs'a), 1878-1956, German poet and novelist. His autobiographical novel *Childhood* (1922, tr. 1930) and its sequels (1928, 1941) are noted for clear, graceful style. *Führung und Geleit* [guidance and companionship] (1933) contains warm vignettes of his literary mentors and friends, among them Mann, Rilke, and Hesse. Other works are *A Roumanian Diary* (1924, tr. 1929), the novel *Doctor Gion* (1931, tr. 1933), and volumes of poems (1938, 1949).

carotene, organic compound composed of carbon and hydrogen and found as an accessory pigment in many higher plants, particularly carrots, sweet potatoes, and leafy vegetables. Carotene is thought to assist in trapping light energy for photosynthesis or to aid in chemical reduction. It is important in animal biology as the main dietary source of vitamin A (see VITAMIN), which is produced by splitting one molecule of carotene into two molecules of vitamin A. Carotene that is thus converted is called provitamin A. This reaction occurs in either the liver or intestinal wall. The absorption of dietary carotene is dependent on the action of bile and is greatly decreased by the presence of mineral oil. Its absorption is less efficient than that of vitamin A. Margarine is sometimes artificially colored by the addition of carotene.

Carothers, Wallace Hume, 1896-1937, American chemist, b. Burlington, Iowa. He received his doctorate at the Univ. of Illinois in 1924, teaching there for the next two years as instructor in organic chemistry. Carothers then took a similar post at Harvard. In 1928 he was made head of the research group in organic chemistry of the E. I. du Pont de Nemours company in Wilmington, Delaware. His work there on compounds of high molecular weight led to the discovery of the first synthetic rubber, neoprene. While with du Pont, he also investigated the physical and chemical properties of polyamides, showing that these compounds could be melt-spun into fibers or made into transparent film. This work resulted in the discovery of nylon.

Carouge (karōōzh'), city (1970 pop. 14,055), Geneva canton, SW Switzerland, on the Arve River. It is an industrial center. Carouge was chartered in 1786 by King Victor Amadeus III of Sardinia and was joined to Geneva canton in 1816.

carp, hardy freshwater fish, *Cyprinus carpio*, the largest member of the MINNOW family. A native of Asia, the carp was introduced into Europe and America and has become so well established that it is called the English sparrow of the fishes. Many variations in color and form have developed. Carp have four barbels ("whiskers") around the mouth and are usually dark greenish or brown (occasionally yellowish or silvery), with red on some of the fins. Most carp are scaled, although the mirror carp has only a few scattered scales and the leather carp has none. Carp may reach a length of 3 ft (91 cm) and a weight of 25 lbs (11.3 kg). They are bottom feeders, eating chiefly aquatic plants but also insects and small animals, their habit of rooting in the mud often makes the water unfit for the feeding and spawning of other fishes. However, they are valued commercially as food fish, especially in Europe, where they are sometimes bred and raised for this purpose. Ornamental varieties are bred in Japan. Carp are classified in the phylum CHORDATA, class Osteichthyes, order Cypriniformes, family Cyprinidae.

Carpaccio, Vittore (vēt-tō'rā karpat'chō), c. 1450-1522, Venetian painter, influenced by Gentile and Giovanni Bellini. His delightful narrative paintings reflect the pageantry of 15th-century Venice. They also offer a fanciful view of the Orient, gained through contemporary drawings. His style is notable for its rich color, luminosity, and wealth of detail. Among his best paintings are the cycle depicting the life of St. Ursula, the St. George series, the *Presentation in the Temple* (all Academy, Venice), scenes from the life of St. Stephen (Louvre, Brera, Milan), *Meditation on the Passion* (Metropolitan Mus.), *Saint Washing* and other works (National Gall. of Art, Washington, D.C.). See T. Pignatti's *Carpaccio* (1958).

Carpathians (karpā'thēanz) or **Carpathian Mountains**, Czech, Pol., and Ukr. *Karpaty*, Rum. *Carpații*, major mountain system of central and E Europe, extending c. 930 mi (1,500 km) along the north and east sides of the Danubian plain. The geologically young mountains, part of the main European chain, link the Alps with the Balkans. The Carpathians begin in SE Czechoslovakia and extend NE to the Polish-Czechoslovak border. There the Northern Carpathians,

comprising the Beskids and the Tatras, run east along the border, then SE through the W Ukraine, USSR, in Rumania they are continued by the Transylvanian Alps (or Southern Carpathians), which extend SW to the Danube River. The highest peaks are Gerlachovka (8,737 ft/2,663 m) in the Tatras and Moldoveanu in the Transylvanian Alps. The Carpathians are rich in minerals and timber. The region's cold winters and hot summers make it a year-round resort. Although the Carpathians are a barrier to the southward movement of cold air masses, numerous low passes facilitate overland travel between the densely populated areas that flank the system. The Carpathians themselves are sparsely populated, with the greatest number of people found in the larger agricultural valleys to the south.

Carpathian Ukraine see ZAKARPATSKAYA OBLAST, USSR.

Carpathus, Greece see KÁRPATHOS.

Carpații see CARPATHIANS.

Carpeaux, Jean-Baptiste (zhan-bâtēst' kār-pō'), 1827-75, French sculptor and painter. He studied with François Rude and won the Prix de Rome. Carpeaux rose to fame with his *Ugolino* (1860-62, Louvre) and became a favorite of the Second Empire, receiving many portrait commissions. Of his sculpture groups, the best known is *The Dance on the facade of the Opera*, Paris. His *Neapolitan Shell Fisher* and his portrait busts of Napoleon III, Dumas fils, Gerôme, and Empress Eugénie are in the Louvre, along with numerous paintings, including *Bal costumé aux Tuileries*, *Les Trois Souverains*, and several portraits. The works of Carpeaux exhibit a freedom and force which distinguish them from the banality of his period.

carpe diem (kar'pē dēēm), a descriptive term for literature that urges readers to live for the moment [from the Latin phrase "seize the day," used by Horace]. The theme, which was widely used in 16th and 17th-century love poetry, is best exemplified by a familiar stanza from Robert Herrick's "To the Virgins, to Make Much of Time":

Gather ye rosebuds while ye may,
Old time is still a-flying,
And this same flower that smiles today
Tomorrow will be dying.

Shakespeare's version of the theme takes the following form in *Twelfth Night*:

What is love? 'Tis not hereafter,
Present mirth hath present laughter
What's to come is still unsure
In delay there lies no plenty,
Then come and kiss me, sweet and twenty,
Youth's a stuff will not endure.

Carpentaria, Gulf of (karpantār'ēa), arm of the Arafara Sea, 305 mi (491 km) wide and 370 mi (595 km) long, indenting the northern coast of Australia. On its eastern shore, near Weipa, lies a vast bauxite deposit. Willem Jansz explored the gulf in 1606.

Carpenter, Edward, 1844-1929, English author. Although ordained a minister in 1869, he became a Fabian socialist in 1874 and renounced religion. Among his works on social reform are *Towards Democracy* (1883-1902), a long unrhymed poem revealing the influence of his friend Walt Whitman, *England's Ideal* (1887), *Civilization: Its Cause and Cure* (1889), and *Love's Coming of Age* (1896), which treats relations between the sexes. See the autobiographical *My Days and Dreams* (1916), Émile Delavenay, *D. H. Lawrence and Edward Carpenter* (1971).

Carpenter, George Rice, 1863-1909, American educator, b. Labrador, grad. Harvard, 1886. After study abroad, he returned to teach at Harvard (1888-90) and Massachusetts Institute of Technology (1890-93). From 1893 he was professor of rhetoric at Columbia. He wrote a number of textbooks on literature and rhetoric and biographies of Longfellow, Whittier, and Whitman.

Carpenter, John Alden, 1876-1951, American composer, b. Park Ridge, Ill., pupil of J. K. Paine at Harvard and of Elgar. His music, refined and skillfully written, influenced by French impressionism, often conveys the spirit and the scenes of American life, in such works as the orchestral suite *Adventures in a Perambulator* (1914) and the ballets *Krazy Kat* (Chicago, 1921) and *Skyscrapers* (New York, 1926). A Spanish flavor and jazz, frequently elements in his music, are both found in *Patterns* (1932) for orchestra. Other important works are his ballet *The Birth day of the Infanta* (Chicago, 1919), a violin concerto (1937), a concerto for piano and orchestra (1915), songs, symphonies, and chamber music.

Carpenter, Malcolm Scott, 1925–, American astronaut, b. Boulder, Colo. The second American to go into orbital flight around the earth, he made his historic and suspenseful flight on May 24, 1962. In his three-orbit trip he repeated the earlier success of John GLENN. Carpenter's second orbit was under manual control, and during it he discovered that he could make small changes in the capsule's orientation in space by movements of his head and arms. On descending, his capsule, *Aurora 7*, overshot the pickup area by 250 mi (212 km) causing nationwide concern for his safety. A commander in the U.S. navy, Carpenter had served with an antisubmarine patrol during the Korean War. From 1965 to 1967 he was a member of the navy aquanaut project and in 1969 retired from the navy to go into private business.

Carpenter, Mary, 1807–77, English educator. She devoted her life to the establishment of schools and institutions and the promotion of educational reforms. In 1835 she organized the Working and Visiting Society, in 1846 opened a school for poor children, and in 1852 founded a juvenile reformatory (see her *Juvenile Delinquents: Their Condition and Treatment*, 1852). Her agitation for reformatory and industrial schools contributed to the passage of the Juvenile Offenders Act (1857) and furthered the movement for free day schools. She made four visits to India after 1866, interesting herself in Indian education, and also lectured in the United States. See biography by J. E. Carpenter (1879, 2d ed. 1881, repr. 1973).

Carpenter, Rhys, 1889–, American archaeologist and classicist, b. Cotuit, Mass., grad. Columbia (B.A., 1908, Ph.D., 1916). He taught classical archaeology at Bryn Mawr (1913–55) and was director of the American School for Classical Studies at Athens (1927–32, 1946–48). His writings include *The Humanistic Value of Archaeology* (1933), *Folktales, Fiction and Saga in the Homeric Epics* (1946), and *Greek Sculpture* (1960).

Carpentersville, village (1970 pop. 24,059), Kane co., NE Ill., on the Fox River, inc. 1887. Pumps and valves are the chief manufactures.

Carpentier, Alejo (alā'hō kārpeñtyār'), 1904–, Cuban novelist and musicologist. Carpentier was a journalist and professor of music history at the National Conservatory. Regarded as one of the most powerful Spanish-American writers of recent decades, he wrote novels that emphasized the exotic in Caribbean life. Among his works are *Ecue-Yamba-O* (1933), *La música en Cuba* (1946), *The Lost Steps* (1953, tr. 1956), *El acoso* (1956), *The Kingdom of This World* (1949, tr. 1957), and *War of Time* (1963, tr. 1970).

Carpentras (karpāNtras'), town (1968 pop. 22,130), Vaucluse dept., SE France, in Provence. It is an important farm market and a small industrial center. Of Gallo-Roman origin, it was an episcopal see from the 3d cent. and was ruled by its bishops until the French Revolution. The long conclave that elected Pope John XXII met in Carpentras. The town served as the capital of the Comtat Venaissin from 1229 to 1791. Of interest are St. Siffrein Church (15th cent.) and a Gallic arch with sculptures.

carpentry, trade concerned with constructing wood buildings, the wooden portions of buildings, or the temporary timberwork used during the construction of buildings. It comprises the larger and more structural aspects of woodworking, rather than the delicate assembling which is the province of cabinetmaking and JOINERY. The craft dates from the earliest use of tools. Though no actual examples of carpentry survive from antiquity, many remains of the earliest known stone architecture exhibit forms which are undoubtedly imitative of still earlier constructions in wood. This is especially apparent in most Asian architecture, and certain details of Greek temples are suggestive of carpentry prototypes. Some monumental wood buildings of the 7th cent. still stand in Japan, a country where intricate, beautiful carpentry has prevailed throughout its history. In the United States, expert carpentry has existed ever since the construction of dwellings by the colonists in the first half of the 17th cent. Rough carpentry refers to the "framing" of a wood building, namely, the erection of the structural frame or skeleton composed of the vertical members, or studs, the horizontal members of foundation sills, floor joists, and the like, the inclined members, or rafters, for the roof, and the diagonal members for bracing. Finished carpentry is the setting in place, over the rough frame, of all finishing members of both exterior and interior, such as sheathing, siding, stairs, the casings of doors and windows, flooring, wainscoting, and trim. The

amount of permanent carpentry required in many modern buildings has been greatly reduced by the use of such substitute materials as concrete and steel. However, the large amount of concrete used has resulted in a great increase in the amount of carpentry performed to make temporary forms in which the concrete can be cast. See CENTERING. See F. M. Mix, ed., *Practical Carpentry* (1963), R. J. De Cristoforo, *The Practical Handbook of Carpentry* (1969).

carpet or rug, thick fabric, usually woolen (but often synthetic), commonly used today as a floor covering. Carpets were formerly woven to protect the body from cold, to be spread on a dais or before a seat of honor, to cover a table, couch, or wall, or to form the curtains of a tent. There is evidence of the existence of handwoven carpets in antiquity. On the rock tombs of Beni Hassan, Egypt, c. 2500 B.C., men are depicted with the implements of rug weaving. Other evidence of the early use of rugs is seen in the drawings on the ancient palace walls of Nineveh. In the mountainous region of the East stretching from Turkey through Persia and central Asia into China, where the fleece of the sheep and the hair of the camel and goat grow long and fine, the art of carpet-weaving reached its height early in the 16th cent. The Oriental artist worked on a handloom consisting essentially of two horizontal beams on which the warp (the vertical threads) was stretched, on the lower one the finished carpet was rolled while the warp unrolled from the upper one. The yarn for the pile, spun and dyed by hand, was cut in lengths of about 2 in. (5.1 cm) and knotted about the warp threads, one tuft at a time, after one of the two established ways of tying—the Ghiordes, or Turkish, knot and the Senna, or Persian, knot. After a row of knots had been placed across the width of the loom, two or more weft, or horizontal, threads of cotton or flax were woven in and beaten into place with a heavy beater, or comb. The tufts, or pile, thus appeared only on the face of the fabric, which when completed was sheared to perfect smoothness. Although the hair of the camel and the goat was used in the weaving of Oriental rugs, the wool of the sheep was the essential component. Beautiful silk rugs interwoven with gold thread were made in the 16th and 17th cent. The quality of a carpet depends on the materials used and the number of knots per square inch of surface, which may vary from 40 to 1,000. In North America the Navahos and other Indian tribes have for generations produced substantial rugs without pile, woven somewhat in the manner of TAPESTRY on simple handlooms. In the palaces of Montezuma remarkable floor coverings were found that utilized the plumage of birds. The primitive use of rushes or straw has survived in the form of Chinese and Japanese matings. In 1608, King Henry IV of France established weavers in the Louvre. About 20 years later an old soap works, the Savonnerie, near Paris, was converted to carpet weaving, and its name remains attached to one of the finest types of handmade carpet, now made at the Gobelin tapestry factory. Tapestries for walls and floors were made at Aubusson at an early date. In 1685 the revocation of the Edict of Nantes scattered skilled Protestant carpet-makers over Europe. Centers of weaving were established in England, first at Kidderminster (1735) and later at Wilton and Axminster. Cheaper, more easily manufactured floor covering soon came into demand, and the making of ingrain, or reversible, carpets began at Kidderminster. The weavers of Flanders had made a loom that produced a pile by looping the worsted warp threads, and this loom, although guarded, was copied by a Kidderminster weaver, soon many looms in England were making Brussels carpet. Axminster was England's headquarters for imitation Oriental or tufted-pile carpet. Until about 1840 all carpets were made on handlooms with such devices and improvements as could be operated by hand or foot power, then Erastus Bigelow's power loom (first used in 1841), which made it possible for carpets to be mass produced, revolutionized the industry. A few classifications—Oriental, European handwoven, Brussels, Wilton, velvet, Axminster, chenille, ingrain, rag, hooked, straw, and fiber—embrace the entire range of carpets, both antique and modern. To the first class belong not only the genuine antique Orientals, now rare, but also the modern reproductions. The materials are dyed with aniline dyes instead of vegetable dyes and then woven. Many are washed in chlorine solutions to give an effect of age or in glycerine to simulate the luster of fine wool. Commercial methods have somewhat standardized and debased the character-

istic ancient patterns, but the modern Orientals are still commercially important. Some traditional Oriental rugs are still produced, incorporating the deep, rich color and intricate patterns of Persia, the brighter hues and conventionalized figures of Asian Turkey, the simpler designs and primitive colorings of Turkistan and the Caucasus, and the symbolic ornament of China. A limited number of European handwoven carpets, both Aubussons (tapestry) and Savonneries (pile), are now made in most Western countries. Modern commercial carpets are woven on complex and highly specialized machines, a development from Bigelow's power loom. Brussels carpet has a warp and weft of linen, with a pile of worsted yarn drawn into loops by means of wires. It is called three-, four-, or five-frame, depending on the number of bobbins carrying different colored warp threads, which make the pattern. Tapestry Brussels is an inexpensive single-frame sort, either yarn printed or piece printed. Wilton is made on the same principle, except that the loops that form the pile are cut as they are woven into place. Velvet is an equivalent of tapestry Brussels with the pile cut. Axminster, similar in effect to Oriental, uses unlimited colors in design made on machines that loop the tufts, one color at a time, and then interlock the weft about them. Chenille, or chenille Axminster, is made in two stages, first the chenille thread, or fur, as it is called, is made, then it is folded and ironed so that the woolen fibers are like a fringe along a cotton or linen chain. This fur is then woven into a strong backing of linen with the nap on the surface. Ingrain, no longer widely used, is a plain-weave fabric, of two- or three-ply woolen weft on a concealed cotton warp. Rag carpets, made of used rags sewn together for warp, were first woven on household looms, they became commercially important in the latter part of the 19th cent. Hooked rugs are made of narrow strips of woolen cloth drawn by a pointed hook through a canvas foundation on which a design is indicated. Although handmade rugs are still produced in some countries, e.g., Turkey, carpet manufacturing has become a highly mechanized industry, notably in the United States, Great Britain, Canada, Belgium, and Japan. See Wilhelm von Bode and Ernest Kühnel, *Antique Rugs from the Near East* (tr. of 4th rev. ed. 1970), George Robinson, *Carpets and Other Textile Floorcoverings* (2d rev. ed. 1972).

carpetbaggers, epithet used in the South after the Civil War to describe Northerners who went to the South during RECONSTRUCTION to make money. Although regarded as transients because of the carpetbags in which they carried their possessions (hence the name *carpetbaggers*), most intended to settle in the South and take advantage of speculative and commercial opportunities there. With the support of the Negro vote the carpetbaggers played an important role in the Republican state governments. The corrupt activities of some made the term *carpetbagger* synonymous with any outsider who meddles in an area's political affairs for his own benefit. See bibliography under RECONSTRUCTION.

carpet beetle, name for several BEETLES that are highly destructive to carpets and upholstery and are classified in the same family as the larder beetles. Adult beetles of this family are pollen eaters, but the larvae feed on a variety of animal matter. The red-dish to yellow-brown carpet beetle larvae feed on wool, fur, leather, and on plant fibers that are soiled with grease, doing more damage to household goods than the clothes moth. The adults, 0.08 to 0.2 in. (3–5 mm) long, solid black or black-and-white patterned, leave the house after emerging from the pupal stage. The larvae of the species commonly called larder beetles feed on meats and cheese, the larvae of other species in the family are pests in museums, feeding on dried insect collections. Carpet beetles are classified in the phylum ARTHROPODA, class Insecta, family Dermestidae, genera *Affagenus* and *Anthenus*.

carpincho (karpín'chō) see CAPYBARA

Carpini, Giovanni de Piano (jōvān'ē dā pyā'nō kārpe'nē), c. 1180–1252, Italian traveler and Franciscan monk, b. Pian del Carpin (now Piano della Magione), Umbria. He was a companion of St. Francis of Assisi and spread Franciscan teachings in Germany and Spain. In 1245 he was sent by Pope Innocent IV to the court of the MONGOLS. With a Pole, Friar Benedict, he started from Lyons, went to Kiev, then across the Dnepr to the Don and the Volga, where he found the camp of a Mongol prince. He then traveled across central Asia to the imperial court at Karakorum in Mongolia. A journey of c. 3,000 mi (4,830 km) was accomplished on horse-

back in 106 days At Karakorum he witnessed the installation (1246) of Jenghiz Khan's grandson as the great khan of the Mongols Carpini returned to Lyons in 1247, and his careful account of the journey, known as *Liber Tartarorum*, proved invaluable It is a full record of Mongol manners, history, policy, and military tactics, it was the first of such works to appear in Europe

Carpocrates (karpōk'rātēz), fl c 130-c 150, Alexandrian philosopher, founder with his son Epiphanes of a Hellenistic sect, notoriously licentious, related to Gnosticism Epiphanes wrote a treatise, *On Justice*, that advocated communal ownership of property, including women, he died, age 17, at Cephalonia and was long worshipped as a deity there The Carpocratians believed that men had formerly been united with the Absolute, had been corrupted, and would, by despising creation, be saved in this life or else later through successive transmigrations Jesus, they held, was but one of several wise men who had achieved deliverance

car puller: see WINCH

Carpus, man of Troas 2 Tim 4 13

Carr, Edward Hallett, 1892-, English political scientist and historian Educated at Cambridge, he was in the diplomatic service until 1936, professor of international relations (1936-47) at University College of Wales, Aberystwyth, and assistant editor for the *London Times* (1941-46) Carr's writings include biographies of Feodor Dostoyevsky (1931), Karl Marx (1934), and Mikhail Bakunin (1937), as well as important studies on international relations and on the Soviet Union His major work is the *History of Soviet Russia* (Vol I-IX, 1950-71), considered by many to be the definitive work in English on Soviet history

Carr, Emily, 1871-1945, Canadian painter She studied (1889-c 1895) at the San Francisco School of Art and later in London and in Paris In Victoria, British Columbia, she taught painting and visited Indian villages From her study of totem poles and other Indian art, she developed a powerful style marked by simplified forms and a fauvist intensity of color She wrote *Klee Wyck* (1941) and *The House of All Sorts* (1944) See her autobiography, *Growing Pains* (1946)

Carr, Eugene Asa, 1830-1910, Union general in the U S Civil War, b Concord, Erie co, NY, grad West Point, 1850 In the Civil War he distinguished himself at Wilson's Creek (1861) and Pea Ridge (1862), was made (March, 1862) a brigadier general of volunteers, and fought in the campaigns at Vicksburg (1863) and Mobile (1865) After the war Carr was a well-known cavalry leader and Indian fighter in the West Promoted to brigadier general in 1892, he was retired in 1893 See biography by J T King (1963)

Carr, Robert: see SOMERSET, ROBERT CARR, EARL OF

Carra, Carlo, 1881-1966, Italian painter Trained as a decorator, he became associated with the artists involved in the development of FUTURISM He then moved toward a more carefully structured art form, related to cubism but concerned with the dynamics of movement After meeting CHIRICO in 1916, Carra became a spokesman of the metaphysical school A prolific writer on art, he also exerted considerable influence as a teacher

Carracci (karat'chē), family of Italian painters of the Bolognese school, founders of an important academy of painting **Lodovico Carracci**, 1555-1619, a pupil of Tintoretto in Venice, was influenced by Correggio and Titian He also studied in Bologna, Padua, and Parma With his cousins, Agostino and Annibale, and with Anthony de la Tour, he established in Bologna an academy of painting that sought to unite in one system the preeminent characteristics of each of the great masters The school rapidly became one of the outstanding schools in Italy, and Lodovico remained its head until his death Its noted pupils include Guido Reni, Francesco Albani, and Domenichino Excelling as a teacher, Lodovico was also a painter of talent and energy Excellent examples of his art abound in the churches of Bologna and elsewhere in Italy Among the best are *Sermon of John the Baptist* (Pinacoteca, Bologna) and *Vision of St Hyacinth* (Louvre) His cousin Agostino Carracci, 1557-1602, left the goldsmith's trade and studied painting with Prospero Fontana He excelled in engraving and devoted most of his time to it until he joined his cousin and his brother in the founding of their academy and in the execution of numerous joint painting commissions In 1597 he went to Rome and collaborated with Annibale in the decorating of the Farnese Palace gallery, he executed the admirable frescoes *Tri-*

umph of Galatea and Rape of Cephalus (cartoons in the National Gall, London) He died in Parma just after completing his great work, *Celestial, Terrestrial, and Venal Love*, in the Casino Other notable examples of his art are *The Last Communion of St Jerome* (Pinacoteca, Bologna), *Adulteress before Christ*, and the masterly engraving of Tintoretto's *Crucifixion* His brother Annibale Carracci, 1560-1609, a pupil of Lodovico Carracci, was a painter of unusual skill and versatility He spent seven years studying the works of the masters, particularly those of Correggio and Parmigiano, in Venice and Parma Returning to Bologna, he aided in the conducting of the academy school until 1595, when he went to Rome to assist in the Farnese gallery The ceiling, for which he made thousands of preliminary drawings according to an elaborate structural system, was rich in illusionistic elements It included feigned architectural and sculptural forms which had great impact on later painters Well known among his numerous works are *Christ and the Woman of Samaria* (Brera, Milan), *Flight into Egypt* (Doria Gall, Rome), *The Dead Christ* (Louvre), and *The Temptation of St Anthony* (National Gall, London) See study by Donald Posner (2 vol 1971)

carrageen: see SEAWEED

Carrantuohill (kā'rāntōō'al), mountain, 3,414 ft (1,041 m) high, Co Kerry, SW Republic of Ireland, in Macgillcuddy's Reeks, highest peak in Ireland

Carranza, Venustiano (vānōōstyā'nō karan'sa), 1859-1920, Mexican political leader While senator from Coahuila, he joined (1910) Francisco I MADERO in the revolution against Porfirio Diaz When President Madero was overthrown (1913) by Victoriano HUERTA, Carranza promptly took the field against Huerta Fighting in the north, he was joined by other insurgents, notably Alvaro OBREGÓN and Francisco VILLA, Emiliano ZAPATA led a peon uprising in the south Huerta was finally forced to resign and Carranza assumed (Aug, 1914) the executive powers Villa and Zapata refused to recognize Carranza's authority, however, and plunged the country into another civil war Carranza, aided by Obregon, emerged supreme by Aug, 1915, although Zapata and Villa continued their rebellions in the south and north Carranza was pressed by Obregon to accept the Constitution of 1917, which contained potentially radical reform measures that Carranza opposed and subsequently failed to enforce In 1920, Carranza attempted to prevent Obregon from succeeding him as president, and Obregon revolted Carranza fled Mexico City, and was ambushed and murdered by a local chieftain in Tlaxcalantongo

Carranza de Miranda, Bartolomé de (bartōlōmā'dā karan'tha dā mēran'da), 1503-76, Spanish churchman He joined the Dominicans (1520) and taught at Valladolid He was active in the first part of the Council of Trent, where he distinguished himself for his vigorous support of the rule that bishops must reside in their sees In 1554, Philip II of Spain sent him to England to aid in the restoration of Roman Catholicism In 1558 he was made archbishop of Toledo (primate of Spain), the same year he attended Holy Roman Emperor Charles V in his last days His commentary on the catechism appeared in 1558, and it was apparently from passages in this that he was accused of heresy He was arrested in 1558 (with King Philip's permission), his case dragged on in Spain until 1564, when the archbishop appealed to Rome At length, in 1576, he was found not guilty of heresy but was compelled to renounce certain propositions

Carrara (kar-ra'ra), city (1971 pop 67,736), Tuscany, N central Italy, near the Ligurian Sea It is the most important center of the Italian MARBLE industry, the famous white Carrara marble is quarried in the nearby Alpi Apuane Chemicals and metal goods are also manufactured in Carrara With Massa, the city constituted the principality, later duchy, of Massa and Carrara (15th-19th cent) Carrara has a fine 12th-century cathedral, the former ducal palace (16th cent) now houses the Fine Arts Academy

Carrel, Alexis, 1873-1944, American surgeon and experimental biologist, b near Lyons, France, M D Univ of Lyons, 1900 Coming to the United States in 1905, he joined the staff of the Rockefeller Institute in 1906 and served as a member from 1912 to 1939 For his work in suturing blood vessels, in transfusion, and in transplantation of organs, he received the 1912 Nobel Prize in Physiology and Medicine In World War I he developed, with Henry D Dakin, a method of treating wounds by irrigation with a sodium-hypochlorite solution With Charles A Lindbergh he invented an artificial, or mechanical, heart,

by means of which he kept alive a number of different kinds of tissue and organs, he kept tissue from a chicken's heart alive for 32 years In 1939 he returned to France He wrote *Man the Unknown* (1935) and, with Lindbergh, *The Culture of Organs* (1938)

Carreño, Teresa (tārā'sa karā'nyō), 1853-1917, Venezuelan pianist, pupil of L M Gottschalk and Anton Rubinstein Her debut was made in New York in 1862 She appeared as an opera singer for a brief period but thereafter continued her piano career, becoming known as one of the foremost pianists of her time She composed a festival hymn for the Bolivar centenary, 1883, and was a teacher of Edward MacDowell See biography by Marta Milinowski (1940)

Carreño de Miranda, Juan (hwan karā'nyō dā mēran'da), 1614-85, Spanish baroque painter A protegee of Velázquez, Carreño eventually succeeded his master as painter to the Spanish court He is best known for his elegant portraits, such as that of the queen mother, Mariana (Prado) Carreño also painted numerous religious pictures and frescoes for the churches and palaces of Madrid, Segovia, and Toledo

Carrera, José Miguel (hōsā' mēgē'l'), 1785-1821, Chilean revolutionist With his brothers, Juan Jose and Luis, he overthrew the revolutionary junta headed by MARTÍNEZ DE ROSAS in 1813 and dominated Chile until replaced by Bernardo O'HIGGINS later that year He again seized control in 1814, precipitating a civil war that facilitated Spanish reconquest of Chile Later he was forbidden by Jose de San Martin to reenter Chile San Martin and O'Higgins ordered the execution at Mendoza of his brothers Involving Argentina in civil turmoil, Carrera was on the point of invading Chile when he too was captured and beheaded at Mendoza

Carrera, Rafael (rafaē'l'), 1814-65, president of Guatemala, a caudillo He led the revolution against the anticlerical liberal government of Guatemala, and his ultimate success in 1840 helped to destroy the Central American Federation Illiterate and of mixed blood, he received unquestioned support from the Indian masses, a conservative devoted to the church, he recalled the Jesuits and restored the power of the church in the state Until his death Carrera dominated Guatemala and was the most powerful figure in Central America, intervening to strengthen, restore, or install conservative governments in the other Central American countries

Carrera Andrade, Jorge (hōr'hā karā'ra andrā'thā), 1903-, Ecuadorian poet Carrera's early poems and some of his later work reveal his profound pro-Indian feeling and his interest in social revolution As he matured his concern with the purely aesthetic aspects of poetry was intensified His lyrics are graceful and charming and reveal a flair for original images Among his works are the essay collections *Latitudes* (1934) and *La tierra siempre verde* (1955), the poetry volumes *Secret Country* (1922, tr 1946), *Rol de la manzana* (1935), *Registro del mundo* (1940), and *Edades poeticas* (1958), and an autobiography (1970) See his *Selected Poems* (tr 1972)

Carrère, John Mervyn (karār'), 1858-1911, American architect, b Rio de Janeiro After graduating from the École des Beaux-Arts, Paris, he worked under McKim, Mead, and White in New York City, and from 1886 until his death practiced in partnership with Thomas Hastings The best-known works of Carrère and Hastings are the New York Public Library (commission awarded in competition, completed 1911), the office buildings of the Senate and the House, and the Carnegie Institution, Washington, D C

Carrero Blanco, Luis (lōōēs' kar-rā'rō blang'kō), 1903-73, Spanish statesman and naval officer After graduation (1922) from the Spanish naval academy, Carrero Blanco first gained distinction fighting the North African Berbers in the mid-1920s Following the Spanish civil war, during which he served in the Nationalist navy, he became chief of naval operations on the admiralty staff and one of Francisco Franco's intimate collaborators In 1951 he was appointed ministerial undersecretary in charge of coordinating the policies of the separate ministries Made vice admiral (1963) and admiral (1966), Carrero Blanco increasingly controlled government affairs as vice premier (1967-73) In June, 1973, when Franco separated the duties of chief of state and head of government, Carrero Blanco became premier Since he had been influential in developing contacts with monarchist groups, his appointment

was generally regarded as a step toward Franco's planned restoration of the monarchy under Juan Carlos. In Dec. 1973, he was assassinated in Madrid, apparently by Basque nationalists, in retaliation for the government's execution of Basque militants.

Carrhae (kâr'ê), Roman name for the ancient Mesopotamian city of HARAN. The name Carrhae is best known because of the battle of Carrhae in 53 B.C. M. Licinius Crassus (see CRASSUS, family) was defeated by the Parthians, who by their archery routed the Roman force.

carriage, wheeled vehicle, in modern usage restricted to passenger vehicles that are drawn or pushed, especially by animals. Carriages date from the Bronze Age; early forms included the two-wheeled cart and four-wheeled wagon for transporting goods. An early passenger carriage was the CHARIOT, but Roman road-building activity encouraged the development of other forms. From the fall of Rome, horses and litters were used exclusively until the 12th cent., when goods carts and wagons were gradually reintroduced. The coach, a closed four-wheeled carriage with two inside seats and an elevated outside seat for the driver, is believed to have been developed in Hungary and to have spread among the royalty and nobility of Europe in the 16th cent. The hackney coach, which was any carriage for hire, was introduced in London c.1605. During the 17th cent. coaches became lighter and less ornate and in England the public STAGECOACH became common. France developed the gig, a light two-wheeled carriage, which was the forerunner of the chaise, the sulky, and the Cuban volante. The numerous forms developed in the 18th cent. include the chariot, a closed carriage with one seat, the landau, a coach whose top folded back from the center in two sections, the barouche coach, which had a folding hood fixed at the back, and the phaeton, any member of a family of four-wheeled carriages, usually with low sides. The hansom cab, patented by J. A. Hansom in 1834, was a closed carriage with an elevated driver's seat in back. Lord Brougham based the carriage known by his name on the hansom. The victoria, popular after 1850, was similar to the phaeton but had only one seat for passengers. The carriage-building trade became firmly established in the United States after the War of 1812, the most distinctive model was a light four-wheeled buggy with open sides and a folding top. The term *carriage* is sometimes used to refer to railroad passenger cars.

Carrickfergus (kâr'rkfûr'gas), municipal borough (1971 pop. 15,162), Co. Antrim, E. Northern Ireland, on the shore of Belfast Lough. A minor fishing port, it has an important textile industry. There also are iron works, and rock salt is mined. A castle and church first built in the 12th cent. are still standing. John Paul Jones fought (1778) a victorious battle offshore from Carrickfergus.

Carrick-on-Shannon, county town (1971 pop. 6,411) of Co. Leitrim, N. Republic of Ireland. It is a farm market and a center for trout fishing.

Carrier, Jean Baptiste (zhân bâ'têst' kar'ê), 1756-94, French Revolutionary. An extreme Jacobin, he demanded the establishment of a revolutionary tribunal, and, as a revolutionary representative to Nantes in the Reign of Terror, he instituted noyades, or wholesale drownings, and committed other atrocities. Although he was denounced to the Convention, of which he was a member, and was recalled to Paris, he temporarily escaped punishment during the Thermidorian reaction (July, 1794, see THERMIDOR). In November, however, he was arrested and executed.

Carnera, Rosalba (rôzal'ba kar-rê'ra), 1675-1757, Italian portrait and miniature painter, one of the greatest of her day. At 24 she had achieved a reputation throughout Italy and abroad for her miniatures and crayon portraits. In 1705 she was elected to the Academy of St. Luke (Rome), the Academy of Bologna, and the Florence Academy. In 1720 she visited Paris, where she painted the portraits of the young Louis XV, the regent, and other court figures. Returning to Italy, she visited the courts of Modena, Parma, and Vienna, receiving honors and commissions wherever she went. Her portraits are delicate in color and vivacious. She is well represented in most of the European galleries. *Muse Crowned with Laurel* is in the Louvre.

Carrière, Eugène (ôzhên' kâr'yêr'), 1849-1906, French painter and lithographer. He is best known for his spiritual interpretations of maternity and family life. His figures and heads emerge from a brownish penumbra, usually with an expression of deep melancholy. Characteristic are his *Crucifixion*

and *Maternity* (both Louvre). He also painted some large canvases for the Sorbonne and the Hôtel de Ville, Paris. Among his works are many notable portraits, including those of Verlaine, Daudet, and Edmond de Goncourt (all Louvre).

carrier wave: see MODULATION

Carrington, Henry Beebe, 1824-1912, U.S. army officer and historian, b. Wallingford, Conn., grad. Yale, 1845, and afterwards studied at Yale Law School. Carrington ably reorganized the Ohio state militia and subsequently became adjutant general. In the Civil War he helped to save West Virginia for the Union by sending Ohio militia there. Later, as chief mustering officer of Indiana, he sent over 100,000 men to the war and was instrumental in quelling the operations of a secret society of Southern sympathizers. After the war, as commander of the Mountain Dist. of the Dept. of the Platte, he led the force that in 1866 attempted to open and guard the Bozeman Trail route to Montana. He planned and built forts C. F. Smith and Phil Kearney on this route. Blamed for the Fetterman massacre (see under FETTERMAN, WILLIAM JUDD), he was later exonerated. After his retirement from the army, Carrington was (1869-78) professor of military science at Wabash College. His *Battles of the American Revolution* (1876), supplemented by a volume of maps (1881), is a standard work. *Ab-sa-ra-ka* (1868), memoirs by his first wife, deals with his life on the plains.

Carroll, Anna Ella, 1815-93, alleged adviser to Abraham Lincoln in the Civil War. A member of the Protestant branch of the Carroll family of Maryland, she was a press agent for the Know-Nothing movement in the 1850s. It is claimed that Carroll was responsible for the successful Union strategy of the early Western campaigns and for numerous other decisions on high policy. See biography by Sydney Greenbie and Marjorie Greenbie (1952).

Carroll, Charles, 1737-1832, political leader in the American Revolution, signer of the Declaration of Independence, b. Annapolis, Md. After completing his education in France and England, he returned home (1765) and his father gave him a large estate near Frederick, Md., known as Carrollton Manor, he was afterwards styled Charles Carroll of Carrollton. As leader of the Roman Catholic element, he opposed support of the established Anglican Church, presenting his views in a series of articles written for the *Maryland Gazette*. He threw himself boldly into revolutionary activities, and in 1776 the Continental Congress appointed him, together with Benjamin Franklin and Samuel Chase, to seek Canadian support for the Continental cause. His journal is one of the chief sources for study of this unsuccessful mission. Carroll served (1776-78) in the Continental Congress, he refused to attend the Federal Constitutional Convention (1787), but he later supported the Constitution. He was U.S. Senator from Maryland, serving from 1789 until 1792. See biographies by K. M. Rowland (1898, repr. 1968), Joseph Gurn (1932), and E. H. Smith (1942, repr. 1971).

Carroll, James, 1854-1907, American bacteriologist and army surgeon, b. Woolwich, England, M.D. Univ. of Maryland, 1891. He went to Canada at 15 and later joined the U.S. army. A member of the Yellow Fever Commission under Walter Reed, he voluntarily submitted to the bite of an infected mosquito, contracted yellow fever, and recovered. This proved the mosquito to be the carrier of the disease. Carroll also proved that the infectious agent is a filterable virus.

Carroll, John, 1735-1815, American Roman Catholic churchman, b. Maryland. He studied as a child with Jesuits at Bohemia, Md., and later at Saint-Omer in Flanders, since Catholic secondary education was not allowed in Maryland. He joined the Jesuits in 1753, studied at Liege, and was ordained in 1769. After the suppression of the Jesuits he returned to America and traveled about, ministering to the scattered Catholics. He had a private chapel, for Catholic churches were forbidden by law. He ardently supported the American Revolution and accompanied Benjamin Franklin (who was his close friend) on the vain mission to Quebec (1776) to persuade the Canadians to join the Revolutionary cause. Seeing that American Roman Catholics should be free of supervision by the vicar apostolic of London, he led in petitioning Rome for the appointment of a priest in America with some episcopal powers. In 1784, Father Carroll was made superior of the missions in the United States. In the same year he published a controversial pamphlet, *An Address to the Roman Catholics of the United States of America*, to combat a paper impugning the loyalty of Catholics.

In 1790 he was consecrated bishop of Baltimore. He invited the Sulpicians, who opened a seminary at Baltimore, and he founded GEORGETOWN UNIV. He encouraged many communities and founded schools throughout his diocese. In 1808 he became archbishop, with suffragans at Boston, New York City, Philadelphia, and Bardonia, Ky. His last years were somewhat clouded by misunderstandings with the Catholics in Philadelphia and New York. See biographies by J. G. Shea (1888), P. K. Guilday (1922), and A. M. Melville (1955).

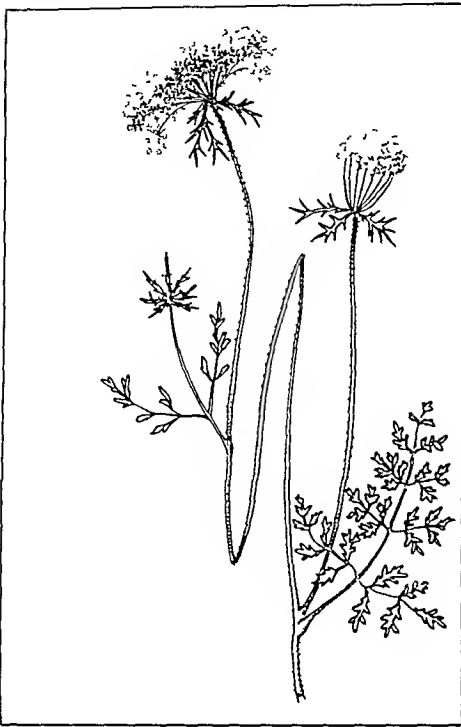
Carroll, Lewis, pseud. of Charles Lutwidge Dodgson, 1832-98, English writer and mathematician, b. Daresbury, Cheshire. Educated at Christ Church College, Oxford, he was nominated to a studentship (life fellowship) in 1852, and he remained at Oxford for the rest of his life. Although his fellowship was clerical, Carroll never proceeded higher than his ordination as a deacon in 1861. Shy and afflicted with a stammer, he felt himself unsuited to the demanding life of a minister. He did lecture in mathematics at Christ Church from 1855 until 1881. Among his mathematical works, now almost forgotten, is *Euclid and His Modern Rivals* (1879). Carroll is chiefly remembered as the author of the famous children's books *Alice's Adventures in Wonderland* (1865) and its sequel *Through the Looking Glass* (1872), both published under his pseudonym and both illustrated by Sir John Tenniel. He developed these stories from tales he told to the children of Dean Liddell, one of whom was named Alice. Many of his characters—the Mad Hatter, the March Hare, the White Rabbit, the Red Queen, and the White Queen—have become familiar figures in literature and conversation. Although numerous satiric and symbolic meanings have been read into Alice's adventures, the works can be read and valued as simple exercises in fantasy. Carroll himself said that in the books he meant only nonsense. He also wrote humorous verses, the most popular of them being *The Hunting of the Snark* (1876). His later stories for children, *Sylvie and Bruno* (1889) and *Sylvie and Bruno Concluded* (1893), though containing interesting experiments in construction, are failures. Carroll remained a confirmed and hard-working bachelor all his life. Because of his stammer he found association with adults difficult and was at ease only in the company of children, especially little girls. Early in 1856 he took up photography as a hobby, his photographs of children are still considered remarkable. See his complete works (ed. by Alexander Woolcott, 1939) and many recent editions, Martin Gardner, ed., *The Annotated Alice* (1960, repr. 1970), biographies by Derek Hudson (1954, repr. 1958) and F. B. Lennon (3d ed., 1972), Stuart Collingwood, *Life and Letters* (1898, repr. 1968), Robert Phillips, ed., *Aspects of Alice* (1971).

Carroll, Paul Vincent, 1900-1968, Irish playwright. His plays, vigorous commentaries on the conflicts of village life in Ireland, include *Shadow and Substance* (1937), *The White Steed* (1939), *The Wise Have Not Spoken* (1946), and *The Wayward Saint* (1955). See his *Irish Stories and Plays* (1958).

Carrollton, 1 City (1970 pop. 13,520), seat of Carroll co., W. Ga., on the Little Tallapoosa River, inc. 1897. A trade center for a fertile farm area, it has textile dyeing plants and factories making wires and chrome plating. West Georgia College is there. 2 City (1970 pop. 13,855), Dallas and Denton counties, N. Texas, a suburb of Dallas, in a rapidly growing and industrializing area. Metal products, aircraft parts, and electronic equipment are the major products.

carrot, common name for some members of the Umbelliferae, a family (also called the parsley family) of chiefly biennial or perennial herbs of north temperate regions. Most are characterized by aromatic foliage, a dry fruit that splits when mature, and an umbellate inflorescence (a type of flattened flower cluster in which the stems of the small florets arise from the same point, like an umbrella). The seeds or leaves of many of these herbs have been used for centuries for seasoning or as greens (e.g., ANGELICA, ANISE, CARAWAY, CHERVIL, CORIANDER, CUMIN, OIL, FENNEL, LOVAGE, and PARSLEY). The carrot, CELERY, and PARSNIP are vegetables of commercial importance. The common garden carrot (*Daucus carota sativa*) is a ROOT CROP, probably derived from some variety of the wild carrot (or QUEEN ANNE'S LACE). In antiquity several types of carrot were grown as medicinals, and in Europe carrots have long been grown for use in soups and stews. The custom of eating carrots raw as a salad has become widespread in the 20th cent. Carrots are a rich source of caro-

tene (vitamin A), especially when they are cooked. Several types of carrot have also been cultivated since ancient times as aromatic plants. Some are still



Carrot, *Daucus carota*

planted as fragrant garden ornamentals, such as the button snakeroot and sweet cicely. A few members of the Umbelliferae produce lethal poison, it was one of these, the poison hemlock, that Socrates was compelled to take. The water hemlock is also poisonous. Carrots are classified in the division MAGNOLIOPHYTA, class Magnoliopsida, order Umbellales, family Umbelliferae.

Carrucci, Jacopo. see PONTORMO, JACOPO DA

Carshena (karshē'nā), counselor of Ahasuerus. Esther 1:14

car sickness: see MOTION SICKNESS

Carso: see KARST, Yugoslavia

Carson, Edward Henry Carson, Baron, 1854-1935, Irish politician. After a successful legal career in Dublin, he was elected to the British Parliament in 1892 and called to the English bar in 1893. He soon established himself as a prominent trial lawyer in London, especially after his brilliant and devastating cross-examination of Oscar Wilde in the Queensberry libel case (1895). Carson was solicitor general in the Conservative government from 1900 to 1905. He had long opposed Home Rule for Ireland, fearing dominance of Protestant Ulster by the Catholic South, and in 1912 he organized military resistance in Ulster against the attempt of the Liberal government to impose it. Faced with the threat of civil war, the government eventually conceded that Ulster should be excluded from the Home Rule settlement. During World War I, Carson served as attorney general (1915) in Herbert Asquith's coalition government and as first lord of the admiralty (1916-17) and member of the war cabinet (1917-18) under David Lloyd George. He resigned as leader of the Ulster Unionists in 1921, was made a baron in the same year, and served (1921-29) as lord of appeal in ordinary. See biographies by Edward Marjoribanks and Ian Colvin (3 vol., 1932-36) and H. M. Hyde (1953).

Carson, Kit (Christopher Carson), 1809-68, American frontiersman and guide, b. Madison co., Ky. In 1811 he moved with his family to the Missouri frontier. After his father's death, he was apprenticed to a saddler in Old Franklin, an outfitting point on the Santa Fe Trail, but in 1826 he ran away, joining a caravan for Santa Fe and continuing on to Taos, N. Mex., which became his home and his headquarters. For the next 14 years he made his living as a teamster, cook, guide, and hunter for exploring parties. In 1842, while returning from St. Louis by boat up the Missouri, he met J. C. FÉREMONT, who employed him as a guide for his Western expeditions of 1842, 1843-44, and 1845. He became famous as a result of Fremont's reports of his skill and courage.

After Los Angeles was taken in 1846 by U.S. military forces, he was ordered to Washington with dispatches. In New Mexico he met Gen. Stephen Kearny's troops, and Kearny commanded him to guide his forces to California. When Kearny's men were surrounded in California, Carson, E. F. Beale, and an Indian made their way by night through enemy lines to secure aid from San Diego. In 1847 and again in 1848, Carson was sent east with dispatches. He determined to retire to a sheep ranch near Taos, but plundering by Indians compelled him to continue as an Indian fighter. In 1853 he was appointed U.S. Indian agent, with headquarters at Taos, a position he filled with notable success. At the outbreak of the Civil War he helped organize and commanded the 1st New Mexican Volunteers, who engaged in campaigns against the Apache, Navaho, and Comanche Indians in New Mexico and Texas. At the end of the war he was made a brigadier general, in command (1866-67) of Fort Garland, Colo. See his autobiography (ed. by Blanche C. Grant, 1926, ed. by M. M. Quail, 1935), biographies by Stanley Vestal (1928) and M. M. Estergreen (1962, repr. 1967), E. L. Sabin, *Kit Carson Days* (rev. ed. 1935).

Carson, Rachel Louise, 1907-64, American writer and marine biologist, b. Springdale, Pa., M.A. Johns Hopkins, 1932. Her well-known books on sea life—*Under the Sea Wind* (1941), *The Sea Around Us* (1951), and *The Edge of the Sea* (1954)—combine keen scientific observation with rich poetic description. Her *Silent Spring* (1962) is a provocative study of the dangers involved in the use of insecticides. See Philip Sterling, *Sea and Earth* (1970), Paul Brooks, *The House of Life* (1972).

Carson, city (1970 pop. 71,150), Los Angeles co., S. Calif., an industrial and residential suburb of Los Angeles, inc. 1968. Oil refining is the major industry, but fabricated metals, paper and many other products are manufactured. Carson is the site of the largest branch of California State College (Dominguez Hills) and a junior college.

Carson City, city (1970 pop. 15,468), state capital, W. Nev., in the Carson valley, inc. 1875. The city is a trade center for a mining and agricultural area. The state government is a major employer, and tourism is important. The city was laid out in 1858 on the site of Eagle Station, a trading post established (1851) on the immigrant trail from Salt Lake City to California. It served as a supply station for miners in the valley, achieved importance with the discovery (1859) of the COMSTOCK LODE, and later became the terminus of the railroad carrying ore. In 1861, when the Territory of Nevada was created, the city was made the capital, and in 1864 it became the state capital—largely through the efforts of William Morris Stewart. A U.S. mint, which closed in 1893, is now occupied by the Nevada State Museum. By act of the legislature, following a statewide referendum, Carson City and Ormsby county were consolidated into one community in July, 1969.

Carson Sink, swampy area, c. 100 sq. mi. (260 sq. km), W. Nev., a remnant of ancient Lake Lahontan. Fallon National Wildlife Refuge is located there. The Carson River (c. 125 mi./200 km long), fed by melted snow, flows into the sink. The river's course was followed by California-bound travelers in the 1850s and 1860s. Lahontan Dam, part of the Newlands project, impounds river water for irrigation and produces electricity.

Carstares or Carstairs, William, 1649-1715, Scottish statesman and Presbyterian divine. While studying theology at Utrecht, he became a friend of William of Orange (later William III of England). He was imprisoned in Edinburgh (1674-79) for alleged coauthorship of *An Account of Scotland's Grievances* and again imprisoned and tortured in Edinburgh (1683) as a suspect in the RYE HOUSE PLOT. He returned to Holland where he was made chaplain to William of Orange. He accompanied William to England in 1688 and became so powerful in his efforts to reconcile the new king and the Scottish church and to frustrate the Episcopal Jacobites that he was nicknamed "the Cardinal." His influence continued under Queen Anne as he worked for the union of England and Scotland, served as principal of the Univ. of Edinburgh from 1703, and was four times moderator of the general assembly of the Church of Scotland. See biography by R. H. Story (1874).

Carstens, Asmus Jacob (as'mōōs ya'kōp kar'stəns), 1754-98, German historical painter and engraver, b. Schleswig. He studied in Copenhagen and in Italy. He was influenced by the work of Giulio Romano. Carstens was a popular professor at the Berlin Academy where, through such pupils as Peter von Corne-

lius, he had a great influence on German historical painting. *Homer Singing* is a characteristic work.

Carstensz, Mount, New Guinea. see DJAJA PEAK

Cartagena (kartahā'na), city (1968 est. pop. 256,600), capital of Bolívar dept., NW Colombia, a port on the Bay of Cartagena in the Caribbean Sea. Oil refining and the manufacture of sugar, tobacco, hides, textiles, and cosmetics are the principal industries. Tourism is also important. Cartagena was founded in 1533 and became the treasure city of the Spanish Main, where precious stones and minerals from the New World awaited transshipment to Spain. Although the harbor was guarded by 29 stone forts and the city was encircled by a high wall of coral, Cartagena suffered sackings and invasions—in 1544, 1560, and in 1586 (by Sir Francis Drake). In 1741 it withstood a three-month British siege. The city was the first of those in Colombia and Venezuela to declare (1811) absolute independence from Spain. Known as the Republic of Cartagena, it was one of the bases used by Simon Bolívar to launch his campaign to liberate Venezuela. In 1815 the city was besieged and captured by the Spanish general Pablo MORILLO, who inflicted savage reprisals on the population. Captured by rebel forces in 1821, Cartagena was incorporated into Colombia. After the revolution the city lost its importance and did not regain it until the 20th cent., with the improvement of communications and the laying of a pipeline to the oil fields of the Magdalena basin. Shady plazas and narrow cobblestone streets make Cartagena one of the most picturesque cities in Latin America. Points of interest include walls and fortifications from colonial times, a 16th-century cathedral, and the Univ. of Cartagena.

Cartagena (kartahā'na), Lat. Carthago Nova, city (1970 pop. 146,904), Murcia prov., SE Spain, on the Mediterranean Sea. A major seaport and naval base, it has a fine natural harbor, protected by forts, with a naval arsenal and important shipbuilding and metallurgical industries. Lead, iron, and zinc are mined and processed nearby, but the rich silver mines exploited in ancient times by Carthaginians and Romans are now almost exhausted. The city is an episcopal see. It was founded by Hasdrubal c. 225 B.C. and soon became a flourishing port, the chief Carthaginian base in Spain. Captured (209 B.C.) by Scipio Africanus Major, it continued to flourish under the Romans. The Moors, who took it in the 8th cent., later included it in Murcia. The Spaniards recovered it definitively in the 13th cent. Cartagena was sacked (1585) by Sir Francis Drake and figured later in the Peninsular and Carlist wars. It served as the Loyalist naval base during the civil war (1936-39). In the 20th cent. it has suffered from the competition of other Mediterranean ports (e.g., Barcelona, Malaga, and Valencia). The medieval Castillo de la Concepcion, whose ruins are surrounded by fine gardens, commands a splendid view of the city and harbor. No traces of the ancient city remain.

Cartago (karta'gō), city (1968 est. pop. 22,000), central Costa Rica. The raising of livestock and the production of coffee are its main industries. Cartago was founded in 1563. It was the political center of Costa Rica until independence was won from Spain in 1821 and has remained a conservative stronghold. It was destroyed by an eruption (1723) of Irazu volcano and was severely damaged by earthquakes in 1822, 1841, and 1910. Cartago's principal church is the scene of annual pilgrimages.

Cartan, Élie Joseph (ālē' zhōzēf' karta'n'), 1869-1951, French mathematician. The son of a village blacksmith, he graduated from the École normale and taught at the universities of Montpellier, Lyons, Nancy, and finally Paris, where he was professor from 1912 to 1940. He developed powerful methods of attacking problems in fields related to modern topology, notably Lie groups, differential systems, and differential geometry; his discoveries are basic to mathematical formulations of quantum mechanics and general relativity. New applications are still found for his work, which is collected in *Oeuvres complètes* (1952-55). The importance of his contributions was recognized belatedly with his election to the French Academy of Sciences in 1931.

Carte, Richard D'Oyly (dōi'lē kart), 1844-1901, English impresario. His choice of presentations did much to raise the level of English musical theater. In 1875 he produced *Trial by Jury*, the first operetta of Sir William S. GILBERT and Sir Arthur SULLIVAN, and he subsequently produced all their other works. In 1881 he built the Savoy Theatre (the first to be lighted electrically), which the operettas made famous. The D'Oyly Carte company still performs Gilbert and Sullivan's works.

cartel, national or international organization of manufacturers or traders allied by agreement to fix prices, limit supply, divide markets, or to fix quotas for sales, manufacture, or division of profits among the member firms. In that it often has international scope the cartel is broader than the TRUST, and in that it carries on manufacture it differs from the speculative CORNER or ring. Of German origin, the cartel achieved prominence in the world depression of the 1870s, which coincided with the unification of Germany and the growth of its economy. The existence of cartels is in opposition to classic theories of economic competition and the free market, and they are forbidden by law in many nations. In Germany, however, by the outset of World War II, nearly all industry was controlled by cartels closely supervised by the government. Opponents of cartels have alleged that they have driven competing firms out of existence, reduced volume of trade, raised prices to consumers, and protected inefficient members from competition. Cartels were blamed for having benefited German aggression by furnishing markets, profits, and technical data to Germany before World War II. Supporters of cartels claim that they protect the weaker participating firms, do away to an extent with limitations on trade resulting from high tariffs, distribute risks and profits equitably, stabilize markets, reduce costs, and hence protect consumers. The U.S. government legalized export associations in 1918 and has itself participated in agreements regulating production and international trade in foodstuffs, rubber, and other commodities. Because they imply the agreement and supervision of several governments, cartels in international trade are usually felt to be less harmful than those which tend to create monopolies in the home market for participants. Formal international agreements, involving governments as well as private firms, still control price, output, and distribution in some industries, notably in diamonds and in oil. Although not referred to as cartels, these agreements have the same general effect on world trade. See also **TARIFF**. See G. W. Stocking and M. W. Watkins, *Cartels or Competition?* (1948, repr. 1968), K. L. Mayall, *International Cartels* (1951), J. P. Miller, *Competition, Cartels and Their Regulation* (1962), Estes Kefauver, *In a Few Hands* (1965), Heinrich Kronstein, *The Law of International Cartels* (1973).

Carter, Elizabeth, 1717-1806, English poet and translator. Under the pen name Eliza she contributed for years to the *Gentleman's Magazine*. One of the group of 18th-century women known as the bluestockings, she was a friend of Johnson, Burke, Reynolds, and Horace Walpole. Collections of her poems appeared in 1738 and 1762. Her translations of Epictetus were published in 1758. See her memoirs (1807), study by Alice C. C. Gausson (1906), *Bluestocking Letters* (ed. by R. B. Johnson, 1926).

Carter, Elliott, 1908-, American composer, b. New York City. Carter is considered by many to be the most important contemporary American composer. He was a pupil of Walter Piston, E. B. Hill, and Gustav Holst at Harvard and studied with Nadia Boulanger in Paris (1932-35). Carter's mature music is organized into highly intellectualized contrapuntal patterns to which sympathetic listeners attribute great emotional power. He characteristically uses tempo as an element of form. Among his notable works are the ballet *Pocahontas* (1939), a cello and piano sonata (1948), three string quartets (1951, 1958-59, 1973), *Variations* (1953-55) for orchestra, a piano concerto (1966), and a concerto for orchestra (1969).

Carter, Hodding, 1907-72, American journalist and news publisher, b. Hammond, La. After teaching briefly at Tulane Univ., he worked as a newspaperman until starting (1932) his own paper, the *Hammond (La.) Daily Courier*, which was distinguished by its opposition to Huey Long's control of Louisiana. In 1936 he moved to Greenville, Miss., and started another paper, which became the *Delta Democrat-Times*. After service with the army bureau of public relations in World War II, he returned to his paper to write a series of articles on racial, religious, and economic intolerance that won him the 1945 Pulitzer Prize for distinguished reporting. Particularly cited was his plea for fairness for returning Nisei soldiers. Among his works—both fiction and nonfiction—are *Mississippi* (1942), *Where Main Street Meets the River* (1953), *The Angry Scar*, *The Story of Reconstruction* (1959), *First Person Rural* (1963), and *Doomed Road of Empire* (1971).

Carter, Howard, 1873-1939, English Egyptologist. He served (1891-99) with the Egyptian Exploration Fund and later helped to reorganize the antiquities

administration for the Egyptian government. Carter's successful excavations (1906-22) with Lord Carnarvon in the Valley of the Kings in Luxor, Egypt, include the tombs of Amenophis I, Hatshepsut, and Thutmose IV. His greatest achievement was the discovery in 1922 of the tomb of Tutankhamen. With A. C. Mace he wrote *The Tomb of Tutankhamen* (Vol. I-II, 1923, Vol. III, 1933, repr. 1963). See study by Barry Wynne (1972).

Carter, Mrs. Leslie, 1862-1937, American actress, b. Lexington, Ky., whose maiden name was Caroline Louise Dudley. She became a protegee of BELASCO and first appeared in 1890 in *The Ugly Duckling*. His *Heart of Maryland* (1895) brought her recognition, and her success continued in his productions of *Zaza* (1899), *Du Barry* (1901), and *Adrea* (1905). Their association ended with her second marriage in 1906, after which her stage popularity diminished.

Carter, Nick, fictional detective character in dime novels said to have been created by J. R. Coryell in the 1880s. The firm of Street & Smith, New York City, published over 1,000 stories about Nick Carter, written variously by F. V. R. Dey, E. T. Sawyer, G. C. Jenks, and others. The name Nicholas Carter was used as a pseudonym by many authors of dime novels.

Carter, Samuel Powhatan, 1819-91, American naval officer and Union general in the Civil War, b. Elizabethton, Tenn., grad. Annapolis, 1846. In the Civil War he was transferred from the navy to the War Dept., sent to organize Union troops in East Tennessee, made brigadier general of volunteers (May, 1862), and given command of a cavalry division in the Army of the Ohio. Discharged from service as brevet major general (1866), he returned to the navy. In 1882 he was made a rear admiral on the retired list. Carter is said to have been the only American who was both a major general and a rear admiral.

Carteret, Sir George (kär'tarēt), c. 1610-1680, proprietor of East Jersey (see NEW JERSEY). He served in the British navy, fought for the royalists, and became (1643) lieutenant governor of his native island of Jersey. In 1663, with several others, he was granted the proprietorship of Carolina and in 1664, in conjunction with Lord Berkeley, was granted part of New Jersey. His widow sold his claim to 12 purchasers who joined with 12 others as the 24 proprietors of East New Jersey.

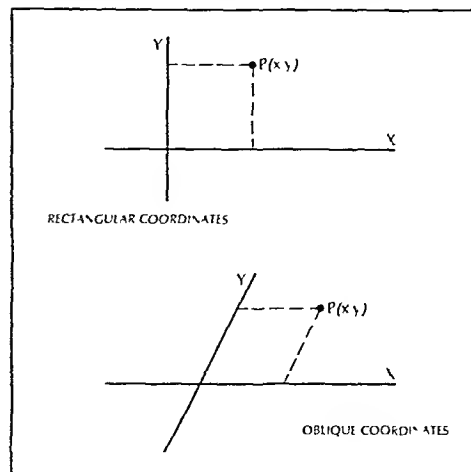
Carteret, John: see GRANVILLE, JOHN CARTERET, 1ST EARL.

Carteret, Philip, 1639-82, first colonial governor of NEW JERSEY. Carteret, commissioned by the proprietor, Sir George Carteret, his fourth cousin, arrived in the province in 1665. He soon faced disputes over confused land titles and rebellion by tenant farmers against quitrents (fixed rents). After the division of New Jersey in 1676, he was made governor of East Jersey. Mounting difficulties with Sir Edmund ANDROS over the right to collect customs duties led to Carteret's imprisonment by Andros and his eventual restoration by the duke of York (later James II).

Carteret, borough (1970 pop. 23,137), Middlesex co., N. E. N. J., on Arthur Kill, opposite Staten Island, inc. 1906. It has oil and copper refineries and industries producing steel, chemicals, and cigars.

Cartesian coordinates (kär'tēzhən) [for René Descartes], system for representing the relative positions of points in a plane or in space. In a plane, the point P is specified by the pair of numbers (x, y) representing the distances of the point from two intersecting straight lines, referred to as the x -axis and the y -axis. The point of intersection of these axes, which are called the coordinate axes, is known as the origin. In rectangular coordinates, the type most often used, the axes are taken to be perpendicular, with the x -axis horizontal and the y -axis vertical, so that the x -coordinate, or abscissa, of P is measured along the horizontal perpendicular from P to the y -axis (i.e., parallel to the x -axis) and the y -coordinate, or ordinate, is measured along the vertical perpendicular from P to the x -axis (parallel to the y -axis). In oblique coordinates the axes are not perpendicular, the abscissa of P is measured along a parallel to the x -axis, and the ordinate is measured along a parallel to the y -axis, but neither of these parallels is perpendicular to the other coordinate axis as in rectangular coordinates. Similarly, a point in space may be specified by the triple of numbers (x, y, z) representing the distances from three planes determined by three intersecting straight lines not all in the same plane, i.e., the x -coordinate represents the distance from the yz -plane measured along a parallel to the x -axis, the y -coordinate represents the distance from the xz -plane measured along a parallel to the y -axis, and the z -coordinate represents the distance from

the xy -plane measured along a parallel to the z -axis (the axes are usually taken to be mutually perpendicular). Analogous systems may be defined for de-



Cartesian coordinates

scribing points in abstract spaces of four or more dimensions. Many of the curves studied in classical geometry can be described as the set of points (x, y) that satisfy some equation $f(x, y) = 0$. In this way certain questions in geometry can be transformed into questions about numbers and resolved by means of ANALYTIC GEOMETRY.

Cartesian philosophy: see DESCARTES, RENÉ.

Carthage (kär'thij), ancient city, on the northern shore of Africa, on a peninsula in the Bay of Tunis and near modern Tunis. The Latin name, Carthago or Cartago, was derived from the Phoenician name, which meant "new city" (the old city being Utica). It was founded (traditionally by DIDO) from Tyre in the 9th cent. B.C. The city-state built up trade and in the 6th and 5th cent. B.C. began to acquire dominance in the W. Mediterranean. Merchants and explorers established a wide net of trade that brought great wealth to Carthage. The state was tightly controlled by an aristocracy of nobles and wealthy merchants. Although a council and a popular assembly existed, these soon lost power to oligarchical institutions, and actual power was in the hands of the judges and two elected magistrates (suffetes). There was also a small but powerful senate. The greatest weakness of Carthage lay in the rivalry of two blocs of leading families that traditionally backed opposing policies. The most important division was between those favoring land expansion and those favoring sea power. The maritime faction was generally in control, and about the end of the 6th cent. B.C. the Carthaginians established themselves on Sardinia, Malta, and the Balearic Islands. The navigator Hanno in the early 5th cent. is supposed to have sailed down the African coast as far as Sierra Leone. The statesman Mago arrived at treaties with the Etruscans, the Romans, and some of the Greeks. However, Sicily, which lay almost at the front door of Carthage, was never brought completely under Carthaginian control. The move against the island, begun by settlements in W. Sicily, was brought to a halt when the Carthaginian general HAMILCAR (a name that recurred in the powerful Carthaginian family usually called the Barcas) was defeated (480 B.C.) by GELON, tyrant of Syracuse, in the battle of Himera. The Greek city-states of Sicily were thus preserved, but the Carthaginian threat continued and grew with the steadily increasing power of Carthage. Hamilcar's grandson, Hannibal (another name much used in the family), destroyed Himera (409 B.C.), and his colleague Himilco sacked Agragas (modern Agrigento) in 406 B.C. SYRACUSE resisted the conquerors, and a century later Carthage was threatened by the campaign (310-307?) of the tyrant Agathocles on the shores of Africa. After his death, however, Carthage had practically complete control over all the W. Mediterranean. In the 3d cent. B.C., Rome challenged that control in the PUNIC WARS (so called after the Roman name for the Carthaginians, Poeni, i.e., Phoenicians). The first of these wars (264-241) cost Carthage all remaining hold on Sicily. Immediately after the First Punic War a great uprising of the mercenaries occurred (240-238). HAMILCAR BARCA put down the revolt and compensated for the loss of Sicilian possessions by undertaking conquest in Spain, a conquest continued by HASDRUBAL. This growth of power again activated trouble with Rome,

and the Second Punic War took place (218–201). Although the Carthaginian general was the formidable HANNIBAL, Carthage was finally defeated, partly by the Roman generals Quintus Fabius Maximus Rullianus (see under FABIIUS) and SCIPIO AFRICANUS MAJOR, and partly by the fatal division of the leading families in Carthage itself, which prevented Hannibal from receiving proper supplies. After Scipio had won (202) the battle of ZAMA, Carthage sued for peace. All its warships and its possessions outside Africa were lost, but Carthage recovered commercially and remained prosperous. However, Rome (and particularly CATO THE ELDER) felt that to be a threat, and the Third Punic War (149–146 B.C.) ended with the total destruction of Carthaginian power and the razing of the city by SCIPIO AFRICANUS MINOR. Romans later undertook to build a new city on the spot in 122 B.C., but the project failed. A new city was founded in 44 B.C. and under Augustus became an important center of Roman administration. Carthage was later (A.D. 439–533) the capital of the Vandals and was briefly recovered (533) for the Byzantine Empire by Belisarius. Although practically destroyed by Arabs in 698, the site was populated for many centuries afterward. There are hardly any remains of the ancient Carthage. A few Punic cemeteries, shrines, and fortifications have been discovered, and there are some Roman ruins including baths, an amphitheater, and other buildings. Louis IX of France (St. Louis) died there when on crusade. A chapel in his honor stands on the hill that is traditionally identified as Byrsa Hill, site of the ancient citadel. The Lavagerie Museum is also there. See B. H. Warmington, *Carthage* (2d ed. 1969), T. A. Dorey and D. R. Dudley, *Rome against Carthage* (1971).

Carthage, city (1970 pop. 11,035), seat of Jasper co., SW Mo., on the Spring River, in a rich farm area, inc. 1873. Its gray marble quarries are the largest of their kind in the world, and Carthage marble is a major product. Carthage became county seat in 1842. A Civil War battle was fought there July 5, 1861, the city was burned and was rebuilt after the war. Points of interest include the log cabin courthouse (1842) and the George Washington Carver National Monument, site of Carver's birthplace, at nearby Diamond.

Carthusians (karthōō'zhānz), small order of monks of the Roman Catholic Church [Lat. abbr., =O. Cart]. It was established by St. BRUNO at La Grande Chartreuse (see CHARTREUSE, GRANDE) in France in 1084. The Carthusians are peculiar among orders of Western monasticism in cultivating a nearly eremitical life: each monk lives by himself with cell and garden and, except for communal worship, scarcely meets the others. No order is more austere. The Carthusian enclosure is called charterhouse in English, and its architecture differs necessarily from that of the Benedictine ABBEY. The CHARTERHOUSE of London was famous, and the CERTOSA DI PAVIA, Italy, is an architectural monument. The Carthusians are devoted mainly to contemplation. In 1973 they numbered 440 members throughout the world, of whom there were 10 in the United States, living at the Charterhouse of Arlington, Vt. They are unchanging in their rule, their independence, and their original way of life. There are a very few Carthusian nuns following a similar rule. CHARTREUSE is the well-known liqueur manufactured by Carthusians in France.

Cartier, Sir Georges Étienne (zhōrhzh ätyēn' kartyā'), 1814–73, Canadian statesman, b. Quebec prov. He was called to the bar of Lower Canada (Quebec) in 1835. He took part in the rebellion of 1837 inspired by Louis Joseph PAPINEAU and was forced to flee to the United States, but he returned to Canada in 1838. In 1848 he was elected to the legislative assembly of Canada, where he became a leader of the French Canadians. With Sir John A. MACDONALD, his ally in Upper Canada, he formed the Macdonald-Cartier ministry (1857–62). He was the leading French Canadian advocate of confederation of British North America, played a prominent role in the Charlottetown and Quebec conferences of 1864, and was mainly influential in persuading his compatriots to accept the federation proposals. On the other hand, in order to protect the French Canadians, he insisted on a federal system rather than a more centralized form of government. As one of Macdonald's most trusted colleagues, Cartier became minister of militia in the first dominion government. In 1868 he went to England with William McDougall to arrange for the purchase of the Hudson's Bay Company territory. He also had an important part in the projection of the Grand Trunk and Canadian Pacific railroads. See biographies by John Boyd (1914, repr. 1971) and A. D. DeCelles (1926).

Cartier, Jacques (zhak), 1491–1557, French navigator, first explorer of the Gulf of St. Lawrence and discoverer of the St. Lawrence River. He made three voyages to the region, the first two (1534, 1535–36) directly at the command of King Francis I and the third (1541–42) under the sieur de Roberval in a colonization scheme that failed. On the first voyage he entered by the Strait of Belle Isle, skirted its barren north coast for a distance and then coasted along the west shore of Newfoundland to Cape Anguille. From there he discovered the Magdalen Islands and Prince Edward Island and, sailing to the coast of New Brunswick, explored Chaleur Bay, continued around the Gaspé Peninsula, and landed at Gaspé to take possession for France. Continuing to Anticosti Island, he then returned to France. Hitherto the region had been considered cold and forbidding, interesting only because of the Labrador and Newfoundland fisheries, but Cartier's reports of a warmer, more fertile region in New Brunswick and on the Gaspé and of an inlet of unknown extent stimulated the king to dispatch him on a second expedition. On this voyage he ascended the St. Lawrence to the site of modern Quebec and, leaving some of his men to prepare winter quarters, continued to the Indian village of Hochelaga, on the site of the present-day city of Montreal, and there climbed Mt. Royal to survey the fertile valley and see the Lachine Rapids and Ottawa River. On his return he explored Cabot Strait, ascertaining Newfoundland to be an island. His *Brief Recit et succincte narration* (1545), a description of this voyage, was his only account to be published in France during his life. On his third trip he penetrated again to the Lachine Rapids and wintered in the same region, but gained little new geographical information. Roberval did not appear until Cartier was on his way home, and Cartier refused to join him. Although Cartier's discoveries were of major geographical importance and the claims of the French to the St. Lawrence valley were based on them, he failed in his primary object, the discovery of the Northwest Passage and natural resources. The region remained virtually untouched until the early 17th cent. The best edition of the voyages is H. P. Biggar, *The Voyages of Jacques Cartier* (1924).

Cartier-Bresson, Henri (aNRé' kartēā'-brēsōN'), 1908–, French photojournalist. Cartier-Bresson is renowned for his countless memorable images of 20th-century individuals and events. Achieved with the simplest of techniques, his works are remarkable for their flawless composition and for the sense they convey of the rush of time arrested. His photographs are uncropped and unmanipulated. In 1944, after escaping from a German prison camp, Cartier-Bresson organized underground photography units. He is the author of many photographic books including *The Decisive Moment* (1952), *People of Moscow* (1955), *China in Transition* (1956), *The World of Henri Cartier-Bresson* (1968), *The Face of Asia* (1972), and *About Russia* (1974). He was a founder of the Magnum photo agency. See François Nourissier, *Cartier-Bresson's France* (tr. 1971).

cartilage (kar'tālij), flexible semitransparent CONNECTIVE TISSUE without blood vessels or nerve cells that forms part of the skeletal system in man and other vertebrates, also called gristle. Temporary cartilage makes up the skeletal system of the fetus and the infant but is gradually replaced by bone as the body matures. Permanent cartilage remains throughout life, as in the external ear, nose, larynx, and windpipe. Cartilage is also present about the JOINTS, where it reduces friction and imparts flexibility.

Cartimandua, fl. 1st cent. A.D., British queen of the Brigantes. Ruler of the largest and most powerful tribe in Roman Britain (inhabiting the area that is now Yorkshire), she surrendered CARACTACUS to the Romans (A.D. 51). The Romans supported her rule as a client-queen in order to stabilize the region and quell dynastic conflicts. She was overthrown in A.D. 69 when she repudiated her husband, Venutius, for his armor-bearer. The Brigantes were then subjugated under direct Roman rule.

cartography see MAP

cartoon [Ital. cartone=paper]. In the fine arts, a full-sized preliminary drawing for a work to be afterwards executed in fresco, oil, mosaic, stained glass, or tapestry. Glass and mosaic are cut exactly according to the patterns taken from the cartoons while in tapestry the cartoon is inserted beneath the warp to serve as a guide. In FRESCO painting, the lines of the cartoon are perforated and transferred to the plaster surface by pouncing (dusting with powder through the perforations). The Italian Renaissance painters made very complete cartoons, and such works as

Raphael's cartoons for the Sistine Chapel tapestries (Victoria and Albert Mus.) are considered masterpieces. In England in 1843 a series of drawings appeared in *Punch* magazine that parodied the fresco cartoons submitted in a competition for the decoration of the new Houses of Parliament. In this way cartoon, in journalistic parlance, came to mean any single humorous or satirical drawing employing distortion for emphasis, often accompanied by a caption or a legend. Cartoons, particularly editorial or political cartoons, make use of the elements of CARICATURE. The political cartoon first appeared in 16th-century Germany during the Reformation, the first time such art became an active propaganda weapon with social implications. While many of these cartoons were crudely executed and remarkably vulgar, some, such as Holbein's *German Hercules*, were excellent drawings produced by the best artists of the time. In England, in the 18th cent., the cartoon became an integral and effective part of journalism through the works of Hogarth, Rowlandson, and Gillray. Daumier, in France, became well known for his virulent satirical cartoons. By the mid-19th cent. editorial cartoons had become regular features in American newspapers and were soon followed by sports cartoons and humorous cartoons. The effect of political cartoons on public opinion was amply demonstrated in the elections of 1871 and 1873 when the power of Tammany Hall was broken and Boss Tweed imprisoned largely through the efforts of Thomas Nast and his cartoons for *Harper's Weekly*. In 1922 the first Pulitzer Prize for editorial cartooning was won by Rollin Kirby of the *New York World*. Other noted political cartoonists include John T. McCutcheon, C. D. Batchelor, Jacob Burck, Bill Mauldin, Rube Goldberg, Tom Little, Patrick Oliphant, and Herblock (Herbert Block). Humorous nonpolitical cartoons became popular with the development of the color press, and in 1893 the first color cartoon appeared in the *New York World*. In 1896, R. F. Outcault originated *The Yellow Kid*, a large single-panel cartoon with some use of dialogue in balloons, and throughout the '90s humorous cartoons by such artists as T. S. Sullivan, James Swinnerton, Frederick B. Opper, and Edward W. Kemble began to appear regularly in major newspapers and journals. *The New Yorker* and the *Saturday Evening Post* were among the most notable American magazines to use outstanding single cartoon drawings. The single cartoons soon developed into the narrative newspaper COMIC STRIP, although the single-panel episodic tradition has been retained, exemplified by the work of humorists such as Charles Addams, Peter Arno, Saul Steinberg, James Thurber, William Steig, Helen Hokinson, Mary Petty, Whitney Darrow, the Englishmen Rowland Emmett and Ronald Searle, and the French cartoonists André François and 8il. See studies by David Low (1953), Osbert Lancaster (1964), R. E. Shikes, *The Indignant Eye* (1969), John Geipel (1972).

Cartouche (kartōosh'), 1693–1721, nickname of Louis Dominique Bourguignon, French highwayman. His band terrorized the Paris area until his capture. He was broken on the wheel. Cartouche's daring exploits have been celebrated in stories, dramas, ballads, and popular prints.

Cartwright, Edmund, 1743–1823, English inventor and clergyman. He was the inventor of an imperfect power loom that, when finally patented (1785), became the parent of the modern loom. It was the first machine to make practical the weaving of wide cotton cloth. A few of Cartwright's many other inventions were a wool-combing machine (1789), a machine for ropemaking (1792), and an engine (1797) that used alcohol as fuel. He cooperated with Fulton on his experiments with steam navigation.

Cartwright, John, 1740–1824, English reformer and pamphleteer, brother of Edmund Cartwright. He had an early career in the navy. He declined to fight the American colonists and wrote *American Independence: the Interest and Glory of Great Britain* (1774). A major in the Nottinghamshire militia (1775–92), he was deprived of his commission in the hysteria at the time of the French Revolutionary Wars. He came to be called the "father of reform" for his advocacy of universal manhood suffrage, parliamentary and army reform, and abolition of slavery. See F. D. Cartwright, ed., *The Life and Correspondence of Major Cartwright* (2 vol., 1826, repr. 1969), biography by J. W. Osborne (1972).

Cartwright, Peter, 1785–1872, American Methodist preacher, b. Virginia. He was a circuit rider in Kentucky, Tennessee, Indiana, Ohio, and Illinois for nearly 50 years. In 1846 he was defeated as a candidate for Congress by Abraham Lincoln. An interest in education led Cartwright to aid in founding Illi-

nois Wesleyan Univ and Illinois Conference Female Academy (now MacMurray College) The methods and experiences of the pioneer preacher are vividly recorded in his autobiography (1857) and other books See biographies by H H Grant (1931) and Sydney and Marjorie Greenbie (1955)

Cartwright, Sir Richard John, 1835-1912, Canadian politician, b Kingston, Ont He was elected as a Conservative to the legislative assembly of Canada (1863) and to the first dominion House of Commons (1867), but he later joined the Liberals He was minister of finance (1873-78) in Alexander Mackenzie's administration As minister of trade and finance (1896-1911) in Sir Wilfrid Laurier's government, Cartwright was acting prime minister on several occasions He entered the Senate in 1904 A noted public speaker, he was the Liberal party's spokesman on financial matters and an earnest advocate of trade reciprocity with the United States See his reminiscences (1912)

Cartwright, William, 1611-43, English author and divine An ardent royalist and a disciple of Ben Jonson, he had a high reputation in his day both as a preacher and as an author In addition to his poems, which are now almost entirely forgotten, Cartwright wrote plays, of which *The Ordinary* (1635?) and *The Royal Slave* (1636) were the most successful See his works (ed with an introduction by G Blakemore Evans, 1951)

Caruaru (karōōarōō'), city (1970 pop 142,808), Pernambuco state, NE Brazil, on the Ipojuca River It is a commercial center in an agricultural and cattle-raising area

Carucci, Jacopo: see PONTORMO, JACOPO DA

Carus (Marcus Aurelius Carus) (kār'ās), d 283, Roman emperor (282-83) Praetorian prefect under PROBUS, he was made emperor by the soldiers after the murder of Probus Leaving his son CARINUS in command of the West, Carus and another son, Numerianus, went on a campaign in the East He defeated the Sarmatians, successfully attacked the Parthians, and took Ctesiphon Soon afterward he died mysteriously

Carus, Paul, 1852-1919, American philosopher, born and educated in Germany For many years he was editor of the *Open Court* and the *Monist*, periodicals devoted to philosophy and religion His philosophy was monistic, seeking to establish religion on a scientific basis Among his many works were *Fundamental Problems* (1889), *The Religion of Science* (1893), *The Gospel of Buddha* (1900), *The History of the Devil* (1900), and *The Principle of Relativity* (1913)

Caruso, Enrico (karōō'sō, Ital ānrē'kō kārōō'zō), 1873-1921, Italian operatic tenor, b Naples The natural beauty, range, and power of his voice made him one of the greatest singers in the history of opera He studied for three years with Guglielmo Vergine and made his operatic debut in Naples in 1894 His first major success came in London in 1902, and he achieved even greater triumph with his American debut in 1903 at the Metropolitan Opera as the duke in *Rigoletto* He remained the reigning favorite at the Metropolitan until a short time before his death (from pleurisy) He also made guest appearances in Europe and Latin America, interrupting his busy career only for a throat operation in 1908-9 He sang more than 50 roles in Italian and French operas, such as *La Traviata*, *Aida*, *La Bohème*, *Tosca*, and *Carmen* After his death his recordings perpetuated his fame His highly emotional interpretation of *Cavito* in *I Pagliacci* perhaps won the most rapturous public applause, but roles in Verdi and Puccini operas and his recitals showed his artistry to better advantage See biographies by Dorothy Park Benjamin Caruso (new ed 1963) and Stanley Jackson (1972)

Carvajal, Francisco de (frānthēs'kō dā kārvāhāl'), 1464?-1548, Spanish conquistador For 40 years he fought in European wars before going to Mexico and subsequently to Peru, where he aided Francisco Pizarro He grew rich from the tributary labor of Indians, thousands of whom died in his mines at Potosí He supported (1542) VACA DE CASTRO against the revolt of Diego de Almagro the younger, but when the New Laws to protect the Indians were put in force in Peru (1544), he joined the revolt of Gonzalo PIZARRO He was captured with Gonzalo Pizarro and executed

carvel: see CARAVEL

Carver, George Washington, 1864?-1943, American agricultural chemist, b Diamond, Mo., grad Iowa State College (BS, 1894, MA 1896) Born a slave, he later, as a free man, earned his college degree In 1896 he joined the staff of Tuskegee Institute as director of the department of agricultural re-

search, retaining that post the rest of his life His work won him international repute Carver's efforts to improve the economy of the South (he dedicated himself especially to bettering the position of Negroes) included the teaching of soil improvement and of diversification of crops He discovered hundreds of uses for the peanut, the sweet potato, and the soybean and thus stimulated the culture of these crops He devised many products from cotton waste and extracted blue, purple, and red pigments from local clay From 1935 he was a collaborator of the Bureau of Plant Industry Carver contributed his life savings to a foundation for research at Tuskegee In 1953 his birthplace was made a national monument See biographies by Rackham Holt (rev ed 1966) and Lawrence Elliott (1966)

Carver, John, c 1576-1621, first governor of Plymouth Colony A wealthy London merchant, in 1609 he emigrated to Holland, where he soon joined the Pilgrims at Leiden His excellent character and his fortune, of which he gave liberally to the congregation, served to make him a leader Carver, the chief figure in arranging for the Pilgrim migration to America, secured the backing of merchant friends in London, enlisted a number of capable settlers who came directly from England, and hired and provisioned the *Mayflower* for the journey After the signing of the Mayflower Compact he was elected (1620) governor for one year and was probably responsible for the choice of the site at Plymouth On his death, William BRADFORD succeeded him See G F Willison, *Saints and Strangers* (1945)

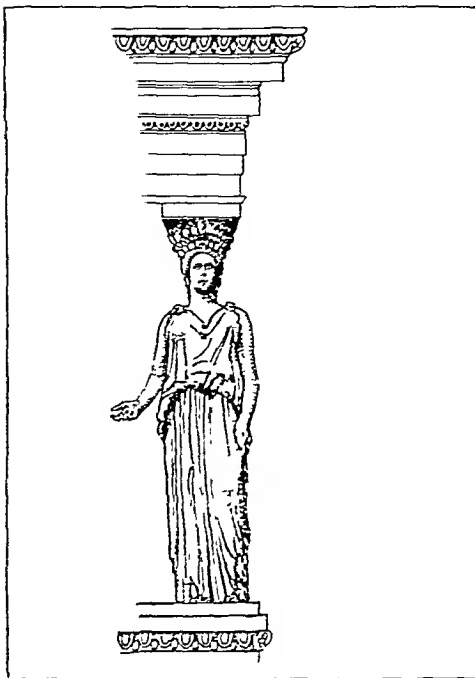
Carver, Jonathan, 1710-80, American explorer, b Weymouth, Mass He served in the French and Indian War and in 1766 was hired by Robert ROGERS to undertake a journey to some of the Western tribes He journeyed to the Mississippi and up that river to a point several days' journey above the present site of Minneapolis In the spring of 1767 he returned to Prairie du Chien, where by Rogers's orders he joined the expedition to search out the "Western Ocean" When their journey northwestward was prevented by war between the Sioux and Chippewa, they ascended the Chippewa River and crossed to Lake Superior, the coast of which they followed to Grand Portage Carver went to London in 1769 with the intention of publishing a narrative of his travels and of pressing claims for compensation for his services, for Rogers, having exceeded his authority in employing Carver, could not pay him After nine years of struggle and poverty, Carver published the first edition of his *Travels through the Interior Parts of North America in the Years 1766, 1767, and 1768* (1778) The popularity of this book, the first English account of the upper Great Lakes and Mississippi region, is attested by the 32 editions, or more, through which it passed

Cary, Henry Francis, 1772-1844, English translator A graduate of Christ Church College, Oxford, he was assistant librarian in the British Museum from 1826 to 1837 He translated several classical writers, including Aristophanes and Pindar His blank-verse rendering (1814) of Dante's *Divine Comedy* is still a standard translation

Cary, Joyce (Arthur Joyce Lunel Cary), 1888-1957, English author From 1910 to 1920 he served as an administrator and soldier in Nigeria Several of his early works, including *Mister Johnson* (1939), reflect his African experiences Cary is perhaps best known for his two trilogies Both these works, full of humor and compassion, convey a sense of the gradual change in the social and political structure of modern England The first trilogy consists of *Herself Surprised* (1941), *To Be a Pilgrim* (1942), and *The Horse's Mouth* (1944), the last book featuring the visionary, iconoclastic painter Gully Jimson, the second trilogy consists of *Prisoner of Grace* (1952), *Except the Lord* (1953), and *Not Honour More* (1955) Cary wrote many other novels, in addition to political studies and poems A collection of his short stories, *Spring Song*, was published posthumously in 1960 See biography by Malcolm Foster (1968), studies by Robert L Bloom (1963), Jack S Wolkenfeld (1968), and R W Noble (1973)

Cary, Lucius: see FAULKLAND, LUCIUS CARY, 2D VISCOUNT
caryatid (kā'rēāt'īd), a sculptured female figure serving as an ornamental support in place of a column or pilaster It was a frequently used motif in architecture, furniture, and garden sculpture during the Renaissance, the 18th cent., and notably, the CLASSIC REVIVAL of the 19th cent., when caryatids were popular as mantelpiece supports The motif appeared in Egyptian and Greek architecture, the most celebrated example extant is the Porch of the Caryatids,

forming part of the ERECHTHEUM Here six beautifully sculptured figures, acting as columns, support an entablature on their heads They are considered the



Caryatid

only faultless examples of a form that ranks as somewhat questionable architecturally Caryatids were used also in two small treasures (6th cent B.C.) at Delphi

Casa, Giovanni della (jōvān'nē dēl'lā kā'zā), 1503-56, Italian cleric and poet He was archbishop of Benevento and papal nuncio to Venice He wrote lyric verse, a life of Bembo, and a treatise on etiquette, the *Galateo* (1560, tr 1576) His verse is often of great dignity and formal beauty See Lorna de' Lucchi, *An Anthology of Italian Poems* (1922)

casaba melon: see MELON

Casablanca (kā''sāblāng'ka, kā''za-, Span kā''-sāblāng'kā), Arab *Dar-al-Baida*, city (1970 est pop 1,395,000), W Morocco, on the Atlantic Ocean It is the largest city of Morocco and handles over two thirds of the country's commerce Phosphates comprise 75% of the total export traffic, and petroleum products are the major imports The city's leading industries produce textiles, glass, and bricks Casablanca is on the site of Anfa, a prosperous town that the Portuguese destroyed in 1468, they resettled it briefly in 1515 under its present name Almost destroyed by an earthquake in 1755, Casablanca was rebuilt (1757) by Muhammad XVI It was occupied by the French in 1907 During World War II, Casablanca was the scene of one of the three major Allied landings in North Africa (Nov., 1942) and of a conference between Franklin Delano Roosevelt and Winston Churchill (Nov., 1943)

Casablanca Conference, Jan 14-24, 1943, World War II meeting of U.S. President Franklin Delano Roosevelt and British Prime Minister Winston Churchill at Casablanca, French Morocco A joint declaration pledged that the war would end only with the unconditional surrender of the Axis states No agreement was reached on the claims for leadership of the rival French generals, Henri H Giraud and Charles de Gaulle, who also attended the conference

Casadesus, Robert (kā'sādāsūs'), 1899-1973, French pianist and composer, b Paris Casadesus was born into a family remarkable for its numerous celebrated musicians After study at the Paris Conservatory, he embarked in 1922 on a long and distinguished concert career After 1940, Casadesus lived in the United States, where he taught and composed He became director of the American Conservatory at Fontainebleau in 1945 Noted as a pianist of lyric sensitivity, he often appeared in concert with his wife, the pianist Gaby Casadesus Their son, Jean Casadesus, 1927-71, was also a well-known concert pianist

Casa Fuerte, Juan de Acuña, marqués de: see ACUÑA, JUAN DE

Casa Grande (kā'sā grān'dā), city (1970 pop 10,536), Pinal co., S Ariz., inc 1915 It lies in an irrigated farm

area near the Casa Grande Mts. The city was named after an excavated Indian pueblo that is now included in the nearby Casa Grande Ruins National Monument (see NATIONAL PARKS AND MONUMENTS, table). Casa Grande is a retail trade center of 5 central Arizona.

Casal, Julian del (hōōlyan' dēl kasal'), 1863-93, Cuban poet, b. Havana. A friend of Ruben Dario, Casal became a leader in MODERNISMO. He was greatly influenced by the French PARNASSIANS. Afflicted with a painful form of tuberculosis, he wrote verse expressing deep pessimism. To escape his agony he often chose subjects from antiquity and far-off lands, especially Japan. His best-known collections are *Hojas al viento* [leaves in the wind] (1890) and *Bustos y rimas* [busts and rhymes] (1893).

Casale Monferrato (kāsa'lā mōnfār-ra'tō) or **Casale**, city (1971 pop. 43,697), Piedmont, NW Italy, on the Po River. Manufactures include cement and electrical appliances, and much wine is produced in the region. It became the capital of the marquisate of MONTFERRAT in 1435 and was strongly fortified. In the mid-16th cent. the city came under Mantua, and in 1703 it passed to the house of Savoy. Of note are the Romanesque cathedral (12th cent.) and the citadel (15th cent., now a barracks).

Casals, Pablo (Pau) (pa'blō kasals', pou), 1876-1973, Spanish virtuoso cellist and conductor. Casals is considered the greatest 20th-century master of the cello and a distinguished composer, conductor, and pianist. A prodigy, he began his concert career in 1891. In 1905 he formed a chamber trio with Jacques Thibaud (1880-1953) and Alfred Cortot. His career as a conductor began in 1919, when the Orquesta Pau Casals, Barcelona, gave its first concert. Casals gained an international reputation for brilliant expressive technique that remains unsurpassed. His superb interpretations of the Bach unaccompanied cello suites brought him worldwide adulation. In 1939, Casals settled at Prades in S France, a voluntary exile in protest against the Spanish government. In 1950 he began to conduct annual music festivals in Prades. In 1956 he moved to Puerto Rico, where the following year he inaugurated annual music festivals at San Juan. He married his third wife, his student Martita Montañes, in 1957. He performed at the United Nations (1958) and the White House (1961), and conducted a celebrated concert of some 80 cellists at Lincoln Center (1972). See his memoirs (1970), biography by H. L. Kirk (1974), Lillian Littlehales, *Pablo Casals* (rev. ed. 1948).

Casanova de Seingalt, Giovanni Giacomo (kāza-nō'vā, Ital. jōvan'ne ja'kōmō kazanō'vā dā sāngalt'), 1725-98, Venetian adventurer and author. His first name also appears as Jacopo. He studied for the church but was expelled from school for immorality. A life of adventure took him all over Europe. He supported himself by gambling, spying, writing, and, especially, by his power to seduce women, and his personal charm affected the foremost persons of his time. Arrested (1755) in Venice, he accomplished the notable feat of escaping (1756) from the "leaden roofs" of the state prison. In Paris, where he enjoyed favor in court circles, he became director of the lottery and amassed a fortune. In 1785 Casanova retired to the castle of Dux, Bohemia, where his friend Count Waldstein employed him as librarian. A man of learning and taste, with interests ranging from mathematics, poetry, and literary and musical criticism to commercial and political projects, Casanova left many writings. His memoirs, written in French, became world-famous. Only abridged versions were published until 1960, when the complete memoirs began to appear in French and in German translation. Accurate as to history, the memoirs probably contain much invented personal matter. Other papers, in prose and verse, were released in 1930. See his autobiography tr. by W. R. Trask (12 vol. in 6, 1967-71), biographies by J. R. Childs (1961) and J. Masters (1969).

Casas, Bartolome de las see LAS CASAS

Casaubon, Isaac (ēzak' kazōbōn'), 1559-1614, English classical scholar and theologian, b. Geneva. He became professor of Greek at Geneva and at Montpellier and by his learning attracted the notice of Henry IV, who made him royal librarian. After Henry's death, he was invited to England by the archbishop of Canterbury. He joined the Church of England and in 1610 James I granted him a royal stipend. The next year Casaubon became an English subject, remaining in England the rest of his life. He was buried in Westminster Abbey. Casaubon's great works are his editions of the classics, particularly Athenaeus and the *Characters* of Theophrastus. His diary, *Ephemerides*, was edited by his son, Florence

Étienne Meric Casaubon, 1599-1671, who was also a classical scholar.

Casca (Publius Servilius Casca Longus) (kās'ka), d. c. 42 B.C., Roman politician, one of the assassins of Julius CAESAR. Casca was the first to stab Caesar. He died (presumably by suicide) soon after the battle of Philippi.

Cascade Range, mountain chain, c. 700 mi (1,130 km) long, extending S from British Columbia to N Calif., where it joins the Sierra Nevada; it parallels the Coast Ranges, 100-150 mi (161-241 km) inland from the Pacific Ocean. Many of the range's highest peaks are volcanic cones, covered with snowfields and glaciers. Lassen Peak, 10,457 ft (3,187 m) high, in Lassen Volcanic National Park, is still volcanically active. Mt. Rainier (14,410 ft/4,392 m), in Mount Rainier National Park, is the highest point in the Cascades. Mt. Shasta and Mt. Hood are other prominent peaks. The Klamath, Columbia, and Fraser rivers flow from east to west across the range. Of the many lakes in the Cascades, Crater Lake, in Crater Lake National Park, and Lake Chelan, in Lake Chelan National Recreation Area, are the most famous. Other Federal lands in this popular recreation area are North Cascades National Park, Ross Lake National Recreation Area, and Lava Beds National Monument, national forests cover an extensive area. Receiving more than 100 in. (254 cm) of precipitation annually, the Cascades are a major source of water in the U.S. Northwest. Hydroelectricity is generated on the western slope; irrigation is used in the fertile eastern side valleys. Timber is the region's chief resource. The Cascade Tunnel, 8 mi (12.9 km), is the longest railroad tunnel in North America.

Casco Bay (kās'kō), deep inlet of the Atlantic Ocean, 200 sq mi (518 sq km), SW Maine. The bay, with its more than 200 wooded, hilly islands, has many summer estates and resorts. Portland, Maine, is the principal harbor.

case, in language, one of the several possible forms of a given noun, pronoun, or adjective that indicates its grammatical function (see INFLECTION), it is usually a series of suffixes attached to a stem, as in Latin *amicus*, "friend" (nominative), *amicum* (accusative), *amici* (genitive), and *amico* (ablative and dative). In English, nouns have two cases, e.g., man (common or nominative) and man's (possessive or genitive), and a few pronouns have three, e.g., he (nominative), him (objective), and his (possessive). The fact that there are only two cases represents a loss in the English case system as Old English also used accusative, dative, and sometimes instrumental, cases. Latin has six cases, nominative, genitive, dative, accusative, ablative, and vocative. The hypothetical ancestor of the Indo-European languages had eight cases, the above six plus the instrumental and locative cases. The Altaic and Finno-Ugric language families also use case systems. German has four cases, Russian six, Finnish sixteen. In Europe, the concept was first introduced by the Greeks, although Sanskrit grammarians established it independently. The names of the most common cases derive from Greek by way of Latin translation, as does the term case itself.

casehardening: see HARDENING

casein (kā'sēn), well-defined group of proteins found in milk, constituting about 80% of the proteins in cow's milk, but only 40% in human milk. Casein is a remarkably efficient nutrient, supplying not only essential amino acids, but also some carbohydrates and the inorganic elements calcium and phosphorus. The calcium caseinates form an insoluble white curd when acidified by hydrochloric acid or sulfuric acid, or when milk is soured by bacterial contaminants. Acid casein is used widely in cheese, adhesives, water paints, for coating paper, and in printing textiles and wallpaper. In neutral solutions the enzyme rennin converts one of the caseins to an insoluble curd, most of the protein in cheese is RENNET casein curd. When treated with formaldehyde the curd forms casein plastic, used for manufacturing imitation tortoiseshell, jade, and lapis lazuli.

Case Institute of Technology: see CASE WESTERN RESERVE UNIV.

Casella, Alfredo (alf'rā'dō kasē'lā), 1883-1947, Italian composer, pianist, conductor, and writer on music, pupil of Gabriel Faure at the Paris Conservatory. He taught piano at the Paris Conservatory (1911-15) and at the St. Cecilia Conservatory, Rome (1915-23). In 1917 he organized a society, later known as *Corporazione delle Nuove Musiche*, to promote the recognition of contemporary music. He is the author of *The Evolution of Music throughout the His-*

tory of the Perfect Cadence (tr. 1924). His best-known compositions are the ballets *Il convento veneziano* (1912) and *La Giara* (Paris, 1924), the latter based on a novel by Pirandello. Other works are piano pieces, songs, chamber music, orchestral works, and concertos. See his memoirs, *Music in My Time* (tr. 1955).

Casement, Sir Roger David, 1864-1916, Irish revolutionary. While in British consular service, he exposed (1904) the atrocious exploitation of wild rubber gatherers in the Congo (thus helping to bring about the extinction of the Congo Free State in 1908) and later exposed similar conditions in South America. He was knighted for these services. Although an Ulster Protestant, Casement became an ardent Irish nationalist. After the outbreak of World War I he went first to the United States and then to Germany to secure aid for an Irish uprising. The Germans promised help, but Casement considered it insufficient and returned to Ireland in April, 1916, hoping to secure a postponement of the Easter Rebellion (see IRELAND). Arrested immediately after his landing from a German submarine, he was tried, convicted, and hanged for treason. To further blacken his name, some British agents had circulated his diaries, which showed him to be a homosexual. The diaries were probably genuine, but the manner of their use helped to inspire controversy about the possibility of forgery. See biographies by Peter Singleton-Gates and Maurice Girodias (1959) and Brian Inglis (1974).

Caserta (kazēr'ta), city (1971 pop. 62,928), capital of Caserta prov., Campania, S central Italy. It is an agricultural and commercial center and a transportation junction. The surrender of the German forces in Italy to the Allies took place there on April 29, 1945. Caserta is noted for its magnificent royal palace (built 1752-74) and gardens. There is an academy of aeronautics in the city.

Case Western Reserve University, at Cleveland, coeducational in most divisions, est. 1967 through the merger of the Case Institute of Technology (chartered 1880, opened 1881) and Western Reserve University (chartered and opened 1826). The university is made up of 13 schools and colleges, including three coordinate undergraduate resident colleges.

Casgrain, Henri Raymond (aNrē' rāmōn' kās-grān'), 1831-1904, French Canadian historian. He traveled widely in Europe, collecting documents relevant to Canadian history, and wrote enthusiastic histories, such as *Légendes canadiennes* (1861), *Un Pèlerinage au pays d'Évangéline* (1887), *Les Pionniers canadiens* (1876), and *Wolfe and Montcalm* ("Makers of Canada" series, rev. ed. 1926).

cash, popular term for ready MONEY. In commerce and banking the term is used in contradistinction to commercial paper. To "cash" such paper means to convert it into currency. In bookkeeping terms such as "petty cash" and "cashbook," the word has the same meaning. "Cash payment" is opposed to "credit," though cash payment may be made in coin, in notes, or by check.

Cashel (kā'shāl) [Irish, = castle], urban district (1971 pop. 2,693), Co. Tipperary, S central Republic of Ireland. Now an agricultural market, it was the ancient capital of the kings of Munster and was the stronghold of Brian Boru. On the Rock of Cashel, rising 300 ft (91 m) in the center of town, are the ruins of the 13th-century St. Patrick's Cathedral, a round tower (10th cent.), an ancient cross, and Cormac's Chapel (12th cent.). Below the Rock are the ruins of Hore Abbey (1272). Cashel is the seat of a Roman Catholic archbishop and of an Anglican bishop.

cashew (kāsh'ōō, kashōō'), tropical American tree (*Anacardium occidentale*) of the family ANACARDIACEAE (SUMAC family), valued chiefly for the cashew nut of commerce. The tree's acrid sap is used in making a varnish that protects woodwork and books from insects. The fruit is kidney-shaped, about an inch in length, and has a double shell. The kernel, which is sweet, oily, and nutritious, is much used for food in the tropics after being roasted to destroy the caustic juice. It yields a light-colored oil said to be the equal of olive oil and is utilized in various culinary ways. In the West Indies it is used to flavor wine, particularly Madeira, and is imported into Great Britain for this purpose. The nut grows on the end of a fleshy, pear-shaped stalk, called the cashew apple, which is white, yellow, or red, juicy and slightly acid, and is eaten or fermented to make wine. Cashews are classified in the division MAGNOLIOPHYTES, class Magnoliopsida, order Sapindales, family Anacardiaceae.

Casilinum (kāsilī'nəm), ancient town, Campania, 5 Italy, 18 mi (29 km) N of present-day Naples.

Founded (c 600 B C) probably by the Etruscans, it became (5th cent B C) the capital of the Samnites. Under the Romans it was an important military station controlling the bridge of the Apennine Way over the Voltumo River. It was destroyed by the Saracens in the 9th cent A D, the inhabitants of nearby CAPUA moved there soon after and changed its name from Casilinum to Capua.

Casimir I (käs'ämër), c 1015-1058, duke of Poland (c 1040-1058), son of MIESZKO II. He succeeded in reunifying the central Polish lands under the hegemony of the Holy Roman Empire, but he was never crowned king. He is also called Casimir the Restorer. His son and successor was Boleslaus II.

Casimir II, 1138-94, duke of Poland (1177-94), youngest son of Boleslaus III. A member of the PIAST dynasty, he drove his brother Mieszko III from power at Krakow in 1177 and became the principal duke of Poland. At the Congress of Leczyca (1180) the nobility and clergy, in return for privileges he had granted them, vested Casimir's descendants with hereditary rights to the crown. Casimir himself was never crowned king.

Casimir III, 1310-70, king of Poland (1333-70), son of Ladislaus I and last of the PIAST dynasty. Called Casimir the Great, he brought comparative peace to Poland. By the Congress of Visegrad (1335) he promised to recognize the suzerainty over Silesia of John of Luxemburg, king of Bohemia, in return John renounced all claim to the Polish throne. In 1339, Casimir officially acknowledged John's power. By the Treaty of Kalisz (1343) with the TEUTONIC KNIGHTS, Casimir consolidated his territories, and later he acquired much of the duchy of Galich-Vladimir. He strengthened the royal power at the expense of the nobility and clergy, codified Polish law in the Statute of Wislica, alleviating the lot of the peasants (hence he was "king of the peasants"), improved the condition of the Jews, encouraged industry, commerce, and agriculture, and founded (1364) the Univ of Kraków. Casimir was succeeded by his Angevin nephew, King Louis I of Hungary.

Casimir IV, 1427-92, king of Poland (1447-92). He became (1440) ruler of Lithuania and in 1447 succeeded his brother Ladislaus III as king of Poland. He united the two nations more closely by placing them on an equal footing. With the Second Peace of Torun (1466) he ended a 13-year war against the Teutonic Knights in his favor, Poland gained territories and the Knights accepted Polish suzerainty over the area they retained. Calling (1467) the first Polish diet, he confirmed the privileges of the aristocracy. His marriage to an Austrian Hapsburg enabled his son Ladislaus to become king of Bohemia and later king of Hungary as Uladislav II. Casimir was succeeded by his sons John I (1492-1501), Alexander I (1501-5), and Sigismund I (1506-48).

Casimir-Perier, Jean Paul Pierre (zhaN pöl pyër kazëmër-përyä'), 1847-1907, French president (June, 1894-Jan., 1895). He held several cabinet posts before serving as premier in 1893. He created the ministry of colonies and acted to suppress anarchist activities. In 1894 he succeeded Sadi Carnot as president of the French republic. He was attacked by the increasingly important left-wing parties and resigned early in 1895. Felix Faure succeeded him.

casino or cassino (both kas'ë'nò), card game played with a full deck by two to four players. Four cards are dealt to each player, and four open cards are dealt to the table. Each player in turn must take in cards by matching his cards with cards of corresponding indices on the table (he may take two or more totaling his card's value), build, add to one or more table cards to total the index value of a card remaining in his hand (there are other building variations), or trail, lay a card face up on the table. The game ends after all the cards of the deck are dealt in successive hands of four cards each. The object is to take the greatest number of cards (counting 3 points), the greatest number of spades (counting 1 point), the ten of diamonds, or big casino (2 points), the two of spades, or little casino (1 point), and the aces (counting 1 point each). Casino probably originated in Italy.

Casiphra (käsif'ëä, käsif'ä), place, on the way from Babylon to Jerusalem. Ezra 8:17.

Casiquiare (käsëkyä'rä), river, c 100 mi (160 km) long, S Venezuela. Also called the Canal Casiquiare, it is a branch of the Orinoco and flows SW to the Rio Negro, thus linking the Orinoco and Amazon basins. The Casiquiare's flow was naturally diverted by the headward erosion of the Rio Negro.

Casket Letters see MARY QUEEN OF SCOTS.

Caslon, William (käs'läN), 1692-1766, English type designer, b Worcestershire. He worked first in Lon-

don as an engraver of gunlocks, then set up his own foundry. In 1716 the merits of Caslon's types were rediscovered after a brief eclipse in the popularity of John BASKERVILLE's types. Caslon's individual letters are less impressive than those of Baskerville and Giambattista BODONI, but their regularity, legibility, and sensitive proportions constituted a remarkable achievement in design. His typefaces were used for most important printed works from c 1740 to c 1800. One such example is the first printed version of the United States Declaration of Independence. Some Caslon types are still in use. His business was carried on by his eldest son, William (1720-78). See biography by Johnson 8all (1974).

Casluhim (käs'lyööhim, käslyöö'-), ancient unidentified tribe. Gen 10:14, 1 Chron 1:12.

Caso, Alfonso (alfön'sö kas'sö), 1896-1970, Mexican archaeologist. An authority on the ancient high civilizations of Mexico, he directed explorations at MITLA and MONTE ALBAN during the 1920s and 30s. Among his many books and articles are *The Religion of the Aztecs* (tr 1937), *Thirteen Masterpieces of Mexican Archeology* (tr 1938), and *The Aztecs: People of the Sun* (tr 1958).

Casona, Alejandro (älähän'drö kas'ö'na), 1903-, pseudonym of Alejandro Rodriguez Alvarez, Spanish poet and playwright, b Besulzo. Since 1937 he has lived in Latin America, spending much time writing and directing films in Argentina. Written with sensitivity and delicate irony, his plays combine poetic realism with philosophical ideas. They include *Nuestra Natacha* [our Natacha] (1936), *La barca sin pescador* [the boat without a fisherman] (1945), and *Carta a una desconocida* [letter to an unknown woman] (1957).

Casorati, Felice (fäil'e'chä käsö'ra'të), 1886-1963, Italian painter. Influenced by Beardsley and other English engravers, Casorati, together with CARRÀ, was involved in the symbolist movement. He was instrumental in the formation of the metaphysical school. An ironic tone and cool refinement are characteristic of his works (e.g., *Still Life*, c 1942-43, National Gall of Modern Art, Rome).

Caspar: see WISE MEN OF THE EAST.

Casper, city (1970 pop. 39,361), alt. 5,123 ft (1,561 m), seat of Natrona co., E central Wyo., on the North Platte River, inc. 1889. It is a rail, distributing, processing, and trade center in a farming, ranching, and mineral-rich area. An oil boom town since the first well was tapped in 1890, it has large oil refineries and many oil-affiliated industries. Open-pit uranium mining nearby is important, and gas, coal, and bentonite deposits are also exploited. The city has wool and livestock markets, meat-packing plants, and a growing tourist industry. At this fording place on the Oregon Trail the Mormons in 1847 established a ferry, which was in the 1850s superseded by Platte Bridge. The city was founded (1888) with the coming of the railroad and burgeoned with the discovery of oil at Salt Creek, followed by the Teapot Dome and Big Muddy finds. In 1948 wells in the Lost Soldier field of Sweetwater co. brought another boom. Casper has a junior college. Nearby are the Central Wyoming Fairgrounds, with a county pioneer museum, Old Fort Caspar Museum (the fort has been restored, a clerk's error accounts for the later spelling of the name), and Casper Mt. (c 8,000 ft/2,440 m high), with a recreational area. Tourist attractions in the surrounding area include Hell's Half Acre, a spectacular eroded area, Independence Rock, a granite landmark on the Oregon Trail, and a petrified forest of subtropical trees.

Caspian Gates see DERBENT, US5R.

Caspian Kara-Kum see KARA-KUM, US5R.

Caspian Sea, Lat. *Mare Caspium* or *Mare Hyrcanum*, salt lake, c 144,000 sq mi (373,000 sq km), US5R and Iran, between Europe and Asia, the largest inland body of water in the world. The largest part lies in Soviet territory, only the extreme southern shore belongs to Iran. The Caspian is 92 ft (28 m) below sea level. It reaches its maximum depth, c 3,200 ft (980 m), in the south, the shallow northern half averages only about 17 ft (5 m). The Caucasus rise from the southwestern shore, and the Elburz Mts parallel the southern coast. The Caspian receives the Volga (which supplies more than 75% of its inflow), Ural, Emba, Kura, and Terek rivers, but it has no outlet. The rate of evaporation is particularly high in the eastern inlet called KARA-BOGAZ-GOL, which is exploited for salt. Variations in evaporation account for the great changes in the size of the sea during the course of history. The construction of large dams and lakes on the Volga is the major reason for the recent lowering of the Caspian's water level, a problem that has reached serious propor-

tions. The chief ports on the Caspian are Baku, a major oil center, and Astrakhan, at the mouth of the Volga. The sea is an important transportation artery, oil and oil products are shipped across it from Baku to Astrakhan and up the Volga. The Caspian is also of great importance for its fisheries and sealeries. The northern part of the sea is the chief source of beluga caviar.

Cass, Lewis, 1782-1866, American statesman, b Exeter, N H. He established (1802) himself as a lawyer in Zanesville, Ohio, became a member (1806) of the state legislature, and was U S marshal for Ohio from 1807 to 1812. In the War of 1812, Cass's command was included against his will in the forces that Gen. William Hull surrendered to the British at Detroit in Aug., 1812. Cass later fought with distinction at the battle of the Thames (Oct. 5, 1813). Left in command at Detroit, Cass was also appointed governor of Michigan Territory, a post he filled ably for 18 years (1813-31). As Secretary of War (1831-36), he favored removal of the Indians beyond the Mississippi and supported President Jackson in the nullification crisis. Minister to France (1836-42) and U S Senator from Michigan (1845-48, 1849-57), Cass was the Democratic candidate for President in 1848, but because of the defection of the antislavery Democrats led by Martin VAN BUREN, who became the candidate of the FREE-SOIL PARTY, he lost the election to the Whig candidate, Zachary Taylor. President Buchanan made (1857) Cass his Secretary of State, but he resigned in Dec., 1860, in protest against the decision not to reinforce the forts of Charleston, S C. See biography by F. 8 Woodford (1951).

Cassander (kasän'där), 358-297 B C, king of Macedonia, one of the chief figures in the wars of the DIADOCHI. The son of Antipater, he was an officer under Alexander the Great, but there was ill feeling between them. After his father's death, Cassander engaged in vigorous warfare against Antipater's successor as regent, Polyperchon. He was successful, and by 318 he had a preponderant influence in Macedonia and Greece. Alexander's mother, Olympias, challenged this and put Philip III, Alexander's half brother, and many others to death. Cassander pursued her, crushed her army, and condemned her to death (316). Later, to strengthen his claim to the throne, he married Alexander's half sister, Thessalonica, and in 311 he murdered Alexander's widow, Roxana, and their son. He resisted the efforts of Antigonus I to rebuild the empire and was one of the coalition that defeated Antigonus and Demetrius at Ipsus in 301. Secure in his position, he founded the cities of Thessaloniki and Cassandreia (on the site of Potidaea) and rebuilt Thebes.

Cassandra (kasän'drä), in Greek legend, Trojan princess, daughter of Priam and Hecuba. She was given the power of prophecy by Apollo, but because she would not accept him as a lover, he changed her blessing to a curse, causing her prophecies never to be believed. While seeking refuge from the Greeks during the Trojan War, she was dragged from the temple of Athena and violated by the Locrian Ajax. After the war she was the slave of Agamemnon and was killed with him by his wife Clytemnestra.

Cassandre, Adolphe Mouron (adölf mööröN' käsaN'drä), 1901-68, French poster artist. b Russia. By 1923 he was celebrated as the artist of *Bücheron* [woodcutter], a poster made for a cabinetmaker. Later works include posters for tennis matches, fairs, magazines, wines, shoes, horse races, steamships, and railways. Cassandre's originality made his designs classics of advertising.

Cassandreia, ancient Greece. see POTIDAEA.

Cassano d'Adda (kas-sa'nò dad'da), town (1971 pop. 13,863), Lombardy, N Italy, on the Adda River. It is an agricultural and industrial center. At Cassano d'Adda the French under Vendôme defeated the imperial forces under Prince Eugene of Savoy in 1705 (see SPANISH SUCCESSION WAR OF THE). The town is also the site of the victory (1799) of the Russians under Suvarov over the French under Moreau during the French Revolutionary Wars.

Cassatt, Mary (kasät'), 1845-1926, American figure painter and etcher, b Pittsburgh. Most of her life was spent in France, where she was greatly influenced by her great French contemporaries, particularly Manet and Degas, whose friendship and esteem she enjoyed. She allied herself with the impressionists early in her career. Motherhood was Cassatt's most frequent subject. Her pictures are notable for their refreshing simplicity, vigorous treatment, and pleasing color. She excelled also as a pastelist and etcher, and her drypoints and color prints are greatly admired. She is well represented in public and private galleries in the United States. Her

best-known pictures include several versions of *Mother and Child* (Metropolitan Mus., Mus. of Fine Arts, Boston, Worcester, Mass., Art Mus.), *Lady at the Tea-Table* (Metropolitan Mus.), *Modern Women*, a mural painted for the Women's Building of the Chicago exposition, and a portrait of the artist's mother. See catalog by A. D. Breeskin (1970), biography by J. M. Carson (1966).

cassava (kása'və) or **manioc** (mān'ēōk), any plant of the genus *Manihot* of the family Euphorbiaceae (SPURGE family). The roots, which resemble sweet potatoes and are eaten in much the same way, yield cassava starch, a staple food in the tropics. The cassava is native to Brazil and has long been cultivated there by the Indians as a major food source. Cassava roots are also fermented to make an alcoholic beverage, are the source of TAPIOCA, or Brazilian arrowroot, and are utilized in other ways, e.g., for cotton sizing and laundry starch. Most cassava flour is made from *M. esculenta*, sometimes called bitter cassava because of the presence in the raw roots of prussic acid in sufficient quantities to be deadly. This poison is dispelled by cooking. Some cultivated varieties with a lesser acid content, called sweet cassava, are edible raw and can be used for fodder. Cassava is classified in the division MAGNOLIOPHYTES, class Magnoliopsida, order Euphorbiales, family Euphorbiaceae.

Cassegrain focus: see TELESCOPE

Cassel, Gustav (gōs'taf ka'səl), 1866–1945, Swedish economist and authority on international monetary problems. He was a delegate to many world economic conferences and wrote valuable papers on foreign exchange. Among his books are *Money and Foreign Exchange after 1914* (1922), *Fundamental Thoughts on Economics* (1925), and *On Quantitative Thinking in Economics* (1935).

cassia (kash'a) see CINNAMON, SENNA

Cassian, John (kash'ən) (Johannes Cassianus), 360–435, Christian monk and theologian. He settled at Marseilles (415) and established religious houses for men and for women. He was attacked for Semi-Pelagianism (see PELAGIANISM), but he was trusted in Rome. His *Collations*, spiritual writings for monks, and his *Institutes*, on monasticism, had critical influence on the thought of St. Benedict, St. Gregory, and hence on all Benedictines, in matters touching ascetic and mystical life. He wrote against Nestorianism. See study by Owen Chadwick (2d ed. 1968).

Cassini (kas-sē'nē), name of a family of Italian-French astronomers, four generations of whom were directors of the Paris Observatory. **Gian Domenico Cassini**, 1625–1712, was born in Italy and distinguished himself while at Bologna by his studies of the sun and planets, particularly Jupiter, he determined rotational periods for Jupiter, Mars, and Venus. He was called to Paris in 1669 to supervise the building of the Royal Observatory and remained there to direct it. While at Paris he discovered four of Saturn's satellites, studied the division in the planet's ring system that now bears his name, and began the mapping of the meridian passing through Paris in order to verify the Cartesian hypothesis of the elongation of the earth. His son **Jacques Cassini**, 1677–1756, took over the observatory after 1700 and continued the mapping of the Paris meridian, adding to it a measurement of the perpendicular to the arc in 1733–34. The triumph of the opposing Newtonian hypothesis of the flattening of the earth caused him to retire in 1740, and he was replaced by his son, **César-François Cassini de Thury**, 1714–84, who continued his father's geodesic work and planned the first modern map of France. On his death, his son **Jean-Dominique Cassini**, 1748–1845, undertook the reorganization and restoration of the observatory. He completed his father's map of France and participated in the geodesic operations joining the Paris and Greenwich meridians. He lost his post in 1793 because of his monarchial views and was briefly imprisoned by the revolutionary government in 1794. He abandoned scientific work in 1800, becoming president of the General Council of Oise. He was decorated by Napoleon I and Louis XVIII and retired in 1818.

Cassini's division: see SATURN

Cassino (kas-sē'nō), town (1971 pop. 24,695), in Latium, central Italy, in the Apennines, on the Rapido River. It is a commercial and agricultural center. The peace between Emperor Frederick II and Pope Gregory IX was signed there in 1230. During World War II (late 1943) the town and the nearby Benedictine abbey of MONTE CASSINO were strongly defended by Germans blocking the Allied advance on Rome. After five months of concentrated ground attacks and attempts to divert German troops by landings at AN-

ZIO and NETTUNO, the Allies finally captured the German positions in May, 1944. Cassino was reduced to rubble but was largely rebuilt. Of note is the cathedral (18th cent., rebuilt after 1944), which contains the alleged remains of St. Benedict and his sister St. Scholastica. Until 1871, Cassino was called San Germano.

cassino. see CASINO

Cassiodorus (Flavius Magnus Aurelius Cassiodorus Senator) (kashōdō'ras), c. 485–c. 585, Roman statesman and author. He held high office under Theodoric the Great and the succeeding Gothic rulers of Italy, who gave him the task of putting into official Latin their state papers and correspondence. These he later collected as *Variae epistolae* (tr. by Thomas Hodgkin, 1886). After retiring to his estate he founded two monasteries, in one of these the monks devoted leisure time to copying old manuscripts, which were thus preserved. Among Cassiodorus' works were his *History of the Goths*, preserved in the abridgment by JORDANES, and a treatise on orthography.

Cassiopeia (kās'ēapē'a), in Greek mythology see ANDROMEDA

Cassiopeia, in astronomy, prominent northern CONSTELLATION located almost directly opposite the Big Dipper across the north celestial pole. Five bright stars in the constellation form a rough W (or M) in the sky. Some see in this formation the shape of a chair known as Cassiopeia's Chair. Tycho's Star, a SUPERNOVA, appeared in the constellation in 1572 and disappeared in 1574. In this constellation is located Cassiopeia A, a discrete radio source emitting 21-cm radiation with great intensity. Cassiopeia reaches its highest point in the evening sky in November, but because of its location near the pole it is visible throughout the year to most northern observers.

Cassirer, Ernst (ērnst kasēr'ər), 1874–1945, German philosopher. He was a professor at the Univ. of Hamburg from 1919 until 1933, when he went to Oxford, he later taught at Yale and Columbia. A leading representative of the Marburg Neo-Kantian school, Cassirer at first devoted himself to a critical-historical study of the problem of knowledge. This work bore fruit in the monumental *Das Erkenntnisproblem in der Philosophie und Wissenschaft der neueren Zeit* (3 vol., 1906–20) and *Substanzbegriff und Funktionsbegriff* (1910, tr. *Substance and Function*, 1923). In his chief work, *Philosophie der symbolischen Formen* (3 vol., 1923–29, tr. *Philosophy of Symbolic Forms*, 1953–57), he applied the principles of Kantian philosophy toward the formation of a critique of culture. His view that all cultural achievements (including language, myth, and science) are the results of man's symbolic activity led Cassirer to a new conception of man as the "symbolic animal." Cassirer wrote many other studies on science, myth, and various historical subjects. These include two written in English: *An Essay on Man* (1944) and *Myth of the State* (1946). See P. A. Schilpp, ed., *The Philosophy of Ernst Cassirer* (1949, repr. 1958), studies by C. H. Hamburg (1956) and S. W. Litzko (1971).

cassiterite (kasit'ərīt), heavy, brown-to-black mineral, tin oxide, SnO₂, crystallizing in the tetragonal system. It is found as short prismatic crystals and as irregular masses, usually in veins and replacement deposits associated with granites. Since it is hard, heavy, and resistant to weathering, it often concentrates in alluvial deposits derived from cassiterite-bearing rocks. It is the principal ore of tin and is mined in many countries, the most important sources are Malaysia, Thailand, China, Indonesia, Bolivia, and the USSR. Except for Bolivia, nearly all of this production is from alluvial deposits.

Cassites: see KASSITES

Cassius (kash'as), ancient Roman family. There were a number of well-known members. **Spurius Cassius Viscellinus**, d. c. 485 B.C., seems to have been consul several times. In 493 B.C. he negotiated a treaty establishing equal military assistance between Rome and the Latin cities. In 486 he proposed that land be distributed equally among the Roman and the Latin poor (see AGRARIAN LAWS). It is said that the patricians, outraged at the suggestion, accused Cassius of royal aspirations and had him executed. A descendant, **Quintus Cassius Longinus**, d. 45 B.C., won a reputation for greed and corruption when he was a quaestor in Spain (54 B.C.). He and ANTONY, as tribunes in 49 B.C., vetoed the attempts of the senate to deprive Julius CAESAR of his army. When the senate overrode the tribunes on Jan. 7, 49 B.C., Cassius and Antony fled to Caesar, who crossed the Rubicon and began the civil war. After Caesar's triumph, Cas-

sius was given (47 B.C.) a post in Farther Spain. There was a rebellion against him, and Caesar had to come from Italy to put it down. Cassius died in a shipwreck. Best known of all was Caius Cassius Longinus, d. 42 B.C., leader in the successful conspiracy to assassinate Julius Caesar. He fought as a quaestor under Marcus Licinius Crassus (see under CRASSUS, family) at CARRHAË in 53 B.C. and saved what was left of the army after the battle. He supported Pompey against Caesar but was pardoned after the battle of PHARSALA. He was made (44 B.C.) peregrine praetor and Caesar promised to make him governor of Syria. Before the promise could be fulfilled, Cassius had become ringleader in the plot to kill Caesar. The plot involved more than 60 men (including Marcus Junius Brutus, Publius Servilius Casca, and Lucius Tullius Cimber) and was successfully accomplished in the senate on the Ides of March in 44 B.C. When the people were aroused by Antony against the conspirators, Cassius went to Syria. He managed to capture DOLABELLA at Laodicea and coordinated his own movements with those of Brutus. Antony and Octavian (later AUGUSTUS) met them in battle at Philippi. In the first engagement Cassius, thinking the battle lost, committed suicide. Another of the conspirators was Caius Cassius Parmensis, d. 30 B.C. He fought at Philippi and later with Sextus Pompeius. He later sided with Antony in the naval battle off Actium and was killed by order of Octavian.

Cassius Dio Cocceianus: see DION CASSIUS

Cassivellaunus (kā'sivīlō'nəs), fl. 54 B.C., British chieftain, a leader in the resistance against the invasion of Julius Caesar in 54 B.C. Caesar crossed the Thames River into Cassivellaunus' home country. Aided by discontented British tribes, he attacked Cassivellaunus in his strong fort in the marshes (probably at Wheathampstead, Hertfordshire) and drove the Britons out with heavy losses. Cassivellaunus sued for peace, which Caesar granted in return for hostages and annual tribute.

cassone (kas-sō'nā), the Italian term for chest or coffer, usually a bridal or dowry chest, highly ornate and given prominence in the home. Major artists such as Uccello and Botticelli painted cassone panels, and prominent sculptors were also employed to carve elaborate chests. The cassone was usually decorated with mythological or historical episodes. It became one of the first means of bold secular expression in Renaissance art.

cassowary (kās'awār'ē), common name for a flightless, swift-running, pugnacious forest bird of Australia and the Malay Archipelago, smaller than the ostrich and emu. The plumage is dark and glossy and the head and neck unfeathered, wattled, and brilliantly colored, with variations in the coloring in different species. The head bears a horny crest. The female is larger than the male, though both sexes are similar in color. They are monogamous and nest in shallow nests of leaves on the ground in forests. Only the male incubates the female's three to six dark-green eggs. Cassowaries are primarily nocturnal. Their diet consists mainly of fruits and berries, although some eat insects and small animals. Cassowaries are notoriously vicious and have attacked and killed men with their sharp, spikelike toenails. They are fast runners, attaining speeds up to 30 mi (48 km) per hr. Cassowaries are classified in the phylum CHORDATA, subphylum Vertebrata, class Aves, order Casuariformes, family Casuariidae.

Castagno, Andrea del (andrē'a dēl kasta'nyō), c. 1423–1457, major Florentine painter of the early Renaissance. His first recorded painting (1440, now destroyed), effigies of hanged men, enemies to the Florentine regime, brought him fame in spite of its disconcerting subject. Two years later he was in Venice, frescoing the ceiling of the chapel in San Zaccaria. He returned to Florence and c. 1445 began the cycle of the *Passion of Christ* for the church of Sant' Apollonia. Best known of these scenes is the *Last Supper*. Castagno combined a rigorous perspective with harsh, metallic lighting that greatly intensified the drama of the scene. He decorated the hall of the Villa Pandolfini with heroic figures, including Pippo Spano, Dante, Petrarch, and Boccaccio. Here the influence of Donatello can be felt, particularly in the vitality and plastic rendering of forms. In the Annunziata Church there is a powerful conception of the *Savior and St. Julian*. His last dated work is the equestrian statue of Niccolò da Tolentino in the cathedral. Other examples of his art are *David* (National Gall. of Art, Washington, D.C.) and the *Resurrection* (Frick Coll., New York City).

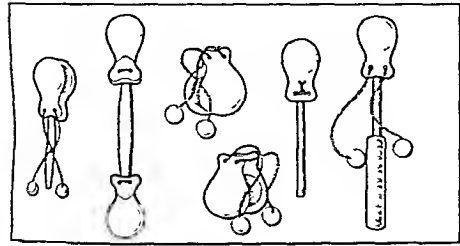
Castaldi, Pamfilo (pam'fēlō kasta'dē), c. 1398–c. 1490, Italian humanist and printer. He was the first printer of the city of Milan. Some credit him with

the invention of movable type See GUTENBERG, JOHANN

Castalia (kăstă'lyă), in Greek mythology, spring on Mt Parnassus Named for a nymph, it was sacred to the MUSES and was said to give poetic inspiration to those who bathed in it

Castalion or **Castellio, Sébastien** (kăstă'l'yan, kăstěl'yô), 1515-63, French Protestant theologian Castalion was with Calvin at Strasbourg and Geneva until he split with Calvin over doctrinal differences and moved to Basel He obtained a chair of Greek literature in the university there Castalion is known for his defense of religious toleration in the preface to his Latin translation of the Bible (1551) In 1554 he published, under the pseudonym Martinus Bellius, *Concerning Heretics* (tr 1935), in which he protested the execution of Servetus The name also appears as Castellion and Châtillon See Stefan Zveig, *Right to Heresy* (1936)

castanets, percussion instruments known to the ancient Egyptians and Greeks, possibly of Oriental origin, now used primarily in Spanish dance music or



Castanets

imitations of it There are many kinds, the most common consisting of two small matching pieces of hard wood or ivory, joined at the inner edge and used with a thin strap in the player's hand, they are snapped together between the palm and fingers Castanets are also occasionally used in orchestral music

caste [Port casta=basket], ranked groups based on heredity within rigid systems of social stratification, especially those that constitute Hindu India Some scholars, in fact, deny that true caste systems are found outside India The caste is a closed group whose members are severely restricted in their choice of occupation and degree of social participation Marriage outside the caste is prohibited Social status is determined by the caste of one's birth and may only rarely be transcended Certain religious minorities may voluntarily constitute a quasi-caste within a society, but they are less apt to be characterized by cultural distinctiveness than by their self-imposed social segregation A specialized labor group may operate as a caste within a society otherwise free of such distinctions (e.g., the ironsmiths in parts of Africa) In general, caste functions to maintain the status quo in a society Nowhere is caste better exemplified by degree of complexity and systematic operation than in India The Indian term for caste is *jati*, which generally designates a group varying in size from a handful to many thousands There are thousands of such *jatis*, and each has its distinctive rules, customs, and modes of government The term *varna* (literally meaning "color") refers to the ancient and somewhat ideal fourfold division of Hindu society (1) the Brahmins, the priestly and learned class, (2) the Kshatriyas, the warriors and rulers, (3) the Vaisyas, farmers and merchants, and (4) the Sudras, peasants and laborers These divisions may have corresponded to what were formerly large, broad, undifferentiated social classes Below the category of Sudras were the untouchables, or Panchamas (literally "fifth division"), who performed the most menial tasks Although there has been much confusion between the two, *jati* and *varna* are different in origin as well as function The various castes in any given region of India are hierarchically organized, with each caste corresponding roughly to one or the other of the *varna* categories Traditionally, caste mobility has taken the form of movement up or down the *varna* scale Indian castes are rigidly differentiated by rituals and beliefs that pervade all thought and conduct (see DHARMA) Extreme upper and lower castes differ so widely in habits of everyday life and worship that only the close intergrading of intervening castes and the intercaste language communities serve to hold them together within the single framework of Indian society The explanation that Indian castes were originally based on color lines to preserve the racial and cultural purity of conquering groups is

inadequate historically to account for the physical and cultural variety of such groups Castes may reflect distinctiveness of religious practice, occupation, locale, culture status, or tribal affiliation, either exclusively or in part Divergence within a caste on any of these lines will tend to produce fission that may, in time, result in the formation of new castes Every type of social group as it appears may be fitted into this system of organizing society The occupational barriers among Indian castes have been breaking down slowly under economic pressures since the 19th cent., but social distinctions have been more persistent Attitudes toward the untouchables only began to change in the 1930s under the influence of Mohandas Gandhi's teachings Although untouchability was declared illegal in 1949, resistance to change has remained strong As increased industrialization produced new occupations and new social and political functions evolved, the caste system adapted and thus far has not been destroyed See McKim Marriott, ed., *Village India* (1955), M N Srinivas, *Social Change in Modern India* (1966), Anthony de Reuck and Julie Knight, ed., *Caste and Race* (1967), Louis Dumont, *Homo Hierarchicus: The Caste System and Its Implications* (1970)

Castelar y Ripoll, Emilio (ămē'lyô kăstălăr' ē rēpô'lyă), 1832-99, Spanish statesman and author A professor of history and philosophy at the Univ of Madrid and a republican leader, he was foreign minister and then president (1873-74) of Spain's first republic Ruling virtually as a dictator, he was partially successful in restoring order to the war-torn country, but he, and the republic, were overthrown by a military coup d'état After the restoration (1875) of Alfonso XII he was a member of the political opposition in the Cortes He wrote historical, political, and literary works

Castel Gandolfo (kăstěl' găndôl'fô), town (1971 pop 4,694), in Latium, central Italy, in the Alban Hills, overlooking Lake Albano Possibly occupying the site of ancient Alba Longa, it is the papal summer residence The papal palace (17th cent.), its magnificent gardens, the Vatican observatory (founded 1936), and the Villa Barberini enjoy extraterritorial rights The Church of St Thomas of Villanova was designed (17th cent.) by Bernini

Castellammare di Stabia (kăstěl'lam-mă'ră dē stă-byă), city (1971 pop 68,656), in Campania, S Italy, on the Bay of Naples A summer resort and spa, it has thermal mineral springs that have been used since Roman times It is also a commercial and industrial center, with navy yards founded in 1783 Manufactures include food products, paper, and cement The city was built on the site of Stabiae, a favorite Roman resort, which was buried in the eruption of Mt Vesuvius in A.D. 79 The royal villa, Quisisana (built 1310, rebuilt 1820), is now a hotel

Castellani, Sir Aldo, 1877-1971, British-Italian bacteriologist, b Florence, Italy He demonstrated the cause and mode of transmission of sleeping sickness (with Sir David Bruce and David Nabarro, 1903), discovered the spirochete of yaws (1905), and did other original work in bacteriology and in parasitic diseases of the skin He also lectured in tropical medicine in London and Ceylon, was professor of tropical medicine at Tulane Univ and at Louisiana State Univ, and founded in Rome the Royal Institute for Tropical Diseases With A J Chalmers he wrote *Manual of Tropical Medicine* (1910, 3d ed 1919) He was knighted in 1928 See his autobiography (1960)

Castello or **Castellion, Sébastien**: see CASTALION, SÉBASTIEN

Castello or **Castelli, Bernardo** (bărnăr'dô kăstěl'lô, -těl'lê), 1557-1629, Italian painter of the Genoese school, pupil of Cambiaso, whose style he imitated He was a friend of Tasso and made the designs for *Jerusalem Delivered*, some of which were subsequently engraved by Agostino Carracci Castello executed numerous works in the churches of Genoa His son, Valerio Castello, 1625-59, a painter of historical scenes, was influenced by Procaccini and Correggio but created a fine style of his own He executed many frescoes of high merit for the churches and monasteries of Genoa His best-known painting is *The Rape of the Sabines* (Genoa)

Castello, Giovanni Battista (jôvăn'ně băt-těs'ta), c 1509-c 1569 Italian painter and architect, called Il Bergamasco to distinguish him from Bernardo Castello, who also worked in Genoa Giovanni was born near Bergamo where many of his works still exist After a trip to Rome he returned to Genoa, where he worked with Luca Cambiaso on the Palazzo Imperiale Giovanni's propensity for grotesque

decorations is best seen in the Palazzo Pallavicino (now the Palazzo Garega-Cataldi) In 1567 he went to Spain, where he became architect and painter to Philip II

Castello, Valerio see CASTELLO, BERNARDO

Castellón de la Plana (kăstelyôn' dă lâ plă'nă), city (1970 pop 93,968), capital of Castellón de la Plana prov., E Spain, in Valencia, 3 mi (4.8 km) from its Mediterranean port of Grao It is a farm center with fishing, mining, and handicraft industries The city was reconquered (1233) from the Moors by James I of Aragon In 1251 it was moved 2 mi (3.2 km) from a hilltop to its present site on a plain (hence "de la Plana")

Castelnau, Michel de (mëshel' dă kăstelnô'), c 1520-1592, French diplomat and soldier He early attracted the favorable notice of the cardinal of Lorraine (Charles de Guise) and performed important services for Anne, duc de Montmorency, and King Henry II In the religious wars he went on missions to England, Scotland, the Netherlands, and Savoy and fought in the royal army, from 1575 to 1585 he served as ambassador to England Upon his return he fell out with the Guises and rendered valuable services against the Catholic League to kings Henry III and Henry IV Although a Catholic, he favored a policy of moderation toward the Huguenots He left valuable memoirs

Castelo Branco, Humberto (ômbêr'tôô kăstêl'brăng'kôô), 1900-1967, president of Brazil (1964-67) An army officer, he served as chief of staff of the Brazilian army before participating in the coup that ousted President João Goulart in April, 1964 Elected provisional president by Congress to succeed Goulart, he wielded enormous power, curtailing political freedoms and imposing sweeping economic reforms The latter, while stringent and unpopular, helped spur the country's economic growth, curb inflation, and reestablish Brazil's credit rating abroad He was succeeded in office by his war minister, Artur da Costa e Silva

Castel Sant' Angelo (kăstêl' sântăn'jălô), **Hadrian's Mausoleum**, or **Hadrian's Mole**, massive construction on the right bank of the Tiber in Rome Originally built (A.D. 135-39) by Emperor Hadrian as a MAUSOLEUM for himself and his successors, it was later decorated and fortified as a place of refuge for the popes and was connected to the Vatican by a secret passage It was used as a fortress and prison until 1870 and is now a museum

Castiglione, Baldassare, Conte (băldăs-sără kôn'tă kăstelyô'nă), 1478-1529, Italian soldier, author, and statesman attached to the court of the duke of Milan and later in the service of the duke of Urbino His famous *Libro del cortegiano* (1528, tr *The Courtier*, 1561), a treatise on etiquette, social problems, and intellectual accomplishments, is one of the great books of its time Written at a time when the author served as envoy to Pope Leo X, it gives a vivid and elegant picture of 15th- and 16th-century court life His book had enormous influence on behavior at courts as far away as England, where it contributed to an ideal of aristocracy embodied in the person and accomplishments of Sir Philip Sidney Castiglione's portrait was painted by Raphael (c 1515), his tomb designed by Giulio Romano, and his epitaph composed by Bembo

Castiglione, Giovanni Benedetto (jôvăn'nê bânădêt'tô), 1610?-1670, Italian painter and engraver of the Genoese school, called Il Grechetto In his later years Castiglione was court painter at Mantua He is best known for his landscapes and rural scenes with animals, but he also painted portraits and religious works, such as the *Nativity* (Genoa) His pictures are full of life and movement, their colors rich and glowing Castiglione's etchings, numbering about 70 and reflecting the influence of Rembrandt, are among the best produced in Italy during his century His treatment of light and shade is particularly fine A number of his oil-on-paper sketches are in the Royal Library at Windsor

Castiglione delle Stiviere (kăstelyô'nă dēl'lă stēvyē'ră), town (1971 pop 13,328), Lombardy, N Italy The French army under Napoleon I and Augereau defeated the Austrians there in 1796

Castile (kăstêl'), Span *Castilla* (kăstê'lyă), region and former kingdom, central and N Spain, traditionally divided into Old Castile (Span *Castilla la Vieja*) in the north and New Castile (Span *Castilla la Nueva*) in the south Old Castile (1970 pop 2,135,788) comprises the provinces of Ávila, Burgos, Logroño, Santander, Segovia, Soria, Valladolid, and Palencia, named after their chief cities New Castile (1970 pop 5,164,026) comprises the provinces and cities of Ciudad Real, Cuenca, Guadalajara, Madrid, and

Toledo Castile is generally a vast underdeveloped region surrounding the highly industrialized Madrid area. It includes most of the high plateau of central Spain, across which rise the rugged Sierra de Guadarrama and the Sierra de Gredos, forming a natural boundary between Old and New Castile. The upper Duero, the Tagus, and Guadiana rivers form the chief basins. The soil of Castile, ravaged by centuries of erosion, is poor, and the climate severe. Old Castile has grain growing and sheep raising, in more fertile areas, especially in New Castile, olive oil and grapes are produced. Scattered forests yield timber and naval stores. Agricultural methods are largely primitive, but irrigation, introduced by the Romans and the Moors, has progressed significantly in recent decades. Of the industries which flourished in the 14th and 15th cent (particularly wool and silk textiles), few have survived. Mineral resources, except for the rich mercury mines of Almaden, are of minor economic importance. The name Castile derives from the many castles built there by the Christian nobles early in the reconquest from the Moors (8th-9th cent.). Old Castile at first was a county of the kingdom of Leon, with Burgos its capital. Its nobles (notably Fernán González) secured virtual autonomy by the 10th cent. Sancho III of Navarre, who briefly annexed the county, made it into a kingdom for his son, Ferdinand I, in 1035. Leon was first united with Castile in 1037, but complex dynastic rivalries delayed the permanent union of the two realms, which was achieved under Ferdinand III in 1230. The Castilian kings played a leading role in the fight against the Moors, from whom they wrested New Castile. They also had to struggle against the turbulent nobles and were involved in dynastic disputes which plunged the country into civil war (see ALFONSO X). PETER THE CRUEL limited the vast privileges of the nobles, but they were permanently curbed only late in the 15th cent. In 1479, after Isabella I had defeated the dynastic claims of Juana la Beltraneja, a personal union of Castile and Aragon was established under Isabella and her husband, FERDINAND II of Aragon. The union was confirmed with the accession (1516) of their grandson, Charles I (later Emperor CHARLES V), to the Spanish kingdoms. Charles suppressed the uprisings of the COMUNEROS in 1520-21. With the decline of Catalan and Valencia during that period, Castile became the dominant power in Spain. It was the core of the Spanish monarchy, centralized in Madrid (the capital after the 16th cent.). Its dialect became the standard literary language of Spain, and the character of its people—proud and austere—has become typical of the entire Spanish nation.

Castilla, Ramon (ramón' kastē'ya), 1797-1867, president of Peru (1845-51, 1855-62). He fought under Antonio José de Sucre in the revolution against Spain (1821-24) in Peru and took part in the civil wars that followed. An army general, energetic and resolute, he twice eliminated his rivals by armed force to become president. He developed the guano, saltpeter, and nitrate industries, helped to reorganize finances, abolished slavery in Peru, and promulgated (1860) a new constitution that became the basis of future Peruvian government. Although he overlooked considerable administrative corruption, Castilla brought unwonted order and a measure of prosperity to the republic.

Castillejo, Cristóbal de (krēstō'bal dā kastēlyā'hō), c 1490-1550, Spanish poet of the Renaissance. As secretary to the king of Bohemia, Castillejo visited Vienna and other European cities. His poems are grouped under the titles *Obras de amores* [works of love] and *Obras morales y de devoción* [moral and devotional works]. His *Diálogo de la vida de corte* is a clever and perceptive picture of life at court. He championed the traditional Spanish as against the Italian verse form.

Castillo de San Marcos National Monument. see SAINT AUGUSTINE, FLA.

Castillon-la-Bataille (kastēyōn'la-batā'yā), town (1968 pop. 3,102), Gironde dept., SW France, in Guienne, on the Dordogne River. An ancient port, it has a wine and liqueur trade and a leather industry. There, in 1453, the French defeated the English in the final great battle of the Hundred Years War. It was formerly called Castillon or Castillon-et-Capitoulran.

casting or founding, shaping of metal by melting and pouring into a mold. Most castings, especially large ones, are made in sand molds. Sand, mixed with a binder to hold it together, is pressed around a wooden pattern that leaves a cavity in the sand. Molten metal is poured into the cavity and allowed to solidify. Permanent metal molds are used to make

many small, simple parts, shell molding gives greater accuracy for a large volume of semiprecision parts. A two-step process, investment casting, produces small, complex shapes. Wax or plastic replicas of the parts are molded in accurate metal molds. These replicas are covered with sand in a box to make the final mold. When the whole mold is heated, the replica melts, leaving behind a cavity into which metal is poured. Large numbers of small, precise parts of metals that have a low melting point, such as zinc, are made by DIE CASTING, in an automatic process, molten metal is forced under pressure into metal molds. Cast iron and cast steel are more brittle than forged iron and forged steel (see FORGING).

casting, plaster. see PLASTER CASTING

cast iron: see IRON

Castle, Barbara Anne, 1911-, British politician. She entered Parliament in 1945 as a Labour member and soon established herself as an influential member of the party's left wing. She served (1950) on the party's national executive committee and was (1958-59) party chairman. When the Labour party was returned to power in 1964, she became minister of overseas development. As minister of transport (1965-68), she instituted a breath-analyzer test for suspected drunken drivers. From 1968 to 1970 she served as minister for employment and productivity, in this capacity she administered the Labour government's wage-restraint policy in the face of trade-union opposition. While Labour was out of office (1970-74) she was opposition spokesman on social security, and she became minister for social security when the party returned to power in 1974.

Castle, Vernon, 1887-1918, English dancer, originally named Vernon Castle Blythe. He studied civil engineering, but turned to the stage and made his debut in 1907. In 1911 he married Irene Foote (1893-1969, b. New Rochelle, N.Y.), and in Paris in 1912 their versions of such dances as the "Texas Tommy" and the "Grizzly Bear" brought them fame. The team originated the "Castle walk," the one-step, and the "hesitation" waltz, and Mrs. Castle introduced bobbed hair and the slim, boyish figure to the ballroom and the world of fashion. Castle was a pilot during World War I and was killed during a training mission in Texas. See Irene Castle, *Castles in the Air* (1958).

castle, type of fortified dwelling characteristic of the Middle Ages. FORTIFICATION of towns had been devised since antiquity, but in the 9th cent. feudal lords began to develop the private fortress-residence known as the castle. It served the twofold function of residence and fortress because of the conditions of medieval life, in which war was endemic. The site of the castle was preferably on a defensible height. England and France, in general, did not afford such inaccessible locations as did the Rhine valley in Germany. The castle of W. Europe was a Norman creation, an outgrowth of the 10th- and 11th-century mound castle, which consisted of a great artificial mound of earth, the motte, surrounded by a dry ditch, or fosse, and surmounted by a wooden blockhouse and its encircling palisade. Until well into the 12th cent., the only English development was the occasional substitution of a massive masonry keep inside the palisade—a form typified in the Tower of London. As siegecraft (see SIEGE) was evolved, provisions were made for an aggressive defense. A castle that became the model for many English and Norman castles was the formidable castle built at Arques in Normandy by Henry I of England. A square donjon, or keep, was set against the strong outer walls of masonry, the entrance was protected by a double gate, two flanking round towers, and advanced earthworks. The place enclosed by the outer circuit of walls was usually divided into two courts, or baileys, by a palisade. Subterranean passages made detection of underground forays easy. In the Near East the Crusaders developed great castles with double circuits of curving outer walls and towers or turrets to overlook all sections of the wall. The form of these castles had an influence throughout the Continent and the British Isles. Thus early in the 13th cent. the medieval castle, a mixture of Norman, English, and Byzantine elements, reached its full flower, as typified in the Château Gaillard on the Seine in France and in Alnwick and the Conisborough in England. In general, the castle was planned for security, the living quarters were rude, poorly lighted, and without provisions for comfort. Typically, the keep contained the living quarters of the lord and his family, the rooms of state, and the prison cells. Two independent systems of walls, each a fortress in itself, extended around the keep, the sections of the walls were flanked by

towers, usually round, and the principal entrance was protected by strong gate towers, the massive gateway, with its PORTCULLIS and drawbridge, and the barbacan, or advanced outwork. The defenders operated from galleries at the tops of walls and from the flat roofs of towers, whose battlements were provided with recesses with flaring sides, called embrasures, and openings, or machicolations, for shooting and dropping missiles on the attackers. The fully developed castle was thus marked by successive series of defenses, the fall of the outer works did not necessarily mean the loss of the entire castle. With the use of gunpowder and consequent perfection of ARTILLERY, the castle lost its military importance. The manor house replaced the castle as the residence of the wealthy landowner, but the architectural influence of the castle has persisted even to the present day, when crenellations and towers are still found in country houses. See CHATEAU. See S. Toy, *History of Fortification from 3000 B.C. to A.D. 1700* (1955), W. D. Simpson, *Castles in Britain* (1966), Alberto Weissmüller, *Castles from the Heart of Spain* (1967), William Anderson, *Castles of Europe from Charlemagne to the Renaissance* (1971), Philip Warner, *The Medieval Castle* (1972).

Castlebar, urban district (1971 pop. 5,970), county town of Co. Mayo, W. Republic of Ireland. It is a market for a farm area. Cured bacon and manufactured hats are products of the town. Castlebar was occupied by the French in 1798.

Castle Clinton National Monument. see BATTERY, THE

Castleford, municipal borough (1971 pop. 38,220), West Riding of Yorkshire, central England, at the junction of the Aire and Calder rivers. Chartered as a municipal borough in 1955, it has bottleworks, chemical works, and collieries. The site of an ancient Roman town lies within its borders. In 1974, Castleford became part of the new metropolitan county of West Yorkshire.

Castlemaine, Barbara, countess of: see CLEVELAND, BARBARA VILLIERS, DUCHESS OF

Castle Pinckney, fortification at the harbor entrance of Charleston, S.C., built in 1797, when war with France seemed imminent, and named for the American diplomat Charles Cotesworth Pinckney. It was a factor in the confrontation at FORT SUMTER (1860), the start of the Civil War.

Castlereagh, Robert Stewart, 2d Viscount (kāsā lrā), 1769-1822, British statesman, b. Ireland. Entering the Irish Parliament in 1790 and the British Parliament in 1794, he was acting chief secretary for Ireland at the time of the Irish rebellion of 1798. Having worked for the Act of Union of England and Ireland (1800), he resigned with William Pitt in 1801 when George III refused to allow CATHOLIC EMANCIPATION. President of the India board of control from 1802 to 1806, he also served (1805-6, 1807-9) as secretary of war. In the latter office, he planned the reorganization and expansion of the army and the effective coordination of British land and sea power. He dispatched a British expedition to Portugal, and after the early disasters in the Peninsular War he succeeded in putting Arthur Wellesley (later duke of Wellington) in command. The opposition of his colleague George CANNING to Castlereagh's policies flared into a serious quarrel. Castlereagh accused Canning of political betrayal, and they fought (1809) a duel. Canning was wounded, and both resigned. As foreign secretary (1812-22), Castlereagh helped to organize the successful final coalition against Napoleon I, partly by secret treaties promising territorial changes. In the Treaty of Chaumont (1814) he obtained that "concert of Europe" later confirmed by the QUADRUPLE ALLIANCE. He advocated a moderate peace settlement for France, including restoration of the Bourbon monarchy and the limitation of France to her prewar boundaries. A dominant figure at the Congress of Vienna (1814-15, see VIENNA CONGRESS OF), Castlereagh worked for the establishment of the United Netherlands and the German Confederation. He favored an independent Poland but was compelled to accept a repartitioning of that country. Castlereagh placed great hope in the "congress system" agreed on at Vienna, by which the great powers would consult regularly for the maintenance of peace. However, he did not approve of outright intervention in the domestic affairs of other countries and protested, in increasingly explicit terms, the assumption of this right by the powers of the HOLY ALLIANCE. By the time of his death it is almost certain that he had decided to break with the wartime allies. In England, however, he was much criticized for his apparent cooperation with those same autocratic governments, and he was also blamed for repressive actions to curb un-

rest in England, though he was not directly responsible for them. He became (1821) the 2d marquess of Londonderry on his father's death, but committed suicide the next year. One of the foremost statesmen of his time, Castlereagh was cold in personality and lacked ability as an orator, he never gained an easy popularity. See biographies by J. A. R. Marriott (1936) and C. J. Bartlett (1966), H. A. Kissinger, *A World Restored* (1957, repr. 1964).

Castle Shannon, borough (1970 pop. 11,899), Allegheny co., SW Pa., a residential suburb S of Pittsburgh, inc. 1919.

castor, see BEAVER

Castor (käs'tar), bright star in the constellation GEMINI, Bayer designation α Geminorum, 1970 position RA 7^h32^m7^s, Dec. +31°57'. Slightly dimmer than POLLUX, with which it forms the Twins, Castor has an apparent MAGNITUDE of 1.58, which still makes it one of the 25 brightest stars in the sky. Castor is actually a six-star system, being a visual triple each component of which is a BINARY STAR, the three components are an eclipsing binary and a pair of spectroscopic binaries. The two brightest components are white, main-sequence stars of SPECTRAL CLASSES A1 and A5. The system is about 50 light-years distant.

Castor and Pollux (pöl'aks), in classical mythology, twin heroes called the Dioscuri, Castor was the son of Leda and Tyndareus, Pollux the son of Leda and Zeus. Pollux is the Latin name for the Greek Polydeuces. Castor excelled as a horseman and Pollux as a boxer. They were great warriors and were noted for their devotion to each other. In one version of the legend, after Castor was killed by Lynceus, Pollux, in accordance with the classical tradition that one of every set of twins is the son of a god and thus immortal, begged Zeus to allow his brother to share his immortality with him. Zeus arranged for the twins to divide their time evenly between Hades and Heaven, and in their honor he created the constellation Gemini. According to another legend, Castor was killed by Idas. The Dioscuri were widely regarded as patrons of mariners and were responsible for SAINT ELMO'S FIRE. They were especially honored by the Romans, on whose side they were said to have appeared miraculously during the battle of Lake Regillus.

castor bean, bean produced by *Ricinus communis*, a plant of the SPURGE family.

castoreum, see BEAVER

castor oil, yellowish oil obtained from the seed of the castor bean. The oil content of the seeds varies from about 20% to 50%. After the hulls are removed the seeds are cold-pressed. Medicinal castor oil is prepared from the yield of the first pressing, this is used as a purgative and laxative. Oil from the second pressing is used as a lubricant for machinery, as a softening agent in making artificial leather, in the dressing of genuine leather, in brake fluids, and in paints and plastic materials. The residue can be used as fertilizer and (after the poisonous substance, ricin, is removed) as cattle feed. Other products having similar properties and uses have been gradually replacing castor oil.

Castracani, Castruccio (kastroöt'chō kastraka'nē), 1281-1328, duke of Lucca. His early life was spent in exile. After his return he was made captain (1316), then lord of Lucca (1320) for life. In the political wars that plagued Italy in the 14th cent. he led the Ghibellines of all Tuscany (see GUELPHS AND GIBELINES), waged long wars against Florence, and conquered Volterra, Pistoia, and the Lunigiana. In 1327, Holy Roman Emperor Louis IV recognized him as duke of Lucca. After quelling a rebellion in Pistoia, he died. His principality disappeared with him.

castration, removal of the sex glands of an animal, i.e., testes in the male, or ovaries and often the uterus in the female. Castration of the female animal is commonly referred to as spaying. Castration results in sterility, decreased sexual desire, and inhibition of secondary sex characteristics. It is performed for the purpose of improving the quality of meat and decreasing the aggressiveness of farm animals, in pet animals it prevents unwanted mating behavior, reproduction, and wandering. Removal of the sex glands in humans is sometimes necessary to prevent the spread in the body of cancerous growths.

castrato (käs'trätō) [Ital., =castrated], a male singer with an artificially created soprano or alto voice, the result of castration in boyhood. The combination of the larynx of a youth and the chest and lungs of a man produced a powerful voice of great range and unique sound. Castrati were especially popular in churches and opera in Europe during the 17th and

18th cent. The greatest castrato was Carlo Broschi FARINELLI.

Castrén, Matthias Alexander (mätē'ās älēksan'dar käs'trān'), 1813-52, Finnish philologist, one of the first scholars to study the Finno-Ugric languages. Castrén was long a professor at the Univ. of Helsinki (now Helsinki).

Castres (kas'trā), city (1968 pop. 42,920), Tarn dept., SW France, on the Agout River. It has been a textile center since the 13th cent., and its machine tools are known worldwide. Wood products, especially furniture, are also manufactured. Once the site of a Roman encampment, Castres grew around a Benedictine monastery founded in 647 A.D. Protestantism took hold in the 16th cent. but was suppressed by Louis XIII. The revocation (1685) of the Edict of NANTES jeopardized the city's economy by expelling Protestants, but Castres prospered anew under Louis XIV. There are several 17th- and 18th-century churches.

Castries, town (1960 pop. 4,353), capital and commercial center of St. Lucia, British West Indies. Its excellent landlocked harbor is one of the best in the West Indies. Castries was founded by the French in 1650.

Castrioti, George: see SCANDERBEG

Castro, Américo (āmā'rēkō kas'trō), 1885-1972, Spanish philologist and literary critic, b. Brazil. His numerous works include *El pensamiento de Cervantes* [the ideas of Cervantes] (1925), *Iberoamérica su presente y su pasado* [Iberoamerica its present and past] (1941), and *España en su historia cristianas, moros y judios* (1948, tr. *The Structure of Spanish History*, 1954).

Castro, Cipriano (sēprēa'nō), 1858?-1924, president of Venezuela (1901-8). In 1899 he usurped the government, overthrowing Andrade. Called the Lion of the Andes by his followers, he was a stern and arbitrary caudillo, who nevertheless improved the country's economy. Castro's administration is notable because of the financial claims (see VENEZUELA CLAIMS) made by several foreign powers and his defiance of them. He retired briefly in 1906 and was succeeded by Juan Vicente GÓMEZ, but after having violent disagreements with Gómez, Castro again assumed power. In 1908 Castro went to Europe. Gómez immediately deposed him and took control. Castro died in exile.

Castro, Fidel (fēdē'l'), 1926-, Cuban revolutionary and political leader, premier of Cuba (1959-). A young lawyer, Castro openly criticized the dictatorship of Fulgencio BATISTA Y ZALDÍVAR in 1952. On July 26, 1953, he led an unsuccessful attack on an army post in Santiago de Cuba and was imprisoned. Released (1955) in a general amnesty, he went to Mexico where he organized the 26th of July movement. In Dec. 1956, he landed in SW Oriente prov. with a small group of rebels. Castro and 11 others, including his brother Raul and Ernesto "Che" GUEVARA, survived the initial encounter and hid in the mountains of the SIERRA MAESTRA, where, despite severe hardships, they built up a following and led the increasingly effective guerrilla campaign that toppled the Batista regime on Jan. 1, 1959. Widely hailed as a liberator, Castro soon proved to be extraordinary as a demagogue, he was a brilliant propagandist and a powerful orator. He established a totalitarian regime, directing the wholesale arrests and execution of Batista supporters, and—in a remarkably short time—he destroyed the old army structure and replaced it with his own military forces under the command of his brother Raul. He proceeded to collectivize agriculture, to expropriate all native and foreign industry, and to promote close ties with Communist countries. He instituted sweeping reforms, uprooting the Cuban social order to the advantage of the lower classes and the general disadvantage of the propertied classes, many of whom fled. In Dec. 1961, he openly declared himself to be a Marxist-Leninist. By constantly denouncing "Yankee imperialism," by aligning himself and the Cuban revolution with the underprivileged peoples of Latin America, Asia, and Africa, and by dramatizing the symbols of his struggles against Batista, he kept alive his image as a folk hero. He weathered his own disastrous economic experiments, the cancellation of the U.S. sugar quota, the rupture of diplomatic relations with the United States and almost all of the Latin American countries, the U.S. Bay of Pigs invasion (April, 1961), an economic blockade, an unexpected compromise by the USSR in the 1962 crisis over missile bases in Cuba, and a protracted shortage of food and consumer goods. His announced goal of extending the Cuban revolution to other countries suffered a severe setback with the capture

and death (1967) of "Che" Guevara in Bolivia. Although relying on Soviet aid, Castro maintained a remarkable degree of independence. While his initial enormous prestige dwindled, he remained an important charismatic symbol of revolution and social change. He wrote *Ten Years of Revolution* (1964) and *History Will Absolve Me* (1968). See Theodore Draper, *Castro's Revolution: Myths and Realities* (1962) and *Castroism: Theory and Practice* (1965), Lee Lockwood, *Castro's Cuba, Cuba's Fidel* (1967, repr. 1969), Andres Suarez, *Cuba: Castroism and Communism 1959-1966* (1967), Enrique Meneses, *Fidel Castro* (1968), H. L. Matthews, *Fidel Castro* (1969), P. W. Bonsal, *Cuba, Castro, and the United States* (1971), Maurice Halperin, *The Rise and Decline of Fidel Castro* (1972).

Castro, Inés de, or Inez de Castro (both ɪ'nēz də käs'trō, Port. ēnēsh' dī käs'h'trōō), d. 1355, Spanish noblewoman, a celebrated beauty, and a tragic figure in Portuguese history. She went (1340) to Portugal as a lady in waiting to Constance of Castile, wife of the heir to the Portuguese throne, Dom Pedro (later PETER I). He fell in love with her. Although his father, Alfonso IV, banished her from court, the prince continued to see her. After Constance died (1345), he established a household with her at Coimbra, where she bore him four children. Her brothers, however, gained political influence and aroused the opposition of Alfonso's advisers. Three of those advisers persuaded the king that Ines must be removed to preserve the legitimate succession to the throne and with his permission murdered Ines. Dom Pedro, overcome with grief and anger, led a rebellion against his father, but peace was restored, and the prince promised to forgive the murderers. When he became (1357) king, however, he extradited two from Castile and executed them horribly, the third escaped. Peter announced that he had been secretly married to Ines and had two tombs erected at Alcobaca depicting the life story of Ines in marble. It is not true that he had her disinterred and crowned as queen, but that story was immortalized in a drama of Juan Ruiz de Alarcón y Mendoza. The romantic story of the love affair has been a favorite theme of Portuguese writers and has been much used by Spanish and other writers also. Ines's sons subsequently contested the claim of their half brother, John I, to the Portuguese throne.

Castro, Rosalía de (rōsālē'ā də), 1837-85, Spanish poet and novelist. Castro's book of verse *Cantares gallegos* (1863) was the first important poetry in Galician since the 13th cent., it reflected the lyrical appeal of Galician folk songs. The melancholy *Follas novas* (1880) was followed by the despairing verse, in Castilian, of *En las orillas del Sar* (1884, tr. *Beside the River Sar*, 1937), written while Castro was suffering with terminal cancer. Her sensitive and compassionate poetry with its metrical innovations has exerted considerable influence on modern poets. Castro's novels of Galician life, e.g., *La hija del mar* [the daughter of the sea] (1859), are less significant.

Castro, Vaca de: see VACA DE CASTRO CRISTÓBAL

Castro, Greece: see KÁSTRON

Castro Alves, Antônio de (antō'nyōō dī käs'trōō al'vās), 1847-71, Brazilian poet. A disciple of Victor Hugo, he came to fame with *Esposas flutuantes* [tossing spume] (1871). The poems of Castro Alves are nationalist and socially conscious. Best known is *O navio negreiro* [the slave ship], which was instrumental in the abolition of slavery in Brazil. His study of law was cut short by his death, of tuberculosis, at 24.

Castrogiovanni: see ENNA, Italy

Castrop-Rauxel (käs'trōp-rouk'səl), city (1970 pop. 84,146), North Rhine-Westphalia, W. West Germany, on the Rhine-Rhine Canal, an industrial city of the RUHR district. Chemicals and other light industrial goods are produced there.

Castro Valley, uninc. city (1970 pop. 44,760), Alameda co., W. Calif., near San Francisco Bay. It is chiefly residential, with some light industry.

Castro y Bellvis, Guillén de (gēlyān' də kas'trō ē bēlvēs'), 1569-1631, Spanish dramatist, best known of the Valencian group of playwrights of the Golden Age. Three of his plays dramatize episodes from *Don Quixote*. His masterpiece, *Las mocedades del Cid* [the youthful adventures of the Cid], is a historical drama that furnished Corneille with the material for his play *Le Cid*. Castro enjoyed considerable success during his lifetime.

casuistry (kāzh'yōō'strē) [Lat. *casus*=case], art of applying general moral law to particular cases. Although most often associated with theology (it has been utilized since the inception of Christianity), it is also used in law and psychology. The function of

casuistry is to analyze motives so individual judgments can be made in accordance with an established moral code. The term is often used in a pejorative sense to indicate specious or equivocal reasoning.

cat, name applied broadly to the carnivorous mammals constituting the family Felidae, and specifically to the domestic cat, *Felis catus*. The great roaring cats, the LION, TIGER, JAGUAR, LEOPARD, and snow leopard are anatomically very similar to one another and constitute the genus *Panthera*. The clouded leopard, *Neofelis*, and the cheetah, *Acinonyx*, are big cats that do not roar. The medium-sized and small cats are classified by different zoologists in varying numbers of genera, but in the system most widely used at present they are all put in the single genus *Felis*, despite the great variation among them. Among these cats are the PUMA (or cougar), the LYNX (including the bobcat), the OCELOT, the JAGUARUNDI, the SERVAL, and many small species described by the name cat or wildcat, such as the golden cat and European wildcat, as well as the domestic cat. The small cats are generally ticked, striped, or spotted. Many of them can interbreed with the domestic cat, and some can be tamed if caught young. Of all the carnivores, cats are the most exclusive flesh-eaters and are the most highly adapted for hunting and devouring their prey. All cats have rounded heads, short muzzles, large eyes, sensitive whiskers about the mouth, and erect pointed ears. They have short, wide jaws equipped with long canine teeth and strong molars with sharp cutting edges. Their tongues are coated with sharp recurved projections called papillae that aid in drinking and grooming. Cats have five toes on the forefeet and four on the hind feet. The fifth toe is set high on the forefoot and does not touch the ground during walking, but it is used in grooming and capturing prey. The ends of the toes bear strong, sharp, curved claws. In all but the cheetah the claws are completely retractile, being withdrawn into protective sheaths when not in use. This mechanism is a distinguishing feature of the cat family, although it occurs in a less developed form in some civets. All cats, with the exception of the lynx and related species, have long tails which they use for balance. The musculo-skeletal system is extremely flexible, allowing cats to arch and twist their bodies in a variety of ways. Most cats have good vision and are able to see well in very dim light, their color vision is weak. Their sense of hearing is excellent and, at least in the small cats, can detect frequencies of up to 40,000 Hz or higher. The sense of smell is not as highly developed as in the dog, its keenness may vary from one species to another. Cats are extremely agile, they can run faster than any other mammal for short distances and are remarkable jumpers. They are also good swimmers and members of many species appear to enjoy bathing. All are able to climb trees, but they vary in their behavior from almost exclusively terrestrial (e.g., the lion) to largely arboreal (e.g., the clouded leopard). Most are more or less solitary, but cheetahs live in family groups and lions live in groups, called prides, of up to 30 individuals. Most cats stalk their victims with great stealth and silence, even the lion, which lives in open country, usually lies in concealment until it can pounce on its victim. Only the cheetah, the swiftest of all mammals, runs down its prey. Cats live in a wide variety of habitats, although they are most numerous in warm climates. Even a single species, such as the tiger, may range from cold northern regions to the tropics. All continents except Australia and Antarctica have native species.

Domestic cats. Cats have been domesticated since prehistoric times, perhaps for as long as 5,000 years. (Dogs are believed to have been domesticated for about 50,000 years.) They have been greatly valued as destroyers of vermin, as well as for their ornamental qualities. The ancient Egyptian domestic cat, which spread to Europe in historic times, was used as a retriever in hunting as well as for catching rats and mice. It was probably derived from *Felis lybica* or one of the other North African wildcats. The modern domestic cat, *F. catus*, is probably descended from this animal, perhaps with an admixture of other wildcat species, or of species domesticated at various times in other parts of the world. Cats were venerated in the ancient Egyptian and Norse religions; they have also been the object of superstitious fear, especially in the Middle Ages, when they were tortured and burned as witches. Cats vary considerably in size, males commonly weigh 9 to 14 lb (4.1–6.4 kg) and females 6 to 10 lb (2.2–4.5 kg). They have coats of varying length and a wide variety of colors: black, white, and many shades of red, yellow, brown, and gray. A cat may be

solid-colored or have patches or shadings of a second color. An extremely common pattern, probably derived from wild ancestors, is tabby—a red, brown, or gray background, striped with a lighter shade of the same color. The tortoiseshell pattern is a mixture of red, yellow, and black patches. The calico pattern is similar, but with large patches of white. Besides the common house cat, with its natural variation, the species *F. catus* includes recognized breeds with characteristics maintained by breeders and fanciers through selective mating. Breeds are established when particular traits breed true for several generations. The short-haired breeds are in general more slender and active than the long-haired. The long-haired breeds are the Persian and Himalayan, *angora* is an old term denoting any long-haired cat. Persians may be black, white, or any of a great variety of colors, including calico, tortoiseshell, tabby, and cameo (cream with red shadings). The Himalayan breed resulted from the crossing of a Siamese with a Persian cat. Himalayans have the stocky bodies and long hair of Persians, with Siamese coloring. All other breeds are short-haired. Abyssinians have long bodies and ruddy brown coats with ticking (marking on each hair) of darker brown or black. They are thought to be the most unchanged descendants of the ancient Egyptian domestic cat. Siamese are slender cats with almond-shaped blue eyes, and white, cream, or fawn-colored coats with brown or gray areas, called points, on the feet, tail, ears, and face. Show Siamese are divided according to color of their coats and markings into seal-, chocolate-, blue-, lilac-, and red-point types. Burmese are small, muscular, roundheaded cats with medium to dark brown coats. Manx are tailless cats of various colors, their hind legs are longer than their forelegs, so that the rump is elevated. They probably arose by mutation on the Isle of Man in the Irish Sea, although tailless cats also occur in the Orient. The Russian Blue has bright green eyes and an evenly blue-gray coat, distinguished for having two layers of short, thick fur. The Rex is a recent breed resulting from mutation and is the only curly-haired cat. Its short, woolly coat may be any color. Domestic shorthair is also a recognized category in American cat shows, cats of this group differ from the common household cat only in having known parentage for at least two generations. The known lineage of an animal is called its pedigree. The Maine coon cat is a non-pedigreed strain of large domestic cats found in Maine and believed to be descended from Persians, coon cats weigh up to 25 lb (11.3 kg). Maltese does not connote a breed but is a name applied indiscriminately to gray cats. Cat fanciers' associations exist to set standards, establish pedigrees, and conduct cat shows. There are seven such associations in the United States, one in Canada, and one in Great Britain. Cats are classified in the phylum CHORDATA, subphylum Vertebrata, class Mammalia, order Carnivora, family Felidae. See Michael Boorer, *Wild Cats* (1970), Claire Necker, *The Natural History of Cats* (1970), A. M. Currah, ed., *The Cat Compendium* (1972), C. M. Ing and Grace Pond, *Champion Cats of the World* (1972), G. N. Henderson and D. J. Coffey, ed., *The International Encyclopedia of Cats* (1973), G. B. Schaller, *Golden Shadows, Flying Hooves* (1973).

catabolism, subdivision of METABOLISM involving all degradative chemical reactions in the living cell. Large polymeric molecules such as polysaccharides, nucleic acids, and proteins are first split into their constituent monomeric units, after which the monomers themselves can be broken down into such simple cellular metabolites as lactic acid, acetic acid, carbon dioxide, ammonia, and urea. The first set of reactions provides the necessary building blocks for the construction of new polymeric molecules. The second set of reactions usually involves the process of oxidation and is accompanied by a release of chemical free energy, not all of which is lost as heat, but is partially conserved through the coupled synthesis of ADENOSINE TRIPHOSPHATE. The hydrolysis of this compound is subsequently used to drive almost every energy-requiring reaction in the cell. Thus catabolism also provides the source of chemical energy necessary for the maintenance of the living cell.

catacombs (kat'akōmz), cemeteries of the early Christians, arranged in extensive subterranean vaults and galleries. Besides serving as places of burial, the catacombs were used as hiding places from persecution, as shrines to saints and martyrs, and for funeral feasts; it is doubtful, despite a widespread belief, that they were ever regularly used for religious services. Catacombs exist mainly at Rome but also at

Naples, Chiuri, and Syracuse and at Alexandria and Susa in N Africa as well as in Asia Minor and other areas inhabited by the early Christians. The cemeteries at Paris, once thought to be catacombs, are actually depleted stone quarries and were not used for burial until the late 18th cent. Although among Greeks and Romans cremation was the rule, there was no bar against burial for Christians or Jews (Jewish catacombs have also been found at Rome, although the term is most generally used for Christian burial places) and the catacombs were not constructed in secrecy. Ordinances forbade interment within the city limits. All the Roman catacombs consequently are outside the city gates. They lie from 22 to 65 ft (6.7–19.8 m) beneath ground level and occupy a space estimated at more than 600 acres (243 hectares), although much of this is in several levels, one above another. The oldest remains date from the 1st cent. A.D., and construction continued until the early 5th cent. Excavated in those places where the subsoil tufa or soft rock possessed the suitable granular structure, they consisted primarily of narrow passages, generally about 3 ft (91 cm) wide. Lining the walls of these passages, are the loculi, or recesses, for the bodies. These niches, arranged one above another in tiers, were sealed after the burials with slabs of marble or terra-cotta that bore painted or incised inscriptions. Some passages contained separate chambers or cubicles, usually about 12 ft (4 m) square but sometimes circular or polygonal, which were privately owned family vaults or contained the tomb of a martyr. In these the bodies were often in carved sarcophagi that stood within arched niches. The walls and ceilings were plastered, and sometimes open shafts for lighting extended to the ground above. In some catacombs rooms are arranged in groups, in the catacombs of Sant'Agnese such a group forms a miniature church. In addition, the intricate underground corridors undoubtedly served as possible refuges from anti-Christian violence. The spreading of the catacombs, the joining together of separate areas, and the cutting of passages, one above the other in as many as five successive levels, eventually produced burial places of labyrinthine character. The walls and ceilings of plaster were customarily painted with fresco decorations, and in these can be studied the beginnings of Christian art. Religious subjects started to appear in the 2d cent., the earlier frescoes being confined to the use of symbols. Even after official recognition of Christianity in 313, burials continued, through a desire for interment near the martyrs. The invasions of Goths, Vandals, Lombards, and Saracens brought about the plundering of the catacombs and the robbing of their graves for the bones of saints. Several popes worked at restoring these sacred places, but by the 8th cent. the bodies had been mainly transferred to churches, by the 10th cent. the catacombs, filled with debris, were forgotten. In 1578 they were rediscovered. Their preservation and maintenance have since been under control of the papacy in the Roman liturgy the requirement that Mass be said in the presence of lighted candles and over martyrs' relics is in conscious reminiscence of the catacombs. Exhaustive publications based upon researches in the catacombs were produced by the archaeologist Battista de Rossi (1822–94). The catacombs discovered in the vicinity of Rome in 1956 and 1959 contained frescoes of notable historical interest. See W. H. Adams, *Famous Caves and Catacombs* (1886, repr. 1972), Stephen Benko and J. J. O'Rourke, ed., *The Catacombs and the Colosseum* (1971).

Catalan art. In Catalonia and the territories of the counts of Barcelona, art flourished in the early Middle Ages and continued to flourish through the Renaissance. Some of the finest surviving altar-panel paintings of the Romanesque period are Catalan. Many of these are preserved in the Museo del Parque, Barcelona, together with numerous frescoes transferred from the apses of Romanesque churches. The small churches, often bare of sculptural ornament, were elaborately painted throughout, although usually only the decoration of the apse has survived. A fine example from Santa Maria del Mar, Barcelona, is in the Museum of Fine Arts, Boston. Superb examples of architectural sculpture also exist in many Catalan churches of the period. Also Romanesque is the famous illuminated Bible from the abbey of Farfa, now in the Vatican. Catalan art shares most of the characteristics of the international Romanesque style. A more obviously regional character is found in the Catalan painting of the 14th cent. and in the work of Ferrer Bassa and Jaime Serra, although Sienese influence is noteworthy. With the 15th cent., particularly in the paintings of

Jaime Huguet, of Jaime, Rafael, and Pablo Vergos, and of other masters, the school reached its maturity in a profuse and highly decorative religious art of great beauty. Only with Luis Dalmau in the middle of the century did direct Flemish influence appear, and it never gained ascendancy. The great period of Catalan painting as such ended with the 15th cent., although the province has never ceased to produce great individual artists. Several prominent artists of the 20th cent. were of Catalonian origin, notably Juan Gris, Joan Miró, and Salvador Dalí. See Chandler R. Post, *A History of Spanish Painting* (9 vol., 1930-47), Vol. VII, George Kubler and Martin Soria, *Art and Architecture in Spain and Portugal* (1959).

Catalan language (kät'älän,-län), member of the Romance group of the Italic subfamily of the Indo-European family of languages. It is spoken by close to 6 million people in the regions of Catalonia and Valencia in Spain, the Balearic Islands, the region of Roussillon in SE France, the city of Alghero in Sardinia, and lastly in Andorra (where it is the official tongue). Like the other ROMANCE LANGUAGES, Catalan is descended from Latin. It is written in the Roman alphabet. It is also the medium of a noteworthy literature. See William J. Entwistle, *The Spanish Language, Together with Portuguese, Catalan and Basque* (2d ed. 1962), Joan Gili, *Introductory Catalan Grammar* (3d ed. 1967).

Catalan literature, like the Catalan language, developed in close connection with that of Provence. In both regions the rhymed songs of the troubadours flourished as an art form from the 11th to the 14th cent. In the 13th cent. court chroniclers gave a fixed form to Catalan prose, and the language became an expressive literary medium in the works of the great Ramon LULL. At the end of the 14th cent. the art of the troubadours began to wane, and in the 15th cent. the influence of Dante and Petrarch was strong, particularly on the work of the poet Ausiàs MARCH. From the rise of Castile during the Renaissance, Catalan literature was eclipsed until the 19th cent., when it experienced a marked revival. The great writers of this period were the dramatist Àngel GUIMERÀ and the poet Mosen Jacinto VERDAGUER. In the 20th cent. Catalan literature flourished. The realistic regional novel had first-rate exponents in Narcís Oller (1846-1930), Joaquim Ruyra (1858-1939), and Prudenci Bertrana (1867-1941). Joan Maragall (1860-1911) was regarded by Miguel de Unamuno as the best lyric poet of the Iberian peninsula. A unique and exotic note was the aesthetic dilettantism advocated by Eugenio d'Ors. After the end of the Spanish civil war the regime of Francisco Franco persecuted Catalan authors and imposed a ban on Catalan books and publications. Although Catalan literary life proceeded underground, it was not until after World War II that normal activity was resumed. The postwar years saw the return of Catalan language and literature to the curriculum of Spanish universities and the establishment of numerous awards for achievement in Catalan literature, e.g., the City of Barcelona Prize for Catalan Poetry. Notable postwar poets include Josep Foix, Maria Marín, and Thomas Garces. See Arthur Terry, *Catalan Literature* (1972).

cataplexy (kät'älëpsë), pathological condition characterized by a loss of consciousness accompanied by rigidity of muscles that keeps limbs in any position in which they are placed. Attacks vary from several minutes to days and occur in a variety of clinical syndromes, most frequently in schizophrenia, epilepsy, and hysteria.

Catalina Island. see SANTA CATALINA.

catalog, descriptive list, on cards or in a book, of the contents of a library. Assurbanipal's library at Nineveh was cataloged on shelves of slate. The first known subject catalog was compiled by Callimachus at the Alexandrian library in the 3d cent. B.C. The library at Pergamum also had a catalog. Early in the 9th cent. A.D. the catalogs of the libraries of the monastery at Reichenau and of the abbey at Saint-Riquier, N. France, included summaries of the works cataloged. In 1472 the monastic library at Clairvaux was recataloged and one of the earliest union catalogs was made—of the contents of 160 Franciscan monastery libraries in England. In 1475 the Vatican librarian, Platina, cataloged that library's 2,527 volumes. About 1660, Clement, librarian of the Bibliothèque du Roi under Louis XV, compiled a subject catalog and inventory of manuscripts. The printing of the British Museum catalog was begun by PANIZZI as keeper (1837-56) of printed books. Charles A. CUTLER devised the modern dictionary catalog (with author, title, and subject arranged in one alphabet) for the Boston Athenaeum library. Melvil DAVEY devised his decimal system in the

1870s, the system was widely applied in smaller libraries and many large ones. In 1901 the Library of Congress began the practice of printing their catalog entries on cards 3 by 5 in. (7.6 by 12.7 cm) and distributing them to other libraries for a small fee. The National Union Catalogue, begun in 1952 by the Library of Congress, collates the card catalog entries of most large American libraries and prints the results in book form. Cataloging processes are currently being mechanized with the aid of computer systems to provide more extensive and generally superior bibliographic services. See Archer Taylor, *Book Catalogues: Their Varieties and Uses* (1957), *Anglo American Cataloguing Rules*, prepared by the American Library Association et al. (1970), M. F. Tauber and Hilda Feinberg, comp., *Book Catalogs* (1971).

Catalonia (kätälö'nëä), Span. *Cataluña*, region (1970 pop. 5,122,567), NE Spain, stretching from the Pyrenees at the French border southward along the Mediterranean Sea. It comprises four provinces, named after their capitals: BARCELONA, GERONA, LÉRIDÀ, and TARRAGONA. Barcelona is the historic capital. Mostly hilly, with pine-covered mountains, it also has some highly fertile plains. Cereals, olives, and grapes are grown, and one third of the wines of Spain are produced there. The beautiful 240-mi (386-km) seacoast has fine harbors and an active tourist trade. The Ebro, Segre, and Cinca rivers furnish hydroelectric power for the industries in Barcelona and Gerona. Chief products are textiles, automobiles, airplanes, locomotives, and foundry and other metal items. Trade has been active along the coast since Greek and Roman times. The history of medieval Catalonia (which, like Castile, took its name from its many castles) is that of the counts of Barcelona, who emerged (9th cent.) as the chief lords in the Spanish March founded by Charlemagne. United (1137) with Aragon through marriage (see RAYMOND BERENGAR IV), Catalonia nevertheless preserved its own laws, its cortes, and its own language (akin to Provençal). CATALAN ART and CATALAN LITERATURE flourished in the Middle Ages. In the cities, notably Barcelona, the burgher and merchant classes grew very powerful. Catalan traders rivaled those of Genoa and Venice, and their maritime code was widely used in the 14th cent. They, and adventurers like Roger de Flor, were largely responsible for the expansion in the Mediterranean of the house of Aragon (see ARAGÓN HOUSE OF). Catalonia failed in its rebellion (1461-72) against John II of Aragon, and after the union (1479) of Aragon and Castile, Catalonia declined. The centralizing policy of the Spanish kings, the shifting of trade routes with the consequent loss of commercial income, pirate attacks, and recurring plagues and famines were all major factors. Agitation for autonomy was always strong. In the Thirty Years War (1618-48), Catalonia rose against Philip IV, and in the War of the Spanish Succession it sided with Archduke Charles against Philip V, who in reprisal deprived it of its privileges. In the late 19th and 20th cent. it was a center of socialist and anarchist strength. In 1932 the Catalans established a separate government, first under Francisco Macià, then under Lluís Companys, which in 1932 won autonomy from the Spanish Cortes. A revolution (1934) for complete independence failed, but in 1936 autonomy was restored. In the civil war of 1936-39, Catalonia sided with the Loyalists and suffered heavily. Barcelona was the Loyalist capital from Oct., 1938, to Jan., 1939. Catalonia fell to Franco in Feb., 1939.

catalpa (kätäl'pə) see BIGNONIA

catalyst, substance that can cause a change in the rate of a CHEMICAL REACTION without itself being consumed in the reaction, the changing of the reaction rate by use of a catalyst is called catalysis. Substances that increase the rate of reaction are called positive catalysts or, simply, catalysts, while substances that decrease the rate of reaction are called negative catalysts or inhibitors. Catalysts work by changing the ACTIVATION ENERGY for a reaction, i.e., the minimum energy needed for the reaction to occur. This is accomplished by providing a new mechanism or reaction path through which the reaction can proceed. When the new reaction path has a lower activation energy, the reaction is said to be catalyzed, the rate of reaction will be increased because there will be a higher proportion of interactions (i.e., collisions) between reactants with enough energy to cause a reaction. If the activation energy for the new path is higher, the reaction rate is decreased and the reaction is said to be inhibited. Enzymes are the commonest and most efficient of the catalysts found in nature. Most of the chemical reactions that occur in the human body and in other

living things are high-energy reactions that would occur slowly, if at all, without the catalysis provided by enzymes. For example, in the absence of catalysis, it takes several weeks for starch to hydrolyze to glucose, a trace of the enzyme ptyalin, found in human saliva, accelerates the reaction so that starches can be digested. Some enzymes increase reaction rates by a factor of one billion or more. Enzymes are generally specific catalysts, that is, they catalyze only one reaction of one particular reactant or substrate. Usually the enzyme and its substrate have complementary structures and can bond together to form a complex that is more reactive due to the presence of FUNCTIONAL GROUPS in the enzyme, which stabilize the transition state of the reaction or lower the activation energy. Catalysis is also important in chemical laboratories and in industry. Some reactions occur faster in the presence of a small amount of an acid or base and are said to be acid catalyzed or base catalyzed. For example, the hydrolysis of esters is catalyzed by the presence of a small amount of base. In this reaction, it is the hydroxide ion, OH⁻, that reacts with the ester, and the concentration of hydroxide ion is greatly increased over that of pure water by the presence of the base. Although some of the hydroxide ions provided by the base are used up in the first part of the reaction, they are regenerated in a later step from water molecules, the net amount of hydroxide ion present is the same at the beginning and end of the reaction, so the base is thought of as a catalyst and not as a reactant. Finely divided metals are often used as catalysts, they adsorb the reactants onto their surfaces (see ADSORPTION), where the reaction can occur more readily. For example, hydrogen and oxygen gases can be mixed without reacting to form water, but if a small amount of powdered platinum is added to the gas mixture, the gases react rapidly. Hydrogenation reactions, e.g., the formation of hard cooking fats from vegetable oils, are catalyzed by finely divided metals or metal oxides. The commercial preparation of sulfuric acid and nitric acid also depends on such surface catalysis. Other commonly used surface catalysts, in addition to platinum, are copper, iron, nickel, palladium, rhodium, silica gel (silicon dioxide), and vanadium oxide. Some substances that are not themselves catalysts increase the activity of a catalyst when added with it to some reaction, such substances are called promoters. Alumina is a promoter for iron when it is used to catalyze the reaction of hydrogen and nitrogen to form ammonia. In some reactions one of the reaction products is a catalyst for the reaction, this phenomenon is called self-catalysis or autocatalysis. An example is the reaction of permanganate ion with oxalic acid to form carbon dioxide and manganous ion, in which the manganous ion acts as an autocatalyst. Such reactions are potentially dangerous, since the reaction rate may increase to the point of explosion. Inhibitors are also of interest to the chemist. Because oxygen is an inhibitor of free-radical reactions, many of which are important in the synthesis of polymers, such reactions must be performed in an oxygen-free environment, e.g., under a blanket of nitrogen gas. The toxicity of certain poisons, e.g., carbon monoxide and the nerve gases, is due to their inhibition of life-sustaining catalytic reactions in the body. Substances that react with catalysts to reduce or eliminate their effect are called poisons, arsenic compounds are catalytic poisons for platinum.

catamaran (kät'amarän'), watercraft made up of two connected hulls. Originally used by the natives of Polynesia, the catamaran design was adopted by Western boat builders in the 19th cent. Because the twin hulls of the Polynesian catamaran are actually logs or other pieces of wood, the vessel is more like a raft than a boat. An extremely stable craft, it can be paddled or sailed even in the heavy waves of the S. Pacific. The American Nathanael Herreshoff first built Western-type catamarans in the 1870s. The twin-hulled sailing or motor boat has since become a popular pleasure craft, largely because of its speed and stability. Catamarans range from 12 ft (3.7 m) to over 100 ft (30.5 m) in length and are among the world's fastest sailing craft.

Catamarca (kätämär'kä), city (1970 pop. 58,186), capital of Catamarca prov., NW Argentina. It is an agricultural and mining center located in a valley that produces wine, cotton, alfalfa, and livestock. Founded in 1683, Catamarca has a 17th-century Franciscan monastery and a church that is a pilgrimage site and a national monument. Tourists are attracted by the area's mineral springs.

catamount: see PUMA.

Catania (kätä'nyä), city (1971 pop. 397,939), capital of Catania prov., E Sicily, Italy, on the Gulf of Cata-

nia, an arm of the Ionian Sea, and at the foot of Mt. Etna. It is a busy port and a major commercial and industrial center. Manufactures include chemicals, silk and cotton textiles, and asphalt. The city also has a fishing industry. Founded (late 8th cent. B.C.) by Chalcidian colonists, Catania was a flourishing Greek town and was later a Roman colony. It was rebuilt after earthquakes in 1169 and 1693 and after a severe volcanic eruption in 1669. In 1862, Garibaldi organized at Catania his expedition to Rome that was stopped at Aspromonte. The city was heavily damaged in World War II. Points of interest include the extensive Bellini Gardens (named for the 19th-century composer, who was born in Catania), the cathedral (originally built in the 11th cent.), and Ursino castle, built (13th cent.) by Emperor Frederick II. The city has a university (founded 1444) and an observatory.

Catanzaro (kātānzā'rō), city (1971 pop. 85,316), capital of Catanzaro prov. and of Calabria, S. Italy, on a hill above the Ionian Sea. It is a commercial and industrial center, with flour mills and distilleries. Founded (10th cent.) by the Byzantines, Catanzaro was famous (11th–17th cent.) for its velvets and damasks.

catapult (kāt'apūlt'), mechanism used to throw missiles in ancient and medieval warfare. There were two major types in wide use. One, a large crossbow, shot spears at a low trajectory (see BOW AND ARROW). The other type threw large stones, pots of boiling oil, and Greek fire (a flammable mixture used by the Byzantine Greeks) at a high trajectory and was used for attacking or defending fortifications. Catapults were widely employed in SIEGE warfare, but with the introduction of artillery in the 14th cent. they passed from use. However, in the 20th cent. a form of catapult using hydraulic pressure was reintroduced as a means of launching aircraft from warships.

cataract, in medicine, opacity of the lens of the eye, which impairs vision. In the young, cataracts are generally congenital or hereditary, later they are usually the result of degenerative changes brought on by advanced age or systemic disease (diabetes). Cataracts brought on by aging are most common, most individuals over 60 exhibit some degree of lens opacity. Injury, extreme heat, X rays, nuclear radiation, inflammatory disease, and toxic substances also cause cataracts. Advanced cataracts are treated by surgical removal of the lens, and contact lenses are used to compensate for the missing lens.

Catargiu, Lascar (kātarjōō'), 1823–99, Rumanian statesman, of an ancient Walachian family. Unsuccessful as Conservative candidate (1859) against Alexander John Cuza for the rule of Moldavia, he became leader of the Conservative opposition. He served several times as premier of Rumania (May–July, 1866, 1871–76, 1889, 1891–95) and effected financial and agrarian reforms.

catastrophism (katās'trafizām), in geology, the doctrine that at intervals in the earth's history all living things have been destroyed by cataclysms, e.g., floods or earthquakes, and replaced by an entirely different population. During these cataclysms the features of the earth's surface, such as mountains and valleys, were formed. The theory, popularly accepted from the earliest times, was attacked in the late 18th cent., notably by James Hutton, who may be regarded as the precursor of the opposite doctrine of UNIFORMITARIANISM. Catastrophism, however, was more easily correlated with religious doctrines, e.g., the Mosaic account of the Flood, and remained for some time the interpretation of the earth's history accepted by the great majority of geologists. It was systematized and defended by the Frenchman Georges Cuvier, whose position as the greatest geologist of his day easily overbore all opposition. In the 19th cent. it was attacked by George Poulett Scrope and especially by Sir Charles Lyell, under whose influence the contrary doctrine gradually became more popular.

catatonia (kāt'atō'nēā), mental state characterized by statuesque posturing and muscular immobility, mutism, apparent stupor, and paralysis of the will. The muscles are held in a plant state of tonus called waxy flexibility, and the catatonic person obediently permits himself to be rearranged into awkward positions that he may subsequently hold for hours. In contrast to the above stuporous or withdrawn form of catatonia, catatonic excitements may occur in which continuous incoherent shouting, unrelenting psychomotor agitation, and a violent destructiveness toward persons and objects alike can lead to collapse and death if untreated. First described by Karl Kahlbaum in 1874 as catatonia, or tension insanity, the entity was included with hebephrenia

and paranoia in Emil Kraepelin's concept of dementia praecox. All of these were subsumed under Eugen Bleuler's concept of SCHIZOPHRENIA in 1911, when the important distinction was made that there was no dementia involved—no defect of memory or intellect. Indeed, the apparently stuporous and totally unresponsive catatonic will often later describe having been acutely sensitive to persons and events around him during the catatonic state.

Catawba Indians (katō'ba), North American Indians whose language belongs to the Siouan branch of the Hokan-Siouan linguistic stock (see AMERICAN INDIAN LANGUAGES). They occupied a region in South Carolina. A large and powerful group, they waged incessant but unsuccessful war against the Cherokee and the Indians of the Ohio River valley, sending war parties to great distances. Fighting and epidemics of smallpox reduced them to a small group in the 18th cent. Until 1962 the Catawba lived on a small reservation in South Carolina, at that time they terminated their relationship with the federal government and distributed the tribal estate among the remaining members. See D. S. Brown, *The Catawba Indians* (1966), C. M. Hudson, *The Catawba Nation* (1970).

cat bear: see PANDA

catbird: see MIMIC THRUSH

catch crop, any quick-growing crop sown between seasons of regular planting to make use of temporary idleness of the soil or to compensate for the failure of a main crop. It may be such rapid-maturing vegetables as radishes, onions grown from sets, or spinach (planted between rows of slower growing crops), quick-growing crops such as rye, millet, or buckwheat, or an annual legume, such as soybean, which is valuable as fodder or, when plowed under, increases the soil's fertility. See COVER CROP.

catchfly: see PINK

catchment area or drainage basin, area drained by a stream or other body of water. The limits of a given catchment area are the heights of land—often called drainage divides, or watersheds—separating it from neighboring drainage systems. The amount of water reaching the river, reservoir, or lake from its catchment area depends on the size of the area, the amount of precipitation, and the loss through evaporation (determined by temperature, winds, and other factors and varying with the season) and through absorption by the earth or by vegetation, absorption is greater when the soil or rock is permeable than when it is impermeable. A permeable layer over an impermeable layer may act as a natural reservoir, supplying the river or lake in very dry seasons. The catchment area is one of the primary considerations in the planning of a reservoir for water-supply purposes.

Cateau, Le (lə kätō'), town (1968 pop. 9,314), Nord dept., N. France, in French Flanders. It was formerly known as Le Cateau-Cambresis. It has textile, metallurgical, and ceramic industries. In a treaty signed there in 1559, the last English foothold on the continent was returned to France. Le Cateau was the scene of much fighting in World War I. A museum contains much of the work of Matisse, who was born there.

Cateau-Cambresis, Treaty of (kätō'-kaNbrāzē'), 1559, concluded at Le Cateau, France, by representatives of HENRY II of France, PHILIP II of Spain, and ELIZABETH I of England. It put an end to the 60-year conflict between France and Spain, begun with the ITALIAN WARS, in which HENRY VIII and later MARY I of England had intermittently sided against France. The terms were a triumph for Spain. France restored Savoy, except Saluzzo, to Duke EMMANUEL PHILIBERT, acknowledged Spanish hegemony over Italy, and consented to a rectification of its border with the Spanish Netherlands. CALAIS, however, was confirmed in French possession by England. Henry II's sister, Margaret, was given in marriage to Emmanuel Philibert of Savoy, Henry's daughter, Elizabeth of Valois, was given to Philip II of Spain.

catechism (kāt'akizām) [Gr., = oral instruction], originally oral instruction in religion, later written instruction. Catechisms are usually written in the form of questions and answers. Almost as old as Christianity, they were used especially for the instruction of converts and children. Catechisms were popular in the later Middle Ages and assumed even greater significance in the Reformation through Martin Luther's emphasis on the religious education of children. His *Small Catechism* (1529) is still the standard book of the Lutheran church. The greatest Calvinist catechism was the *Heidelberg Catechism* (1563). It was revised at Dort (1619) and was used in Dutch and German Reformed churches, other cate-

chisms are the Longer and Shorter Catechisms of 1647 and 1648, drawn up to supplement the Westminster Confession, they are used in the Presbyterian churches. The catechism for the Anglican Communion is included in the Book of Common Prayer. A catechism long in use in the Roman Catholic Church was that prepared by the Jesuit Peter Canisius, which appeared in 1555. The catechism of the Council of Trent, a document of high authority issued in 1566, is not really a catechism but a manual of instruction for use by the clergy. The best-known Catholic catechism in England is the Penny Catechism, adopted by the bishops of England and Wales, that in the United States is the Baltimore Catechism.

catecholamine (kāt'akōl'amēn), any of several compounds occurring naturally in the body that help regulate the sympathetic nervous system. The catecholamines include such compounds as EPINEPHRINE, or adrenaline, isoproterenol, norepinephrine, and dopamine. They resemble one another chemically in having an aromatic portion (catechol) to which is attached an amine, or nitrogen-containing group. Epinephrine and norepinephrine are secreted by the adrenal medulla and norepinephrine is also secreted by some nerve fibers. These substances prepare the body to meet emergencies such as cold, fatigue, and shock, and norepinephrine is probably a chemical transmitter at nerve synapses. Dopamine is an intermediate in the synthesis of epinephrine, in addition, a deficiency of dopamine in the brain is responsible for the symptoms of the condition PARKINSONISM. Medical administration of the drug L-DOPA, which is presumed to be converted to dopamine in the brain, relieves the symptoms. Epinephrine and isoproterenol are both used medically to stimulate heartbeat and to treat emphysema, bronchitis, and bronchial asthma and other allergic conditions. Epinephrine is also used in the treatment of the eye disease glaucoma.

catechu (kāt'achōō) or **cutch**, extract from the heartwood of *Acacia catechu*, a leguminous tree of the PULSACE family, native to India and Burma. Catechu is a fast brown dye used for various shades of brown and olive, including the familiar khaki, and also in tanning. White cutch is a synonym for gambier, a leaf extract of a shrub (*Uncaria gambir*) of the madder family, which is similarly used.

categorical imperative: see KANT, IMMANUEL

category, philosophical term that literally means predication or assertion. It was first used by Aristotle, whose 10 categories formed a list of all the ways in which assertions can be made of a subject. Immanuel Kant's 12 categories constitute an exhaustive list of the a priori forms through which a person knows the phenomenal world. The term has also been used in many other senses by various philosophers.

category, in taxonomy: see CLASSIFICATION

Catena, Vincenzo di Biagio (vēnchēn'tsō dē byā'jō kātā'nā), c. 1470–1531, Venetian painter. His early work, reflecting the influence of Giovanni Bellini, includes the two paintings of *Madonna and Child with Saints* in the Walters Art Gallery, Baltimore, and the Academy, Venice. In his later period Catena followed closely the style of Giorgione. The best works of this period are *The Doge Loredan Kneeling before the Madonna* (Correr Mus., Venice), *The Martyrdom of St. Christina* (Church of Santa Maria Mater Domini, Venice), and *Christ Giving the Keys to St. Peter* (Gardner Mus., Boston). See monograph by Giles Robertson (1954).

Caterham and Warlingham (kā'taram, wōrl'ing-am), urban district (1971 pop. 35,781), Surrey, SE England. A residential suburb of London, it has engineering, chemical, perfume, and printing industries.

caterpillar, common name for the LARVA of a MOTH or BUTTERFLY. Caterpillars have distinct heads and are segmented and wormlike. They have three pairs of short, jointed legs (retained in the adult) on the thorax, in addition, they have unjointed, fleshy appendages, called prolegs, on some abdominal segments. The prolegs end in clusters of tiny hooks. There is a row of simple eyes on either side of the body. Sawfly larvae are often mistaken for caterpillars, but their prolegs have no hooks and they have a single simple eye on each side. Almost all caterpillars are vegetarian and have strong jaws for chewing. The chewing mouth parts and the prolegs disappear during the PUPA stage, as the larva is transformed into an adult. Caterpillars have silk glands that open into a mouth part called the spinneret. The caterpillar exudes a silk strand continuously as it moves along, small caterpillars swing by the strand when dropping from a height. Many caterpillars use the thread

to build a cocoon in which to pupate. Most molt their skin (to accommodate growth) five or six times before pupation. Some caterpillars have smooth skin, others are hairy, such as the woolly bear, or hedgehog, caterpillar of the Isabella tiger moth. The caterpillars of the larger night-flying moths (e.g., the luna moth and polyphemus moth) are smooth and green and may be over 3 in (7.5 cm) long. Caterpillars are equipped with various protective devices. The io moth caterpillar has sharp spines connected with glands that secrete an irritating substance. Others have irritating bristles, and the SWALLOWTAIL BUTTERFLY larva emits a repellent odor when disturbed. Nevertheless, caterpillars form the major part of the diet of many birds and other animals. Caterpillars are voracious eaters and some cause considerable economic damage. Among these are the appleworm, the CUTWORM, and the larvae of the BEE MOTH, the CODLING MOTH, and the CLOTHES MOTH. Some moths and butterflies remain caterpillars for two or three months, others for about 10 months, hibernating through the winter in this stage. In the arctic regions are some forms that require two or three years to develop from egg to adult.

catfish, common name applied to members of the freshwater fish families constituting the suborder Nematognathi. The catfish is related to the SUCKER and the MINNOW and like them has a complex set of bones forming a sensitive hearing apparatus. Catfish are omnivorous feeders and are valuable scavengers. They are named for the barbels ("whiskers") around their mouths and have scaleless skins, fleshy, rayless posterior fins, and sharp defensive spines in the shoulder and dorsal fins. They are able to use the SWIM BLADDER to produce sounds. Some species, such as the stone and tadpole catfishes and the madtom, can inflict stings by means of poison glands in the pectoral spines. Catfish are usually dull-colored, though the madtoms of E North American streams are brightly patterned. Members of most madtom species are no more than 5 in (12.7 cm) long, some are less than 2 in (5 cm) long. Danube catfish called wels, or sheatfish, reach a length of 13 ft (4 m) and a weight of 400 lb (180 kg). The South American catfishes show great diversity. There are small, delicate species armored with bony plates, parasitic types that live in the gills of other fish, and one catfish of the E Andes in which the pelvic fins are modified into suckers that enable it to cling to rocks. African species include the ELECTRIC FISH and the Nile catfish, which swims upside down to feed at the water's surface and has a white back and a dark belly, the reverse of the normal coloration. Of the 30 American species the largest and most important is the blue, or Mississippi, catfish, an excellent food fish weighing up to 150 lb (70 kg). Best known is the smaller channel catfish, which reaches 20 lb (9 kg) and has a deeply forked tail and slender body. The stonecat, 10 in (25.4 cm) long, is found in clear water under logs and stones. The bullheads, or horned pouts, are catfish of muddy ponds and streams, feeding on bottom plants and animals. Bullheads have square or slightly rounded tails and may reach 1 ft (30 cm) in length and 2 lb (0.9 kg) in weight. The black, yellow, and brown bullhead species are common in the waters of the central and eastern states. There are no catfish in the Pacific except the introduced white catfish. Marine catfish found during the summer in bays and harbors of the Atlantic and Gulf states include the 2-ft (61-cm) gaff-top-sail catfish, named for its long, ribbonlike pectoral and dorsal fins, and the smaller sea catfish, a very common trash fish. The males of both these species carry the fertilized eggs in their mouths (and therefore do not eat) until well after the young hatch, a period of two months. In certain other species the eggs are embedded in the underside of the female. Some tropical catfish survive dry seasons by burrowing into the mud or by crawling overland in search of water. Catfishes are classified in the phylum CHORDATA, subphylum Vertebrata, class Osteichthyes, order Cypriniformes, suborder Nematognathi.

catgut or **gut**, cord made from the intestines of various animals (especially sheep and horses, but not cats). The membrane is chemically treated, and slender strands are woven together into cords of great strength, which are used for stringing musical instruments such as the violin and the harp. Roman strings, imported from Italy, are considered the best for musical instruments. Catgut is also used for stringing tennis rackets and for some surgical sutures.

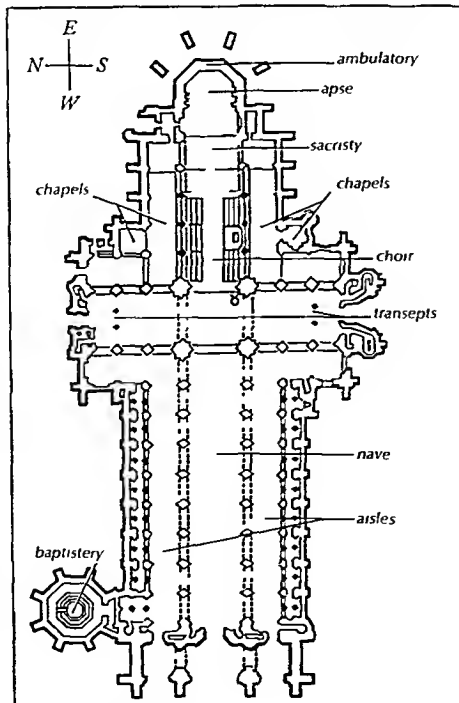
Cathari (kăth'arī) [Gr., = pure], name for members of the widespread dualistic religious movement of the Middle Ages. Carried from the Balkans to Western

Europe, Catharism flourished in the 11th and 12th cent as far north as England. It was known by various names and in various forms (see BOGOMILS, ALBIGENSES). Catharism was descended from GNOSTICISM and MANICHAEISM and echoed many of the ideas of MARCION. The Cathari tended to reject not only the outward symbols of the Christian church, such as the sacraments and the hierarchy, but also the basic relationship between God and man as taught by Christianity. Instead, the Cathari believed in a dualistic universe, in which the God of the New Testament, who reigned over spiritual things, was in conflict with the evil god (or Satan), who ruled over matter. Asceticism, absolute surrender of the flesh to the spirit, was to be cultivated as the means to perfection. There were two classes of the Cathari, the believers and the Perfect. The believers passed to the ranks of the Perfect on acceptance of the *consolamentum*, a sort of sacrament that was a laying on of hands. The Catharist concept of Jesus resembled modalistic MONARCHIANISM in the West and ADOPTIONISM in the East. Persecution, such as that by the INQUISITION, and the efforts of popes like Innocent III wiped out Catharism by the 15th cent. See E. Holmes, *The Albigensian or Catharist Heresy* (1925), Jacques Madaule, *The Albigensian Crusade* (tr 1967), J. R. Strayer, *The Albigensian Crusades* (1971).

cathartic (kăth'ar'tīk) see LAXATIVE

Cathay (kăth'ā), medieval name for China, derived from the Khitai, a seminomadic people of S Manchuria whose rule under the Liao dynasty (937-1125) extended to N China. It was popularized by Marco Polo (c 1254-c 1324) and usually applied only to China N of the Yangtze River. S China was sometimes called Mangi.

cathedral, church in which a bishop presides. The designation is not dependent on the size or magnificence of a church edifice, but is entirely a matter of its assignment as the church in which the bishop shall officiate. Romanesque cathedrals (see ROMANESQUE ARCHITECTURE AND ART) were massive, block-like, domed and heavily vaulted structures based on the traditional BASILICA form, reflecting the style dominant in Europe from c 1050 to c 1200. The tall, wide nave arcade or colonnade, flanked by shallower, shorter aisles, ran from decorative exterior portals to a large ambulatory and an apse with radiating chapels. The nave was crossed by a TRANSEPT and illuminated by a CLERESTORY pierced by small windows so as not to diminish the strength of the supporting walls. The Romanesque cathedral is a strong visual whole with interrelated parts that emphasize its basic structural clarity. The great cathedrals of the 13th and 14th cent are the culminating expression of GOTHIC ARCHITECTURE. These buildings are distinctive in their consistent use of ribbed VAULTS, pointed ARCHES, ROSE WINDOWS, BUTTRESSES, geometric TRACERY, and variegated STAINED GLASS. All of these elements were combined into a design of



Floor plan of a cathedral

infinite complexity and richness. Gothic interior structure, also based on basilica form, included a long central arcade or colonnaded nave with flanking aisles, a transept, a choir, ambulatory, and apse with radiating chapels. Stained glass was used to create a light, lacy effect of spiderweb airiness, made possible by buttressing the comparatively thin walls. The exterior facade was ornamented with great portals covered with sculpture and surmounted by double towers. Further towers often rose above transepts and crossing, and the rear portion of the entire edifice was engulfed in a profusion of buttresses and pinnacles. The building's structure is entirely subordinated visually to the intricacy of its details. Among the most important medieval cathedrals are the following: *France*—Amiens, Beauvais, Bourges, Chartres, Le Mans, Notre-Dame de Paris, Rouen, Rheims, Strasbourg, *England*—Canterbury, Durham, Ely, Lincoln, Peterborough, Salisbury, Wells, Westminster Abbey, Winchester, York, *West Germany*—Bonn, Cologne, Mainz, Speyer, Ulm, Worms, *Belgium*—Antwerp, Brussels, Louvain, Ypres, *Italy*—Como, Florence, Milan, Monreale, Orvieto, Pisa, Siena, *Spain*—Ávila, Burgos, Barcelona, Salamanca, Seville, Toledo, *Sweden*—Lund, Uppsala. Among major cathedrals built in modern times and adhering to medieval styles of architecture are St. Patrick's Cathedral and the Cathedral of St. John the Divine (Episcopal) in New York City and the cathedrals of Washington, D.C., and Liverpool, England. See Auguste Rodin, *Cathedrals of France* (1960), G. H. Cook, *The English Cathedral through the Centuries* (1965), Wim Swaan, *The Gothic Cathedral* (1970).

Cather, Willa Sibert, 1876-1947, American novelist and short-story writer, b. Winchester, Va., considered one of the great American writers of the 20th cent. When she was nine her family moved to the Nebraska prairie frontier. She graduated from the Univ. of Nebraska in 1895 and worked as a journalist and as a teacher in Pittsburgh. In 1904 she went to New York City. The publication of *The Troll Garden* (1905), her first collection of short stories, led to her appointment to the editorial staff of *McClure's Magazine*. She eventually became managing editor and saved the magazine from financial disaster. After the publication of *Alexander's Bridge* in 1912, she left *McClure's* and devoted herself to creative writing. For many years she lived quietly in New York City's Greenwich Village. The first of her novels to deal with her major theme is *O Pioneers!* (1913), a celebration of the strength and courage of the frontier settlers. Other novels with this theme are *My Ántonia* (1918), *One of Ours* (1922, Pulitzer Prize), and *A Lost Lady* (1923). *The Song of the Lark* (1915) focuses on another of Cather's major preoccupations—the need of the artist to free himself from inhibiting influences, particularly that of a rural or small-town background, the tales collected in *Youth and the Night Medusa* (1920) and the novel *Lucy Gayheart* (1935) also treat this theme. With success and increasing age Cather became convinced that the beliefs and way of life she valued were disappearing. This disillusionment is poignantly evident in her novel *The Professor's House* (1925). She subsequently turned to North America's far past for her material to colonial New Mexico in *Death Comes for the Archbishop* (1927), widely regarded as her masterpiece, and to 17th-century Quebec for *Shadows on the Rock* (1931), in both novels blending history with religious reverence and loving characterizations. The volumes *My Mortal Enemy* (1926) and *The Old Beauty and Others* (1948) present her highly skilled shorter fiction. Her intense interest in the craft of fiction is shown in the essays in *Not Under Forty* (1936) and *On Writing* (1949). Cather herself was a master of that craft, her novels and stories written in a pellucid style of great charm and stateliness. See biographies by E. K. Brown (completed by Leon Edel, 1953) and J. L. Woodress (1970), studies by D. Daiches (1951), E. A. Bloom and L. D. Bloom (1962), and J. M. Schroeter (1967).

Catherine, Saint, 4th cent?, Alexandrian virgin martyr. Nothing certain is known of her life, and in 1969 her name was dropped from the liturgical calendar. According to tradition she was learned. She was condemned to die on the wheel and was saved by a miracle, but was later beheaded. Her principal shrine is the great monastery of Mt. Sinai. Attributes: sword, crown, palm, wheel, and book. The marriage of St. Catherine to Christ, a popular Renaissance subject, represents symbolically the dedication of her virginity. Feast Nov. 25.

Catherine I, 1683?-1727, czarina of Russia (1725-27). Of Livonian peasant origin, Martha Skavronskaya was a domestic when she was captured (1702) by

Russian soldiers As mistress of Aleksandr D. MENSHIKOV she met Czar Peter I (Peter the Great), who made her his mistress After her conversion from the Lutheran to the Orthodox Church (when she changed her name from Martha to Catherine), Peter, who had divorced his first wife, married her (1712) In 1724 he had her crowned czarina and joint ruler Her loyalty and devotion to her difficult husband were remarkable When Peter died without naming a successor, Menshikov and the imperial guards raised Catherine to the throne Her policy was dominated by Menshikov Peter II succeeded her, her daughter Elizabeth became czarina in 1741

Catherine II or Catherine the Great, 1729-96, czarina of Russia (1762-96) A German princess, she was the daughter of Christian Augustus, prince of Anhalt-Zerbst She emerged from the obscurity of her relatively modest background when, in 1744, Czarina Elizabeth of Russia, partly on the recommendation of Frederick II of Prussia, chose her as the wife of the future Czar PETER III Accepting the Orthodox faith, she changed her original name, Sophie, to Catherine Her successful effort to become completely Russian made her popular with important political elements who opposed her eccentric husband Neglected by the czarevich, Catherine read widely, especially Voltaire and Montesquieu, and informed herself of Russian conditions In Jan, 1762, Peter succeeded to the throne, but he immediately alienated powerful groups with his program and personality In June, 1762, a group of conspirators headed by Grigori ORLOV, Catherine's lover, proclaimed Catherine autocrat, and shortly afterward Peter was murdered Catherine began her rule with great projects of reform She drew up a document based largely on the writings of BECCARIA and Montesquieu to serve as a guide for an enlightened code of laws She summoned a legislative commission (with representatives of all classes except the serfs) to put this guide into law, but she disbanded the commission before it could complete the code Some have questioned the sincerity of Catherine's "enlightened" outlook, and there is no doubt that she became more conservative as a result of the peasant rising (1773-74) under PUGACHEV As a result, the nobility's administrative power was strengthened when Catherine reorganized (1775) the provincial administration to increase the central government's control over rural areas This reform established a system of provinces, subdivided into districts, which endured until 1917 In 1785, Catherine issued a charter that made the gentry of each district and province a legal body with the right to petition the throne, freed nobles from taxation and state service, made their status hereditary, and gave them absolute control over their lands and peasants Another charter, issued to the towns, proved of little value to them Catherine extended serfdom to parts of the Ukraine and transferred large tracts of state lands to favored noblemen The serfs' remaining rights were strictly curtailed She also encouraged colonization of ALASKA and of areas gained by conquest She increased Russian control over the Baltic provinces and the Ukraine Catherine attempted to increase Russia's power at the expense of its weaker neighbors, Poland and Turkey In 1764 she established a virtual protectorate over Poland by placing her former lover Stanislaus Poniatowski on the Polish throne as STANISLAUS II Catherine eventually secured the largest portion in successive partitions of Poland among Russia, Prussia, and Austria (see POLAND, PARTITIONS OF) Catherine's first war with Turkey (1768-74, see RUSSO-TURKISH WARS) ended with the Treaty of Kuchuk Kainarji, which made Russia the dominant power in the Middle East Catherine and her advisers, particularly POTEKIN, developed a program known as the Greek project, which aimed at a partition of Turkey's European holdings among Russia, Austria, and other countries However, her attempts to break up the Ottoman Empire met with only partial success In 1783 she annexed the Crimea, which had gained independence from Turkey by the Treaty of Kuchuk Kainarji Her triumphal tour of 5 Russia, accompanied by Potemkin, provoked the Turks to renew warfare (1787-92) The Treaty of Jassy (1792) confirmed the annexation of the Crimea and cemented Russia's hold on the northern coast of the Black Sea Catherine also extended Russian influence in European affairs In 1778 she acted as mediator between Prussia and Austria in the War of the Bavarian Succession, and in 1780 she organized a league to defend neutral shipping against Great Britain, which was then engaged in the war of the American Revolution Catherine increased the power and prestige of Russia by skillful diplomacy and by extending Russia's western boundary into

the heart of central Europe An enthusiastic patron of literature, art, and education, Catherine wrote memoirs, comedies, and stories, and corresponded with the French Encyclopedists, including Voltaire, Diderot, and d'Alembert (who were largely responsible for her glorious contemporary reputation) She encouraged some criticism and discussion of social and political problems until the French Revolution made her an outspoken conservative and turned her against all who dared criticize her regime Although she had many lovers, only Orlov, Potemkin, and P. I. Zubov (1767-1822) were influential in government affairs She was succeeded by her son Paul I See biographies by Kazimierz Waliszewski (tr 1894, repr 1968), Katharine Anthony (1925), Zoe Oldenbourg (1965), and L. J. Oliva (1971), G. S. Thomson, *Catherine the Great and the Expansion of Russia* (1947, repr 1962), M. E. von Almedingen, *Catherine, Empress of Russia* (1961), Marc Raef, ed., *Catherine the Great: A Profile* (1972)

Catherine de' Medici (dē mēd'ichē, Ital dā mē'-dēchē), 1519-89, queen of France, daughter of Lorenzo de' Medici, duke of Urbino She was married (1533) to the duc d'Orleans, later King Henry II Neglected during the reign of her husband and that of her eldest son, Francis II, she became (1560) regent for her son CHARLES IX, who succeeded Francis She remained Charles's adviser until his death (1574) Concerned primarily with preserving the power of the king in the religious conflicts of the time, with the aid of her chancellor Michel de L'HÔPITAL, she at first adopted a conciliatory policy toward the Huguenots, or French Protestants The outbreak (1562) of the Wars of Religion (see RELIGION, WARS OF), however, led her to an alliance with the Catholic party under François de GUISE After the defeat of royal troops by the Huguenot leader Gaspard de COLIGNY, Catherine agreed (1570) to the peace of St Germain Subsequently Coligny gained considerable influence over Charles IX Fearing for her own power, and opposed to Coligny's schemes for expansion in the Low Countries, which might lead to war with Spain, Catherine and Henri de Guise arranged Coligny's assassination When the first attempt failed, she took part in planning the massacre of SAINT BARTHOLOMEW'S DAY (1572) in which Coligny and hundreds of other Protestants were murdered After the accession of her third son, Henry III, she vainly tried to revive her old conciliatory policy See Edith Sichel, *Catherine de' Medici and the French Reformation* (1905, repr 1969) and *The Later Years of Catherine de' Medici* (1903, repr 1969), Paul Van Dyke, *Catherine de' Medici* (1922), Ralph Roeder, *Catherine de' Medici and the Lost Revolution* (1937), Sir J. E. Neale, *The Age of Catherine de' Medici* (1962), W. H. Ross, *Catherine de' Medici* (1973)

Catherine Howard, queen of England see HOWARD, CATHERINE

Catherine of Aragón: see KATHARINE OF ARAGÓN

Catherine of Braganza (brəgān'zə), 1638-1705, queen consort of Charles II of England, daughter of John IV of Portugal She was married to Charles in 1662 As part of her dowry England secured Bombay and Tangier Unpopular in England for her Roman Catholic faith, she also had to suffer the humiliation of her husband's infidelities and the disappointment of her own childlessness In 1678 she was accused by Titus OATES of a plot to poison the king but was protected from the charge by Charles himself After William III's accession she returned to Portugal, where she supported the commercial Treaty of Methuen (1703) with England, and in 1704 she acted as regent for her brother, Peter II

Catherine of Siena, Saint (sēēn'ə), 1347-80, Italian mystic and diplomat, a member of the third order of the Dominicans, Doctor of the Church The daughter of Giacomo Benincasa, a Siennese dyer, Catherine from early childhood had mystic visions and practiced austerities, she also showed the devotion to others and the winning manner that characterized her life From the age of about 19, Catherine devoted herself to the poor and the sick, not sparing her own frail health In 1370, in response to a vision, she began to take part in the public life of her time, sending letters to the great of the day She went to Avignon and exerted decisive influence in inducing Pope GREGORY XI to end the "Babylonian captivity" of the papacy and return to Rome in 1376 As papal ambassador to Florence, she helped bring about peace between Florence and the Holy See In the Great Schism, she adhered to the Roman claimant and helped to advance his cause In 1375 she is supposed to have received the five wounds of the stigmata, visible only to herself until after her death She was the center of a spiritual revival almost ev-

erywhere she went A formidable family of devoted followers gathered around her Her mysticism contains overwhelming love for humanity as well as love for God Though she never learned to write, she dictated hundreds of letters and a notable mystic work, commonly called in English *The Dialogue of Saint Catherine of Siena* or *A Treatise on Divine Providence* (or both as title and subtitle), which has been much used in devotional literature She was one of the major religious figures of the Middle Ages Feast April 30 The accounts of her life collected by her followers were used in a biography by her confessor, Fra Raimondo da Capua (1398) See *Saint Catherine as Seen in Her Letters* (ed by V. D. Scudder, 1905), biographies by Alice Curtayne (1929), Sigrid Undset (tr 1954), and J. M. Perrin (tr 1965), F. P. Keyes, *Three Ways of Love* (1963)

Catherine of Valois (vāl'wa, Fr vālwa'), 1401-37, queen consort of Henry V of England, daughter of Charles VI of France Married in 1420, she bore Henry the son who was to become Henry VI Some years after Henry V's death (1522), Catherine married the Welshman Owen TUDOR, from whom the Tudor kings of England were descended

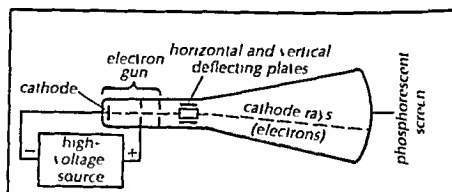
Catherine Parr, queen of England see PARR, CATHERINE

Catherine Tekakwitha (tēk'akwīth'ə), 1656-80, American Indian holy woman, b. Auriesville, NY Her name is sometimes given as Kateri Tekakouita She was the daughter of a Mohawk chief and was baptized a Roman Catholic at the age of seven by a Jesuit missionary Her tribesmen jeered and stoned her for her adopted faith, and she eventually went to a missionary settlement in Canada Piety led her to the severest asceticism The movement for her beatification began in the 1930s See biography by M. C. Buehrle (1954)

Catherine the Great: see CATHERINE II

cathode, ELECTRODE through which current leaves an electric device In ELECTROLYSIS, it is the negative electrode in the electrolytic cell

cathode-ray tube, special-purpose electron tube in which electrons are accelerated by high-voltage anodes, formed into a beam by focusing electrodes, and projected toward a phosphorescent screen that forms one face of the tube The beam of electrons leaves a bright spot wherever it strikes the phosphor



Cathode-ray tube

screen To form a display, or image, on the screen, the electron beam is deflected in the vertical and horizontal directions either by the electrostatic effect of electrodes within the tube or by magnetic fields produced by coils located around the neck of the tube Some cathode-ray tubes can produce multiple beams of electrons and have phosphor screens that are capable of displaying more than one color Principally, these are made for color television receivers, but some are made for special-purpose OSCILLOSCOPES Cathode-ray tubes are also used in radar and sonar displays

Catholic Apostolic Church, religious community originating in England c 1831 and extending later to Germany and the United States (1848) It was founded under the influence of Edward IRVING, its members are sometimes called Irvingites Because of their prophetic gifts, 12 apostles (including Henry DRUMMOND) were in 1835 set aside as officers They were expected to survive until the Second Coming of Christ, but the last of them died in 1901 When the apostles began to die, a schism took place in Germany over the appointing of successors This led to the formation (1863) of the New Apostolic Church, the formal name of the present-day sect An angel, or bishop, presides over each congregation, he is assisted by pastors, teachers, and others Symbolism and mystery of worship characterize the elaborate liturgy, which has borrowed much from the Roman Catholic Church, including devotion to the Blessed Virgin Mary Much emphasis is given to the Second Coming of Christ The membership is about 50,000, half of which is in Germany See P. E. Shaw, *The Catholic Apostolic Church* (1946), R. A. Davenport, *Albany Apostles* (1970)

Catholic Church [Gr. = universal], the body of Christians, living and dead, considered as an organization. It is common for Christian groups to identify their particular churches (exclusively or not) as the Catholic Church. The word *catholic* was first used c.110 to describe the Church by St. Ignatius of Antioch. In speaking of the time before the Reformation, Catholic is technically used to mean orthodox (i.e., those accepting the decrees of Leo I and the Council of Chalcedon). Today in English it usually means the Roman Catholic Church. Protestants use the words in their original sense to designate the Christian Church taken as a whole.

Catholic Emancipation, term applied to the process by which Roman Catholics in the British Isles were relieved in the late 18th and early 19th cent. of civil disabilities. They had been under oppressive regulations placed by various statutes dating as far back as the time of Henry VIII (see PENAL LAWS). This process of removing the disabilities culminated in the Catholic Emancipation Act of 1829 (and some subsequent provisions), but it had begun a number of years before. Priest hunting, in general, ended by the mid-18th cent. In 1778, English Catholics were relieved of the restrictions on land inheritance and purchase. A savage reaction to these concessions produced the Gordon Riots (see GORDON, LORD GEORGE) of 1780, and the whole history of Catholic Emancipation is one of struggle against great resistance. In 1791 the Roman Catholic Relief Act repealed most of the disabilities in Great Britain, provided Catholics took an oath of loyalty, and in 1793 the army, the navy, the universities, and the judiciary were opened to Catholics, although seats in Parliament and some offices were still denied. These reforms were sponsored by William PITT the Younger, who hoped thereby to split the alliance of Irish Catholics and Protestants. But Pitt's attempt to secure a general repeal of the Penal Laws was thwarted by George III. Pope Pius VII consented to a royal veto on episcopal nominations if the Penal Laws were repealed, but the move failed. In Ireland the repeal (1782) of Poyning's Law (see under POYNINGS, SIR EDWARD) was followed by an act (1792) of the Irish Parliament relaxing the marriage and education laws and an act (1793) allowing Catholics to vote and hold most offices. By the Act of Union (1800) the Irish Parliament ceased to exist, and Ireland was given representation in the British Parliament. Then, since the Irish were a minority group in the British legislature, many English ministers began to advocate Catholic Emancipation, influenced also by the decline of the papacy as a factor in secular politics. Irish agitation, headed by Daniel O'CONNELL and his Catholic Association, was successful in securing the admission of Catholics to Parliament. In 1828 the TEST ACT was repealed, and O'Connell, although still ineligible to sit, secured his election to Parliament from Co. Clare. Alarmed by the growing tension in Ireland, the duke of WELLINGTON, the prime minister, allowed the Catholic Emancipation Bill, sponsored by Sir Robert PEEL, to pass (1829). Catholics were now on the same footing as Protestants except for a few restrictions, most of which were later removed. The Act of SETTLEMENT is still in force, however, and Catholics are excluded from the throne and from the office of lord chancellor. See studies by Bernard Ward (1911), Denis Gwynn (1929), J. A. Reynolds (1954, repr. 1970), and G. I. T. Machin (1964), S. L. Gwynn, Henry Grattan and His Times (1939, repr. 1971).

Catholic League, in French history, see LEAGUE.

Catholic University of America, at Washington, D.C., Roman Catholic, coeducational, the only university belonging to the U.S. hierarchy of the Roman Catholic Church, founded 1867 and opened 1889. It includes a college of arts and sciences as well as schools of canon law, sacred theology, and social science. The university has access to the facilities of the national laboratories at Oak Ridge, Tenn., and participates in a cooperative program with the Armed Forces Radiobiology Research Institute at Bethesda, Md.

Catiline (Lucius Sergius Catilina) (kāt'īlīn), c.108 B.C.–62 B.C., Roman politician and conspirator. At first a conservative and a partisan of Sulla, he was praetor in 68 B.C. and governor of Africa in 67 B.C. The next year he was barred from candidacy for the consulship by accusations of misconduct in office, charges that later proved false. Feeling with some justification that he had been cheated, he concocted a wild plot to murder the consuls. He and the other conspirators were acquitted (65 B.C.). Catiline became more bitter than ever against the conservatives and began to advocate popular demagogic proposals. When in 63 B.C. he ran again for

consul, he found CICEPO, the incumbent, and the conservative party anxious to stop his election at any cost. Catiline was defeated, prompting him to try for the consulship by force. He sent money for the troops in Etruria and spread lavish promises in Rome. Cicero became alarmed and on Nov. 8, with facts gained from Catiline's mistress, accused him in the senate (*First Oration against Catiline*). Catiline fled to Etruria. The conspirators remaining in the city did not cease activities but even approached some ambassadors of the Allobroges. The ambassadors reported the whole plot to Cicero, who arrested the conspirators and arraigned them in the senate on Dec. 3. On Dec. 5 they were condemned to death and executed, in spite of a most eloquent appeal from Julius CAESAR to use moderation. Cicero's haste and summary behavior were technically illegal, and it was on a charge (by CLODIUS) of executing these Roman citizens without due process of law that Cicero was exiled. Catiline did not surrender; he fell in battle at Pistoia a month later. The prime sources for Catiline's conspiracy are Cicero's four orations against him and Sallust's biography of him. Both of these are prejudiced and unreliable. Catiline's treason may be partly explained, although not condoned, by the ruthless and devious means used against him. The affair did little credit to any concerned, except for the honest and patriotic CATO THE YOUNGER and possibly for Julius Caesar, who made a daring plea to a vindictive and ruthless majority on behalf of the conspirators whom he scorned. See study by Lester Hutchinson (1957).

Catinat, Nicolas (nēkōlā' kātēnā'), 1637–1712, marshal of France. The son of a magistrate, he won promotion by merit rather than by wealth or descent. In the War of the Grand Alliance he commanded against Duke Victor Amadeus II of Savoy, whom he defeated in N. Italy at Staffarda (1690) and at Marsaglia (1693). Early in the War of the Spanish Succession, he commanded the French army in Italy, against Prince Eugene of Savoy, but after suffering reverses he was replaced. He retired in 1705 and later wrote his memoirs.

cation (kāt'Tān), atom or group of atoms carrying a positive charge. The charge results because there are more protons than electrons in the cation. Cations can be formed from a metal by oxidation (see OXIDATION AND REDUCTION), from a neutral base (see ACIDS AND BASES) by protonation, or from a polar compound by ionization. Cationic species include Na⁺, Mg²⁺, and NH₄⁺. The cations of the TRANSITION ELEMENTS have characteristic colors in water solution. SALTS are made up of cations and ANIONS. See ION.

Cat Island, see SAN SALVADOR, island.

Catledge, Turner, 1901–, American newspaperman, b. Ackerman, Miss. He worked for several southern newspapers before being hired by the New York Times in 1929. He became a political reporter, eventually heading the Times's Washington News Bureau. He was made managing editor, and later executive editor, and in 1968 became vice president of the New York Times Company. He has been semiretired since 1970, remaining a member of the board of directors of the Times. See his autobiography, *My Life and Times* (1971).

Catlin, George, 1796–1872, American traveler and artist, b. Wilkes-Barre, Pa. Educated as a lawyer, he practiced in Philadelphia for two years but turned to art study and became a portrait painter in New York City. He went west c.1832 to study and paint the Indians, and after executing numerous portraits and tribal scenes he took his collection to Europe in 1839. In 1841 he published *Manners, Customs, and Condition of the North American Indians*, in two volumes, with about 300 engravings. Three years later he published 25 plates, entitled *Catlin's North American Indian Portfolio*, and, in 1848, *Eight Years' Travels and Residence in Europe*. From 1852 to 1857 he traveled through South and Central America and later returned for further exploration in the Far West. The record of these later years is contained in *Last Rambles amongst the Indians of the Rocky Mountains and the Andes* (1868) and *My Life among the Indians* (ed. by N. G. Humphreys, 1909). Of his 470 full-length portraits of Indians and tribal scenes, the greater part constitutes the Catlin Gallery of the National Museum, Washington, D.C., some 700 sketches are in the American Museum of Natural History, New York City. His observations of the Indians have been questioned as to accuracy. He was the first white man to see the Minnesota pipestone quarries, and pipestone is also called catlinite. See Harold McCracken, *George Catlin and the Old Frontier* (1959), Robert Plate, *Palette and Tomahawk: the Life of George Catlin* (1962); M. C. Roehmer, *The Catlin Family Papers* (1966).

catnip or **catmint**, strong-scented perennial herb (*Nepeta cataria*) of the family Labiatae (mint family), native to Europe and Asia but naturalized in the United States. A tea of the leaves and flowering tops has long been used as a domestic remedy for various ailments. Catnip is best known for its stimulating effect on cats. Catnip is classified in the division MAGNOLIOPHYTES, class Magnoliopsida, order Lamiales, family Labiatae.

Catoche, Cape (kātō'chā), extremity of Yucatán peninsula, SE Mexico. It was the first Mexican land seen by the Spanish (1517).

Catoctin Mountain Park: see NATIONAL PARKS AND MONUMENTS (table).

Catonsville (kāt'ānzvīl), uninc. city (1970 pop. 54,812), Baltimore co., N. Md., a suburb of Baltimore. A state hospital and park are nearby.

Cato Street Conspiracy: see THISTLEWOOD, RUTHUR.

Cato the Elder (kātō) or **Cato the Censor**, Lat. *Cato Major* or *Cato Censorius*, 234–149 B.C., Roman statesman and moralist, whose full name was Marcus Porcius Cato. He fought in the Second Punic War and later served as quaestor (204), aedile (199), praetor (198), consul (195), and censor (184). He was renowned for his devotion to the old Roman ideals—simplicity of life, honesty, and unflinching courage. He inveighed against extravagance and new customs, but his policy was not aimed at repression but rather at reform and the rebuilding of Roman life. He sought to restrict seats in the senate to the worthy and undertook much building, including the repair of the city sewers. He was sent on an official visit to Carthage in his old age. Upon his return he expressed stem disapproval of Carthaginian ways and told the senate to destroy Carthage. He thus helped to bring on the Third Punic War, in which Carthage was destroyed. Probably his detestation of luxury and cultivated ways inspired the deep hatred that he had for the Scipio family. He himself deliberately affected a rustic appearance and rustic manners. However, he complacently accepted class division and treated his servants harshly. He wrote many works, most of which are now lost. Probably the most influential was his history of early Rome. His *De agri cultura* or *De re rustica*, translated as *On Farming*, is a practical treatise that offers valuable information on agricultural methods and country life in his day.

Cato the Younger or **Cato of Utica**, 95 B.C.–46 B.C., Roman statesman, whose full name was Marcus Porcius Cato, great-grandson of Cato the Elder. Reared by his uncle Marcus Livius Drusus, he showed an intense devotion to the principles of the early republic. He had one of the greatest reputations for honesty and incorruptibility of any man in ancient times, and his Stoicism put him above the graft and bribery of his day. His politics were extremely conservative, and his refusal to compromise made him unpopular with certain of his colleagues. He was from the first a violent opponent of Julius CAESAR and, outdoing CICERO in vituperation of the conspiracy of CATILINE in 63 B.C., tried to implicate Caesar in that plot, although maintaining his fairness to all. As a result he was sent (59 B.C.) to Cyprus by CLODIUS in what amounted to exile. He and his party supported POMPEY after the break with Caesar. He accompanied Pompey across the Adriatic and held Dyrrhachium (modern Durazzo) for him until after the defeat at Pharsala. Then he and Quintus Caecilius Metellus Pius Scipio (see SCIPIO family) went to Africa and continued the struggle against Caesar there. Cato was in command at Utica. After Caesar crushed (46 B.C.) Scipio at THAPSUS, Cato committed suicide, bidding his people make their peace with Caesar. Cicero and Marcus Junius BRUTUS (Cato's son-in-law) wrote eulogies of him while Caesar wrote his *Anticato* against him, the noble tragedy of his death has been the subject of many dramas. He became the symbol of probity in public life. See biography by J. M. Conant (1953).

cat's-eye, gemstone that displays a thin band of reflected light on its surface when cut as a cabochon. Its name is derived from its supposed resemblance to the eye of a cat. The optical effect, known as chatoyancy, is caused by the reflection of light from very thin, closely spaced filaments in parallel arrangement within the stone. True cat's-eye, a variety of CHRYSOBERYL from Ceylon (now Sri Lanka) and Brazil, is the most valuable, but some quartz, tourmaline, and a few other minerals that display chatoyancy are also used as gems. A golden-yellow species called tiger's-eye is a type of naturally altered crocidolite asbestos.

Catskill (kāt'skīl), village (1970 pop. 5,317), seat of Greene co., SE N.Y., on the Hudson River; settled

17th cent by Dutch, inc 1806 Connected with the manufacturing town of Hudson, NY, by the Rip Van Winkle Bridge (completed 1935), it is a gateway to resorts in the Catskill Mts The Catskill Game Farm is nearby Thomas Cole lived and painted in the village

Catskill Aqueduct: see ASHOKAN RESERVOIR, NY

Catskill Mountains, dissected plateau of the Appalachian Mt system, SE NY, just W of the Hudson River, to which it descends abruptly in places This glaciated region, which is well wooded and rolling, with deep gorges and many beautiful waterfalls, is drained by the headstreams of the Delaware River and by Esopus, Schoharie, Rondout, and Catskill creeks Most of the summits are c 3,000 ft (910 m) above sea level, Slide Mt (4,180 ft/1,274 m) and Hunter Mt (4,040 ft/1,231 m) are the highest Close to New York City, the area is a popular summer and winter resort Ashokan Reservoir is a source of the New York metropolitan area's water supply Catskill Forest Preserve embraces some of the most impressive scenery of the Catskills, including the region of the Rip Van Winkle legend See Alf Evers, *The Catskills*, (1972)

Catt, Carrie Chapman, 1859-1947, American suffragist and peace advocate, b Carrie Lane, Ripon, Wis, grad Iowa State College, 1880 She was superintendent of schools (1883-84) in Mason City, Iowa In 1885 she married Lee Chapman, a journalist (d 1886), and in 1890, George Catt, an engineer (d 1905) From 1890 to 1900 an organizer for the National American Woman Suffrage Association, she became its president in 1900 She led the campaign to win suffrage through a Federal amendment to the Constitution After the ratification of the Nineteenth Amendment (1920), she organized the League of Women Voters for the education of women in politics At the Berlin convocation of the International Council of Women she helped organize the International Woman Suffrage Alliance, of which she was president from 1904 to 1923 After 1923 she devoted her efforts chiefly to the peace movement With Nettie R Shuler she wrote *Woman Suffrage and Politics* (1923) See biography by M G Peck (1944)

cattail or reed mace, any plant of the genus *Typha*, perennial herbs found in almost all open marshes The cattail (also called club rush) has long narrow leaves, sometimes used for weaving chair seats, and a single tall stem bearing two sets of tiny flowers, the male flowers above the female The pollinated female flowers form the familiar cylindrical spike of fuzzy brown fruits, the male flowers drop off and leave a naked stalk tip The starchy rootstock can be used for food Cattails are classified in the division MAGNOLIOPHYTES, class Liliatae, order Typhales, family Typhaceae

Cattaneo, Carlo (kat-tan-ē'ō), 1810-69, Italian nationalist and philosopher, b Milan He edited (1839-44) the journal *Il Politecnico*, and in 1848 he led the nationalist revolt in Milan against Austria, which he related in *L'insurrezione di Milano nel 1848* Forced into exile after the end of the first Italian war for independence, he eventually settled in Lugano, Switzerland, where he revived and edited (1860-63) *Il Politecnico* An empiricist and a social positivist, Cattaneo saw philosophy as having primarily a social role the philosopher's business is to deal with the problems of current history History was not conceived by Cattaneo as following from any first principles, its phenomena were plural and subject to change, so its problems were also continually different What is consistently true about the problems of history is that they are social, and the notion of a philosopher as a detached intelligence is both psychologically and practically untenable See C M Lovett, *Carlo Cattaneo and the Politics of the Risorgimento* (1973)

Cattermole, George, 1800-1868, English watercolor painter and illustrator His subject matter was varied, and his works were popular during his lifetime He painted picturesque scenes of antique subjects in a romantic mode He made illustrations for some of Dickens's works, including *Barnaby Rudge* Cattermole is represented in most of the important British galleries

cattle, name for the RUMINANT mammals of the genus *Bos*, and particularly those of the domesticated species, *Bos taurus* and *B. indica* The term oxen is used more or less synonymously, it sometimes includes other closely related animals, such as the BUFFALO and the BISON In more restricted usage, ox refers to a mature castrated male used for draft purposes In the nomenclature of domestic cattle a grown male is a bull, a grown female a cow, an infant a calf, and an animal between one and two

years old a yearling A female that has not given birth is a heifer, a castrated male is a steer Most cattle have unbranched horns consisting of a horny layer surrounding a bone extension of the skull, these horns, unlike those of deer, are not shed Some domestic breeds are naturally hornless, and some customarily have their horns removed Western, or European, domestic cattle (*Bos taurus*) are thought to be descended mainly from the AUROCHS, a large European wild ox domesticated during the Stone Age A smaller species, the Celtic shorthorn, was the most important domestic ox of the Stone Age and may also be involved in the ancestry of *B. taurus* The ZEBU, or Indian ox, *B. indica*, is the humped domestic species of Asia and Africa, in the United States this type of cattle is called Brahman The YAK, *B. grunniens*, exists in Asia in both wild and domestic forms There are also wild and semi-domesticated species in Asia Domestic cattle were first brought to the Western Hemisphere by Columbus on his second voyage Wealth has sometimes consisted chiefly of cattle and has been measured in terms of the number of cattle a person owns, the word *pecuniary* is derived from the Latin *pecus*, cattle, and the words *cattle*, *chatel*, and *capital* are related Breeding for improvement of beef and dairy qualities was practiced by the Romans but was not established on scientific principles until the middle of the 18th cent by English livestock breeder Robert Bakewell The principal beef breeds include the ANGUS and HEREFORD The principal dairy breeds include the Ayrshire, Brown Swiss, Guernsey, Holstein-Friesian, and Jersey The chief dual-purpose breeds include the Devon, Red Poll, and Shorthorn Associations have been formed by breeders interested in improving the various breeds Cattle are classified in the phylum CHORDATA, subphylum Vertebrata, class Mammalia, order Artiodactyla, family Bovidae See also BEEF, DAIRYING See publications of the US Dept of Agriculture, A L Neumann and R R Snapp, *Beef Cattle* (6th ed 1969), J E Rouse, *World Cattle* (2 vol, 1970)

cattleya (kāt'lē-ā) see ORCHID

Catton, Bruce, 1899-, American historian, b Petoskey, Mich He studied at Oberlin College and then entered upon a varied career as a journalist (1926-42) and public official (1942-52) His service with the War Production Board during World War II led to his first major book, *The War Lords of Washington* (1948) After 1952 he devoted himself to full-time literary work, serving as an editor from 1954 (senior editor, 1959) of the *American Heritage* magazine In 1954 he received the Pulitzer Prize for his historical work, *A Stillness at Appomattox* (1953) Catton has written extensively on the military history of the Civil War, his many works include *Mr Lincoln's Army* (1951), *Glory Road* (1952), *This Hallowed Ground* (1956), *Grant Moves South* (1960), *Grant Takes Command* (1969), *The Centennial History of the Civil War* (3 vol, 1961-65), and *Prefaces to History* (1970)

Catullus (Caius Valerius Catullus) (kāt'ūl'ās), 84? B C-54? B C, Roman poet, b Verona Of a well-to-do family, he went c 62 B C to Rome, where he and other young writers formed a cult of youth He fell deeply in love, probably with Clodia, sister of the demagogue Publius Clodius She was a beautiful, notorious woman, suspected of murdering her husband Catullus wrote to his beloved, addressed as Lesbia (to recall Sappho of Lesbos), a series of superb little poems that run from early passion and tenderness to the hatred and disillusionment that overwhelmed him after his mistress was faithless Of the 116 extant poems attributed to him, three (18-20) are almost certainly spurious They include, besides the Lesbia poems, poems to his young friend Juventius, epigrams, ranging from the genial to the obscenely derisive, elegies, a few long poems, notably "Attis" and a nuptial poem honoring Thetis and Peleus, and various short pieces His satire is vigorous and flexible, his light poems gay and full-bodied He was influenced by the Alexandrians and drew much on the Greeks for form and meter, but his genius outran all models Catullus is one of the greatest lyric poets of all time Two of the most popular of his poems are the 10-line poem, touching and simple, which ends, "frater ave atque vale" [hail, brother, and farewell], and "On the Death of Lesbia's Sparrow" See translations by Peter Whigham (1966), James Michie (1969), Reney Myers and R J Ormsby (1970), studies by A L Wheeler (1934, repr 1964), Tenney Frank (1928, repr 1965), and Kenneth Quinn (1959, 1970, and 1972)

Catulus (käch'ōō-lās), family of ancient Rome, of the Lutatian gens Caius Lutatius Catulus was consul in

242 B C He won the great Roman naval victory over Carthage off the Aegates (modern Aegadian Isles) that ended the First Punic War Quintus Lutatius Catulus, d 87 B C, was consul in 102 B C His colleague in the consulship was MARIUS, with whom he went north to oppose a Germanic invasion He had to retreat before the Cimbri until Marius returned from Gaul The two then defeated the Cimbri near Vercelli in 101 B C He later opposed Marius in the Social War and favored Sulla Proscribed by the Marians, he either committed suicide or was killed He was the patron of a literary circle and was himself a writer and a philosopher Cicero praises his oratory His son, also Quintus Lutatius Catulus, d c60 B C, was consul in 78 B C He opposed the constitutional changes sought by Marcus Lepidus (d 77 B C, see under LEPIDUS), and when Lepidus led a revolt, Catulus and Pompey defeated him Catulus was censor in 65 B C He was the leader of the archconservative group He led the minority opposing the conferring of unusual powers on Pompey by the Manilian Law in 66 B C, and he was one of the bitterest opponents of Julius Caesar

Cauca (kou'kă), river, c 600 mi (970 km) long, rising in the Cordillera Central, near Popayan, W Colombia It flows north in a rift valley between the Cordillera Central and Cordillera Occidental to the Magdalena River It is navigable in its lower course and drains a fertile valley, coffee is the chief crop The valley has many minerals including gold There is a river-control and utilization scheme on the upper Cauca

Caucasia, see CAUCASUS

Caucasian and Caucasoid: see RACE

Caucasian Gates: see DARYAL

Caucasian languages, family of languages spoken by about five million people in the CAUCASUS region of the USSR The Caucasian languages take their name from the Caucasus Mountains, on the slopes of which their original homeland is believed to have been located This linguistic family was once considerably more extensive, however, only about 25 of its tongues have survived into modern times There are two major subdivisions of the Caucasian family of languages, northern and southern Whether or not these two branches are related linguistically is still disputed, but Georgian scholars since the 1930s have regarded as proved the kinship of all the Caucasian tongues The northern group consists of about 20 languages native to two million people Its most important members are Chechen and Abkhaz, which are spoken in the Soviet Union, and Adyghe (with its two dialects of Kabardin and Circassian), which is spoken not only in the USSR, but also to some extent in Turkey and Syria The southern group of Caucasian languages includes four tongues with some three million speakers Georgian, the leading member of the northern group, is the mother tongue of well over two million people in the Georgian SSR of the USSR and in neighboring areas of Turkey and Azerbaijan in Iran It is a modern representative of the language of the ancient Colchians, of whom the celebrated mythological figure Medea was one A literature in Georgian goes back to the 5th cent A D, and the language has two alphabets of its own, one of which is still in use, although increasingly the Cyrillic alphabet is being adopted In general, the Caucasian languages have inflection and tend to be agglutinative in that different linguistic elements, each of which exists separately and has a fixed meaning, are often joined to form one word Phonetically, the Caucasian tongues are distinctive, combining simplicity of vowels with abundant richness of consonants Many of the Caucasian languages are spoken by comparatively few people (that is, fewer than 100,000), and they are gradually giving ground to Russian The chances for survival for many of the Caucasian tongues are not considered good An exception is Georgian, which has a comparatively large number of speakers, whose cultural development is higher than that found among other Caucasian-speaking peoples See Bernhard Geiger et al, *Peoples and Languages of the Caucasus* (1959)

Caucasus (kō'kāsas), Rus Kavkaz, region and mountain system, SE European USSR The mountain system extends c 750 mi (1,210 km) from the mouth of the Kuban River on the Black Sea SE to the Apsheron peninsula on the Caspian Sea As a divide between Europe and Asia, the Caucasus has two major regions—North Caucasus and Transcaucasia North Caucasus, composed mainly of plain (steppe) areas, begins at the Manych Depression and rises to the south, where it runs into the main mountain range, the Caucasus mts This is a series of chains running

recall Much of his verse, very little of which remains, is in the *Canzone d'amore* [song of love] For translations, see his *Sonnets and Ballate* (tr by Ezra Pound, 1912) and *Lorna de' Lucchi, An Anthology of Italian Poems* (1922)

Cavalcaselle, Giovanni Battista (jōvān'ne bat-tēs'-ta kavalkasē'lā), 1820-97, Italian art critic and writer Cavalcaselle studied painting at the Academy of Venice and traveled extensively through Italy studying its art treasures He participated in the Revolution of 1848 and escaped to England, where he remained for several years While there he produced in collaboration with Joseph A Crowe their first joint work, *Early Flemish Painters* (1856) Cavalcaselle returned to Italy in 1857 The writings of Crowe and Cavalcaselle include the still basic *History of Painting in Italy* (3 vol., 1864-66)

Cavalier, Jean (zhaN kavalyā'), 1681?-1740, French Protestant soldier, a leader of the CAMISARDS From his home in the Cevennes region of France, he fled to Geneva (1701) when persecution of the Protestants became intolerable, but he returned when he knew that the Protestants were about to rebel As chief leader of the Camisards, he showed remarkable military genius In 1704 he made peace with Marshal Villars and received from King Louis XIV a commission as colonel and a pension The peace was repudiated by his followers because it did not restore the Edict of Nantes (see NANTES, EDICT OF) Distrustful of the king, Cavalier fled from France He fought for the duke of Savoy and later for England in Spain against the French His later years were spent in Great Britain, where he was given a pension, made major general, and appointed governor of the Isle of Jersey The *Memoirs of the Wars of the Cevennes*, published in 1726 and dedicated to Lord Carteret, is attributed to Cavalier See biography by A P Grubb (1931)

cavalier, in general, an armed horseman In the English civil war the supporters of Charles I were called Cavaliers in contradistinction to the ROUNDHEADS, the followers of Parliament The royalists used the designation until it was replaced by TORY

Cavaliere d'Arpino see CESARI, GIUSEPPE

Cavalieri, Francesco Bonaventura (franchās'kō bōnavāntōō'ra kavalyā'rē), 1598-1647, Italian mathematician, a Jesuit priest Professor at Bologna from 1629, he invented the method of indivisibles (1635) that foreshadowed integral calculus

Cavalieri, Lina (lē'na kavalyē'rē), 1874-1944, Italian operatic soprano After her debut in Lisbon in 1900 she achieved great success throughout Europe and in the United States in the lyric French and Italian roles Renowned as much for her great beauty and fiery temperament as for her light, pleasant voice, she sang with the Metropolitan Opera Company, New York City, (1906-8) and with Oscar Hammerstein's Manhattan Opera Company (1909-10)

cavalier King Charles spaniel, breed of small dog developed in the early 20th cent from the English toy spaniel It stands about 12 in (30 cm) high at the shoulder and weighs from 13 to 18 lb (6-8 kg) Its long, silky coat may be slightly wavy, but never curly, and forms a fringe of longer hair, or feathers, on the ears, legs, tail, and feet Although it is usually white with chestnut markings, it may have any of the color patterns of the English toy spaniel Around 1926 there began a revival of interest in the toy spaniel that had been popular in 17th cent England This dog, often depicted in the paintings of that period, was larger than the modern type and had a less domed skull and longer nose By selective breeding of modern toy spaniels that resembled this older type, a new breed, the cavalier, was developed in the relatively short span of approximately 20 years A widely popular dog in England that is also gaining recognition in the United States, the cavalier King Charles is exhibited in the miscellaneous class at dog shows sanctioned by the American Kennel Club See DOG

Cavalier poets, a group of English poets associated with Charles I and his exiled son Most of their work was done between c 1637 and 1660 Their poetry embodied the life and culture of upper-class, pre-Commonwealth England, mixing sophistication with naivete, elegance with raciness Writing on the courtly themes of beauty, love, and loyalty, they produced finely finished verses, expressed with wit and directness The poetry reveals their indebtedness to both Ben Jonson and John Donne The leading Cavalier poets were Robert Herrick, Richard Lovelace, Sir John Suckling, and Thomas Carew

cavalla (kavā'lā) see POMFANO

Cavalli, Pietro Francesco (pyē'trō franchēs'kō kaval'lē), 1602?-76, Italian composer, whose real name was Caletti-Bruni, pupil of Monteverdi, whom he succeeded as choirmaster of St Mark's, Venice He wrote many operas, including *Didone* (1641), *Giason* (1649), *Serse* (1654), and *Ercole Amante* (1662), all of which show the full development of the bel canto aria

Cavallini, Pietro (pyē'trō kaval'lē'nē), c 1250-c 1330, Italian painter and mosaicist Working in a classical style, he had an important influence on the art of Cimabue and Giotto His surviving works are frescoes in Santa Cecilia, Rome, and in Santa Maria Donnaregina, Naples He designed some beautiful mosaics in the Church of Santa Maria in Trastevere, Rome

cavalry, part of a military force, consisting of mounted troops trained to fight from horseback Cavalry was used by the ancient Egyptians, but it was more extensively employed by the ancient Hittites, Assyrians, Babylonians, and Persians Some of the Greek city-states had mounted troops, but the typical Greek force was heavy infantry The Romans also employed cavalry Horsemen were particularly useful in scouting and in pursuit of a routed enemy but remained at a disadvantage against well-disciplined infantry until saddles were introduced (4th cent AD) in the time of Constantine I The wide and expert use of cavalry in Europe came with the invaders from the East, the Huns, Avars, Magyars, and Mongols In medieval Europe the mounted knight became the typical warrior, and cavalry dominated in the incessant small wars With the re-introduction of mass fighting at the end of the Middle Ages, infantry came to the fore again The use of firearms did much to enhance the importance of infantry, but horsemen remained valuable for their rapid striking power and mobility Cavalry was prominent in the armies of Louis XIV and Frederick II (Frederick the Great), and particularly under Napoleon the cavalryman became the elite of the fighting forces, although most of the actual fighting was done by the infantry Gaily uniformed cuirassiers, dragoons, hussars, and lancers were prominent in European armies of the 19th cent, and most of these forces were recruited from the nobility and the landed gentry Cavalry was of great value during the 19th cent on the African, American, and British-Indian frontiers, where mobility was essential in fighting lightly armed natives It was also much used in the US Civil War However, the value of cavalry, already diminished by the development of rifles, plummeted with the introduction of machine guns and other automatic weapons at the end of the 19th cent In World War I, because of the trench warfare, horsemen were used only in small numbers on the plains of E Europe and the Middle East Cavalry was employed against Germany at the beginning of World War II by the Polish and Soviet armies However, it finally disappeared as a force in modern warfare when highly mobile tank units were introduced In 1946 the US army abolished the cavalry as a separate arm of the service, merging what remained of it with the armored forces See J D Lunt, *Charge to Glory* (1960), G C Anglesey, *A History of the British Cavalry* (vol 1, 1973)

Cavan (kāv'an), county (1971 pop 52,674), 730 sq mi (1,891 sq km), N Republic of Ireland The county town is Cavan It is a hilly region of lakes (Lough Oughter chief among them) and bogs, and the climate is extremely damp and cool Most of the soil is clay The Erne is the principal river, and the Shannon has its source in Cavan Pastoral agriculture is the chief occupation, very little land is under cultivation, and that mostly in very small farms Manufactures are negligible Cavan was organized as a shire of Ulster prov in 1584

Cavan, urban district (1971 pop 3,268), county town of Co Cavan, N Republic of Ireland It is a farm market and the seat of the Roman Catholic and Anglican dioceses

Cave, Edward, 1691-1754, English publisher He founded (1731) the *Gentleman's Magazine*, the first modern magazine in English Cave gave Samuel Johnson his first regular literary employment when he printed (1741-44) Johnson's parliamentary reports, "Debates in the Senate of Magna Lilliputia," in his periodical Later Cave published other works by Johnson

cave, a hollow, either above or below ground Caves may be formed by the chemical and mechanical action of a stream upon soluble or soft rock, of rainwater seeping through soluble rock to the groundwater level, or of waves dashed against a rocky shore Volcanic action (accompanied by the formation of gas pockets in lava or the melting of ice un-

der lava) and earthquakes or other earth movements are also sources of cave formation Limestone regions almost invariably have caves, some of these are notable for their STALACTITE AND STALAGMITE formations or for their magnitude and unearthly beauty Some caves were the means of preserving both the remains of prehistoric man and animals and indications of man's early culture Speleology, the scientific study of caves and their plant and animal life, contributes to knowledge of biological adaptation and evolution Some cave animals lack sight, and both plants and animals living where light is excluded show loss of pigment Among famous caves in the United States are Carlsbad Caverns National Park (N Mex.), Mammoth Cave National Park (Ky.), and Wind Cave National Park (Black Hills, S Dak.), Luray Caverns (Va.), and Wyandotte Cave (Ind.) In Europe there are celebrated caves in Belgium, Dalmatia, Gibraltar, Capri, Sicily, Pistoia, and England (Kent's Cavern and Kirkdale) The caves of the Pyrenees and the Dordogne are famed for their prehistoric paintings (see PALEOLITHIC ART), and those of Ajanta, India, and Tunhwang, China, for their Buddhist frescoes Fingal's Cave in the basalt of the Hebrides off Scotland is one of the many caves about which there are legends The caves of Iceland and Hawaii are volcanic See CAVE DWELLER See C E Mohr and T L Poulson, *The Life of the Cave* (1966), D R McClurg, *The Amateur's Guide to Caves and Caving* (1973)

cave art: see PALEOLITHIC ART, ROCK CARVINGS AND PAINTINGS

Cavedone, Giacomo (ja'kōmō kavādō'nā), 1577-1660, Italian painter, of the Bolognese school He assisted Guido Reni in Rome, but his reputation as a master of color and composition was won through his paintings in the churches of Bologna His paintings were strong in naturalistic detail and reflected Venetian influence *Virgin and Child with SS Alo and Petronius* is in the Pinacoteca Nazionale in Bologna

cave fish, common name for blind, cave-dwelling fishes of the family Amblyopsidae The Amblyopsidae are whitish fish, up to 5 in (13 cm) long With the exception of a single species, all members of the family live in the limestone cave region of the Mississippi basin The three species that live in caves have nonfunctioning rudimentary eyes The other two species, the springfish and the ricefish (or rice-ditch killifish), have small, functional eyes The ricefish, which superficially resembles the toothed minnows, is found in streams and swamps of the SE United States The cave fish and their relatives are classified in the phylum CHORDATA, subphylum Vertebrata, class Osteichthyes, order Cyprinodontiformes, family Amblyopsidae

Cavell, Edith (kāv'əl), 1865-1915, English nurse When World War I broke out, she was head of the nursing staff of the Berkendael Medical Institute in Brussels In 1915 she was arrested by the German occupation authorities and pleaded guilty to a charge of harboring and aiding Allied prisoners and assisting some 130 to cross the Dutch frontier She was shot Oct 11, 1915, despite the efforts of Brand Whitlock, US minister to Belgium, to secure a reprieve See biography by A E Clark-Kennedy (1965)

Cavendish (kāv'əndīsh), pseud of Henry Jones, 1831-99, English card game expert Jones studied medicine, practiced in London, and retired in 1868 He became a leading authority on card games and was the first man to formulate a system of playing whist He was the author of *Principles of Whist Stated and Explained by "Cavendish"* (1862) and later wrote books on piquet, écarté, billiards, lawn tennis, and croquet

Cavendish, Lord Frederick Charles see PHOENIX PARK MURDERS

Cavendish, George, 1500-1561?, English gentleman, usher to Cardinal Wolsey His biography of Wolsey, written in 1557, remained in manuscript until 1641 and first appeared in entirety in Christopher Wordsworth's *Ecclesiastical Biography* (1810) One of the great books of the English Renaissance, the work imparts tragic stature to Wolsey's life by contrasting the splendor of his early career with the ignominy of his last days The book was long attributed to Cavendish's brother William, but in 1814 Joseph Hunter clearly established its authorship See W Singer, ed., *The Life of Cardinal Wolsey* (1825)

Cavendish, Henry, 1731-1810, English physicist and chemist, b Nice He was the son of Lord Charles Cavendish and grandson of the 2d duke of Devonshire He was a recluse, and most of his writings were published posthumously His great contributions to science resulted from his many accurate experiments in various fields His conclusions were re-

markedly original. His chief researches were on heat, in which he determined the specific heats for a number of substances (although these heat constants were not recognized or so called until later), on the composition of air, on the nature and properties of a gas that he isolated and described as "inflammable air" and that Lavoisier later named HYDROGEN, and on the composition of water, which he demonstrated to consist of oxygen and his "inflammable air." In his *Electrical Researches* (1879) he anticipated some of the discoveries of Coulomb and Faraday. His experiments to determine the density of the earth led him to state it as 5.48 times that of water. His *Scientific Papers* were collected in two volumes (*Electrical Researches and Chemical and Dynamical*) in 1921. See biography by A. J. Berry (1960), J. G. Crowther, *Scientists of the Industrial Revolution* (1963).

Cavendish, Thomas, 1560-92, English navigator. He commanded a ship in the flotilla under Sir Richard Greenville sent (1585) by Sir Walter Raleigh to establish the first colony in Virginia. In 1586, in command of three vessels, he sailed from England on a voyage round the world (the third to be made), crossing from the coast of W. Africa to Patagonia, where he discovered a fine harbor that he named Port Desire. He ravaged Spanish towns and shipping on the west coast of South America and thence continued his journey by way of the Philippines, East Indies, and Cape of Good Hope, returning to England in 1588 after a voyage of more than two years. A second circumnavigation that commenced in 1591 ended disastrously, his fleet of five ships was dispersed, and he died at sea.

Cavendish, William: see NEWCASTLE, WILLIAM CAVENDISH, DUKE OF.

Cavendish Laboratory: see CAMBRIDGE UNIV.

Caventou, Joseph Bienaimé (zhōzé'f' byāNnāmā' kāvāNtō'), 1795-1877, French chemist. He was professor at the École de Pharmacie, Paris. With P. J. Pelletier he isolated quinine (from cinchona bark), strychnine, and brucine and studied the green pigment in plants (which they named chlorophyll).

Caves of the Thousand Buddhas: see TUN-HUANG. **caviar** or **caviare** (kāvē'ār), the roe (eggs) of various species of sturgeon prepared as a piquant table delicacy, especially in the Soviet Union and Iran. The ovaries of the fish are beaten to loosen the eggs, which are then freed from fibers, fat, and membrane by being passed through a sieve. The liquid is pressed off, and the eggs are mildly salted and sealed in small tins or kegs. Fresh caviar (the unripe roe), made in winter from high-grade eggs, is scarce and consequently expensive, especially when imported. Less choice varieties are cured with 10% salt. The eggs, black, green, brown, and the rare yellow or gray, may be tiny grains or the size of peas. The caviar in the Soviet Union comes chiefly from the vicinity of the Black and Caspian seas and from the Danube provinces. In the United States an imitation of sturgeon caviar is produced from the roe of other fish, such as paddlefish, whitefish, cod, and salmon.

Cavite (kāvē'tā), city (1970 est. pop. 77,100), Cavite prov., SW Luzon, the Philippines. The city, situated on a small peninsula in Manila Bay, has been important as a naval base and trade center since the days of the Spanish. In the Spanish-American War it was captured by Dewey on May 1, 1898. The United States established a major naval base at Sangley Point just opposite the city proper. In World War II this base was bombed (Dec. 10, 1941) by the Japanese and virtually destroyed—a major blow to the defense of the Philippines. After the Philippines acquired independence it was agreed (1947) that the United States would retain the base for a 99-year period, subsequent negotiations reduced the time to 25 years, beginning in 1967. The Philippine government also maintains a naval school center at Cavite.

Cavour, Camillo Benso, conte di (kāmə'lō bān'sō kōntā dē kāvōr'), 1810-61, Italian statesman, premier (1852-59, 1860-61) of Sardinia (see SARDINIA, KINGDOM OF). The active force behind King VICTOR EMANUEL II, he was responsible more than any other man for the unification of Italy under the house of Savoy (see RISORGIMENTO). Of a noble Piedmontese family, he entered the army early but came under suspicion for his liberal ideas and was forced to resign in 1831. He then devoted himself to travel, agricultural experimentation, and the study of politics. In 1847 he founded the liberal daily, *Il Risorgimento*, through which he successfully pressed King Charles Albert of Sardinia to grant a constitution to his people and to make war on Austria in 1848-49. A member of parliament briefly in 1848 and again in July of the following year, he became minister of

agriculture and commerce (1850), finance minister (1851), and premier (1852). As premier, he aimed at making the kingdom of Sardinia the leading Italian state by introducing progressive internal reforms. Having reorganized the administration, the financial and legal system, industry, and the army, he won for Sardinia prestige and a place among the powers through participation in the Crimean War (1855). Conscious of the failures of the 1848-49 revolution, Cavour probably did not believe that the creation of a unified Italy was feasible within his lifetime, until at least 1859 he strove rather for an aggrandized Italian kingdom under the house of Savoy. To achieve this goal he wooed foreign support against Austrian domination. In 1858, by an agreement reached at Plombières, he won the backing of Emperor Napoleon III of France for a war against Austria, promising in exchange to cede Savoy and possibly Nice to France. Austria was maneuvered into declaring war (1859), but Cavour refused to accept the separate armistice of VILLAFRANCA DI VERONA between France and Austria. He resigned the premiership but returned to office in 1860. In that year Tuscany, Parma, Modena, and the Romagna voted for annexation to Sardinia, and Giuseppe GARIBOLDI overran the Two Sicilies. Cavour, taking advantage of the auspicious circumstances for Italian unification, sent Sardinian troops into the Papal States, which, with the exception of Latium and Rome, were soon annexed to Sardinia. By his superior statesmanship Cavour convinced Garibaldi to relinquish his authority in the south and avoided foreign intervention in favor of the dispossessed rulers and of the pope, whose interests he professed to be safeguarding. The annexation (1860) of the kingdom of the Two Sicilies was consummated with the abdication (1861) of Francis II. Cavour's labors were crowned two months before his death, when the kingdom of Italy was proclaimed under Victor Emmanuel II. See studies by D. Mack Smith (1954 and 1971), Massimo Salvadori, *Cavour and the Unification of Italy* (1961).

cavy (kā'vē), name for several species of South American rodents of the family Caviidae, including the domestic GUINEA PIG. The wild cavy is usually small, rounded, and tailless, with fur of a uniform shade of brown. Nocturnal animals, they occupy a variety of habitats, especially dense vegetation. An unusual, large species is the Patagonian cavy, or mara (*Dolichotis patagonum*), a long-legged, hare-like animal that reaches a length of about 2½ ft (76 cm) and lives in arid regions. The CAPYBARA belongs to a related family. Some cavy is hunted for food in South America. Cavy is classified in the phylum CHORDATA, subphylum Vertebrata, class Mammalia, order Rodentia, family Caviidae.

Cawdor (kō'dər), village, Nairnshire, NE Scotland, SW of Nairn. Cawdor Castle, whose earliest construction dates from 1454, was represented by Shakespeare, following tradition, as the scene of the slaying (1040) of Duncan by MACBETH. In 1975, Cawdor became part of the Highland region.

Cawnpore, India: see KANPUR.

Caxias do Sul (kashē'ash dōō sōōl), city (1970 pop. 144,284), Rio Grande do Sul state, S Brazil. It is an important metallurgical center and has the most extensive vineyards in Brazil. There is little agriculture because of the rough terrain. The city was founded in 1875.

Caxton, William, c.1421-1491, English printer, the first to print books in English. He served apprenticeship as a mercer, and from 1463 to 1469 was at Bruges as governor of the Merchants Adventurers in the Low Countries, serving as a diplomat for the English king. He learned printing in Cologne in 1471-72, and at Bruges in 1475 he and Colard Mansion printed *The Recuyell of the Histories of Troye*, his own translation from the French, and the first book printed in English. In 1476 he returned to England, and at Westminster in 1477 he printed *Dictes or Sayengis of the Philosophres*, the first dated book printed in England. Caxton is known to have printed about 100 books, many dealing with themes of chivalry. He was the translator, from French, Latin, and Dutch, of about one third of the books that he printed, and for some he wrote original prologues, epilogues, and additions. His books are of superb craftsmanship and are carefully edited. One of the typesets used by Caxton is the original Old English type. The size of this type of Caxton's (14 point) is known as English WYNNYN DE WORDE, his successor as a printer, was his assistant at Westminster, and the printers Richard Pynson and Robert Copland refer to Caxton (possibly figuratively) as their master. See biographies by N. S. Auer (1926, repr. 1965),

H. R. Plomer (1925, repr. 1968), N. F. Blake (1969), and William Blades (1877, repr. 1971).

Cayenne (kiēn', kāēn'), city (1967 pop. 19,668), capital of FRENCH GUIANA, on Cayenne island at the mouth of the Cayenne River. The city has a shallow harbor, and deep-draft ships must anchor some distance out. Timber, rum, essence of rosewood, and gold are exported. Cayenne was founded by the French in 1643, but it was wiped out by an Indian massacre and was not resettled until 1664. Throughout the 17th cent. the city and its surrounding region were sharply contested by Great Britain, France, and the Netherlands. It was occupied (1808-16) by both the British and the Portuguese. From 1851 to 1946 the city was the center of French penal settlements in Guiana, and part of its population is made up of prisoners' descendants. Cayenne's development has long been hindered by internal strife, a hot, wet climate, and the prevalence of disease. In the city are the Pasteur Institute, which specializes in the study of tropical diseases, and several buildings from the colonial period. The city gives its name to cayenne pepper, a very sharp condiment found on the island in abundance.

Cayes, Haiti: see AUX CAYES.

Cayey (kiā'), town (1970 pop. 21,562), SE Puerto Rico, in the Sierra de Cayey Mts. It is a sugar, tobacco, and poultry center and a summer resort. Cigars and clothing are manufactured. Cayey was founded in 1774. Outside the town is a U.S. military reservation, Henry Barracks.

Cayley, Arthur (kā'lē), 1821-95, English mathematician. He was admitted to the bar in 1849. In 1863 he was appointed first Sadlerian professor of mathematics at Cambridge. His researches, which covered the field of pure mathematics, included especially the theory of matrices and the theory of invariants. The algebra of matrices was the tool Heisenberg used in 1925 for his revolutionary work in quantum mechanics. The concept of invariance is important in modern physics, particularly in the theory of relativity. Cayley's collected papers were published in 13 volumes (1889-98).

Cayley, Sir George, 1773-1857, British scientist. He is recognized as the founder of aerodynamics on the basis of his pioneering experiments and studies of the principles of flight. He experimented with wing design, distinguished between lift and drag, and formulated the concepts of vertical tail surfaces, steering rudders, rear elevators, and air screws. Although powered flight was impossible in his time because of the lack of an engine with a high enough power-to-weight ratio, he was able to calculate the power required for different speeds and loads. Cayley was also a founder of the Regent Street Polytechnic, London.

Caylus, Anne Claude Philippe de Tubières, comte de (ān klōd fēlēp' də tūbyēr' kōN də kālūs'), 1692-1765, French archaeologist and antiquarian. Caylus learned drawing from Watteau. He traveled in Europe and Asia and became known as an etcher and as a patron of the arts. He was the champion of classical purity and influenced the development of the Louis XVI style. He is said to have initiated the scientific study of the antique. His collections are in the Louvre. *Caylus's Recueil d'antiquités égyptiennes, étrusques, grecques, romaines, et galloises* (7 vol., 1752-67) is the major 18th-century work of antiquarian scholarship; it did much to encourage interest in and study of classical subjects.

Caylus, Marie Marguerite, comtesse de (māre mārghārēt' kōNtēs' də), 1673-1729, French writer and actress. A noted beauty and wit, she was lauded for her performance at Saint-Cyr in Racine's *Esther*. Her *Souvenirs* (1770), edited by Voltaire, describe the court of Louis XIV with vivacity and taste.

Cayman Islands (kā'mən), archipelago (1970 pop. 10,249), 100 sq mi (259 sq km), British West Indies. Georgetown, the capital and chief port, is on Grand Cayman, the other islands are Little Cayman and Cayman Brac. The inhabitants, who are of mixed European and black African descent, engage in shipbuilding, turtle and shark fishing, coconut raising, and lumbering; exports include green turtles, turtle shells, shark skins, coconuts, and dyewood. Tourism is also a major industry. The islands were discovered by Christopher Columbus in 1503.

Cayuga Indians: see IROQUOIS CONFEDERACY.

Cayuga Lake (kāyōō'gə, kī-, kə-), 38 mi (61 km) long and 1 to 3.5 mi (1.6-5.6 km) wide, W central N.Y., longest of the Finger Lakes. It is connected by canal and by the Seneca River with the Barge Canal to the north. Cornell Univ. and Wells College overlook Cayuga's clifflike banks. Near the southern end of the lake are Taughannock Falls, 215 ft (66 m) high.

cayuse (kīyōōs') see MUSTANG

Cayuse Indians (kīyōōs'), North American Indians who formerly occupied parts of NE Oregon and SE Washington. They were closely associated with the Nez Perce. They spoke a language belonging to the Sahaptin-Chinook branch of the Penutian linguistic stock (see AMERICAN INDIAN LANGUAGES). A mission was established (1836) among them by Marcus WHITMAN called Waiilatpu. In 1847 the Cayuse, blaming the missionaries for an outbreak of smallpox, attacked the mission and killed the Whitmans and their helpers. The settlers then declared war and subdued the Cayuse. In 1855 they were placed on the Umatilla Reservation, which they continue to share with the Wallawalla and Umatilla Indians, by the 1970s they numbered about 650. A small horse bred by them gave the name cayuse to all Indian ponies. See R. H. Ruby and J. A. Brown, *The Cayuse Indians* (1972).

Cb, formerly chemical symbol of the element columbium, now called NIOBIUM

Cd, chemical symbol of the element CADMIUM

CDP (cytidine diphosphate) see CYTOSINE

Ce, chemical symbol of the element CERIUM

Ceanannus Mor or Kells, urban district (1971 pop. 2,395), Co. Meath, NE Republic of Ireland, on the Blackwater River. It is a market town and was once a royal residence for Irish kings. Noteworthy are the relic of an ancient monastery founded in the 6th cent. by St. Columba, the round tower, and several ancient crosses. *The Book of Kells*, now one of the treasures of the Trinity College library in Dublin, is a beautifully illuminated manuscript of the Latin Gospels, with notes on local history, found in the ancient monastery and believed to have been written in the 8th cent. The manuscript is generally regarded as the finest example of Celtic illumination.

Ceará (sē'arā'), state (1970 pop. 4,366,970), 57,149 sq mi (148,015 sq km), NE Brazil, on the Atlantic Ocean. FORTALEZA (sometimes called Ceara) is the capital.

Ceausescu, Nicolae (nēkōlī' choushēs'kōō), 1918–, Rumanian statesman. The son of a peasant, he early became active in the Rumanian Communist movement and was arrested as a revolutionary, he spent the late 1930s and early 40s in prison, where he became acquainted with the future first secretary of the Rumanian Communist party, Gheorghe Gheorghiu-Dej. Escaping in 1944, Ceausescu held a variety of posts within Communist party and government ranks after the Communist takeover in 1948. He soon became a member of the party's central committee and then, in 1955, a member of the politburo. Upon Gheorghiu-Dej's death in March, 1965, he was chosen first secretary of the central committee of the Communist party and continued his mentor's policy of nationalism and independence from the USSR within the context of Marxism-Leninism. He promoted closer relations with the People's Republic of China and with the West, as well as industrial and agricultural development. In Dec., 1967, he assumed the office of president of the state council, or head of state.

Cebu (sābōō'), island (1970 pop. 1,632,642), 1,702 sq mi (4,408 sq km), one of the Visayan Islands, the Philippines, between Leyte and Negros. The coastal plains are intensely cultivated and densely populated. The island is a leading peanut and corn producer, rice, sugarcane, coconuts, and hemp are also grown. There are major coal and copper deposits. Fertilizer is made from local pyrite. Magellan landed on the island in 1521, the wooden cross he planted is a major tourist attraction. The island, with several small adjacent islands, comprises Cebu province, the capital of which is the city of Cebu (1970 pop. 342,116), the second (after Manila) most important harbor and city in the Philippines. With its excellent port, which handles both interisland and overseas shipping, it is the trade and manufacturing center of the Visayan Islands. The city has sugar mills, cement factories, shipyards, metalworks, and automobile repair and assembly plants. The first permanent Spanish settlement in the Philippines, it was founded in 1565 as San Miguel by Lopez de Legaspi, it was capital of the Spanish colony until 1571. As a major Japanese base in World War II, it was largely destroyed by U.S. bombs. It has been rebuilt and today is a charming mixture of old and new, East and West. A Roman Catholic archdiocese, it has a bishop's palace, a cathedral, and a church with a jewel-encrusted gold statue of the Holy Child, said to have been given by Magellan. Cebu is the seat of the Univ. of San Carlos (1595), the Univ. of the Southern Philippines, the Univ. of the Visayas, Southwestern

Univ., an institute of technology, several colleges, and many private schools.

Cecco d'Ascoli (chēk'kō das'kōlē), 1269?–1327, Italian astrologer, mathematician, poet, and physician, whose real name was Francesco degli Stabili, b. Ascoli. A teacher of astrology at several institutions in Italy, he was professor of mathematics and astrology at the Univ. of Bologna (1322–24). He was denounced as heretical largely because, in defending astrology against Dante's attack on it in the *Divine Comedy*, Cecco himself had accused the great poet of heresy, he was burned at the stake. His chief work was *L'acerba*, an allegorical didactic poem of encyclopedic range.

Čech, Svatopluk (svā'tōploōk chēkh), 1846–1908, Czech poet and novelist. His strong Pan-Slavism and his love for democracy and freedom won him great popularity. His political enthusiasms animate many of his writings. Among Čech's major epics are *The Adamites* (1873), *Žižka* (1879), and *Václav of Michalovice* (1880). He also wrote idyllic verse on Czech country life, notably *In the Shade of the Linden Tree* (1879), and satirical novels, including the utopian *Excursion of Mr. Brouček to the Moon* (1886).

Cecil, Lord David (Lord Edward Christian David Gascoyne Cecil), 1902–, English biographer. He was professor of English literature at Oxford (1948–70). Cecil's works are all distinguished for their astuteness as well as for their sound scholarship. His masterpiece is his life of Lord MELBOURNE, published in two volumes, *The Young Melbourne* (1939) and *Lord M* (1954). His other works include *Sir Walter Scott* (1933), *Jane Austen* (1935), *Walter Pater: Scholar Artist* (1955), and *Max* (1964), a study of Max Beerbohm. *The Cecils of Hatfield House, an English Ruling Family* (1973) is about his own family.

Cecil, Edgar Algernon Robert, 1st Viscount Cecil of Chelwood (sēs'al), 1864–1958, British statesman, known in his earlier life as Lord Robert Cecil, 3d son of the 3d marquess of Salisbury. A Conservative who held several ministerial posts, Cecil gained fame largely through untiring advocacy of internationalism. In 1919 he collaborated with U.S. President Woodrow Wilson in drafting the Covenant of the League of Nations. He was created a viscount in 1923 and awarded the Nobel Peace Prize in 1937. See his autobiography, *A Great Experiment* (1941).

Cecil, Robert: see SALISBURY, ROBERT CECIL, 1ST EARL OF CECIL, Robert Arthur Talbot Gascoyne-: see SALISBURY, ROBERT ARTHUR TALBOT GASCOYNE-CECIL, 3D MARQUESS OF

Cecil, William: see BURGHLEY, WILLIAM CECIL, 1ST BARON

Cecilia, Saint, 2d or 3d cent., Roman virgin martyr. An ancient and famous account of her life is factually valueless. As patron of music, she is represented at the organ. St. Cecilia is the subject of one of the *Canterbury Tales*, of a song by Dryden, and an ode by Pope. Cecily is an English form of her name. Feast Nov. 22.

Cecrops (sē'krōps), in Greek mythology, founder and first king of Athens. A primeval being, he was half man and half serpent. As a maker of laws, he abolished human sacrifice, established monogamy, and initiated burial of the dead.

cecum (sē'kam) see INTESTINE

cedar, common name for a number of trees, mostly coniferous evergreens. The true cedars belong to the small genus *Cedrus* of the family Pinaceae (PINE family). All are native to the Old World from the Mediterranean to the Himalayas, although several are cultivated elsewhere as ornamentals, especially the cedar of Lebanon (*C. libani*). This tree, native to Asia Minor and North Africa, is famous for the historic groves of the Lebanon mts., frequently mentioned in the Bible. The wood used in building the Temple and the house of Solomon (1 Kings 5, 6, and 7) may, however, have been that of the deodar cedar (*C. deodora*), native to the Himalayas. It has fragrant wood, durable and fine grained, and is venerated by the Hindus, who call it Tree of God. The name cedar is used (particularly in North America, where no cedars are native) for other conifers, e.g., the JUNIPER (red cedar), ARBORVITAE (white cedar), and others of the family Cupressaceae (CYPRESS family). Several tropical American trees of the genus *Cedrela* of the mahogany family are also called cedars. True cedars are classified in the division PINOPHYTES, class Pinopsida, order Coniferales, family Pinaceae.

Cedar Breaks National Monument: see NATIONAL PARKS AND MONUMENTS (table)

Cedar Creek, small tributary of the North Fork of the Shenandoah River, N of Strasburg, N Va. It was

the scene of a Civil War battle (Oct. 19, 1864) in which Union general P. H. Sheridan defeated J. A. Early.

Cedar Falls, city (1970 pop. 29,597), Black Hawk co., N Iowa, on the Cedar River, inc. 1854. It developed as a milling center in the late 19th cent. after the coming of the railroad. Its manufactures include pumps, farm machinery, tools and dies, golfing equipment, and refuse disposal equipment. Cedar Falls is the seat of the Univ. of Northern Iowa and of the Evangelical Campgrounds, scene of the annual Interdenominational Bible Conference.

Cedar Mountain: see BULL RUN, SECOND BATTLE OF

Cedar Rapids, city (1970 pop. 110,642), seat of Linn co., E central Iowa, on the Cedar River, inc. as a city 1856. It is named for the surging rapids in the river. One of Iowa's principal commercial and industrial cities, Cedar Rapids is a distribution and rail center for an extensive agricultural area. The city's major manufactures are cereals, communications equipment, farm and road machinery, syrup, plastic products, trampolines and other gymnastic equipment. Coe College, Mt. Mercy College, and Kirkwood Community College are there. Points of interest include a large Masonic library (1884), an art museum with a collection by the American artist Grant Wood, and the landscaped Municipal Island, a strip of land in the main channel of the Cedar River, on which the municipal building and a neoclassical war memorial are located. The Duane Arnold Energy Center, the first nuclear powered generator in Iowa, is in Cedar Rapids.

cedar waxwing: see WAXWING

Cedron (sē'drən) 1 The same as KIDRON. 2 Place, near Jamnia, fortified against the Maccabees. 1 Mac 15:39–41, 16:9.

Cefalù (chāfalōō'), town (1971 pop. 12,062), N Sicily, Italy, a port on the Tyrrhenian Sea. It is a commercial and fishing center and a seaside resort. Formerly known as Cephaloedium, it made an alliance with Carthage in 396 B.C. The town was later taken by the Arabs (mid-9th cent. A.D.) and the Normans (11th cent.). Its famous cathedral, started in 1131 by King Roger II, is one of the finest examples of Norman architecture in Sicily.

Cegled (tsēg'lād), city (1970 pop. 38,082), central Hungary. It is a road and rail hub and a trade center for agricultural products.

Ceiba, La (la sā'ba), city (1961 pop. 24,863), N Honduras, capital of Atlantida dept., on the Caribbean Sea. It is the commercial and processing center of a rich agricultural region. Coconuts and citrus fruits are exported. The city was Honduras's main banana port until disease ruined the surrounding plantations in the 1930s. La Ceiba is located at the foot of Peak Bonito (5,000 ft/1,524 m), has fine beaches, and is a departure point for the Bay Islands. More than 1,000 people were killed when the city was struck (1974) by Hurricane Fifi.

ceiling balloon: see WEATHER BALLOON

ceiometer (sēlōm'ītār), in aviation and meteorology, automatic instrument used to record ceiling, i.e., the altitude of the lowest cloud layer covering more than half of the sky. The ceiometer consists essentially of a projector, a detector, and a recorder. The projector emits an intense beam of light into the sky. The detector, located at a fixed distance from the projector, uses a photoelectric cell to detect the projected light when it is reflected from clouds. In the fixed-beam ceiometer, the light is beamed vertically into the sky by the projector and the detector is aligned at various angles to intercept the reflected light. In the rotating-beam ceiometer, the detector is positioned vertically and the light projected at various angles. In either case, trigonometry is used to determine the altitude of the clouds reflecting the light from a knowledge of the angle at which the light is detected and the distance between the projector and detector. The recorder is calibrated to indicate cloud height directly. False readings from extraneous light sources are reduced by modulating the projected light beam so that it can be recognized when it is reflected.

Cela, Camilo José (kamē'lō hōsā' thā'la), 1916–, Spanish novelist, short-story writer, and poet, b. Iria Flavia. Among the writers to emerge after the Spanish civil war, he won critical acclaim with the novel *La familia de Pascual Duarte* (1942, tr. *The Family of Pascual Duarte*, 1964). Its brutal realism and crudeness of language are characteristic of Cela's style. His other novels include *La colmena* (1951, tr. *The Hive*, 1953) and *Mrs. Caldwell habla a su hijo* (1953, tr. *Mrs. Caldwell Speaks to Her Son*, 1968). See studies by D. W. Foster (1967) and D. W. McPheeters (1969).

Celaenae (sil'ē'nē), ancient city of Asia Minor, in Phrygia, near the source of the Maeander River, in present-day W central Turkey. In the days of the Persian Empire, Cyrus the Great had a palace there, and Xerxes I built a fort. Alexander the Great conquered the city in 333 B.C. Seleucus I moved the inhabitants to neighboring Apamea. Modern Dinar is on the site.

Čelakovský, František (fran'tishěk chě'lakófskī), 1799-1852, Czech folklorist and poet. A disciple of Herder and a romantic Pan-Slavist, he collected Slavic folk songs from 1822 to 1827. These he later imitated in his own intricate free verses, *Echoes of Russian Song* (1829) and *Echoes of Czech Song* (1830). At Breslau he became (1841) the first professor of Slavic languages in a Central European university.

celandine, see POPPY

Celano, Thomas of: see THOMAS OF CELANO

Celaya (sā'lā'yā), city (1970 pop. 143,703), Guanajuato state, W central Mexico. In a region watered by the Lerma irrigation works, Celaya is the center of a prosperous bean, maize, and cereal growing area. Cattle raising and the associated dairy industry are also important. Founded in 1571, Celaya was frequently involved in Mexican wars. It was the first city to be captured (Sept. 28, 1810) by Hidalgo y Costilla. In 1915, Álvaro Obregón decisively defeated Francisco Villa at Celaya.

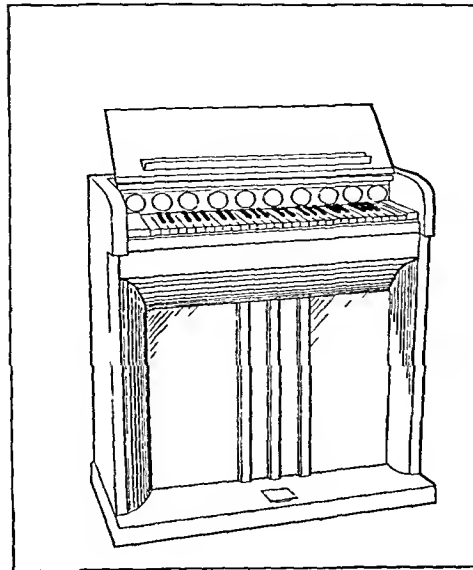
Celebes (sē'lā'bēs) or **Sulawesi** (sōō'lāwā'sē), island (1970 est. pop., including offshore islands, 8,925,000), c. 73,000 sq mi (189,070 sq km), largest island in E Indonesia, E of Borneo, from which it is separated by the Makasar Strait. MAKASAR is its chief city and port; other important towns are Manado, Gorontalo, and Palopo. Extremely irregular in shape, it comprises four large peninsulas separated by three gulfs—Tomini on the northeast, Tolo on the southeast, and Boni on the south. The terrain is almost wholly mountainous, with many active volcanoes. Mt. Rantemario (11,286 ft/3,440 m) and Mt. Rantekombola (11,335 ft/3,455 m) are the highest peaks. There are numerous lakes, of which Towuti is the largest and Tondano, with its waterfall, is the most beautiful. Asian and Australian elements are mingled in the fauna, which includes the babirusa (resembling swine), the small wild ox called anoa (found only in the Celebes), the baboon, some rare species of parrot, and a large number of crocodiles. Valuable stands of timber cover much of the island; many forest products are exported. Mineral resources include nickel, gold, diamonds, sulfur, and low-grade iron ore. The mountainous terrain, with only a few narrow coastal plains, limits agriculture; many inhabitants seek their livelihood from the sea, and there are trepang and mother-of-pearl industries. Celebes is, however, a major source of copra for the country, and corn, rice, cassava, yams, tobacco, and spices are grown. The inhabitants are Malayan, except for some primitive tribes in the interior. The largest ethnic group are the Makasarese-Bugis, who are renowned as seafaring traders; they are Muslim. In the north are the Minahassa, who are Christian. The Portuguese first visited the Celebes in 1512. The Dutch expelled the Portuguese in the 1600s and conquered the natives in the Makasar War (1666-69). In 1950, Celebes became one of 10 provinces of the newly created republic of Indonesia; it has since been divided into 4 provinces. The Univ. of North and Central Sulawesi is in Manado, and private universities are in Manado, Gorontalo, and Makasar. The Celebes Sea is north of the island, between it and the Philippines.

Celebrezze, Anthony Joseph (sālabrē'zē), 1910-, U.S. Secretary of Health, Education, and Welfare (1962-65), b. Anzi, Italy. He was taken to the United States as a child. He later practiced law in Cleveland before being elected (1951) to the Ohio state senate. A Democrat, he was elected mayor of Cleveland in 1953 and was reelected four times. In the 1961 election he received almost three quarters of the total vote and carried every ward in the city. President John F. Kennedy appointed him to the cabinet in 1962 to succeed Abraham A. Ribicoff. He resigned in 1965 to become a U.S. circuit court judge.

celery, biennial plant (*Apium graveolens*) of the family Umbelliferae (CARROT family), of wide distribution in the wild state throughout the north temperate Old World and much cultivated also in America. It was first cultivated as a medicinal, then (during the Middle Ages) as a flavoring, and finally as a food, chiefly for soups and salads. The seeds are still used for seasoning. Celery is a variety cultivated chiefly in N Europe for the large edible turnip-like root. Celery is classified in the division MAGNO-

LIOPHYTA, class Magnoliopsida, order Umbellales, family Umbelliferae.

celesta (sil'ē'stā), keyboard musical instrument patented in 1886 by Auguste Mustel of Paris. It consists of a set of steel bars fastened over wood resonators and struck by hammers operated from the keyboard.



Celesta

The compass is four octaves upward from middle C. Its tone is delicate and ethereal. Tchaikovsky, in his *Nutcracker Suite*, was one of the first composers to write for it.

celestial coordinate system: see ECLIPTIC COORDINATE SYSTEM

celestial equator: see EQUATORIAL COORDINATE SYSTEM

celestial horizon, one axis of the HORIZON COORDINATE SYSTEM. It is the great circle on the celestial sphere midway between the observer's zenith and nadir; it divides the celestial sphere into two equal hemispheres. The observer may be unable to see all the stars that lie above his celestial horizon because of obstructions such as buildings, trees, or mountains; he may be able to see some stars that lie below his celestial horizon because of atmospheric refraction.

celestial mechanics, the study of the motions of astronomical bodies as they move under the influence of their mutual GRAVITATION. Celestial mechanics analyzes the orbital motions of planets, comets, asteroids, and natural and artificial satellites within the solar system as well as the motions of stars and galaxies. Newton's laws of motion and his theory of universal gravitation are the basis for celestial mechanics. Calculating the motions of astronomical bodies is a complicated procedure because many separate forces are acting at once, and all the bodies are simultaneously in motion. The only problem that can be solved exactly is that of two bodies moving under the influence of their mutual gravitational attraction. A special case of the problem involving three bodies has been solved, and each of the 12 asteroids called the Trojan Group represent examples of it; they are characterized by being equidistant from both Jupiter and the sun. Since the sun is the dominant influence in the solar system, an application of the two-body problem leads to the simple elliptical orbits as described by KEPLER'S LAWS; these laws give a close approximation of planetary motion. More exact solutions, which consider the effects of the planets on each other, cannot be found in a straightforward way. However, methods accounting for these other influences, or PERTURBATIONS, have been devised; they allow successive refinements of an approximate solution to be made to almost any degree of precision. In computing the motions of stars and the rotations of galaxies, statistical methods are often used.

celestial meridian, VERTICAL CIRCLE passing through the north celestial pole and an observer's ZENITH. It is an axis in the HORIZON COORDINATE SYSTEM.

celestial pole, one of the two points at which the earth's axis of rotation intersects the CELESTIAL SPHERE. The celestial pole is important as a reference point in the EQUATORIAL COORDINATE SYSTEM; the celestial meridian passes through it, as do the hour circles of

the stars. The polestar (see POLARIS) lies within 0.5° of the north celestial pole. Although there is no bright star near the south celestial pole, the Southern Cross (see CRUX) points directly to it. The ALTITUDE of the celestial pole in an observer's hemisphere is equal to the observer's latitude on the earth.

celestial sphere, imaginary sphere of infinite radius with the earth at its center. It is used for describing the positions and motions of stars and other objects. For these purposes, any astronomical object can be thought of as being located at the point where the line of sight from the earth through the object intersects the surface of the celestial sphere. In ASTRONOMICAL COORDINATE SYSTEMS, the coordinate axes are great circles on the celestial sphere. In most systems of this type, the reference points are fixed on the sphere, so the two coordinates needed to locate a body are relatively constant.

Celestine I, Saint (sē'lā'stīn), d. 432, pope (422-32), an Italian, successor of St. Boniface I. The opposition of St. Cyril of Alexandria to NESTORIANISM inspired both sides to appeal to the pope, who judged that Nestorius should be excommunicated if he refused to retract. Celestine sent legates to the Council of Ephesus with orders not to discuss, but to judge. Celestine also advanced orthodoxy in the West by suppressing Semi-Pelagianism in Gaul and by sending Germanus of Auxerre to Britain. He was succeeded by St. Sixtus III. Feast: July 27.

Celestine V, Saint, 1215-96, pope (elected July 5, resigned Dec. 13, 1294), an Italian (b. Isernia) named Pietro del Morrone, successor of Nicholas IV. Celestine's election ended a two-year deadlock among the cardinals over a successor to Nicholas IV. Although he was known for his austere life as a hermit and for his extremist followers, who called themselves Celestines, he proved a most ineffectual pope and an easy prey to opportunists. King Charles II of Naples quickly dominated him and kept the pope in Naples. Celestine granted privileges and offices to who asked for them, turned the duties of his office over to a committee of three cardinals, and kept to his cell. His reign was so chaotic that he himself abdicated after only five months and ordered a new election. His successor, Boniface VIII, canceled his official acts and, to avert possible schism among Celestine's ardent followers, kept Celestine in confinement until his death. Celestine was canonized in 1313. Feast: May 19.

celite (sē'lā'stī) or **celestine** (sē'lā'stīn, -tīn), mineral appearing in blue-tinged or white orthorhombic crystals or in fibrous masses. The natural sulfate of strontium, SrSO₄, it is important as a source of strontium and of certain of its compounds, e.g., strontium hydroxide, used in refining beet sugar and strontium nitrate, used in red signal flares. Occurs in England, in Sicily, and in the United States on islands in Lake Erie and also in Pennsylvania, New York, and Ohio.

celiac disease: see SPRUE

celiac plexus: see SOLAR PLEXUS

celibacy, voluntary refusal to enter the married state with abstinence from sexual activity. It is one of the typically Christian forms of ASCETICISM. In ancient Rome the VESTAL virgins were celibates, and successful MONASTICISM has everywhere been accompanied by celibacy as an ideal. Among ancient Jews the SEPTUAGINT were celibates. In the Judaism of postexilic times, sexual activity in the married state was considered lawful and good, otherwise it was unlawful. This rule remained in Christianity. But the mainstream of Christian tradition from the start has interpreted the Gospels and epistles as teaching that voluntary celibacy, especially virginity, is peculiarly meritorious. 1 Cor. 7. In the Orthodox Eastern churches, monks and nuns are celibates, but the ordinary parish clergy are married; generally they may be married before ordination and may not remain Eastern bishops are widowers or unmarried, but they are usually from monasteries rather than parishes. In the West, celibacy has been common among the parish clergy since the 3d cent., and time passed, the Holy See became adamant in opposing the marriage of the secular clergy. The problem of reformers in the early Middle Ages was to end concubinage among the clergy, marriage of the clergy having fallen into disrepute; the violations were of the laws of chastity rather than of marriage. In the 12th cent. the most stringent laws enacted, and by the time of the Reformation popular opinion tolerated neither concubinage nor marriage in the clergy. The Roman Catholic Church the Roman rite allows no sacerdotal marriage, the clergy of Eastern rites united with the Holy

are often married before ordination. Protestants have rejected voluntary celibacy as an ideal. A standard apologetic explanation of the Western discipline of celibacy for parish priests is that marriage would prevent the priest from giving his complete attention to his parish. Since the Second Vatican Council, the Roman Catholic Church has restored the diaconate to a prominent place in the ministry and accepts married men into it. In the face of criticism, however, the council, Pope Paul VI, and various national groupings of bishops have insisted on the retention of celibacy for priests.

Céline, Louis Ferdinand (lɔ̃ʁ ʃɛʁdɛnɑ̃ ʁ sɑ̃lɛ̃n'), 1894-1961, French author, whose real name was Louis Ferdinand Destouches. Céline wrote sensationally misanthropic novels, such as *Journey to the End of Night* (1932, tr. 1934) and *Death on the Installment Plan* (1936, tr. 1938). Based on his experiences as a doctor during World War I, these works portray the violence of humanity through frank, often obscene, language. *Mea Culpa* (1937, tr. 1937) is a renunciation of Communism. His later works include the autobiographical novels *Castle to Castle* (1957, tr. 1968), *North* (tr. 1972), and *Rigadoon* (1961, tr. 1974), which form a trilogy recounting Céline's nightmarish journey through Germany to Denmark in the last days of the Third Reich. See study by Erika Ostrovsky (1967).

Celje (tsě'lyě), city (1971 pop. 157,515), NW Yugoslavia, in Slovenia. It is an industrial center where agricultural machinery, textiles, and chemicals are manufactured. Founded (1st cent. AD) by the Roman Emperor Claudius, it was the seat (1341-1456) of the powerful Slovenian counts of Celje (or Cilli). In the city are a 13th-century monastery and a 16th-century palace.

cell, in biology, the unit of structure and function of which all plants and animals are composed. The cell is the smallest unit in the living organism that is capable of carrying on the essential life processes sustaining metabolism for the production of energy and reproducing for the self-perpetuation of the organism. There are many unicellular organisms (e.g., BACTERIA and PROTOZOA) in which the single cell performs all the life functions. In higher organisms, a division of labor has evolved in which groups of cells have differentiated into specialized TISSUES, which in turn are grouped into organs and organ systems. Because almost all cells are microscopic, knowledge of the component cell parts has increased proportionately to the development of the MICROSCOPE and other specialized instruments and of allied experimental techniques. In both plants and animals, the cell is differentiated into the CYTOPLASM, the cell membrane, which surrounds it, and the nucleus, which is contained in it. In plant cells

there is, in addition to the membrane, a thickened cell wall, usually composed chiefly of CELLULOSE secreted by the cytoplasm. Included in the cytoplasm are many discrete bodies (called organelles), vacuoles containing cell sap, and inert granules and crystals. The most important of the organelles are the chloroplasts (occurring only in the cells of green plants) and the mitochondria. Both these organelles are the "power plants" of life that supply the organism with energy. The chloroplasts convert energy from sunlight by the process of PHOTOSYNTHESIS, the mitochondria extract energy by breaking down the chemical bonds in molecules of complex nutrients during oxidation and respiration (see ADENOSINE TRIPHOSPHATE). Other organelles in the cytoplasm are the lysosomes, which contain digestive enzymes, the centrosomes, which function during cell division, the Golgi apparatus, which functions in the synthesis, storage, and secretion of various cellular products, and, in plants primarily, other plastids in addition to the chloroplasts. The cytoplasm also contains ribosomes, which are the sites of protein synthesis, and the endoplasmic reticulum, a highly convoluted system of membranes believed to be responsible for the transmission of substances from outside the cell to the nucleus. It also appears to be the means by which the nucleus communicates with the rest of the cell, in its capacity as "director" of the cell's total activity. The nucleus itself, separated from the cytoplasm by an inner and outer nuclear membrane, consists of a nuclear ground substance in which may be contained one or more nucleoli as well as the long filaments of chromatin that coil tightly into CHROMOSOMES during MITOSIS. The chromatin directs the metabolic functions of the whole cell and, during cell division, passes on its "code" to the new cell by exactly replicating itself. Among those who contributed to early knowledge of cells through their use of the microscope were Antony van LEEUWENHOEK, Robert HOOKE, and Marcello MALPIGHI. In the 19th cent. Matthias J. SCHLEIDEN and Theodor SCHWANN developed what is now known as the cell theory. The very careful observations made by these and other men were primarily of the physical and mechanical attributes of the cell. Just as scientists now realize that atoms cannot be thought of only as physical units of matter but must also be described as manifestations of energy, so living cells too must be viewed as more than a complicated architecture of physical "building blocks" or components. It is now known that many processes, such as the passage of substances across the cell membrane, are a series of chemical and electrostatic phenomena rather than purely mechanical functions. The study of the cell is called cytology, the study of its chemical processes is cytochemistry. See A. G. Loewy and Philip Siekevitz, *Cell Structure and Function* (2d ed. 1969), C. P. Swanson, *The Cell* (3d ed. 1969), E. J. Ambrose and D. M. Easty, *Cell Biology* (1970), Ernest Borek, *The Sculpture of Life* (1973).

cell, in electricity, source of electric current that operates by chemical action, converting chemical energy into electrical energy. A cell consists essentially of two dissimilar substances, a positive ELECTRODE and a negative electrode, that conduct electricity, and a third substance, an ELECTROLYTE, that acts chemically on the electrodes. A group of several such cells connected together is called a battery. One simple form of cell consists of a glass jar containing a dilute solution of acid into which are introduced the electrodes of the cell, a strip of copper and a strip of zinc. When the two electrodes are connected externally by a conductor, such as a piece of copper wire, an electric current is produced in the wire. Electrons leave the zinc electrode and enter the wire. Upon reaching the copper electrode, they pass back into the solution. There they are captured by the hydrogen ions of the acid, forming hydrogen gas that evolves from the solution on and near the copper electrode. The zinc electrode diminishes in size as the action proceeds, the copper is unaffected, but the hydrogen bubbles, collecting rapidly in great numbers, form a covering over the copper electrode and interfere with the cell's action—a condition called polarization. There are several kinds of cells, differing in electrode material and electrolyte. The voltage, or electromotive force (abbreviated emf), depends upon the chemical properties of the substances used but is not affected by the size of the electrodes or the amount of electrolyte. The Leclanché cell is a single-fluid cell having a negative electrode of zinc, a positive electrode of carbon, and an electrolyte of ammonium chloride solution. It produces an emf of 1.46 volts. Similar to the Leclanché cell is the common dry cell, so

called because the electrolyte is in the form of a paste instead of a pure liquid solution. The cell parts are contained in a zinc cylinder that acts as the negative electrode. The cylinder is closed at one end and is lined on its entire inside surface with a layer of absorbent material. A carbon rod surrounded by manganese dioxide is inserted into the cylinder, forming the positive electrode of the cell. The manganese dioxide is mixed with carbon granules to improve its conductivity and to absorb the electrolyte. The electrolyte consists of a solution composed mainly of water, zinc chloride, and ammonium chloride. The open end of the cylinder is sealed with pitch, and the entire cell is enclosed in a jacket with a tin-plated top and bottom that enables the cell to be electrically connected to a circuit. The principal parts of an alkaline dry cell are a manganese dioxide positive electrode, a zinc negative electrode, and an electrolyte of alkaline potassium hydroxide. Such a cell can operate up to 10 times as long as a common dry cell. The principal parts of a mercury dry cell are a positive electrode of mercuric oxide, a negative electrode of zinc, and an electrolyte of potassium hydroxide. This cell has a relatively constant output voltage during most of its operating life, and it maintains its ability to generate current even after several years of storage. See BATTERY, ELECTRIC CIRCUIT, FUEL CELL, SOLAR CELL.

cella (sě'l'a), that portion of a Roman temple which was enclosed within walls, as distinct from the open colonnaded porticoes which formed the rest of it. It corresponds to the NAOS in Greek temples. The cella housed the statue of the deity to whom the temple was dedicated and was also used as a treasury. Sometimes it extended the whole width of the building, instead of being kept entirely within free-standing colonnades. The cella was generally a single chamber, but there were sometimes two chambers, or even three, as in the temple of Jupiter, on the Capitoline Hill.

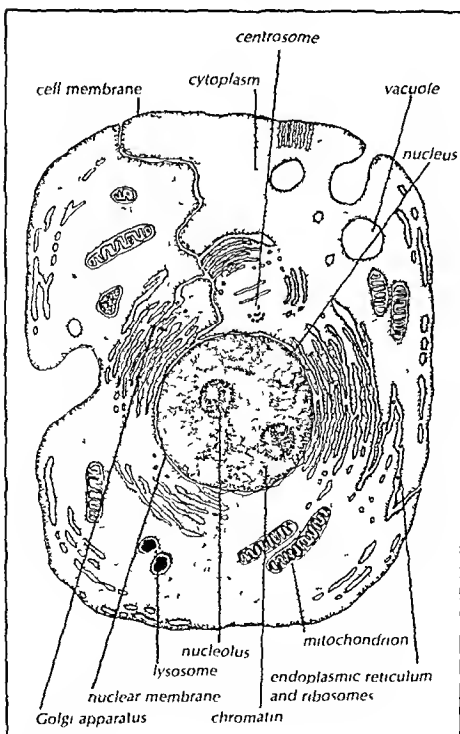
cell division. See CELL, MITOSIS, MEIOSIS.

Celle (tsě'l'a), city (1970 pop. 57,155), Lower Saxony, N West Germany, on the Aller River. Its manufactures include food products, machinery, chemicals, and textiles. Celle was chartered in 1294. Its castle was the residence of the dukes of Lüneburg-Celle, a branch of the house of Braunschweig, from 1378 to 1705. The castle still houses a famous 17th-century Baroque theater.

Cellini, Benvenuto (chě'lě'ně, Ital. bānvānō'tō chāl-lě'ně), 1500-1571, Italian sculptor, metalsmith, and author. His remarkable autobiography, written between 1558 and 1562, reads like a picaresque novel. It is, in fact, one of the most important documents of the 16th cent. Cellini tells of his escapades with the frankness and consummate egoism characteristic of the Renaissance man. He was born in Florence, the son of a musician, he studied music until his 15th year, when he was apprenticed to a goldsmith. Banished from Florence after fighting a duel, he went from town to town working for local goldsmiths and in 1519 went to Rome. Under the patronage of Pope Clement VII he became known as the most skillful worker in metals of his day, producing medals, jewel settings, caskets, vases, candlesticks, metal plates, and ornaments. Imprisoned on false charges, he worked at the court of Francis I at Paris after his release. He returned to Florence in 1545 and remained until his death in 1571. The decorative quality of his work, its intricate and exquisite detail and workmanship, are typical of the best of the period. Unfortunately, most of his works have perished. The famous gold and enamel saltcellar of Francis I and the gold medallion of Leda and the Swan (both Vienna Mus.) are perhaps the best examples of those remaining. His sculptures, most of them executed in the later Florentine period, include the colossal bronze bust of Cosimo I (Bargello), the bronze bust of Altoviti (Gardner Mus., Boston), the *Nymph of Fontainebleau* (Louvre), the life-size *Crucifixion*, a white marble Christ on a black cross (Escorial), and the renowned *Perseus with the Head of Medusa* (Loggia dei Lanzi, Florence), a beautifully wrought bronze statue surmounting a marble pedestal lavishly adorned with statuettes and carvings. See translation of his autobiography by J. A. Symonds (1888, many later editions).

cello or 'cello. See VIOLIN.

cellophane, thin, transparent sheet or tube of regenerated CELLULOSE. Cellophane is used in packaging and as a membrane for DIALYSIS. It is sometimes dyed and can be moisture-proofed by a thin coating of PYROXYLIN. There are several steps in the preparation of cellophane from raw cellulose. The cellulose is first treated with an alkali, e.g., sodium hydroxide,



Animal cell

and mixed with carbon disulfide to form viscose (see *VISCOSE PROCESS*). The viscose is aged for several days and then forced through a straight or circular slit into a dilute acid solution. The dissolved cellulose precipitates, and this regenerated cellulose has a lower molecular weight and a less orderly structure than the cellulose from which it is formed.

cellosolve: see GLYCOL

celluloid [from *cellulose*], transparent, colorless synthetic PLASTIC made by treating cellulose nitrate with camphor and alcohol. Celluloid was the first important synthetic plastic and was widely used as a substitute for more expensive substances, such as ivory, amber, horn, and tortoise shell. It is highly flammable and has been largely superseded by newer plastics with more desirable properties. It has been used for combs, brush handles, billiard balls, knife handles, buttons, and other useful objects.

cellulose, chief constituent of the CELL walls of plants. Chemically, it is a carbohydrate that is a high molecular weight polysaccharide. Raw cotton is composed of 91% pure cellulose, other important natural sources are flax, hemp, jute, straw, and wood. Cellulose has been used for the manufacture of paper since the 2d cent. Insoluble in water and other ordinary solvents, it exhibits marked properties of absorption. Because cellulose contains a large number of HYDROXYL GROUPS, it reacts with acids to form ESTERS and with alcohols to form ETHERS. Cellulose derivatives include guncotton, fully nitrated cellulose, used for explosives, celluloid (the first plastic), the product of cellulose nitrates treated with camphor, collodion, a thickening agent, and cellulose acetate, used for plastics, lacquers, and fibers such as RAYON.

Celman, Miguel Juárez: see JUÁREZ CELMAN

Cheloron de Blainville, Pierre Joseph de (pyér zhôzêf' sâlarôN' da biâNvêl'), 1693–1759, French Canadian soldier, b. Montreal. He was commandant at Michilimackinac (1734–42), Detroit (1742–43, 1750–53), Niagara (1744–46), and Crown Point (1746–47). In 1739–40 he led a detachment south to what is now Tennessee to cooperate with the Sieur de Bienville in a campaign against the Chickasaw Indians and was decorated for his conduct. His most famous service was as leader of the expedition sent by the governor of New France in 1749 to take official possession of the Ohio valley and warn English traders to leave.

Celsius, Anders (an'dars sêl'sëus), 1701–44, Swedish astronomer. While professor of astronomy at the Univ. of Uppsala (1730–44), he traveled through Germany, France, and Italy, visiting great observatories. At Nuremberg in 1733 he published a collection of 316 observations of the aurora borealis made by himself and others. While in Paris he was instrumental in bringing about an expedition (of which he became a member) organized by the French Academy for the measurement of an arc of the meridian in Lapland (1736). He supervised the building of an observatory at Uppsala in 1740 and became its director, while there he pioneered in the measuring of the magnitude of stars, using photometric methods. In 1742 he invented the centigrade (or Celsius) thermometer. His works include *De observationibus pro figura telluris determinanda* (1738).

Celsius temperature scale (sêl'sëas), TEMPERATURE scale according to which the temperature difference between the reference temperatures of the freezing and boiling points of water is divided into 100 degrees. The freezing point is taken as 0 degrees Celsius and the boiling point as 100 degrees Celsius. The Celsius scale is widely known as the centigrade scale because it is divided into 100 degrees. It is named for the Swedish astronomer Anders Celsius, who established the scale in 1742. Temperatures on the Celsius scale can be converted to equivalent temperatures on the FAHRENHEIT TEMPERATURE SCALE by multiplying the Celsius temperature by 9/5 and adding 32° to the result, according to the formula $9/5C + 32 = F$.

Celsus (sêl'sas), 2d cent., Roman philosopher, an aggressive antagonist of Christianity. His works have been lost, but the substance of his *True Discourse* is given by Origen in his *Against Celsus*, ed. and tr. by Henry Chadwick (1953, repr. 1965).

Celsus, Aulus Cornelius, fl. A.D. 14, Latin encyclopedist. His only extant work, *De re medicina*, consists of eight books on medicine believed to have been written A.D. c. 30. He was not esteemed as a scientist in his time, but he was one of the first works to be rediscovered and printed (Florence, 1478) during the Renaissance and was very influential, largely because of its splendid Latin style. It was

translated by James Grieve in 1756 and by W. G. Spencer in 1935. Celsus' first name is also written Aurelius.

Celt (sêlt, kêlt) or **Kelt** (kêlt) 1 One who speaks a Celtic language or who derives ancestry from an area where a Celtic language was spoken, i.e., one from Ireland, the Scottish Hebrides and Highlands, the Isle of Man, Wales, Cornwall, or Brittany. 2 A member of a group of peoples first found early in the 2d millennium B.C. in SW Germany and E France. The Celts were a group of tribes speaking Indo-European dialects. Armed with iron weapons and mounted on horses, they spread rapidly over Europe, crossing into the British Isles, moving S over France, Italy, and Spain, fighting the Macedonians, and penetrating into Asia Minor, where they raided Hellenistic centers. The Celts introduced the newly developed iron industries. Their wealth from trade and from raiding helped to maintain their dominance over Central Europe during the Iron Age. The LA TÈNE culture developed among the Celts. Greek influences that stimulated Celtic culture included the introduction of the chariot and of writing. Art flourished in richly ornamented styles. The Celts lived in semifortified villages, with a tribal organization that became increasingly hierarchical as wealth was acquired. Priests, nobles, craftsmen, and peasants were clearly distinguished, and the powers of the chief became kinglike. The Celts believed in a demonic universe and relied on the ministry of the DRUIDS. Much Western European folklore is derived from the Celts. By the 4th cent. B.C. they could no longer withstand the encroaching Germanic tribes, and they lost most of their holdings in the north and in W Germany. From that time on, Celtic history becomes confused with that of the many unsettled tribes in Europe. Celtic language and culture were vanously dispersed among peoples of little historical identity, and until the 20th cent. historians obscured the very important differences among these groups by naming them all Celts. Further confusion has resulted from the designation of the Celts as a racial group. To the Greeks and Romans, the Celts were tall, muscular, and light-skinned, but it is believed that these were qualities of the Celt warriors rather than Celts in general. The term *Celtic* is actually a cultural one, unrelated to physical heredity. It implies a cultural tradition maintained through many centuries of common history in the same general area. See also IRON AGE. See T. G. E. Powell, *The Celts* (1958, rev. ed. 1959), Henri Hubert, *The Rise of the Celts* (1966), Nora Chadwick, *The Celts* (1970).

Celtes, Conradus Protucius (kôn'radôs prô'tôitsêas kêl'tas), pseud. of **Konrad Pickel** (kôn'rat pîk'el), 1459–1508, German scholar and humanist. He traveled widely, lectured at several universities, became librarian to Maximilian I, and founded various societies dedicated to classical learning. He was made (1487) first German poet laureate. Of his works—didactic, lyric, and dramatic—his odes in the manner of Ovid and Horace are noteworthy. Celtes discovered the works of the nun HROTSWITH or Roswitha von Gandersheim.

Celtic art. The earliest clearly Celtic style in art was developed in S Germany and E France by tribal artisans of the mid- to late 5th cent. B.C. With the dispersal of Celtic tribes during the next five centuries, their characteristically sophisticated designs were spread throughout Europe and the British Isles. Although some classical influence was evident in Celtic work, most of the complex, linear, highly ornamented pieces that survive reveal an inspiration of great originality and power. Stylized and fantastic plant and animal forms, as well as strong, geometrical, intertwining patterns, decorated the surfaces of household and ritual vessels, weapons, and body ornaments. The principal materials used in the surviving pieces of metalwork, most numerous of the remains, are gold and bronze. Some painted ceramics and enamel work survive as well from the early period. Frequently, Greek-inspired arabesque motifs were modeled in low relief. Artisans of the British Isles adapted Celtic design in the 3d cent. B.C., producing distinctive, vigorous works that soon owed little to Continental originals. Asymmetrical line engraving gained ascendancy in the 1st cent. B.C. for decorated weaponry and utensils. Two hundred years later Roman influence had effectively overwhelmed Celtic styles, although typical motifs were retained well into the medieval period. Numerous first-rate examples of Celtic craftsmanship may be seen at the British Museum. See J. R. Allen, *Celtic Art in Pagan and Christian Times* (1912), Paul Jacobsthal, *Early Celtic Art* (2 vol., 1944), George Bain, *The Methods of Construction of Celtic Art* (1951), C. F.

Fox, *Pattern and Purpose: A Survey of Early Celtic Art in Britain* (1958), Ian Finlay, *Celtic Art* (1973).

Celtic Church, name given to the Christian Church of the British Isles before the mission (597) of St. Augustine of Canterbury from Rome. Founded in the 2d or 3d cent. by missionaries from Rome or Gaul, the church was well established by the 4th cent. when it sent representatives to the Synod of Arles (314) and to the Council of Rimini (359). It continued to spread in the 5th cent. due to the work of St. Ninian in Scotland, St. Dyfrig in Wales, and St. Patrick in Ireland. The heresies of the 4th cent. that played a significant role in church affairs on the Continent seem to have had little influence in Britain, and although it was the home of Pelagius (see PELAGIANISM), his teachings did not gain followers there until 421 with an influx of refugees from the Continent. The missions of St. Germanus of Auxere (429 and 447) against the Pelagians in Britain and the spread of monasticism from Gaul attest to contacts with the church on the Continent. The Saxon invasions, beginning c. 450, all but destroyed Celtic culture, dealing a deathblow to the Celtic Church in England through the destruction of the towns in which it had gained its greatest following. The few small Christian communities that survived were to be found in Wales and Ireland and in N and SW Britain. The period of peace that followed the British defeat of the Saxons at Mons Badonicus (c. 500) once again allowed for growth of the Celtic Church (especially through the work of St. COLUMBA), although isolation from the Continent continued until the mission of St. Augustine. Having converted King Æthelbert of Kent to Christianity, St. Augustine attempted to convince the leaders of the Celtic Church to change those practices (such as the dating of Easter and the forms of baptism and tonsure) that were at variance with the Roman Church and to accept the imposition of a diocesan organization on the essentially monastic structure of their church. He failed, and it was not until the Synod of Whitby (664, see WHITBY, SYNOD OF) that such agreement was largely reached, although independent Celtic churches continued on for some time in Wales and Ireland. See N. K. Chadwick, *The Age of the Saints in the Early Celtic Church* (1961), James Bulloch, *The Life of the Celtic Church* (1963).

Celtic languages (sêl'tik, kêl'-), subfamily of the Indo-European family of languages. At one time, during the Hellenistic period, Celtic speech extended all the way from Britain and the Iberian Peninsula in the west across Europe to Asia Minor in the east, where a district still known as Galatia recalls the former presence there of Celtic-speaking Gauls. Later, however, in the course of the Roman conquest, Celtic speech tended to yield to Latin, and by the 5th cent. A.D. Celtic had virtually disappeared from continental Europe. Today the Celtic languages that have survived into the modern era are limited almost entirely to the British Isles and French Brittany, where these tongues are spoken by a total of about three million people. The Celtic subfamily is made up of three groups of languages: the Continental, the Brythonic (also called British), and the Goidelic (also called Gaelic). Continental Celtic, which includes all Celtic idioms on the Continent with the exception of Breton, died out following the fall of the Western Roman Empire in the late 5th cent. A.D. The principal example of this group is the now extinct language Gaulish, for little remains of any other Continental Celtic tongues. Gaulish was once the language of Gaul proper (now modern France). Evidence of Gaulish is found both in words and in personal and proper names referred to by ancient Greek and Latin writers as well as in more than a hundred Gaulish inscriptions from Gaul and N Italy (ranging in date from the 3d cent. B.C. to the 3d cent. A.D.). Coins and Greek and Latin inscriptions in Europe also preserve Celtic place-names and personal names. Yet the material as a whole is quite limited, furnishing only a number of proper names, a small vocabulary, and certain indications regarding the sounds and grammar of Gaulish and of Continental Celtic in general. The Brythonic group includes Breton, Cornish, and Welsh. They are all descendants of British, the Celtic language of the ancient Britons of Caesar's day. The emergence of Welsh, Cornish, and Breton from British as separate languages probably took place during the 5th and 6th cent. A.D. and was a result of the Germanic invasions of Britain. Breton today reaches more than one million people in Brittany, most of whom are bilingual, speaking also French. It is not surprising that Breton, unlike Welsh, has many loan words from French. Breton is by no means de-

scended from ancient Gaulish, but rather from the Celtic dialects taken by Welsh and Cornish immigrants from the British Isles who were fleeing Germanic invasions and found refuge in Armorica (now French Brittany) in the 5th and 6th cent. A.D. Surviving literary documents in Breton go back only as far as the 15th cent., but the earlier stages of the language are known through glosses and proper names (see BRETON LITERATURE). Cornish, once the Celtic language of Cornwall, became extinct in the late 18th cent. Cornish proper names in manuscripts of the 10th cent. A.D. are the oldest recorded traces of the language. A number of Cornish place-names have survived, and some Cornish words appear in the English spoken in Cornwall today. The Cornish language was written in the Roman alphabet. It is not noted for an outstanding literature (see CORNISH LITERATURE). Modern efforts to revive Cornish have had little success. Welsh (called *Cymraeg* or *Cymric* by its speakers) is the language today of about one million people, chiefly in Wales (a western peninsula of Great Britain) but also in the United States, to which a number of Welsh people have migrated. Most speakers of Welsh in Great Britain also use English, with perhaps 50,000 limiting themselves to Welsh. The oldest extant Welsh texts are from the 8th cent. A.D. (see WELSH LITERATURE). Welsh and Breton have discarded the originally numerous Indo-European cases for the noun and use only one case. Both employ the Roman alphabet for writing. The accent in Welsh and Breton generally falls on the next-to-last syllable, with the exception of a single Breton dialect that has the accent on the last syllable. The third group of the Celtic subfamily is Goidelic, to which Irish (also called Irish Gaelic), Scottish Gaelic, and Manx belong. The term *Erse* is used as a synonym for Irish and sometimes even for Scottish Gaelic. All the modern Goidelic tongues are descendants of the ancient Celtic speech of Ireland. It is thought that the Celtic idiom first came to Ireland shortly before the Christian era. An official language of Ireland, Irish is spoken by approximately 900,000 people in that country and by 50,000 more in Northern Ireland, though most speakers of Irish also use English (see IRISH LANGUAGE). Scottish Gaelic is the tongue of about 100,000 persons in the Highlands of Scotland and an additional 30,000 in Canada. Most of these people also speak English. Gaelic speech began to reach Scotland in the late 5th cent. A.D., when it was brought by the Irish invaders of that country. However, a truly distinctive Scottish Gaelic did not appear before the 13th cent. The chief difference between Scottish Gaelic and Irish results from the substantial Norse influence on the former. There are four cases for the noun (nominative, genitive, dative, and vocative) in Scottish Gaelic, which uses the Roman alphabet (see GAELIC LITERATURE). Manx is a dialect of Scottish Gaelic that was once spoken on the Isle of Man, but it has almost entirely died out there. First recorded in writing in the early 17th cent., Manx does not have an important literature. It shows a strong Norse influence and is written in the Roman alphabet. The rules of pronunciation for all the Celtic languages are extremely complicated. For example, the final sound of a word frequently brings about a phonetically changed initial consonant of the next word, as in Irish *fuil*, "blood," but ar *bhfuil*, "our blood." Another example is Welsh *pen*, "head," but *fy mhen*, "my head." In order to look up a word in the dictionary, one has to be familiar with these rules of phonetic change, or mutation. There are only two genders in the Celtic languages, masculine and feminine. Words of Celtic origin that have been absorbed by English include *bard*, *blarney*, *colleen*, *croak*, *dolmen*, *druid*, *glen*, *slogan*, and *whiskey*. An interesting feature of Celtic languages is that in several characteristics they resemble some non-Indo-European languages. These characteristics include the absence of a present participle and the use instead of a verbal noun (found also in Egyptian and Berber), the frequent expression of agency by means of an impersonal passive construction instead of by a verbal subject in the nominative case (as in Egyptian, Berber, Basque, and some Caucasian and Eskimo languages), and the positioning of the verb at the beginning of a sentence (typical of Egyptian and Berber). See INDO-EUROPEAN. See Henry Lewis and Holger Pedersen, *A Concise Comparative Celtic Grammar* (1937); K. H. Jackson, *Language and History in Early Britain* (1953).

Celtic literature: see BRETON LITERATURE, CORNISH LITERATURE, GAELIC LITERATURE, WELSH LITERATURE

Celtic religion: see DRUIDS

cement, hydraulic, building material typically made by heating a mixture of limestone and clay

until it almost fuses and then grinding it to a fine powder. Once it is mixed with water, cement will harden even if immersed in water. It may also be mixed with water and aggregates (crushed stone, sand, and gravel) to form CONCRETE. A cement made by grinding together lime and a volcanic product found at Pozzuoli on the Bay of Naples (hence called pozzuolana) was used in ancient Roman construction works, notably the Pantheon. During the Middle Ages the quality of cements declined. In the 18th cent. John Smeaton, an English engineer, was commissioned to rebuild the Eddystone lighthouse off the coast of Cornwall, England. In the course of the project he found that a natural cement made from clayey limestone was superior to other available cements for a building that must stand in water. The production of natural cement began in the United States c. 1820. It was made by processing cement rock from various deposits, such as those found in Rosendale, N.Y. In 1824, Joseph Aspdin, an English bricklayer, patented a process for making what he called portland cement, a natural cement with properties superior to its predecessors. Modern portland cement is made by mixing substances containing lime, silica, alumina, and iron oxide and then heating the mixture until it almost fuses. During the heating process dicalcium and tricalcium silicate, tricalcium aluminate, and a solid solution containing iron are formed. Gypsum is later added to these products during a grinding process. Portland cement is by far the most widely used hydraulic cement. Natural cement, although slower-setting and weaker than portland cement, is still employed to some extent and is occasionally blended with portland cement. Aluminous, or aluminite, cement is used when a quick-setting cement is necessary. It is made from limestone and bauxite.

cemetery, name used by early Christians to designate a place for burying the dead. First applied in Christian burials in the Roman CATACOMBS, the word *cemetery* came into general usage in the 15th cent. Group burials have been found in Paleolithic caves, and fields of prehistoric grave mounds, or BARROWS, are located throughout Europe, Asia, and North America. In the ancient Middle East, graves were often grouped around temples and sanctuaries. In Greece the dead were buried outside the city walls along the roads leading into the city in a necropolis (city of the dead). Christian belief in resurrection made chapel crypts and churchyards desirable for burial, but overcrowding and the rise of urban centers made it necessary to establish cemetery plots outside the city limits. Graveyards of all periods tend to reflect the familial and class groupings of their living society. Among the many beautiful and historic cemeteries of Europe are the Pere-Lachaise in Paris and the Campo Santo in Pisa. A noteworthy U.S. cemetery is the ARLINGTON NATIONAL CEMETERY. The National Park Service also maintains cemeteries (see NATIONAL PARKS AND MONUMENTS, table). See FUNERAL CUSTOMS, GRAVE, TOMB.

Cenchrea (sĕn'krĕā) or **Cenchreae** (-krĕ-ē'), port of ancient Greece, on the Saronic Gulf, ESE of Corinth. Acts 18:18, Rom. 16:1.

Cenci, Beatrice (bātrĕ'chā chān'chē), 1577-99, Italian noblewoman, tragic figure of the late Renaissance. Her father, Francesco Cenci (1549-98), was a Roman noble noted for his viciousness. In 1595 he imprisoned Beatrice and her stepmother Lucrezia in a lonely castle, his cruel treatment finally led Beatrice, with the complicity of her stepmother, her brothers, and perhaps her lover, to procure his murder. After a famous trial (1599) the conspirators were put to death. This tragedy, often cited as an example of the dissipation and cruelty of 16th-century Rome, is the subject of, among other works, Francesco D. Guerrazzi's novel *Beatrice Cenci*, Percy Bysshe Shelley's tragedy *The Cenci*, and Alberto Ginastera's opera *Beatrice Cenci*. A painting by Guido Reni in the Barberini Palace, Rome, is sometimes said to represent her. See Corrado Ricci, *Beatrice Cenci* (1923, tr. 1925).

Cendrars, Blaise (blĕz saNdrar'), 1887-1961, French writer. He was at various times an art critic, a journalist, and a film director, and he traveled widely, notably in China and Africa. For a while he was associated with *cubisme*, a movement that attempted to apply the principles of cubism to literature. He was particularly noted for his fast-paced adventure novels. His works include *Du Monde entier* (1919), poems, *Petits Contes negres pour les enfants blancs* (1928, tr. *Little Black Stories for Little White Children*, 1929), stories, and the novel *L'Or* (1925, tr. *Sutler's Gold*, 1926).

Cenis, Mont (mōN sənĕ'), Ital. *Moncenisio*, Alpine pass, 6,831 ft (2,082 m) high, on the French-Italian border. It is one of the great invasion routes in Italian history. Napoleon I built a new road there in 1810. The Mont Cenis railroad tunnel (c. 8 mi/13 km long) was built in 1871 and connects Turin, Italy, with Chambéry, France, via Modane, France; it is one of the world's longest railroad tunnels.

Cennini, Cennino (chān-nĕ'nō chān-nĕ'nĕ), c. 1370-1440, Florentine painter, follower of Agnolo Gaddi. None of his paintings is extant. He is most famous for having written the *Libro dell'arte* (written 1400?, tr. *The Craftsman's Handbook*, 1933). This treatise marks a transition between medieval and Renaissance concepts of art. Closely following the tradition of Giotto, he offers detailed advice about the established technique of painting. At the same time, Cennini was one of the first to call for imagination in art and to advocate the elevation of painting from artisanship to the fine arts.

Cenozoic era (sĕnəzō'ik, sĕn-), fifth and last major division of geologic time (see GEOLOGIC ERAS, table). Following the disturbances of the late MESOZOIC ERA, the geography of North America at the beginning of the Cenozoic attained substantially its present form. The only areas subjected to inundation by shallow marine waters were the Atlantic and Gulf coasts and a small area on the Pacific coast. It is in the Cenozoic era that man appeared. The life of this era has been dominated by the mammals, which were most numerous in the TERTIARY PERIOD and have declined, with the exception of a few specialized types, in the QUATERNARY PERIOD. The elapsed portion of the Cenozoic is about 65,000,000 years, less than half the estimated duration of the Mesozoic. See also GEOLOGY.

censor (sĕn'sər), title of two magistrates of ancient Rome (from c. 443 B.C. to the time of Domitian). They took the census (by which they assessed taxation, voting, and military service) and supervised public behavior. They also had charge of public works and filled vacancies among the senators and knights.

Censorinus (sĕnsōrī'nəs), fl. c. 238, Roman grammarian. He wrote *De die natali* [on the day of birth], an essay partly astrological, partly chronological, which affords much information on ancient methods of computing time.

censorship, official prohibition or restriction of any type of expression believed to threaten the political, social, or moral order. It may be imposed by governmental authority, local or national, by a religious body, or occasionally by a powerful private group. It may be applied to the mails, speech, the press, the theater, dance, art, literature, photography, the cinema, radio, or television. Censorship may be either preventive or punitive, according to whether it is exercised before or after the expression has been made public. The practice has been in use since ancient times, and was particularly thoroughgoing under autocratic and heavily centralized governments, from the Roman Empire to the totalitarian states of the 20th cent., especially Fascist Italy, Nazi Germany, and the Communist states. In other countries, censorship is accepted as inevitable in times of war, but it has been imposed to varying degrees even in peacetime. In the Middle Ages the attempts to uproot heresy and the establishment of the Inquisition were examples of censorship, as are the modern instances of book burning. The absolute monarchs of the 17th and 18th cent. imposed strict controls, and because the Reformation had resulted in a reshuffling of the relations between CHURCH AND STATE, these controls were used to persecute opponents of the established religion of a particular state, Roman Catholic or Protestant. A form of book banning was adopted by the Roman Catholic Church in the INDEX, a list of publications that the faithful were forbidden to read. The last edition of the Index was published in 1948. Pope Paul VI, in 1966, decreed that it would be discontinued but that papal lists of prohibited books would continue to be issued. Paradoxically, in the lands under Calvinist domination (such as Geneva, Scotland, and England of the Puritan period), where the ideals of liberty and freedom first blossomed, regulation of private conduct and individual opinion was rigorous, and censorship was strong. In the Soviet Union, Boris Pasternak's *Doctor Zhivago*, which won the 1958 Nobel Prize in Literature, was not permitted publication, and the novels of Aleksandr Solzhenitsyn, considered by many as masterpieces, have been banned since 1966. In Britain during the 19th and 20th cent., the object of censorship has most often been literature regarded as obscene. With the passage of the

Obscene Publications Act in 1857, there followed many criminal prosecutions and seizures of so-called obscene books. This law remained in effect for over a century when a new one superseded it in 1959. The new law provided that the opinion of artistic or literary experts could be submitted as evidence in deciding obscenity cases and that an alleged obscene work had to be judged as a whole rather than in part. However, in 1971 the editors of an underground periodical, *Oz*, were convicted in a much publicized trial for violating postal laws. An appeal court held that a periodical need not be judged as a whole, an apparent reversal of the 1959 act, which had stated otherwise. Censorship has existed in the United States since colonial times, but its emphasis has gradually tended to shift from the political to the sexual. Attempts to suppress political freedom of the press in the American colonies were recurrent, a notable example was the trial of John Peter Zenger. The Bill of Rights in the U.S. Constitution guarantees freedom of the press, of speech, and of religion. Nevertheless, there have been examples of official political censorship, notably in the actions taken under the Sedition Act of 1798 (see ALIEN AND SEDITION ACTS), suppression of abolitionist literature in the antebellum South, and local attempts to repress so-called radical publications in the 19th and 20th cent. Long before World War I there were vigilante attacks, such as those by Anthony COMSTOCK, on what was reckoned obscene literature, and the U.S. Post Office expanded (1873) its ban on the shipment of obscene literature and art, but it was after World War I that public controversy over censorship raged most fiercely. Until the Tarriff Act was amended in 1930, many literary classics were not allowed entry into the United States on grounds of obscenity. Even subsequently, attempts persisted, and *Ulysses* by James Joyce was not allowed into the country until after a court fight in 1933. Other works of literature involved in obscenity cases included *Lady Chatterley's Lover* by D. H. Lawrence, *Tropic of Cancer* by Henry Miller, and *Fanny Hill* by John Cleland. Beginning in 1957, the Supreme Court began a series of decisions that tended to relax restrictions on so-called obscene materials. Although these decisions covered a 15-year period, not all obscenity cases during this time were dismissed. In a famous case in the 1960s, Ralph Ginzburg was convicted of advertising in an obscene manner. As the Supreme Court decisions struck down many state obscenity laws, the states responded by passing laws prohibiting the sale of obscene materials to minors, and these were upheld (1968) by the Supreme Court. The liberalizing trend, however, was reversed in 1973, when the Supreme Court ruled that the individual states could decide, according to local standards, what is obscene. Another variety of censorship that was much attacked and much defended was the effort to keep out of schools and colleges textbooks and teaching that might be deleterious to what was termed "the American form of government" (see ACADEMIC FREEDOM). In the 1960s, the issue of sex education in schools became highly controversial. Films have also been the target of censorship. The producers of motion pictures, dependent for success upon widespread public approval, somewhat reluctantly adopted a self-regulatory code of morals (see HAYS WILLIAMS). Although the code has been relaxed and revised (1956, 1966, and 1970), the 1973 Supreme Court ruling on obscenity will certainly have an effect on the degree to which films will be censored at the local level. Another area of censorship involves radio and television broadcasting. Since 1934, local stations have operated under licenses granted by the Federal Communications Commission, which is expressly forbidden to exercise censorship. However, the required three-year review of a station's license invites indirect censorship. The issue of government secrecy was dealt with in the Freedom of Information Act of 1966, which stated that, with some exceptions, people have the right of access to government records. The issue was challenged in 1971, when a secret government study that came to be known as the PENTAGON PAPERS was published by major newspapers. The government sued to stop publication, but the Supreme Court ruled in favor of the newspapers (see PRESS FREEDOM OF THE). See Robert Downs, *The First Freedom* (1960), P. S. Jernison, *Freedom to Read* (1963), M. L. Ernst, *Censorship* (1964), Paul Boyer, *Purity in Print* (1968), Edward De Grazia, *Censorship Landmarks* (1969), E. J. R. Widmer, *Freedom and Culture* (1970).

census, periodic official count of the number of persons and their condition and of the resources of a country. In ancient times, among the Jews and Ro-

mans, such enumeration was mainly for taxation and conscription purposes. The introduction of the modern census—a periodic and thorough statistical review—began in the 17th cent. The first efforts to count people in areas larger than cities at regular periods were in French Canada (1665), Sweden (1749), the Italian states (1770), and the United States (1790). The first British census was taken in 1801. The Belgian census of 1846, directed by Adolphe QUETELET, was the most influential in its time because it introduced a careful analysis and critical evaluation of the data compiled. Most industrialized countries now take a census every 5 to 10 years. Scientific census taking in the United States began with the decennial census of 1850, when the scope and methods were greatly improved by making the individual the unit of study. In 1902 the Bureau of the Census was established in the Dept. of Commerce, and in 1972 the Bureau was combined with the Office of Business Economics to form the Social and Economic Statistics Administration. The census is considered the most vital source of statistical information about a nation, providing invaluable data to social scientists and government planners. See A. H. Scott, *Census USA* (1968), W. S. Holt, *The Bureau of the Census* (1929, repr. 1973).

centaur (sēn'tōr), in Greek mythology, creature, half man and half horse. The centaurs were fathered by Ixion or by Centaurus, who was Ixion's son. Followers of Dionysus, they were uncouth and savage, but some, such as Chiron, became friends and teachers of men.

Centaurus (sēn'tōr'ās), southern CONSTELLATION located N and E of Crux, the Southern Cross. It is known especially for its bright stars ALPHA CENTAURI and HADAR. It also contains Centaurus A, a radio galaxy, as well as a globular STAR CLUSTER visible to the naked eye. Centaurus reaches its highest point in the evening sky in May.

Centennial Exposition, International, held in Philadelphia from May to Nov., 1876, to celebrate the 100th anniversary of the Declaration of Independence. The buildings, in Fairmount Park, included the Main Building, covering 20 acres (8 hectares), Machinery Hall, Agricultural Hall, Horticultural Hall, and Memorial Hall, many state buildings, and buildings of 37 foreign countries. The total number of persons attending in 159 days was almost 10 million. This was the first of a series of world's fairs that the United States was to hold, and it set a high standard, exhibiting in graphic manner the technical advances and industrial growth of the nation. Memorial Hall, a Renaissance structure of granite, became part of the Pennsylvania Museum of Art.

center, in politics, a party following a middle course. The term was first used in France in 1789, when the moderates of the National Assembly sat in the center of the hall. It can refer to a separate party in a political system, e.g., the Catholic Center party of imperial and Weimar Germany, or to the middle group of a party consisting of several ideological factions.

centering, the framework of wood or of wood and steel built to support a masonry arch or vault during its construction. The centering itself must be rigidly supported, either by posts from the ground or by trusses when piers are available to receive their ends. After the centering is built, the setting of the masonry proceeds equally from the ends or sides toward the central point, where the keystone of the arch or the crowning blocks of the vault are finally wedged into position. The centering is removed after setting in the case of arches where the shape is dependent on the cement or concrete, but in other instances, e.g., where dressed stone is used with a lime mortar joint, it is better to remove the centering before setting, so that gravity will control the disposition of the stones. Removal of the centering is a delicate operation, since undue stress on one part endangers the whole structure. The Romans built vast domes and vaults of concrete with the aid of wood centerings and of integral brick ribs within the vault itself. Arches of steep rise may sometimes be built without centering. Brunelleschi is said to have dispensed with it in constructing the steep dome of the cathedral of Florence. Today inflatable plastic balloons are often used instead of centering.

Center Line, city (1970 pop. 10,379), Macomb co., SE Mich., a suburb of Detroit, inc. 1925.

center of gravity, see CENTER OF MASS.

center of mass, the point at which all the mass of a body may be considered to be concentrated in analyzing its behavior. Since mass is usually observed in a gravitational field, often the center of mass is also

called the center of gravity. The center of mass of a sphere of uniform density coincides with the center of the sphere. The center of mass of a body need not be within the body itself, the center of mass of a ring or a hollow cylinder is located in the enclosed space, not in the object itself. A body suspended or balanced at its center of mass will be stable, there will be no net MOMENT acting on it. Sometimes a problem may be analyzed from the point of view of the center of mass of an entire system of objects, such as several colliding elementary particles or a multiple-star system. For example, the complex motions of the earth and moon about the sun become somewhat simpler when viewed from the common center of mass of the earth-moon system, located about 1,000 mi (1,600 km) below the earth's surface. It is this point that is moving in an elliptical orbit around the sun rather than the center of mass of the earth alone.

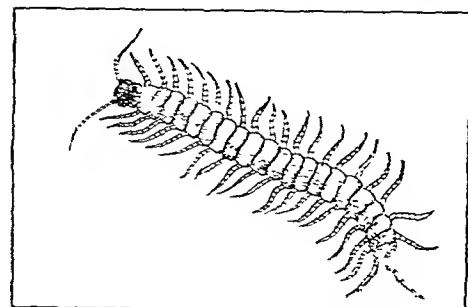
Center Point, uninc. town (1970 pop. 15,675), Jefferson co., N. central Ala., a suburb of Birmingham.

Centerville, city (1970 pop. 10,333), Montgomery co., SW Ohio, a residential suburb of Dayton, inc. 1879. It has a small industrial park.

centigrade temperature scale: see CELSIUS TEMPERATURE SCALE.

centimeter, abbr. cm, unit of length equal to 0.01 METER, the basic unit of length in the METRIC SYSTEM. The centimeter is the unit of length in the CGS SYSTEM. It is approximately equal to 0.39 inch, or 1 inch equals about 2.54 centimeters.

centipede, common name for members of a single class, Chilopoda, of the phylum ARTHROPODA. Centipedes are widely distributed in temperate and tropical lands, living in the soil or surface litter, and under logs or rocks. The largest species, *Scolopendra gigantea*, may reach 12 in. (30 cm) in length, many other tropical species are over 6 in. (15 cm) long. Temperate species are usually only about 1 in. (2.5 cm) long. The flattened body is divided into a head and a trunk composed of segments, or somites. The head bears long antennae, jaws, and two pairs of maxillae used for food-handling. Although the name centipede means "hundred-legged," the average is actually about 35 pairs of legs, one pair on each body segment except for the last two, the pre-genital and genital segments. The appendages of the trunk's first segment are modified into claws that are equipped with poison glands and are used to kill or stun prey. Larger centipedes can cause a painful bite, but the poison is not powerful enough to cause death in humans. Centipedes are chiefly nocturnal and predominantly carnivorous, feeding on insects or other small arthropods, though the largest species can kill small vertebrates. Sexes are separate, and some species have extensive courtship ceremonies. Members of the orders Lithobiomorpha and Scutigermorpha have 15 pairs of legs as adults. These centipedes release eggs singly in the soil. Not all of the body segments are present at the time of hatching, and the young add somites and pairs of legs as they molt. Lithobiomorphs are widely distributed in temperate and subtropical regions. The swift scutigermorphs have very long legs, the last pair is often extended to the rear, serving as posterior tactile appendages. Although especially abundant in the tropics, they include *Scutigera forceps*, the rather common house centipede of temperate climates. The house centipede has long, delicate legs and compound eyes. It feeds on roaches, clothes moths, and other insects. Members of the orders Geophilomorpha and Scolopendromorpha produce clusters of eggs, which are guarded while they develop. A full set of body segments and legs is present at hatching. Geophilomorphs have very long, slender bodies with from 31 to over 180 pairs of short legs. They are burrowing forms and are found



Centipede, representative of the class Chilopoda

in the soil from temperate to tropical regions. The scolopendromorphs are also widely distributed, but are more abundant in the tropics. They have from 21 to 23 pairs of legs and include the largest and most colorful centipede species. Centipedes belong to the phylum ARTHROPODA, subphylum Mandibulata, class Chilopoda.

Central African Republic, republic (1973 est pop 1,700,000), 240,534 sq mi (622,983 sq km), central Africa. BANGUI is the capital. The landlocked nation is bordered by Chad in the north, Sudan in the east, Zaïre and the Congo Republic in the south, and Cameroon in the west. The terrain consists of a 2,000–3,000 ft (610–910 m) undulating plateau, mainly covered by savanna, dense tropical forests in the south, and a semidesert area in the east. The Bongo Massif in the northeast reaches a height of c 4,500 ft (1,370 m). The country is drained by numerous rivers, but only the Ubangi is commercially navigable. Rainfall is heavy in the south. There are no railroads, and the network of all-weather roads is inadequate; rivers are the chief means of transportation. Population density is only about six persons per square mile. The chief ethnic groups are the Mandjia-Baya, the Banda, the Mbaka, and the Zande. French is the official language, but Sangho is the lingua franca. More than half the population practices traditional animist religions, the remainder is predominantly Christian. The overwhelming majority of the people are engaged in agriculture, although only about 2% of the land is under cultivation. Cassava, millet, rice, and peanuts are grown for subsistence. The principal cash crops and exports are cotton and coffee, cocoa, rubber, and palm products are raised in the southwest. Timber is also an important product and export. There have been recent attempts to develop a livestock (mainly cattle) industry, despite unfavorable climate and the prevalence of the tsetse fly. Mining, formerly limited to diamonds (another leading export), has become increasingly important with extraction of uranium, begun in 1972. Industry is limited to food and mineral processing and to the production of light consumer goods. Inadequate transportation has been a major obstacle to the country's economic development. The Central African Republic belongs to the French franc zone and trades chiefly with France. Most exports are shipped via Pointe-Noire, in the Congo Republic, more than 1,100 mi (1,770 km) away. Among the country's educational institutions are a university at Bangui (founded 1970) and two agricultural colleges. Between the 16th and the 19th cent., much of the region was subject to devastating slave raids. The Baya people, seeking refuge from the Fulani of N Cameroon, arrived in what is now the Central African Republic in the early 19th cent., the Banda, fleeing the Muslim Arab slave raiders of Sudan, came later in the century. French expeditions, pushing out from the Congo and making treaties with local tribal chiefs, occupied the area in 1887. It was organized in 1894 as the colony of Ubangi-Shari and was united administratively with Chad in 1906 and incorporated into French Equatorial Africa in 1910. Chad later became a separate French territory. Much of the region was leased to French concessionaires, whose fostering of forced labor and other abuses sparked rebellions in 1928, 1935, and 1946. The population of Ubangi-Shari actively supported the Free French forces during

World War II. In 1946 the colony was given its own territorial assembly and representation in the French parliament. In the French constitutional referendum of 1958 the country opted for membership in the French Community. It received autonomy and took its present name. Full independence was attained on Aug 13, 1960, under President David Dacko. (The nationalist leader Barthélemy Boganda, founder of the country's only political party, the Mouvement d'évolution sociale de l'Afrique noire [MESAN], had been killed in a plane crash in 1959.) The Central African Republic had a parliamentary government until Dec., 1965, when a military coup led by Col Jean-Bedel Bokassa (Boganda's nephew) overthrew the Dacko regime, dissolved the national assembly, and abrogated the constitution. The military regime, with Bokassa as both president and head of MESAN, has dealt harshly with dissenters. There have been frequent cabinet changes and Bokassa has personally taken charge of various branches of the civil service. Close relations with France have been maintained. The Central African Republic is an associate member of the European Common Market and belongs to the French-oriented Afro-Malagasy Common Organization and the five-nation Central African Customs and Economic Union. It also holds membership in a monetary union with other equatorial African states and Cameroon, all of whom share a central bank and common currency. In 1968 the Central African Republic, Chad, and Zaïre formed a loose union of central African states. See Virginia Thompson and Richard Adloff, *The Emerging States of French Equatorial Africa* (1960), V T LeVine, *Political Leadership in Africa* (1967), Pierre Kalck, *Central African Republic* (tr 1971).

Central America, narrow, southernmost portion of the continent of North America, linked to South America by the Isthmus of Panama. It separates the Caribbean Sea from the Pacific Ocean. From a geological standpoint, Central America includes the land (c 276,400 sq mi/715,900 sq km) between the Isthmus of Tehuantepec, S Mexico, and the Isthmus of Panama, although it includes four states and one territory of Mexico and excludes the republic of Panama (which occupies an arm of South America), the term is generally applied to the colony of Belize (British Honduras) and the republics of Guatemala, Honduras, El Salvador, Nicaragua, Costa Rica, and Panama. The mountains of N Central America are an extension of the mountain system of W North America and are related to the islands of the West Indies. The middle portion of Central America is an active zone of volcanoes and earthquakes, it contains the Nicaragua Depression, which includes the huge lakes Nicaragua and Managua. The ranges of S Central America are outliers of the Andes Mts of South America. Tajumulco (13,846 ft/4,210 m high), a volcano in Guatemala, is the region's highest peak. Central America's climate varies with altitude from tropical to cool. The eastern side of the region receives heavy rainfall. Bananas, coffee, and cacao are the chief crops of Central America, and gold and silver are mined there. The Inter-American Highway traverses W Central America. See R C West and J P Augelli, *Middle America: Its Lands and Peoples* (1966), E G Squier, *Notes on Central America* (1855, repr 1969), H C Espy and Lex Greener, *Another World: Central America* (1970).

Central American Common Market (CACM), trade organization formed in 1960 by a treaty on economic integration between Guatemala, Honduras, Nicaragua, and Salvador. Costa Rica later became a member. By the mid-1960s the group had made impressive advances toward economic integration, and by 1970 trade between member nations had risen more than tenfold over 1960 levels. During the same period, imports doubled and a common tariff was established for 98% of the trade with non-member countries. In 1967, at the conference of American presidents at Punta del Este, Uruguay, it was decided that CACM, together with the LATIN AMERICAN FREE TRADE ASSOCIATION, would be made the basis for a comprehensive Latin American common market. However, by the middle of the 1970s little progress toward a Latin American common market had been made, and CACM, after a decade of economic gains, had been weakened by internal strife. After the Salvador-Honduras conflict of 1969, Honduras rescinded its CACM trade agreements—thus, in effect, withdrawing from CACM. In 1972 meetings were held to restructure the association.

Central American Federation or Central American Union, political confederation (1825–38) of the republics of Central America—Costa Rica, Guatemala, Honduras, Nicaragua, and Salvador. United

under a captaincy general in Spanish colonial times, they gained independence in 1821 and were briefly annexed to the Mexican empire formed by Agustín de Iturbide. The nations joined in a loose federal state, appointing (1825–29) as first president Manuel José Arce, who was succeeded (1830–38) by the liberal leader, Francisco MORAZÁN. Political and personal rivalries between liberals and conservatives, poor communication, and the fear of the hegemony of one state over another led to dissolution (1838) of the congress and the defeat (1839) of Morazán's forces by Rafael CARRERA. In 1842, Morazán made an abortive attempt to reestablish the federation from Costa Rica. Later efforts by Nicaragua, Honduras, and Salvador failed. The attempts of Justo Rufino BARRIOS (1885) and José Santos ZELAYA (1895) only increased existing enmities. At the Central American conference of 1922–23 the US recommendation of a union was not favorably received, partly because of earlier US policies in Panama and Nicaragua. Nevertheless, geography, history, and practical expedience are factors that constantly encourage union. In 1951 the organization of Central American States was formed to help solve common problems, and in 1960 the five nations established the CENTRAL AMERICAN COMMON MARKET. See T L Karnes, *The Failure of Union: Central America, 1824–1960* (1961), Nino Maritano, *A Latin American Economic Community* (1970).

Central Asiatic Railroad· see TRANS CASPIAN RAILROAD.

Central Australia: see NORTHERN TERRITORY, Australia.

central bank, financial institution designed to regulate and control the fiscal and monetary activities of a nation. Usually state owned, central banks turn all or most of their profits over to the government. They are responsible for issuing notes to be used as legal tender, maintaining adequate reserve backing for the nation's banks, and controlling the flow of money and precious metals. Such responsibilities are met by regulating the discount rate, making reserve advances to commercial banks, trading in government obligations, clearing checks, and acting as the government's fiduciary agent in its dealings with other governments and other central banks. In essence, the central bank acts as a banker's bank and as its government's bank. Although the term was hardly known before 1900, the concept of central banking dates back to at least 1694, when the Bank of England was founded. Another early central bank was the Swedish Riksbank. Today every economically developed nation possesses the equivalent of a central bank, most of which have been modeled after the Bank of England. Notable central banks include France's Banque de France, Germany's Deutsche Bundesbank, and the US FEDERAL RESERVE SYSTEM (established 1913). Central banking in the United States developed as a result of the weakness of state banks following the lapse of the BANK OF THE UNITED STATES.

Central Falls, industrial city (1970 pop 18,716), Providence co., N R I., on the Blackstone River, set off from Lincoln and inc 1895. Electric light bulbs are made there.

Centralia (sēntrā'lēə) 1 City (1970 pop 15,217), Clinton and Marion counties, S Ill., in an oil, coal, farm, and fruit region, inc 1859. Founded in 1853 by the Illinois Central RR and named accordingly, it is the shipping center for the products of the area. Its railroad yards are still its major industry, but the city has varied manufactures, including clothing, candy, and stoves and heaters. A junior college is there. 2 City (1970 pop 10,054), Lewis co., SW Wash., at the confluence of the Chehalis and Skookumchuck rivers, inc 1889. It is a railroad junction and a farm trade center, with a great lumbering industry. A massive electric steam plant and two nearby dams make the city a major power center. A junior college and the county fairgrounds are there. A violent clash between townspeople and organized lumber workers occurred in Centralia on Nov 11, 1919.

Central Intelligence Agency (CIA), independent executive bureau of the US government established by the National Security Act of 1947. It replaced the wartime OFFICE OF STRATEGIC SERVICES (1942–45), the first US intelligence agency. The CIA was established to gather intelligence information abroad and report to the President and to the National Security Council, his advisory body. For secrecy, it was given (1949) special powers under the Central Intelligence Act, its director may spend the agency's funds without accounting for them, and the size of its staff is never divulged. Employees, exempt from civil service procedures, may be hired, investigated, or dismissed as the CIA sees fit. To



safeguard civil liberties in the United States, however, the CIA is denied domestic police powers, for operations in the United States it must enlist the services of the Federal Bureau of Investigation. Faulty intelligence reports prior to the Korean War led (1950) to the appointment of Gen. Walter Bedell Smith as director. Allen Welsh Dulles, a veteran intelligence agent who was director from 1953 to 1961, strengthened the agency and emboldened its tactics. The CIA has often been criticized for taking an active role in the internal affairs of foreign countries. The agency was heavily involved in the 1961 invasion of Cuba, the failure of which deeply embarrassed the United States. In 1971 the U.S. government acknowledged that the CIA had recruited and paid an army fighting in Laos. In 1973 the CIA came under Congressional investigation for its role in the PENTAGON PAPERS case. The agency had provided members of the White House staff, on request, with a personality profile of Daniel Ellsberg, defendant in the Pentagon Papers trial in 1973, and it had supplied materials that were used in the break-in at Ellsberg's psychiatrist's office in 1971 by members of a special unit established by the White House to investigate internal security leaks. The CIA's involvement in domestic affairs was a direct violation of the National Security Act of 1947, and efforts were begun in Congress to strengthen provisions barring the agency from domestic operations. Operations of the CIA again came under attack in 1974 when it was revealed that the agency had been involved in Chilean internal affairs during the administration of Salvador Allende Gossens. Further revelations of CIA domestic surveillance prompted President Ford to establish a commission of inquiry in Jan., 1975, at the same time Congress set up its own investigations. After Dulles's retirement John Alex McCone was (1961-65) director of the agency. He was succeeded by William F. Raborn (1965-66), Richard M. Helms (1966-72), James R. Schlesinger (1973), and William E. Colby (1973-). See Andrew Tully, *CIA: The Inside Story* (1962), L. B. Kirkpatrick, *The Real CIA* (1968), H. H. Ransom, *The Intelligence Establishment* (rev. ed. 1970), P. J. McGarvey, *CIA: The Myth and the Madness* (1972).

Central Michigan University, at Mount Pleasant, Mich., coeducational, est. 1892 as a normal school, became Central State Teachers College in 1927, achieved university status in 1959. From 1938 to 1958 graduate courses were offered in association with the Univ. of Michigan. The university maintains a forest of over 200 acres (81 hectares) used for botanical and biological research. The Clarke Historical Library contains material on the Old Northwest Territory.

Central nervous system: see NERVOUS SYSTEM

Central Park, 840 acres (340 hectares) largest park in Manhattan, New York City, bordered by 59th St. on the south, Fifth Ave. on the east, 110th St. on the north, and Central Park West on the west. The land, acquired by the city in 1856, was improved according to the plans of U.S. landscape architects Frederick L. Olmsted and Calvert Vaux. The park has rolling terrain with lakes and ponds, greeneries, bridle paths, walks, and park drives. There are many playgrounds and other recreational facilities, including the Wollman Skating Rink. The Metropolitan Museum of Art stands in the park on Fifth Ave., other points of interest include a formal garden, a zoo, an Egyptian obelisk called "Cleopatra's Needle," a New York City reservoir, and the Mall, where concerts are given. In the open-air Delacorte Theater, Shakespearean dramas and other plays are presented free of charge.

Central Powers, in WORLD WAR I, the coalition of Germany, Austria-Hungary, Bulgaria, and the Ottoman Empire.

Central Provinces and Berar: see MADHYA PRADESH

Central Treaty Organization (CENTO), international governmental organization, formed in 1955 for the military defense of the Middle East. The initial pact was signed by Turkey and Iraq. Great Britain, Pakistan, and Iran joined later that year. In 1956, although it did not become a full member, the United States pledged to cooperate. Originally known as the Middle East Treaty Organization, the association was based on the Baghdad Pact of 1955. After Iraq left the organization in 1959, the name was changed to CENTO, and headquarters were moved from Baghdad to Ankara. The CENTO powers are also pledged to economic and social cooperation in the Middle East.

Central Utah Project, N. central Utah, begun 1959 near Vernal, Utah, by the U.S. Bureau of Reclamation in conjunction with the COLORADO RIVER STORAGE PROJECT. Water, collected from streams in the

Uinta Mts., is carried across the Wasatch Range to the densely populated Salt Lake City region by a system of dams, reservoirs, tunnels, aqueducts, and canals. Strawberry Dam and Reservoir, in which the water is stored, provides water for domestic and industrial use, irrigation, hydroelectricity, fish and wildlife preservation, and flood control.

Central Valley, great trough of central Calif., c 450 mi (720 km) long and c 50 mi (80 km) wide, between the Sierra Nevada and the Coast Ranges. The Sacramento and San Joaquin rivers drain most of the valley before converging in a huge delta and flowing into San Francisco Bay. The delta is California's leading truck-farming and horticultural area. The Central Valley is the largest agricultural belt in California. With its long growing season and rich soil, the valley has the largest single concentration of fruit farms and vineyards in the United States; cotton, grain, and vegetables are also grown. Precipitation ranges from 30 in. (76 cm) in the north to 6 in. (15.2 cm) in the south. Two thirds of the valley's agricultural land is located in the south, while two thirds of the water is in the north. The Central Valley project attempts to remedy this problem by bringing water from the Sacramento basin in the north into the San Joaquin Valley in the south. The Tulare Lake basin in the extreme southern part of the valley is very dry and has alkaline conditions that make it almost totally unsuitable for irrigation. The Central Valley was first seen by Spanish explorers in the 1500s but remained virtually uninhabited until 1848, when gold was discovered nearby. In the late 1800s the valley became a rich agricultural region, with wheat as the main crop. Irrigation was introduced in the 1880s.

Central Valley project, central Calif., long-term general scheme for the utilization of the water of the Sacramento River basin in the north for the benefit of the farmlands of the San Joaquin Valley in the south, undertaken by the U.S. Bureau of Reclamation in 1935. The aims of the program are flood control, improvement of navigation, the development of hydroelectric power, irrigation, and municipal and industrial water supply, protection of the Sacramento delta from seawater encroachment, and the propagation and preservation of fish and wildlife. The project irrigates c 300,000 new acres (121,410 hectares) and supplements c 938,000 acres (379,610 hectares) of cultivated land. Shasta and Keswick dams on the Sacramento River, and Friant Dam with its reservoir, Lake Millerton, on the San Joaquin River, were among the first units built. Canals transport water throughout the valley, among the most important are the Friant-Kern Canal, the Madera Canal, the Delta Cross Channel (which uses Sacramento water to fight soil salinity in the delta), and the Delta-Mendota Canal. The Central Valley project, which will include 48 dams and reservoirs, 20 large canals, and numerous power plants, is still in progress. Among the newer hydroelectric dams are San Luis (424,000-kw capacity), Spring Creek (150,000 kw), and Judge Francis Carr (134,000 kw). Auburn Dam (240,000-kw capacity) was scheduled for completion in the mid-1970s. Folsom Dam (162,000-kw capacity) is one of several units constructed in the valley by the U.S. Corps of Engineers.

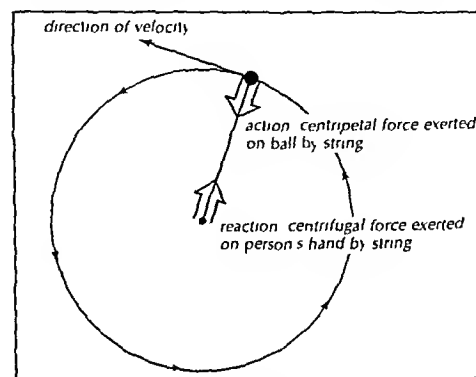
Centreville, city (1970 pop. 11,378), St. Clair co., SW Ill., a suburb of East St. Louis.

centrifuge (sên'trafyôj), device using centrifugal force to separate two or more substances of different density, e.g., two liquids or a liquid and a solid. The centrifuge consists of a fixed base or frame and a rotating part in which the mixture is placed and then spun at high speed. One type is used for the separation of the solid and the liquid parts of blood. Test tubes containing blood specimens are set in the rotating part in holders so arranged that when the rotary motion begins the test tubes swing into a slanted or a horizontal position with the open ends toward the axis of rotation; the heavier, solid part of the blood is thrown outward into the bottom of the tube and the lighter liquid part comes to the top. Another common type of centrifuge called the cream separator is used to separate cream from whole milk. Uranium-235, which is found in nature mixed with uranium-238, must be separated to be used to produce nuclear energy. The separation can be done by a centrifuging process in which the uranium, contained in gas molecules, is rotated at high speed in a chamber so that the more massive molecules containing uranium-238 concentrate near the outer edge of the chamber and the lighter molecules containing uranium-235 concentrate near the axis. Several stages of centrifuging are needed to effect the required degree of separation. The first successful centrifuge was built in 1883 by Carl G. P. de Laval, a Swedish engineer, whose design was used

chiefly for cream separators. The ultracentrifuge, devised in the 1920s by the Swedish chemist Theodor Svedberg, found wide application in scientific research. Using an optical system with it to observe sedimentation rates, Svedberg determined accurately the molecular weights of substances including proteins and viruses. Centrifuges are also used for such diverse purposes as simulating gravitational fields in space and for drying laundry.

centriole: see MITOSIS

centripetal force and centrifugal force, action-reaction force pair associated with circular MOTION. According to Newton's first law of motion, a moving body travels along a straight path with constant speed (i.e., has constant VELOCITY) unless it is acted on by an outside FORCE. For circular motion to occur there must be a constant force acting on a body, pushing it toward the center of the circular path. This force is the centripetal ("center-seeking") force. For a planet orbiting the sun, the force is gravitational; for an object twirled on a string, the force is mechanical; for an electron orbiting an atom, it is electrical. The magnitude F of the centripetal force is equal to the mass m of the body times its velocity squared v^2 divided by the radius r .



Centripetal and centrifugal forces. When a ball is swung in a circle at the end of a string, centripetal and centrifugal forces act as shown above.

of its path $F = mv^2/r$. According to Newton's third law of motion, for every action there is an equal and opposite reaction. The centripetal force, the action, is balanced by a reaction force, the centrifugal ("center-fleeing") force. The two forces are equal in magnitude and opposite in direction. The centrifugal force does not act on the body in motion; the only force acting on the body in motion is the centripetal force. The centrifugal force acts on the source of the centripetal force to displace it radially from the center of the path. Thus, in twirling a mass on a string, the centripetal force transmitted by the string pulls in on the mass to keep it in its circular path, while the centrifugal force transmitted by the string pulls outward on its point of attachment at the center of the path. The centrifugal force is often mistakenly thought to cause a body to fly out of its circular path when it is released; rather, it is the removal of the centripetal force that allows the body to travel in a straight line as required by Newton's first law. If there were in fact a force acting to force the body out of its circular path, its path when released would not be the straight tangential course that is always observed.

centumviri (sêntûm'vîrî) [Lat., = a hundred men], in ancient Rome, law court of a varying number of members that heard civil cases having to do with land and property claims. Each Roman tribe was represented in it. Under the empire the centumviri had to deal chiefly with inheritance. The last mention of it is in A.D. 395.

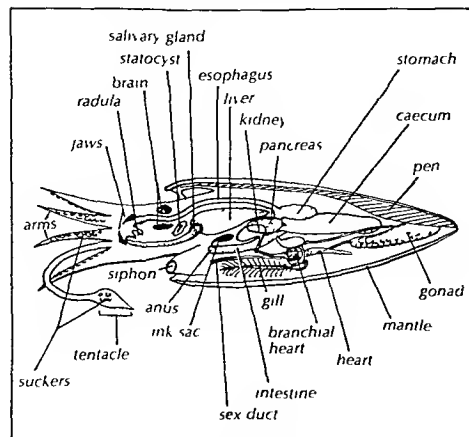
century plant: see AMARYLLIS

Ceos, Greece. See KÊA

cephalic index (səfāl'ik) [Gr. *kephale* = head], ratio of the breadth of the head to its length. Expressed as a percental number, it provides the simplest description of the geometric relation of two dimensions. The index is obtained by dividing the maximum width of the cranium by its maximum length and multiplying by 100. In ANTHROPOMETRY, the cephalic index has been the favored measurement. A cephalic index of 80 or more is called brachycephalic or broad; a measurement between 75 and 80 is mesocephalic; below 75 is considered dolicocephalic or long. The cranial index is the same ratio taken on a skull.

Cephalonia, Greece. See KEFALLINIA

cephalopod, member of the class Cephalopoda, the most highly organized group of mollusks (phylum MOLLUSCA), and including the SQUIDS, OCTOPUSES, CUTTLEFISH, and NAUTILUSES. The class as a whole has become adapted for a free-swimming existence. Cephalopods are able to move about rapidly, and most are aggressive carnivores. The part of the body that forms the foot in other mollusks is located ante-



Internal anatomy of a squid, *Loligo*, representative mollusk of the class Cephalopoda

riorly in cephalopods instead of ventrally. Part of the foot area surrounds the mouth and is modified into sucker-bearing tentacles, used to capture prey. The tentacles number 8 in octopuses, 10 in squids, and as many as 90 in nautilus. The rest of the foot forms a muscular funnel, or siphon, which expels water from the mantle cavity, permitting cephalopods to move about by a kind of jet propulsion. Only one existing genus, the nautilus, the sole survivors of an extinct group known as the nautiloids, possesses an external shell. In the squid and cuttlefish the shell has become internalized and reduced, and in the octopus it is completely absent. The cephalopod head is large and is equipped with prominent eyes that resemble those of vertebrate animals. The class Cephalopoda has a fossil record of 10,000 species, although only 400 exist today. The nautiloid group was dominant through Paleozoic times, and the AMMONITES flourished in the Mesozoic era.

cephalosporin (sēf'ālōspōr'īn), any of a group of ANTIBIOTICS derived from species of fungi of the genus *Cephalosporium* and closely related chemically to PENICILLIN. Cephalosporins act against both gram-positive and gram-negative bacteria (see GRAM STAIN) by inhibiting bacterial cell wall synthesis. They are used to treat urinary infections and infections of penicillin-resistant staphylococci, especially in patients sensitive to penicillin.

Cephalus (sē'faləs), in Greek mythology, husband of Procris. The two swore eternal fidelity, but Eos, who had fallen in love with Cephalus, persuaded him to test his wife. Cephalus disguised himself and offered to pay Procris to commit adultery. When she yielded, he angrily deserted her. Later they were reconciled, but eventually Procris became suspicious and followed Cephalus one night while he was hunting. Mistaking his wife for an animal, Cephalus killed her. He then wandered for many years but was unable to escape his grief and finally leaped to his death from a precipice.

Cephas (sē'fəs), Jesus' name for St. Peter. John 1:42.

cephheid variable (sē'fēid), rather small class of variable stars that brighten and dim in an extremely regular fashion. The periods of the fluctuations (the time to complete one cycle from bright to dim and back to bright) range from 1 to 50 days. These stars are important because the period of a cepheid depends on its intrinsic brightness, or absolute MAGNITUDE, in a known way the brighter the star, the greater its period. All cepheid variables with the same period have nearly the same intrinsic brightness, but their apparent brightnesses differ because they are at different distances. By observing a cepheid's period, one can determine how bright it actually is. By comparing this intrinsic brightness to how bright it appears to be, one can determine its distance. This property makes the cepheids invaluable in estimating interstellar and intergalactic distances, and they are often called the "yardsticks of the universe." The cepheid class takes its name from

the first one discovered (1784), which is located in the constellation Cepheus. Cepheids are yellow supergiant stars, and their fluctuations in luminosity result from an actual physical pulsation, with attendant changes in surface temperature and size. The stars are hottest and brightest when expanding at maximum rate midway between their largest and smallest size. The period-luminosity relation was discovered by studying the many cepheids in the Magellanic Clouds, the two closest galaxies, these stars are all almost equally distant. It was found that the brighter variables had the longer periods. The absolute magnitude of a few cepheids is required to infer absolute, rather than merely relative, distances. These absolute magnitudes were measured by a statistical study of the proper motions of cepheids within our own galaxy. Difficulties in this method caused an overestimation of the absolute magnitude of all cepheid variables. It was also found that there are two distinct classes of cepheids with different period-luminosity relations. The correction of these errors in the 1950s led to a dramatic doubling of estimated cosmological distances.

Cephisodotus (sēfīsō'dōtəs), Gr. *Kephisodotos*, fl. 4th cent. B.C., two Greek sculptors. The elder, the master and probably the father or the brother of Praxiteles, is noted for the statue *Irene and Plutus* (*Peace and Wealth*). The original was erected on the Areopagus at Athens c. 372 B.C. to celebrate the victory of Timotheus over the Spartans. The best copy is in Munich. Cephisodotus, the Younger, a son of Praxiteles, continued the Praxitelean tradition into the early 3d cent. B.C.

Ceram (sā'ram), island (1970 est. pop. including offshore islands, 100,000; c. 6,600 sq mi (17,100 sq km)), E. Indonesia, W. of New Guinea, second largest of the Moluccas. Its chief port and town is Waihai. Traversed by a central mountain range rising to more than 10,000 ft (3,050 m), the island is c. 210 mi (340 km) long and c. 40 mi (60 km) wide. The interior has dense rain forests and is largely unexplored. Copra, resin, sago, and fish are important commercial products. Oil is exploited in the northeast near Bula. Portuguese missionaries were active there in the 16th cent. Dutch trading posts were opened in the early 17th cent., and the island came under nominal Dutch control c. 1650. Variants of the name are Seran and Serang.

Ceramic Gulf· see CERAMICUS SINUS

ceramics (sērām'īks) includes all forms of POTTERY, from crude EARTHENWARE to the finest PORCELAIN. The term is usually applied to handmade objects, such as figurines and fine dinnerware.

Ceramicus Sinus (sērām'īkəs sī'nəs) or **Ceramic Gulf** (sērām'īk), ancient name of the Gulf of Kos, or of Kerme, SW Turkey, an inlet of the Aegean Sea. The celebrated city of Halicarnassus, capital of Carpatocia, was on the gulf.

Cerano, Il· see CRESPI, GIOVANNI BATTISTA

ceratotherium· see RHINOCEROS

Ceraunian Mountains (sērōn'ēən), Albanian Kanalet, coastal range, S. Albania, extending northwest c. 70 mi (110 km) from the Greek border to the Strait of Otranto, Mt. Çikes (6,726 ft/2,050 m) is the highest peak. At the northern end the rugged range forks around Vlore Bay, the west fork ends in Cape Lingua (Albanian *Gjuhezës*). The range is sometimes called the Acroceraunian Mts.

Cerberus (sēr'berəs), in Greek mythology, many-headed dog with a mane and a tail of snakes, offspring of Typhon and Echidna. He guarded the entrance of Hades. One of the 12 labors of Hercules was to capture him.

Cerdic (kūr'dīk, sūr'-), d. 534, traditional founder of the kingdom of Wessex. A Saxon, he and his son Cynric are said to have landed on the southern coast of England in 495. Little is certain about him except that later West Saxon kings traced their descent from him through his son Cynric and his grandson Ceawlin.

cerebellum (sēr'ābēl'am), portion of the BRAIN that coordinates movements of voluntary (skeletal) muscles. In the cerebellum, motor impulses from the cerebrum are organized and modulated before being transmitted to muscle. As the muscle tissue responds, sensory nerve cells in the muscle return information to the cerebellum. Thus throughout a period of muscular activity, the cerebellum is able to adjust speed, force, and other factors involved in movement. The overall result is smooth and balanced muscular execution. If the cerebellum is injured, an activity like walking becomes a series of jerks; the muscles involved contract too much or too little and operate out of sequence. Maintaining

muscle tone is also a function of the cerebellum. Filling most of the skull behind the brainstem and below the cerebrum, the human cerebellum approximates an orange in size and consists of two hemispherical lobes. The grooved surface of the cerebellum is gray matter, composed chiefly of nerve cells. The interior, dense with nerve fibers, is white matter. Three main nerve tracts link the cerebellum with other brain areas.

cerebral palsy (sarē'bral pōl'zē), disability caused by brain damage before or during birth, resulting in a loss of muscular control and coordination. Most cases are thought to be caused by oxygen deficiency during the birth process. The severity of the affliction is dependent on the extent of the brain damage. Those with mild cases may have only a few affected muscles, while severe cases can result in total loss of coordination or paralysis. Nowadays it is believed that there are six different forms of the disability, each caused by damage to a different area of the brain. The spastic type, accounting for over half of the cases, results from damage to the motor areas of the cerebral cortex and causes the affected muscles to be contracted and overresponsive to stimuli. Athetosis, caused by damage to the basal ganglia, results in sudden, exaggerated movements. The two types of ataxia cause either an impaired sense of balance or a lack of coordinated movements. In flaccid paralysis, the muscles are flabby and unresponsive, patients with spastic rigidity are unable to contract their muscles, while those with tremor suffer from repeated muscular contractions. About 25% of those affected suffer some degree of mental retardation. There is no cure for the disorder and treatment usually includes physical, occupational, and speech therapy. Sometimes appliances such as braces are helpful, as well as certain surgical procedures.

cerebrospinal meningitis· see MENINGITIS

cerebrum· see BRAIN

ceremony, expression of shared feelings and attitudes through more or less formally ordered actions of an essentially symbolic nature performed on appropriate occasions. A ceremony involves stereotyped bodily movements, often in relation to objects possessing symbolic meaning. For example, people bow or genuflect, tip hats, present arms, slaughter cattle, salute flags, and perform a myriad of other actions. Ceremonies express, perpetuate, and transmit elements of the value and sentiment system and aim at preserving such values and sentiments from doubt and opposition; moreover, they intensify the solidarity of the participants. Ceremonies are found in all societies.

Cerenkov radiation· see CHERENKOV RADIATION

Ceres, in astronomy, the first ASTEROID to be discovered. It was found on Jan. 1, 1801, by G. Piazzi. He took three distinct observations, on the basis of these the mathematician Gauss calculated Ceres' orbit with such accuracy that it was found one year later within 0.5° of the predicted position. Ceres is the largest and most massive of the asteroids; it has a diameter of c. 470 mi (750 km) and a mass 1/100,000 that of the earth. Its ORBIT has a semimajor axis of 2.78 ASTRONOMICAL UNITS and a period of 1,681 days.

Ceres (sēr'ēz), in Roman religion, goddess of grain, daughter of Saturn and Ops. She was identified by the Romans with the Greek Demeter. Her worship was connected with that of the earth goddess and involved not only fertility rites but also rites for the dead. Her chief festival was the Cerealia, celebrated on April 19, and her most famous cult was that of the temple on the Aventine Hill. There is much argument about the origins and nature of her cults.

cereus· see CACTUS

Cerignola (chārēnyō'la), city (1971 pop. 47,683), Apulia, S. Italy. It is an agricultural center and a transportation junction. The city suffered a severe earthquake in 1731 and was largely rebuilt. Nearby, in 1503, the Spanish under Gonzalo Fernández de Córdoba defeated the French under Louis XII (see ITALIAN WARS).

Cerinthus (sēr'īn'thəs), fl. A.D. c. 100?, Jewish-Christian religious leader, b. Ephesus. He held tenets influenced by Gnosticism and similar to those of the Ebionites. He taught that the Christ descended into Jesus at his baptism and left him again before the Passion.

cerium (sēr'ēəm) [from the asteroid Ceres], metallic chemical element, symbol Ce, at no. 58, at wt. 140.12, m.p. about 800°C, b.p. 3468°C, sp. gr. 6.77 at 25°C, valence +3 or +4. Cerium is a soft, malleable, ductile, iron-grey metal with hexagonal or cubic

crystalline structure. It is slightly harder than lead. It is the most abundant of the RARE-EARTH METALS of group IIIb of the PERIODIC TABLE. It does not tarnish rapidly in dry air but quickly loses its luster in moist air. It oxidizes slowly in cold water and rapidly in hot water. It is attacked by solutions of alkalis and by concentrated or dilute acids. When heated it burns with a brilliant flame to form the oxide (ceria) that exhibits incandescence and is used in making lamp mantles (see WELSBACH MANTLE). The metal is used as a core for the carbon electrodes of arc lamps. The element forms alloys with other metals. An alloy of cerium and iron is used as the flint in cigarette and gas lighters. Minute particles of this alloy ignite in the air when scratched from the surface of the larger mass. Cerium is prepared by electrolysis of the chloride or by reduction of the fused fluoride with calcium. Cerium was recognized in 1803 in the oxide (ceria) as a new metal by M. H. Klaproth and by J. J. Berzelius and Wilhelm Hisinger; it was named for the asteroid Ceres, which had been discovered only two years earlier. The metal was obtained in a very impure state by C. G. Mosander and by Friedrich Wöhler some thirty years later; the nearly pure metal was not obtained until 1875 by W. F. Hillebrand and T. H. Norton.

CERN: see EUROPEAN ORGANIZATION FOR NUCLEAR RESEARCH

Cernauti: see CHERNOVTSY, USSR

Cernuda, Luis (lōōēs' thārnōō'thā), 1904-, Spanish poet. Cernuda fled Spain after the Spanish civil war and taught abroad. His works include *La realidad y el deseo* [reality and desire] (1936), a collection of his delicate surrealist verse, and *Oknos el afarrero* (1943), a prose lyric. He has also written about contemporary Spanish poetry (1957) and English lyric poetry (1958). See *The Poetry of Luis Cernuda* (bilingual ed. 1971), studies by John A. Coleman (1964) and Philip Silver (1965).

Cernuschi, Henri (chārnōō'skē), 1821-96, Italian politician and economist. A strong republican, he was a leader in the Milan revolt of 1848 in support of Giuseppe Garibaldi. In 1850 he went to France, where he became a director of the Bank of France. Cernuschi vigorously advocated Bimetallism and is said to have coined the word. His writings include many pamphlets on the subject, notably *Silver Vindicated* (1876).

Cesari, Jean Gabriel (zhāN gābrēēl' sērā'), 1734-1805, frontiersman and trader in the American Midwest, b. Montreal, Canada. By 1755 he had established a fur-trading post at Kaskaskia, Ill., where for many years he was a prominent and powerful figure. He outfitted many traders and hunters for the Missouri region and maintained close relations with the Indians. The British made efforts to gain his support in the American Revolution, but he allied himself with the patriots and gave George Rogers Clark provisions and financial aid. Later he moved to St. Louis, where his influence was maintained until his death.

Cerro de Pasco (sēr'ō thā pās'kō), city (1961 pop. 21,363), capital of Pasco dept., central Peru. At an altitude of 13,973 ft (4,259 m), it is one of the highest cities in the world. Cerro de Pasco is noted for its silver mines, which, according to tradition, were discovered in 1630. When silver deposits declined late in the 19th cent., the exploitation of other metals, chiefly copper, again made Cerro de Pasco Peru's leading mining center. From the nearby Minasranga mines comes about 80% of the world's supply of vanadium.

Cerro Gordo (sār'ō gōr'thō), mountain pass, E Mexico, on the road between Veracruz and Jalapa, site of a decisive battle (April 17-18, 1847) of the Mexican War. General Santa Anna, having established himself firmly at and behind the pass, attempted to halt the advance of Gen. Winfield Scott from Veracruz to Mexico City. Although the Mexicans thought their position impregnable, the Americans were able to rout the weak left flank and take the pass from the rear. Santa Anna was defeated, and Jalapa occupied. Capt. Robert E. Lee (who scouted out a route for the flanking movement) and Lt. U. S. Grant took part in the battle.

Cerro Tololo Inter-American Observatory (sār'ō tōlō'lō), astronomical OBSERVATORY located on Cerro Tololo peak, Chile, with offices in La Serena, about 40 mi (64 km) to the west. It is operated by the Association of Universities for Research in Astronomy (AURA), which also operates Kitt Peak National Observatory in Arizona. The principal instrument is a 158-in (401-cm) reflecting telescope, the largest in the Southern Hemisphere and the twin of the 158-

in reflector at Kitt Peak. Other equipment of the observatory includes 60-in (152-cm), 36-in (91-cm), and twin 16-in (41-cm) reflectors, the 24-in (61-cm) Curtis-Schmidt telescope formerly at the Univ. of Michigan, and the Fabry-Perot interferometer. Also at Cerro Tololo, a half mile from the summit, is a 24-in reflector belonging to the Lowell Observatory. **Certosa di Pavia** (chārtō'zā dē pāvē'ā), former Carthusian abbey of Pavia. One of the most magnificent of all monastic structures, it has been maintained as a national monument since 1866. The church, forming its nucleus, was begun in the style of the Italian Gothic in 1396 by Gian Galeazzo Visconti, duke of Milan. Little more than the nave was executed in this style, since the Renaissance, diffusing its new taste, quickly dominated the design of the edifice. The facade seems to have been begun in 1491 by a group of architects and sculptors under the leadership of Giovanni Antonio Amadeo; it was finished in the mid-16th cent. Built of rich marbles and profusely ornamented with fine sculptural decorations, it is one of the masterpieces of Renaissance decorative design. The two large arched cloisters are of richly ornamented terra-cotta. The main choir was badly damaged in World War II but was restored between 1953 and 1959.

Cerussite (sēr'āsīt), colorless to white or gray mineral, sometimes yellowish or greenish, transparent to opaque, very brittle, crystallizing in the orthorhombic system and occurring also in granular and massive form. It is a carbonate of lead, PbCO₃, formed by the action of carbonate and bicarbonate solutions on galena. It is an important ore of lead widely distributed throughout the world and found associated with galena and other lead minerals.

Cervantes Saavedra, Miguel de (sərvān'tēs, Spān' mēgēl' dā thērvān'tās sāv'āvāthērā), 1547-1616, Spanish novelist, dramatist, and poet, author of *Don Quixote de la Mancha*, b. Alcalá de Henares. Little is known of Cervantes's youth. He went to Italy (1569), where, in the service of a cardinal, he studied Italian literature and philosophy, which were later to influence his work. In 1570 he enlisted in the army and fought in the naval battle of Lepanto (1571), receiving a wound that permanently crippled his left arm. While returning to Spain in 1575 he was captured by Barbary pirates and was sold as a slave; he eventually became the property of the viceroy of Algiers. After many attempted escapes, he was ransomed in 1580, at a cost that brought financial ruin to himself and to his family. As a government purchasing agent in Seville (1588-97), he proved less than successful; his unbusinesslike methods resulted in deficits, and he was imprisoned several times. His first published work was an effusive pastoral romance in prose and verse, *La Galatea* (1585). Between 1582 and 1587 he wrote more than 20 plays, only 2 of which survive. He was 58 when Part I of his masterpiece, *Don Quixote* (1605, Part II, 1615) was published. As a superb burlesque of the popular romances of chivalry, *Don Quixote* was an enormous and immediate success. A spurious Part II was published in 1614, probably spurring Cervantes to complete the work. *Don Quixote* is considered a profound delineation of man's two conflicting attitudes toward the world and his relationship to it: his idealism and his realism. The work has been appreciated as a satire on unrealistic extremism, an exposition of the tragedy of idealism in a corrupt world, or a plea for widespread reform. Whatever its intended emphasis, the work presented to the world an unforgettable description of the transforming power of illusion, and it had an indelible effect on the development of the European novel. *Don Quixote* is a country gentleman who has read too many chivalric romances. He and the peasant Sancho Panza, as his squire, set forth on a series of extravagant adventures. The whole fabric of 16th-century Spanish society is detailed with piercing yet sympathetic insight. The added idealism of *Don Quixote* and the earthy acquisitiveness of Sancho serve as catalysts for numerous humorous and pathetic exploits and incidents. Its panorama of characters, the excellence of its tales, and its vivid portrayal of human nature contribute to the enduring influence of *Don Quixote*. In later years Cervantes wrote other works of fiction, including *Novelas ejemplares* (1613), 12 original tales of piracy, gypsies, and human passions, drawn from his own experience and molded by his mature craftsmanship. Some of these stories in themselves prove him one of the great literary masters. Among the most acclaimed translations of *Don Quixote* are those by Samuel Putnam (1949) and J. M. Cohen (1950). See biographies by Luis Astrana Marín (in Spanish, 7 vol. 1948-58), Fernando Díaz Plaja (tr. 1970), Francisco Navarro y Ledesma (tr. 1973) and R. L. Predmore

(1973), studies by Lowry Nelson (1969), Angel Flores and M. J. Benardete, ed. (1948, repr. 1969), bibliographies by D. B. Drake (vol. I, 1968), R. L. Grismer (2 vol., 1942-43, repr. 1971).

Cervera y Topete, Pascual (pāskvāl' thērvā'rā ē tōpā'tā), 1839-1909, Spanish admiral. During the SPANISH-AMERICAN WAR of 1898 he was given command of the Atlantic fleet and sent, against his own advice, to Cuba. He was blockaded by the American fleet in the harbor of Santiago de Cuba from May until July 3. Then, in an attempt to run the blockade, he lost his entire fleet and was captured. After his release he was tried and absolved from responsibility for the disaster.

Cervetri: see CAERE

Cervin, Mont., or Monte Cervino: see MATTERHORN

Cerynean hind (sērīnē'ən), in Greek mythology, golden-horned hind sacred to Artemis. The fourth labor of Hercules was to capture the hind.

Césaire, Aimé (ēmā' sēzēr'), 1913-, West Indian poet and essayist who writes in French. After studying in Paris he became concerned with the plight of blacks in what he considers a decadent Western society. With Léopold SENGHOR and LÉON DAMAS he formulated the concept of *négritude*, which urges blacks to reject assimilation and cultivate consciousness of their own racial qualities and heritage. Césaire voiced this idea through poetry, collected in such volumes as *Les armes miraculeuses* (1946) and *Ferremets* (1960) and in the essay *Discours sur le colonialisme* (1950, tr. 1972). In addition to his literary output, which comprises poetry, plays, and historical essays on black leaders, Césaire has held a number of government positions in his native Martinique, including that of mayor of Fort-de-France. See study by Susan Frutkin (1973).

Cesalpino, Andrea: see CAESALPINUS, ANDREAS

cesarean section, delivery of an infant by surgical removal from the uterus through an abdominal incision. The operation is of ancient origin; a Roman law permitted the fetus to be delivered in this manner if the mother died in the last four weeks of pregnancy. The name of the operation derives from the legend that Julius Caesar was born in this fashion. The possibility of saving the mother by such an operation was slight until an improved technique was evolved in the late 19th cent. The procedure was also aided by antiseptics and other developments that made surgery as a whole more successful. Cesarean section is performed nowadays when factors that make natural childbirth too hazardous are present, such as an abnormally narrow pelvis, pelvic tumors, hemorrhage due to accident, or an abnormal position of the fetus within the uterus. Since the wall of the uterus is weakened in the area where the incision is made, subsequent deliveries are usually also by cesarean section.

Cesari, Giuseppe, called *Cavaliere d'Arpino* (jōōzēp'pā chā'zārē kāvālyā'rā dārpē'nō), 1568-1640, Italian late mannerist painter. Cesari's outstanding works are the frescoes in the Capitol and in the Borghese Chapel, Church of Santa Maria Maggiore, Rome. Other works are *Adam and Eve Expelled from Paradise* (Louvre), a self-portrait (Uffizi), and *Perseus and Andromeda* (Metropolitan Mus.). Several eminent baroque painters, including Caravaggio, were his pupils.

Cesena (chāzā'nā), city (1971 pop. 86,070), in Emilia-Romagna, N central Italy, on the Savio River. It is an agricultural market and a food-processing center. Cesena flourished (1379-1465) under the MALATESTA family, who built (15th cent.) a castle on a hill overlooking the city. The castle includes the splendid Renaissance-style Malatestiana Library, which contains numerous valuable manuscripts.

Cesis (tsā'sēs, -zēs), Ger. Wenden, town (1967 est. pop. 17,000), W European USSR, in Latvia, on the Gauja River. It is a rail terminus, an agricultural market town, and a popular summer resort. Founded in 1209, Cesis was the seat of the Livonian Knights and became a member of the Hanseatic League. In 1561 it passed to Poland-Lithuania. Attacked by the forces of Ivan the Terrible in 1577, the fortress was blown up by its own garrison. Cesis was transferred to Sweden in 1629, to Russia in 1721, and to newly independent Latvia in 1918. It was the site in 1919 of a Latvian victory over a German free corps.

cesium (sē'zēm) [Lat. =bluish gray], a metallic chemical element, symbol Cs, at no 55, at wt 132.905, m.p. 28.5°C, b.p. about 700°C, sp. gr. 1.873 at 20°C, valence +1. Cesium is a ductile, soft-as-wax, silver-white metallic element. It is in group Ia of the PERIODIC TABLE. An ALKALI METAL, it is the most

alkaline of all elements. Cesium liquefies in a warm room, mercury and gallium are the only other metals with this property. Chemically cesium resembles rubidium and potassium. It is the most reactive metal and is never found uncombined in nature. Pure cesium can be prepared by electrolysis of fused cesium cyanide in an inert atmosphere; the pure metal must be kept under an inert liquid or gas or in a vacuum to protect it from air and water. Cesium reacts readily with oxygen; it is sometimes used to remove traces of the gas from vacuum tubes and from light bulbs. It reacts with ice, it reacts explosively with water to form cesium hydroxide, the strongest base known. Cesium reacts with the halogens to form a fluoride, chloride, bromide, and iodide. It also forms a sulfate, carbonate, nitrate, and cyanide. The chloride is used in photoelectric cells, in optical instruments, and in increasing the sensitivity of electron tubes. Cesium compounds are used in the production of glass and ceramics and as antishock agents in conjunction with drugs containing arsenic. Cesium-137, a waste product of nuclear reactors, is a radioactive isotope used in the treatment of cancer. Cesium is found in the mineral pollux, or pollucite, which occurs on the island of Elba, in SW Africa, in the United States in Maine and South Dakota, and in Manitoba, Canada. Commercially useful quantities of inexpensive cesium are now available as a by-product of the production of lithium metal. Minute quantities of cesium chloride are found in mineral springs and in seawater. In 1860, R. W. Bunsen and G. R. Kirchhoff discovered the element (the first to be discovered by the use of the SPECTROSCOPE) and named it for the two bright blue lines characteristic of its spectrum. It was first isolated by Carl Seffnerburg in 1881 by electrolysis of its salts.

Česká Lípa (chě'ská lě'pa), Ger *Bohmisch-Leipa*, city (1970 pop 17,008), N Czechoslovakia, in Bohemia, near the East German and Polish borders. A railway junction, it manufactures railroad cars, mining equipment, and electrical instruments. The city has an old castle and an Augustinian monastery.

České Budějovice (chě'ská bōō'dyěōvitsě), Ger *Budweis*, city (1970 pop 78,037), SW Czechoslovakia, in Bohemia, on the Vltava (Moldau) River. An important road and rail hub and river port, České Budějovice is famous for its breweries. Other industries produce machinery, enamelware, food products, and pencils. The city was founded in the 13th cent. It is noted for its inner town, with an arcaded square, and for a nearby castle.

Český Les: see BOHEMIAN FOREST

Český Těšín: see TESCHEN

Céspedes, Carlos Manuel de (kar'lōs manwēl' dā sā'spāthās), 1819-74, Cuban revolutionist. He completed his education in Spain and there took part (1843) in a revolution led by Juan Prim. On returning (1868) to Cuba he began the revolt by proclaiming the demands of Cuban liberals. The TEN YEARS WAR followed. He was elected president by the revolutionists (1869), but other leaders, notably Ignacio Agramonte, disagreed with him, discontent increased, and he was deposed (1873). He was killed in 1874, probably by Spanish soldiers.

Céspedes, Carlos Manuel de, 1871-1939, president of Cuba (1933), b. New York City, son of Carlos Manuel de Céspedes (1819-74). He actively participated in the Revolution of 1895 and the Spanish-American War. When Gerardo MACHADO was overthrown in Aug., 1933, Céspedes became provisional president, but was forced to resign after a coup (Sept. 5) by a student junta supporting Ramon GRAU SAN MARTIN.

Céspedes, Pablo de (pa'blō dā thās'pāthās), 1538-1608, Spanish artist, poet, and scholar. He studied for the priesthood and subsequently studied painting with Federigo Zuccaro in Rome. There he spent some 20 years and won a considerable reputation as painter, architect, and sculptor. On his return to Spain in 1577, he was appointed canon of the Córdoba Cathedral, where the best of his surviving works remain, including the well-known *Last Supper*. He was the author of a comparison of ancient and modern painting, of a work on the Córdoba Cathedral, and of treatises on architecture.

cesspool: see SEPTIC TANK

cestode: see PLATHYHELMINTHES, TAPEWORM

cestus or **caestus**: see BOXING

Cetewayo, Cetywayo (both sē'tivā'ō, -wī'ō, kē-), or **Ketchwayo** (kēchwi'ō), c. 1836-1884, king of the Zulus. Cetewayo gained ascendancy in 1856, when he defeated in battle and killed his younger brother, who was the favorite of their father, Umpanda. On his father's death in 1872, Cetewayo took over. He

was determined to resist European advances in his territory, and in Dec., 1878, he rejected British demands that he disband his troops. The British attacked in 1879, and after losing two engagements they utterly defeated Cetewayo at Ulundi. After a period of exile he was reinstated (1883) in rule over part of his former territory. Discredited by his defeats in the eyes of his subjects, Cetewayo was soon driven out of Zululand to die in exile.

Cetine (tsē'tīnyē), town (1971 pop 22,032), SW Yugoslavia, in Montenegro. It grew around a monastery founded in 1485. The town became the residence of Montenegro's ruling prince-bishops and remained the capital of Montenegro until 1945. The monastery, the burial place of the Montenegrin princes, and the former royal palace (now a museum) remain.

Cetywayo: see CETEWAYO

Ceuta (thāōō'tā), city (1970 est. pop. 67,000), c. 7 sq mi (18 sq km), NW Africa, a possession of Spain, on the Strait of Gibraltar. An enclave in Morocco, Ceuta is administered as an integral part of Cádiz prov., Spain. It is located on a peninsula whose promontory forms one of the PILLARS OF HERCULES. The city, which has a European appearance, is a free port, with a large harbor and ample wharves; it is also a refueling and fishing port. Food processing is an important activity. Ceuta is connected with Tétouan, Morocco, by road and rail. Built on a Phoenician colony, the city was held by Carthaginians, Romans, Vandals, Byzantines, and Arabs (711). Taken by Portugal in 1415 (the first permanent European conquest in Africa), it then passed (1580) to Spain. It has remained Spanish despite several attacks, notably a prolonged siege (1694-1720) by the Sultan Moulay Ismail.

Cevennes (sāvēn'), mountain range, S France, bordering the Massif Central on the southeast. The Cevennes proper occupy the central section of a mountainous arc (average height 3,000 ft/910 m), swinging generally NE from the Montagne Noire (NE of Toulouse) to Mont Pilat (SW of Lyons). Between the Cevennes proper and the Montagne Noire are the Causses—barren limestone plateaus intersected by deep chasms and ravines. The Loire, Allier, Lot, Tarn, Aveyron, Hérault, Gard, and Ardèche rivers all radiate from the Cevennes or the Causses. Mont Lozère (5,584 ft/1,702 m) is the highest peak of the Cevennes proper; Mont Mezenc rises to 5,753 ft (1,754 m). The cultivation of silkworms and the manufacture of silk were characteristic of the area, but the silk industry has greatly declined. Exploitation of coal in the Grand Combe-Bessegès area has activated industry at Ales, making this area the most progressive in the Cevennes. Intensive sheep raising in the interior has worsened erosion.

Ceylon: see SRI LANKA

Cézanne, Paul (pōl sāzan'), 1839-1906, French painter, b. Aix-en-Provence. Cézanne was the leading figure in the revolution toward abstraction in modern painting. From early childhood he was a close friend of Emile Zola, who for a time encouraged the painter in his work. Cézanne went to Paris in 1861, there he met Pissarro, who was a continuing strong influence in his development. He divided his time between Provence and the environs of Paris until his retirement to Aix in 1899. Cézanne's early work is marked by a heavy use of the palette knife, from which he created thickly textured and violently deformed shapes and scenes of a fantastic, dreamlike quality. Although these impulsive paintings exhibit few of the features of his later style, they anticipate the expressionist idiom of the 20th cent. Through Pissarro, he came to know Manet and the impressionist painters. He was concerned, after 1870, with the use of color to create perspective, but the steady, diffused light in his works is utterly unrelated to the impressionist preoccupation with transitory light effects. *House of the Hanged Man* (1873-74, Louvre) is characteristic of his impressionist period. He exhibited at the group's show of 1874 but later diverged from the impressionist mode of expression and developed a firmer structure in his paintings. Cézanne sought to "re-create nature" by simplifying forms to their basic geometric equivalents, utilizing color and considerable distortion to express the essence of landscape (e.g., *Mont Sainte-Victoire*, 1885-87, Phillips Coll., Washington, D.C.), still life (e.g., *The Kitchen Table*, 1888-90, Louvre), and figural groups (e.g., *The Card Players*, 1890-92, one version, S. C. Clark Coll., New York City). Although his portraits are also geometric in approach, they remain vital studies of character, e.g., *Madame Cézanne* (c. 1885, S. S. and V. White Coll., Ardmore, Pa.) and *Amboise Vollard* (Musée du Petit Palais,

Paris). Cézanne developed a new type of spatial pattern. Instead of adhering to the traditional focalized system of perspective, he portrayed objects from shifting viewpoints. He created vibrating surface effects from the play of flat planes against one another and from the subtle transitions of tone and color. In all his work he revealed a reverence for the integrity and dignity of simple forms by rendering them with an almost classical structural stability. His *Bathers* (1898-1905, Philadelphia Mus. of Art) is the monumental embodiment of several of Cézanne's formal visual systems. Cézanne worked in oil, watercolor, and drawing media, often making several versions of his works. His influence upon the course of modern art, particularly upon CUBISM, is enormous and profound. His theories spawned a whole new school of aesthetic criticism, especially in England, that has ranked Cézanne among the foremost French masters. There are fine collections of his paintings in the Louvre, the Metropolitan Museum and the Museum of Modern Art, New York City, and the Barnes Foundation, Merion, Pa. See his letters, ed. by John Rewald (tr. 1941), his drawings, ed. by Adrien Chappuis (1973), his watercolors, ed. by Theodore Reff (1963), catalogue raisonné by Adrien Chappuis (2 vol., tr. 1973), biographies by John Rewald (new ed. 1967) and Jack Lindsay (1969), studies by Roger Fry (new ed. 1958), Meyer Schapiro (2d ed. 1962), and Wayne Andersen (1970).

Cf. chemical symbol of the element CALIFORNIUM

cgs system, system of units of measurement based on the METRIC SYSTEM and having the CENTIMETER of length, the GRAM of mass, and the SECOND of time as its fundamental units. Other cgs units are the DYNE of force and the ERG of work or energy. The units of the cgs system are generally much smaller than the comparable units of the MKS SYSTEM, the impracticality of their size has led most scientists to favor the mks system. The cgs system is still used for some calculations, however, for example, densities are often expressed in grams per cubic centimeter rather than the more complicated and less familiar mks equivalent.

Chadayev, Piotr Yakovlevich (pyō'ter ya'kav-lyivich chada'yēv), 1794-1856, Russian philosopher. An aristocrat by birth, he was converted to Roman Catholicism. In 1836 the first of his *Philosophical Letters* appeared in a Moscow journal. Its devastating attack on Russian institutions, such as autocracy, the church, and serfdom, created a sensation. Chadayev was declared insane and was confined to his home. His vigorous writings helped clarify the basic differences between the SLAVOPHILES AND WESTERNIZERS. See his major works, ed. by R. T. McNally (1969), study by R. T. McNally (1971).

Chaban-Delmas, Jacques (zhak shabaN'-dēlma'), 1915-, French political leader, whose name originally was Jacques Delmas. He joined the French resistance in 1940, using the nom de guerre "Chaban," which he later adopted legally. He entered the chamber of deputies as a Radical in 1946, but soon joined the party of General de Gaulle. From 1947 he was mayor of Bordeaux and also served in several cabinets. He was president of the national assembly from 1958 until his appointment in 1969 as premier by President Pompidou. His government faced several scandals, including charges that he had evaded personal income taxes. Although Chaban-Delmas won a vote of confidence in May, 1972, he was considered too liberal by many hard-line Gaullists, and Pompidou forced him to resign in July. In 1974 he ran unsuccessfully for the presidency.

Chabanel, Noel (St. Noel Chabanel) (nōēl' shabanēl'), 1613-49, French missionary in North America, a Jesuit. He entered the Society of Jesus in 1630, came as a missionary to New France in 1643, and worked among the Huron Indians. He was captured by the Iroquois and put to death. Chabanel was canonized in 1930 with other missionaries (including Isaac Jogues and Jean de Brebeuf) and laymen. As a group they are known as the Martyrs of North America. Feast Sept. 26 or (among the Jesuits) March 16.

Chabannes, Antoine de, comte de Dammartin (a'ntwan' dā shaban' kōnt dā dammartāN'), 1408?-1488, French soldier in the Hundred Years War. He served with Joan of Arc, distinguishing himself at the siege of Orléans in 1428-29, fought as a captain of *écourcheurs*, or armed bands, and took part in the PRAGUE revolt (1440). Pardonned by King Charles VII, he was appointed to various offices and presided over the committee that procured the conviction of the financier, Jacques CŒUR. After the accession (1461) of King Louis XI he was imprisoned. He escaped and joined (1465) the League of the Public Weal against LOUIS XI, but was pardoned once more and became one of the king's most trusted officers.

Chabas, Paul Émile (pōl āmēl' shābās'), 1869–1937, French academic painter. He is remembered chiefly for his nude, *September Morn*, which created a sensation when it was exhibited in 1912. It was sold to a Russian, hidden during the Russian Revolution, and in 1935 rediscovered in a private collection in Paris. It is now owned by the Metropolitan Museum.

Chablis (shāblē'), village (1968 pop. 1,982), Yonne dept., central France, in Burgundy. It is famous for the white wine named for it. There is a remarkable early Gothic church (12th cent.).

Chabot, Philippe de (fēlēp' də shābō'), also known as **Amiral de Brion** (brōn'), 1480–1543, count of Charny and of Suzançois, admiral of France. After a successful campaign (1536) in Savoy and Piedmont, he was, through the intrigues of Anne, duc de MONTMORENCY, accused and convicted (1541) of misconduct in office, but he was pardoned by King Francis I. Chabot was instrumental in arranging the voyages of Giovanni da VERRAZANO.

Chabrier, Alexis Emmanuel (ālēksē' emānūēl' shābrēā'), 1841–94, French composer. His best-known works are an orchestral rhapsody, *España* (1883), an opera, *Le Roi malgré lui* (1887), and piano pieces, such as *Habanera* (1885) and *Bourrée fantasque* (1891). Chabrier's works display vivid harmonic and orchestral color and musical drollery. His music influenced such French composers as Ravel and Satie.

Chacabuco, battle of, Feb. 12, 1817, fought between Chilean independence forces and Spanish troops. It took place just N of Santiago, Chile. José de SAN MARTÍN, with Bernardo O'HIGGINS, assaulted and decisively defeated the Spanish forces, thus gaining entry into Santiago, where O'Higgins was then installed as supreme director of Chile. One year later, to the day, the independence of Chile was proclaimed. The battle climaxed a torturous three-week march across the Andes from Argentina, where San Martín had trained his army.

Chaco; Chaco Austral; Chaco Boreal; Chaco Central; and Chaco War: see GRAN CHACO

Chaco Canyon National Monument: see NATIONAL PARKS AND MONUMENTS (table)

chaccone (shākōn') and **passacaglia** (pās'sakāl'yā), two closely related musical forms popular during the baroque period. Both are in triple meter time and employ a recurring harmonic pattern of four or eight bars. Compositions labeled *passacaglia* often have, in addition, a recurring sequence of pitches, called *ostinato*, usually in the bass line. J. S. Bach's *Chaconne* from the D Minor Violin Suite and his *Passacaglia* in C Minor for organ are the most famous examples of these forms.

Chad (chād, chād), Fr. Tchad, republic (1973 est. pop. 3,800,000), 495,752 sq mi (1,284,000 sq km), N central Africa. NIJAMENA is the capital. Chad is bordered by the Central African Republic on the south, Sudan on the east, Libya on the north, and Cameroon, Niger, and Nigeria on the west. The terrain in the south is wooded savanna; it becomes brush country near Lake Chad. The only important rivers are the Chari and the Logone, both of which flow into Lake Chad and are used for irrigation and seasonal navigation. Northern Chad is a desert that merges with the S. Sahara, areas of the mountainous Tibesti region there are 11,000 ft (3,353 m) high. The country has no railroads and few all-weather roads. Its landlocked position, great distance from the coast, poor transportation network, and inadequate natural resources have severely hampered economic development. The economy is based primarily on sedentary agriculture and nomadic pastoralism. The best farming zone is in the south, where rainfall is sufficient for the cultivation of cotton and peanuts (the country's leading cash crops) for export and some subsistence crops. Natron is the country's chief mineral; tungsten has been found in the arid Tibesti region. Industry is limited to food processing and the production of textiles and light consumer goods. Chad belongs to the French franc zone and is an associate member of the European Common Market. French is the official language. The country comprises two distinct, and often hostile, population groupings. In the politically dominant south, where the bulk of the population is concentrated, live sedentary agricultural black African peoples, including the Saras, Massa, and Moudang, they are mostly animists, but some are Christians. In the north are seminomadic and nomadic Muslim tribes, including Bedouin Arabs, Fulani, Tuareg, and Wadaians, herding is their main occupation. Traditionally, the region around Chad was a focal point for trans-Saharan trade routes. Arab traders penetrated

the area in the 7th cent. Shortly thereafter, nomads from N. Africa, probably related to the Berbers, entered the region; they eventually established the



state of Kanem, which reached its zenith in the 13th cent. Its kings converted to Islam, the religion also practiced by the successor state of Bornu. The Wadai and Bagirmi empires arose in the 16th cent., they warred with Bornu and in the 18th cent. surpassed it in power. By the early 1890s all of these states, weakened by internal dissension, fell under the control of the Sudanese conqueror Rabih. French expeditions advanced into the region in 1890, and French sovereignty over Chad was recognized by agreements among the European powers. In 1900, French forces defeated Rabih's army, and by 1913 the conquest of Chad was completed; it was organized as a French colony in French Equatorial Africa and remained under military rule. Chad was later linked administratively with Ubangi-Shari (now the Central African Republic), but in 1920 it again became a separate colony. It was granted its own territorial legislature in 1946. In the French constitutional referendum of 1958, Chad chose autonomy within the French Community. Full independence was attained on Aug. 11, 1960, with Ngarta Tombalbaye as the first president. Tombalbaye steadily strengthened his control over the country, and by 1965 it had become a one-party state. The president is chosen for a seven-year term by an electoral college composed of the national assembly, heads of urban and rural communities, and tribal chiefs. A council of ministers assists the president. The unicameral national assembly serves for five years. Chad is a member (with Cameroon, Niger, and Nigeria) of the Chad Basin Commission. Discontent among northern Muslim tribes with the increasing power of Tombalbaye's southern-dominated government evolved into a full-scale guerrilla war in 1966. Invoking its defense pact with France, the government of Chad requested French troops to help battle the guerrillas. These troops were withdrawn in 1971, and the revolt was over by 1973. Chad suffered severely from the W. African drought that began in the late 1960s and continued unabated in 1974. See Virginia Thompson and Richard Adloff, *The Emerging States of French Equatorial Africa* (1960), G. M. Carter, ed., *National Unity and Regionalism in Eight African States* (1966), Guy de Lusignan, *French-Speaking Africa since Independence* (1969), H. D. Nelson, ed., *Area Handbook for Chad* (1972).

Chad, Lake (chād, chād), N central Africa. It lies mainly in the Republic of Chad and partly in Nigeria, Cameroon, and Niger. The size of the lake varies seasonally from c. 4,000 to c. 10,000 sq mi (10,360–25,900 sq km). It is divided into north and south basins, neither of which is generally more than 25 ft (7.6 m) deep, although the lake was formerly much larger and attained a depth of c. 930 ft (285 m) in the 19th cent. The Chari River is the chief tributary of Lake Chad, which has no outlets.

Chadderton, urban district (1971 pop. 32,406), Lancashire, NW England. Cottons and electrical and aircraft equipment are manufactured. In 1974, Chadderton became part of the new metropolitan county of Greater Manchester.

Chadds Ford: see BRANDYWINE, BATTLE OF.

Chadwick, Sir Edwin, 1800–1890, English social reformer. For many years an assistant to Jeremy Ben-

tham, Chadwick applied Bentham's utilitarianism to the reform (1834) of the Poor Law and to the development of public health measures, particularly in his *The Sanitary Conditions of the Labouring Population* (1842). He was largely responsible for the passage of the Public Health Act of 1848, which established a board of health. Chadwick's chief writings were collected and edited by B. W. Richardson as *The Health of Nations* (1887). See biography by Samuel Finer (1952, repr. 1970).

Chadwick, Florence May, 1918–, American distance swimmer, b. San Diego, Calif. She began swimming at the age of six, and four years later she swam the San Diego Bay Channel, the first child to do so. On Aug. 8, 1950, she broke Gertrude Ederle's 24-year record for English Channel swims by women. Florence Chadwick covered the 20 mi (32 km) from France to England in 13 hr 20 min. She also swam (Sept., 1951) from England to France, the first woman to swim the channel in both directions. In 1952 she became the first woman to swim the 21-mi (34-km) Catalina Channel off Long Beach, Calif., breaking speed records for any swimmer (13 hr 47 min). She swam the Bosphorus, the Dardanelles, and the strait of Gibraltar in 1953.

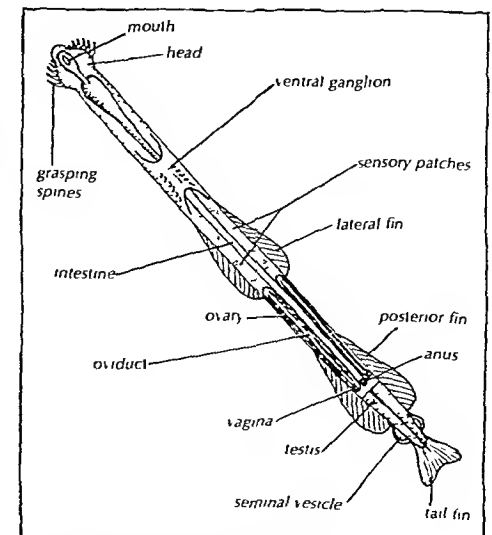
Chadwick, George Whitefield, 1854–1931, American composer, b. Lowell, Mass., studied in Germany. In 1882 he joined the faculty of the New England Conservatory of Music, of which he was director from 1897 until his death. His chief compositions are the overtures *The Miller's Daughter* (1884) and *Rip Van Winkle* (1879), the opera *Judith* (1901), and especially *Symphonic Sketches* (1908) and the song *A Ballad of Trees and the Master* (1899). Although much influenced by German music, Chadwick's best works have been described as having Yankee humor and impudence.

Chadwick, Sir James, 1891–1974, English physicist, grad. Manchester Univ., 1908. He worked at Manchester under Ernest Rutherford on radioactivity. He was assistant director of radioactive research in the Cavendish Laboratory, Cambridge (1923–35), professor at the Univ. of Liverpool (1935–46), and master of Gonville and Caius College, Cambridge (1948–58). For his discovery of the NEUTRON in 1932 he received the 1935 Nobel Prize in Physics. He was knighted in 1935.

Chadwick, Lynn, 1914–, English sculptor. After studying architecture, Chadwick began his career as a sculptor in 1945. He first produced wire MOBILES, and after 1955 he turned to triangular works of great mass that are largely abstract. Several of his works are in the Museum of Modern Art, New York City.

Chaeronea (kērōnē'ā), ancient town of Boeotia, Greece, in the Cephissus (now Kifisos) River valley and NW of Thebes. There the Athenians and Thebans were defeated (338 B.C.) by the Macedonians under Philip II, and in 86 B.C. Sulla defeated the army of Mithridates VI of Pontus under Archelaus. Chaeronea was the birthplace of Plutarch.

Chaetognatha (kētōgnāth'ā), phylum of predominantly pelagic marine animals commonly known as arrowworms. Arrowworms have slender, transparent bodies, usually under 1 in. (2.5 cm) long. Lateral and caudal fins propel the animal in sudden darting



Anatomy of an arrow worm, *Sagitta*, representative of the phylum Chaetognatha.

movements. The well-developed head bears eyes and other sense organs, grasping spines used in the capture of prey, and rows of teeth flanking the mouth. A protective hood can be folded down over the bristles and teeth. The digestive system includes a glandular pharynx, a straight intestine, and a short, muscular rectum. The nervous system centers in a bilobed, dorsal brain and several other nerve ganglia. Although widely distributed, arrowworms prefer warm, shallow seas and are particularly plentiful in the Indo-Pacific region. They are voracious predators, some feed on freshly hatched fish nearly as large as themselves. They are influential planktonic consumers when abundant.

chaffinch: see FINCH

Chagai (cha'gi'), town, W Pakistan, near the border with Afghanistan, on the trade route to Afghanistan and Iran. Pastoral Baluchi and Brahui tribes inhabit the region, which is noted for its oriental alabaster and other ornamental stones. British forces occupied Chagai in 1897.

Chagall, Marc (mark shag'al'), 1889-, Russian painter. In 1907, Chagall left his native Vitebsk for St. Petersburg, where he studied under L. N. BAKST. In Paris (1910) he began to assimilate cubist characteristics into his expressionistic style. He is considered a forerunner of SURREALISM. After some years in Russia, Chagall returned to France in 1922, where he has spent most of his life. His frequently repeated subject matter is drawn from Jewish life and folklore, he is particularly fond of flower and animal symbols. His major early works include murals for the Jewish State Theater (now in the Tretyakov Mus., Moscow). Among his other well-known works are *I and the Village* (1911, Mus. of Modern Art, New York City) and *The Rabbi of Vitebsk* (Art Inst., Chicago). He designed the sets and costumes for Stravinsky's ballet *Firebird* (1945). Chagall's twelve stained-glass windows, symbolizing the tribes of Israel, were exhibited in Paris and New York City before being installed (1962) in the Hadassah-Hebrew Univ. Medical Center synagogue in Jerusalem. His two vast murals for New York's Metropolitan Opera House, treating symbolically the sources and the triumph of music, were installed in 1966. Much of Chagall's work is rendered with an extraordinary formal inventiveness and a deceptive fairy-tale naivete. Chagall has illustrated numerous books, including Gogol's *Dead Souls*, La Fontaine's *Fables*, and *Illustrations for the Bible* (1956). A museum of his work opened in Nice in 1973. His name is also spelled Shagall. See his autobiography (1931, tr. 1960), biography by Jean-Paul Crespelle (1970), studies by Franz Meyer (tr. 1964), J. J. Sweeney (1946, repr. 1970), and Werner Haftmann (1974).

Chahar (cha-har), Mandarin *Ch'a-ha-erh*, former province (109,527 sq mi/283,675 sq km), N China. Chang-chia-k'ou (Kalgan) was the capital. It was abolished as a province in 1952, most of it was incorporated in the Inner Mongolian Autonomous Region, and the rest was divided between Shansi and Hopeh provs. The Chinese, who constitute a majority of the population of the Chahar region, are concentrated in the southern tip of the territory, which contains Chang-chia-k'ou and lies between two sections of the Great Wall. This area, economically the most important, includes the eastern terminus of the main road to the Mongolian People's Republic and is well connected by rail. Kaoliang, wheat, and corn are raised in its fertile loess soil. The rest of the region, mainly inhabited by Mongolian herdsmen, is a high, almost barren plateau, where livestock raising and animal trapping are the chief economic activities, horses, hides, fur, and wool are exported.

Chaikovsky, Nikolai Vasilyevich see CHAYKOVSKY, NIKOLAI VASILYEVICH

Chaillé-Long, Charles (shayä'-lông), 1842-1917, American soldier, African explorer, and writer, b. Princess Anne, Md. After serving in the Civil War, he was commissioned (1869) in the Egyptian army under Gen. C. G. Gordon. Chaillé-Long explored the Victoria Nile and was awarded a medal by the American Geographical Society. In 1875 he crossed the Congo-Nile divide to the Bahr al Ghazal region. He returned to the United States, graduated from Columbia Law School, and became (1887-89) consul general and secretary to the legation in Korea. His travel narratives in English include *The Three Prophets* (1884), *My Life in Four Continents* (1912), and *Central Africa: Naked Truths of Naked People* (1876). Among his writings in French are *Les Sources du Nil* (1891), *L'Égypte et ses provinces perdues* (1892), and *La Corée ou Tschosen* (1894).

Chailu, Paul Belloni du see DU CHAILLU

Chain, Ernst Boris, 1906-, English biochemist, b. Berlin, Germany. In 1933 he left Germany and went to England, where he conducted research at Cambridge from 1933 to 1935 and at Oxford from 1935, he lectured (1936-48) in chemical pathology at Oxford. In 1951 he became director of the International Research Center for Chemical Microbiology, Istituto Superiore di Sanita, Rome. He was professor of biochemistry at the Univ. of London from 1961. For his work on penicillin, Chain shared with Sir Alexander Fleming and Sir Howard Florey the 1945 Nobel Prize in Physiology and Medicine.

chain, flexible series of connected links used in various ways, especially for the transmission of motive power, for hoisting (see PULLEY), and for securing or fastening. Commonly, mechanical energy from a motor or other source applied to a sprocket wheel is conveyed by means of an endless chain to another sprocket wheel for driving a mechanism. Examples of such an arrangement are found in bicycles, motorcycles, and conveyor belts. The chain in this application is so designed that each consecutive link fits over a sprocket, the distance between links being called the pitch. The relative speed of the wheels varies according to their relative circumferences and, thus, the number of sprockets on each. There are several types of chain for the transmission of power. A detachable-link chain has links that are simple rectangles, each with a connecting hook at one end by which it is attached to the next link. A pintle chain has links that are approximately U-shaped. The closed end of each link fits into the open end of the next one, a pin holds the two links together. A block chain consists of metal blocks that are joined together by side plates and pins to form links. A roller chain has links consisting of side plates with hollow cylindrical rollers between them. Pins pass through the rollers and side plates to hold the links together. A silent, or inverted-tooth, chain has links made of toothed metal plates. A number of these links are placed side by side to form a group. Each group is joined to another one by meshing the ends of the links of both groups and inserting a pin there. By repeating the process a chain can be formed. Its width can be varied by varying the number of links in a group. Although not completely silent, this type of chain is quieter than other power transmission chains. The coil chains used in hoists and for locking or fastening purposes are of the open-link type, comprising solid interlocked rings, or of the stud-link type, in which a stud, or bar, across the link keeps the chain from kinking.

chain compound: see ALIPHATIC COMPOUND

chain gang: see CONVICT LABOR

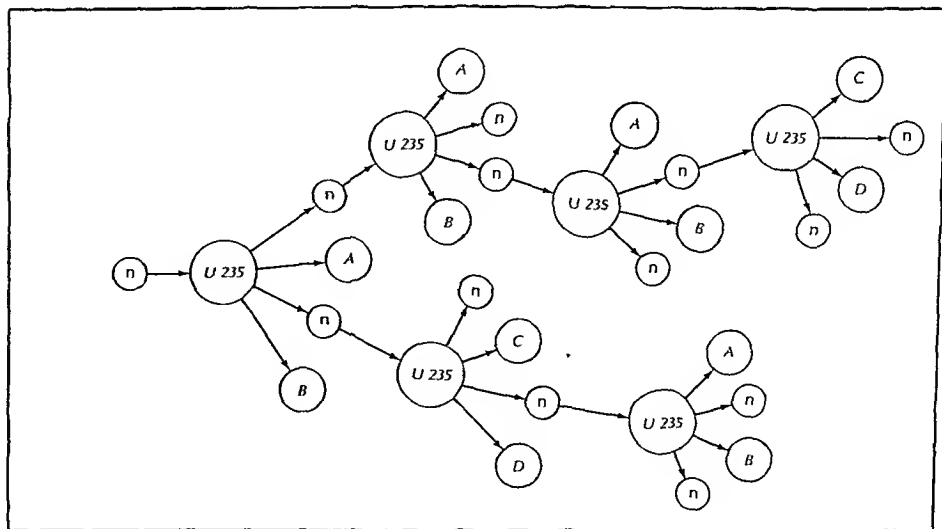
chain reaction, self-sustaining reaction that, once started, continues without further outside influence. Proper conditions for a chain reaction depend not only on various external factors, such as temperature, but also on the quantity and shape of the substance undergoing the reaction. A chain reaction can be of various types, but nuclear chain reactions are the best known. A line of dominoes falling after

the first one has been pushed is an example of a mechanical chain reaction, a pile of wood burning after it has been kindled is an example of a chemical chain reaction. In the latter case each piece of wood, as it burns, must release enough heat to raise nearby pieces to the kindling point. The wood, therefore, must be piled close enough together so that not too much heat is lost to the surrounding air. The conditions for a nuclear chain reaction can be understood by analogy. In the case of the fission of a nucleus, the reaction is begun by the absorption of a slow neutron. Each fission produces two or three fast neutrons. In order to sustain a chain reaction, a sample must be large enough to slow the neutrons so that one can be captured by another nucleus and produce a second fission. The sample must also be compact to prevent neutrons from escaping. The minimum quantity of a fissionable material necessary to sustain a nuclear chain reaction is called the critical mass. In a nuclear fission bomb, a chain reaction is started by forcing together two or more samples of fissionable material, each of less than critical mass, to form one sample of supercritical mass. The number of subsequent fissions produced by a single fission is always greater than one and increases rapidly (exponentially) with time. In a fission reactor, the number of subsequent fissions must be exactly one. If the rate is less, the chain reaction will stop; if greater, it will soon grow out of control. In one type of fission reactor, a combination of fuel rods and control rods are moved in or out of a solid block of moderating material to control the reaction rate. In another type of reactor, the temperature of a liquid moderator controls the reaction. See also NUCLEAR REACTOR. Nuclear-fusion chain reactions are initiated by very high temperatures. In a thermonuclear bomb, the necessary high temperatures are created by the explosion of a fission bomb within the fusion bomb. The principal problem in the development of controlled fusion reactors has been the containment and control of the fusion fuel at such temperatures, which are far above the melting point of any known solid. See also NUCLEAR ENERGY.

chain snake: see KING SNAKE

chain store: see STORE

chair, movable piece of furniture combining a seat with a supporting back, with or without arms, and usually designed to accommodate one person. Before the 17th cent. chairs were symbolic of wealth and authority, the ordinary person rested on a bench or stool or storage chest. The Egyptians created exquisite carved and painted chairs, the legs of which were fashioned to represent animal legs and feet, and the seats of which were adorned with valuable woven cloth or hide. The Greek *klismos*, as depicted on classical pottery, was an elegant, armless chair with an S-shaped profile of the rear leg and back. It was the prototype for the many Greek revival furniture styles. The Romans designed the curule with an X-shaped frame, a style that has also been frequently revived. Characteristic chairs of the



Chain reaction. A neutron (n) strikes the uranium nucleus (U-235), causing it to split into fission products A and B and release two neutrons. These neutrons can in turn cause further fissions. In some cases, a different pair of products, C and D, may be produced. The atomic numbers of the products always add up to 92, the atomic number of uranium.

Middle Ages had tall slab backs and sides and were often draped in velvet or canopied to provide warmth. Oriental influence, brought about by increased trade in the 17th cent., was reflected in curvilinear designs and the use of caning for back panels and seats. At the end of the century upholstery was introduced, and the "easy chair" became a popular item throughout the 18th cent. and later. Technological advances exerted a prodigious influence upon chair design of the 19th and 20th cent. Coiled springs, bent woods, papier-mâché, plastics, molded foam, prefabricated metal, and synthetic fabrics have all inspired furniture designers and architects (including Harry Bertola, Eero Saarinen, Marcel Breuer, and Alvar Alto) to create bold new chair forms, many created in keeping with the aesthetic of FUNCTIONALISM.

Chaitanya (chī'tūn'yā), 1485–1533, Indian mystic, also called Gaurāṅga ("the Golden"). He was born of Brahman parents in Nabadwip, Bengal, a center of Sanskrit learning. As a young man he attained prominence as a scholar, but at 22 he underwent a profound religious conversion and became an ecstatic devotee of KRISHNA. At 24 he became a renunciant and left Nabadwip on pilgrimage, finally settling in Puri, Orissa, where he lived the rest of his life. His charisma made him the leader of an important sect of Vaishnavites that is still active. He emphasized the importance of nonritualistic worship in the form of kirtan, or religious song and dance, and devotion focusing on the love of Krishna and his consort Radha as the archetype of mystical union. Chaitanya is regarded by his followers as an avatar (incarnation) of Krishna and Radha in a single form. See BHAKTI.

Chaka (shā'ka), d. 182B, paramount chief (1818–28) of the Zulus. He organized an army of some 40,000 tribesmen, and after reducing many enemy tribes to vassalage, he subjugated all of what is now Natal. Chaka was murdered by his half brother, Dingaan. The name is also spelled Shaka.

chakra: see YOGA

Chalcedon (kāl'sīdōn, -dān, kāl'sē'dān), ancient Greek city of Asia Minor, on the Bosphorus. It was founded by Megara on the shore opposite Byzantium in 685 B.C. Taken by the Persians and recovered by the Greeks, it was later a possession of the kings of Bithynia, from whom it passed (A.D. 74) to Rome. The Council of Chalcedon was held there in A.D. 451. The site is in the suburbs of Istanbul.

Chalcedon, Council of, fourth ecumenical council, convened in 451 by Pulcheria and Marcian, empress and emperor of the East, to settle the scandal of the Robber Synod and to discuss Eutychianism (see EUTYCHES). It deposed the principals in the Robber Synod and destroyed the Eutychian party. Its great work, however, was its definition regarding the nature and person of Jesus Christ. Based upon the formulation given by Pope St. Leo I in his famous *Tome* to Flavian, it declared (contrary to the view taken by Eutychianism) that the second Person of the Trinity has two distinct natures—one divine and one human. It was also proclaimed that these two natures exist inseparably in one person. This definition became the test of orthodoxy in the East and the West. The Roman Catholic Church has never admitted a decree of the council that made the patriarch of Constantinople single head of the Church in Eastern Europe.

chalcedony (kāl'sēd'ōnē) [from Chalcedon], form of quartz the crystals of which are so minute that its crystalline structure cannot be seen except with the aid of a microscope. Chalcedony has a waxy luster and is translucent to transparent. The name chalcedony is applied more specifically to white, gray, blue, and brown varieties. Some varieties differing in color because of the presence of impurities are AGATE, BLOODSTONE, CARNELIAN, CHRYSOPRASE, JASPER, ONYX, SARD, and SARDONYX.

Chalcidice, Greece. See KHALKIDIKI.

Chalcis, Greece. See KHALKIS.

Chalcol (kāl'kōl), the same as CALCOL.

chalcocopyrite (kāl'kōp'i'rīt, kāl'kōp'i'rīt) or **copper pyrites** (pī'rītēz, pā-), brass-yellow mineral, sometimes with an indolent tarnish. It is a sulfide of copper and iron, CuFeS₂. It crystallizes in the tetragonal system but is usually found in the massive form. Chalcocopyrite is of primary origin and occurs in igneous and metamorphic rocks and in metalliferous veins. It is an important ore of copper and is widely distributed throughout the world.

Chaldea or **Chaldea** (both. kāl'dē'ā), properly the southernmost portion of the valley of the Tigris and the Euphrates rivers. Sometimes it is extended to in-

clude Babylonia and thus comprises all S Mesopotamia, as in the Bible (e.g., Gen. 11:28, Jer. 50:10). The Chaldeans were a Semitic people who first came into S Babylonia c. 1000 B.C. With the death of Assur-bani-pal (626 B.C.), Nabopolassar seized the throne and established a new Babylonian or Chaldaean empire. The empire flourished under Nabopolassar's son Nebuchadnezzar II, but it declined rapidly thereafter and came to an end when Babylon fell to Cyrus the Great in 539 B.C. The study of astronomy and astrology was developed in this period, and "Chaldean" came to mean simply "astrologer," as in Daniel 1:4 and among the Romans. The term is also understood in the Bible to mean Aramaean.

Chaldean rite: see NESTORIAN CHURCH

Chaleur Bay (shalōōr'), inlet of the Gulf of St. Lawrence, c. 85 mi (140 km) long and from 15 to 25 mi (24–40 km) wide, between N.N.B. and the Gaspé Peninsula, E. Que., Canada. It is the submerged valley of the Restigouche River, which enters at its head. Chaleur Bay is a famous fishing ground for cod, herring, mackerel, and salmon, and there are many Acadian fishing villages on both coasts. The bay was discovered and named by Jacques Cartier in 1534.

Chalgrin, Jean François (zhāN fraNswā' shalgrāN'), 1739–1811, French architect. He studied under Servandoni and in Italy as a winner of the Grand Prix de Rome (1758). He rebuilt (1777) part of the Church of St. Sulpice in Paris. His most influential work was the Church of St. Philippe-du-Roule, in which he reintroduced a basilica plan to French ecclesiastical architecture. He also enlarged the buildings of the Collège de France and, after the Revolution, altered the palace of the Luxembourg to serve as headquarters for the Directory. In 1806 he was commissioned by Napoleon to design a commemorative arch to the victorious armies of France, and the executed scheme for the ARC DE TRIOMPHE DE L'ÉTOILE was chiefly Chalgrin's, although he died shortly after commencement of the actual construction.

Chalopin, Feodor Ivanovich (fyō'dar ēva'novich shalyā'pyin'), 1873–1938, Russian operatic bass. His powerful and supple voice, together with his tremendous physique, his gusto, and his superb ability as a naturalistic actor, made him one of the greatest performers in the history of opera. Taught by the singer Usatov, he first gained notice in 1894 in St. Petersburg, then he sang in Moscow and rapidly won an international reputation. After the Russian Revolution he was a lauded "artist of the people," but disagreement with the Soviet government caused him to remain outside Russia after 1921, although he maintained that he was not anti-Soviet. After an unspectacular American debut at the Metropolitan Opera in New York in 1907, he returned in 1921 and sang there with immense success for eight seasons. His most famous role was the lead in Moussorgsky's *Boris Godunov*, but he also won praise as Ivan the Terrible in Rimsky-Korsakov's *Maid of Pskov*, in the title role of Boito's *Mefistofele*, and as Mephistopheles in Gounod's *Faust*. His recitals, which included popular Russian music, were also highly successful wherever he performed. See his autobiography as told to Maxim Gorky, ed. by Nina Froud and James Hanley (1968).

chalice [Lat., =cup], ancient name for a drinking cup, retained for the eucharistic or communion cup. Its use commemorates the cup used by Jesus Christ at the Last Supper. Celebrated examples are the Great Chalice of Antioch (Syria), of embossed silver, excavated there in 1910 and attributed to the 1st cent., and an elaborately ornamented chalice found in 1868 at Ardagh, Ireland, and believed to be Celtic work of the 9th or 10th cent. See GRAIL. HOLY.

chalk, mineral of CALCIUM CARBONATE, similar in composition to limestone, but softer. It is characteristically a marine formation and sometimes occurs in great thickness, the chief constituents of these chalk deposits are the shells of minute animals called Foraminifera. Chalk has been laid down in all periods of geologic time, but most of the best-known deposits, e.g., the cliffs of the English Channel, date from the Cretaceous period. Chalk is used in the manufacture of putty, plaster, cement, quicklime, mortar, and rubber goods and also for blackboard chalk. Harder forms are used as building stones. Poor soils containing an excessive proportion of clay are frequently improved and sweetened by mixing chalk into them.

Chalkley, Thomas, 1675–1741, Quaker mariner and missionary preacher, b. England. He made his home

after 1701 in Philadelphia, Pa. He traded chiefly with the West Indies, navigating his own ship, and made preaching tours up and down the colonies from New England to the Carolinas and also through England, Scotland, and Wales. *Chalkley's Journal* (1747), simple in style and elevated in thought, was widely read by many generations of Quakers.

Chalk River Nuclear Laboratories, nuclear research center located on the Ottawa River in Ont., Canada, 125 miles (201 km) NW of Ottawa. Founded in 1944 by the Canadian government, it is now operated by a government corporation, Atomic Energy of Canada Limited. It is the largest nuclear research center in Canada and is devoted to exploring the peaceful uses of atomic energy.

Challenger expedition, British oceanographic expedition under the direction of the Scottish professor Charles Wyville Thompson and the British naturalist Sir John Murray. Taking place from 1872 to 1876, it opened the era of descriptive oceanography. The team sailed in the converted 18-gun corvette, *Challenger*, the first vessel specifically equipped for general oceanographic research. The expedition cruised almost 69,000 nautical mi (130,000 km) in the Atlantic, Pacific, and Antarctic oceans, gathering data on temperature, currents, water chemistry, marine organisms, and bottom deposits at 362 oceanographic stations scattered over 14 million sq mi (36 million sq km) of ocean floor. Its major contributions, covered in a 50-volume, 29,500-page report that took 23 years to compile, included the first systematic plot of currents and temperatures in the ocean, a map of bottom deposits that has not been changed much by more recent studies, an outline of the main contours of the ocean basins, incorporating the discovery of the mid-Atlantic Ridge and the then record 26,900-ft (8,200-m) Challenger Deep in the Mariana Trench, the discovery of 715 new genera and 4,717 new species of ocean life forms, and the discovery of prodigious life forms even at great depths in the ocean. See H. N. Mosely, *A Naturalist on the "Challenger"* (1879), Sir C. Wyville Thompson, *Voyage of the "Challenger"* (2 vol., 1877), Eric Linklater, *The Voyage of the Challenger* (1972).

Challoner, Richard (chāl'anar), 1691–1781, English Roman Catholic prelate. Brought up a Protestant, he became a Roman Catholic in his teens and was ordained in 1716. In 1730 he returned from Douai to England, where he was widely known for the number of conversions he made. In 1738 he was forced to leave England because he published an open reply to an anti-Catholic pamphlet by an Anglican. In 1739, Challoner was appointed coadjutor of the vicar apostolic in London. He was consecrated titular bishop of Debra in 1741. The rest of his life he spent working among his people (after 1758 as vicar apostolic) in the face of great difficulties. From 1765 to 1780 a series of efforts were instigated to molest English Catholics, and Bishop Challoner was involved, in the Gordon riots (1780) he had to flee London for his life. He was an indefatigable writer. He revised the Douay version of the Bible, his revision becoming the standard one chiefly used by English-speaking Catholics. His chief learned works are on English Catholicism since the Reformation, they did much to preserve the memory of English Catholics. He wrote a number of devotional works, *The Garden of the Soul* (1740) was especially popular. Bishop Challoner's translations of the *Imitation of Christ* were standard. See biography by Michael Trappes-Lomax (1936).

Chalmers, Thomas (chām'ar, chō'-), 1780–1847, Scottish preacher, theologian, and philanthropist, leader of the Free Church of Scotland. His preaching and his interest in philanthropic work during his ministry (1815–23) in Glasgow brought wide recognition. In 1823, Chalmers became professor of moral philosophy at St. Andrews Univ. and in 1828 was made professor of theology at the Univ. of Edinburgh. His Bridgewater treatise (1833) *On the Adaptation of External Nature to the Moral and Intellectual Constitution of Man* brought him a number of honors. Chalmers took a leading part (1843) in organizing the Free Church of Scotland, formed when, after much friction between church and state and trouble over patronage, 470 clergymen withdrew from the Established Church. His foresight had planned for the rapid organizing of the Free Church of Scotland, of which he was the first moderator. He was made principal (1843–47) of the New College (Free Church) at Edinburgh. His published works fill 34 volumes. See biographies by M. O. W. Oliphant (1893), Adam Philip (1929), and Hugh Watt (1943).

Chalmette National Historical Park: see NATIONAL PARKS AND MONUMENTS (table)

Châlons-sur-Marne (shalôn'-sur-märn), city (1968 pop. 54,075), capital of Marne dept., NE France, in Champagne, on the Marne River. It is a commercial and industrial center. Among its manufactures are electrodes, paper, hosiery, foundry products, and musical and precision instruments. There, in 451, the Huns under Attila were defeated by Aetius. Although badly damaged in both World Wars, it still retains its cathedral (13th-17th cent.) and many remarkable Gothic churches. An arts and crafts school is there.

Chalon-sur-Saône (shälôn'-sür-sôn), town (1968 pop. 52,746), Saône-et-Loire dept., E central France, in Burgundy, on the Saône River and the Canal Central. It is an inland port with a large wine and grain trade. The town contains a thermal power station, its many manufactures include metal products, electrical equipment, barges, textiles, chemicals, and glass. Of pre-Roman origin, it was the capital of King Guntram of Burgundy (6th cent.) and the scene of 10 church councils, most notably the one convoked by Charlemagne in 813. Its cathedral, begun in the 12th cent., was completed in the 15th cent.

Chalukya (chä'loōkyä), S Indian dynasty that ruled in the Deccan. It was founded by Pulakesin I (reigned 543-566), who established himself at Badami (in Bijapur). His grandson Pulakesin II (c. 608-642) expanded his domain while defending his northern frontier against HARSHA. He also captured (c. 624) Vengi (in E Andhra Pradesh) and gave it to his brother Vishnuvardhana, founder of the Eastern Chalukya dynasty, which ruled Vengi until the 11th cent. The Chalukyas of Badami were in constant conflict with the Palavas. The dynasty lost power to another family in 757, but it recovered ascendancy in the Deccan c. 973, its power now centered at Kalyani. The history of the Kalyani Chalukya kingdom was largely one of war with the Cholas and defense against the incursions of the Turks and Arabs who were plundering N India. The kingdom broke up in 1189, and the last Chalukya ruler died in 1200.

chalybite (käl'abīt') see SIDERITE

Cham (kām), pseud. of Amédée de Noé (amādä' də nōä'), 1819-79, French caricaturist and lithographer. He abandoned a military career to produce over 4,000 designs, many of them caricatures and sketches of French and Algerian life.

Chamavi see GERMANI

Chamberlain, Sir Austen (Joseph Austen Chamberlain), 1863-1937, British statesman, son of Joseph Chamberlain and half brother of Neville Chamberlain. He entered Parliament as a Conservative in 1892. He was chancellor of the exchequer (1903-5), secretary of state for India (1915-17), a member of Lloyd George's war cabinet (1918), again (1919-21) chancellor of the exchequer, and lord privy seal (1921-22). Although he succeeded Bonar Law as Conservative leader in 1921, he opposed the Conservative withdrawal that brought down Lloyd George's government in 1922. From 1924 to 1929, Chamberlain was foreign secretary under Stanley Baldwin. The LOCARNO PACT of 1925 was largely his work, and in the same year he was awarded (with Charles C. Dawes) the Nobel Peace Prize. He last held a cabinet position in 1931, but he continued to be influential in Parliament until his death. See his *Down the Years* (1935), *Politics from Inside* (1936), and *Seen in Passing* (1937), Sir Charles Petrie, *Life and Letters of Sir Austen Chamberlain* (1939-40).

Chamberlain, Houston Stewart, 1855-1927, Anglo-German writer, b. England. The son of a British admiral, he was educated in France and in Germany, where he settled. He became an admirer of Richard Wagner, he eventually married Wagner's daughter and became a German citizen. His chief work, *Foundations of the Nineteenth Century* (1899, tr. 1910), is a major document of racist doctrine. Aristocratic and anti-Semitic, Chamberlain glorified the Teutons and credited them with all modern achievement. His ideas on "racial purity" were adopted and reshaped as the racist policies of Adolf Hitler. His other works include a biography of Wagner (1896, tr. 1897).

Chamberlain, John, 1927-, American sculptor, b. Rochester, Ind. In the late 1950s, Chamberlain became known for his welded assemblages of smashed automobile parts and colored scrap metal. His work is represented in the Los Angeles County Museum and the Museum of Modern Art, New York City.

Chamberlain, Joseph, 1836-1914, British statesman. After a successful business career, he entered local politics and won distinction as a reforming mayor of Birmingham (1873-76). Entering Parliament as a Lib-

eral in 1876, Chamberlain advocated radical social reform and served under William Gladstone as president of the Board of Trade (1880-85). In 1886, however, he broke with Gladstone, leading the defection from the Liberal party of the Liberal Unionists (those Liberals who opposed Home Rule for Ireland). In 1887-88 he negotiated a treaty with the United States to settle the fisheries dispute between that country and Canada. Chamberlain became leader of the Liberal Unionists in the House of Commons in 1891, and in 1895 he joined the Conservative government as colonial secretary. While maintaining his interest in social reform at home, he pursued a vigorous colonial policy aimed at imperial expansion, cooperation, and consolidation. Although a parliamentary inquiry cleared him of complicity in the Jameson Raid (see JAMESON, SIR LEANDER STARR), there is some evidence that he was at least aware of the conspiracy. His subsequent attempts to reach a settlement with the Boers failed, resulting in the South African War (1899-1902). After the war he worked for a conciliatory peace. Chamberlain's belief in the need for closer imperial union led him to espouse the cause of imperial preference in tariffs. However, this proposed abandonment of Great Britain's traditional free trade policy provoked great controversy, and in 1903 he resigned from office to spend three years in an attempt, through the Tariff Reform League, to convert the country to his views. His campaign split the Liberal Unionist-Conservative bloc and contributed to its defeat in the election of 1906. Ill health ended Chamberlain's public life in 1906, but his tariff policy was adopted (1919, 1932) within the lifetime of his sons, Austen and Neville. See E. E. Guiley, *Joseph Chamberlain and English Social Politics* (1926), W. L. Strauss, *Joseph Chamberlain and the Theory of Imperialism* (1942, repr. 1971), biography (to 1903 only) by J. L. Garvin and Julian Amery (6 vol., 1932-51), studies by Peter Fraser (1966), Michael Hurst (1967), and R. V. Kubiček (1969).

Chamberlain, Joshua Lawrence, 1828-1914, Union general in the Civil War, b. Brewer, Maine, grad. Bowdoin, 1852, and Bangor Theological Seminary, 1855. He taught at Bowdoin from 1855 to 1862, when he became lieutenant colonel in the 20th Maine Infantry. Chamberlain was awarded the Congressional Medal of Honor for his defense of Little Round Top at Gettysburg (1863), and in June, 1864, Grant promoted him brigadier general of volunteers on the field for his gallantry before Petersburg. He was governor of Maine (1867-71) and president of Bowdoin (1871-83). He wrote *The Passing of the Armies* (1915), which deals with the final campaigns in the East. See biography by W. M. Wallace (1960).

Chamberlain, Neville (Arthur Neville Chamberlain), 1869-1940, British statesman, son of Joseph Chamberlain and half brother of Sir Austen Chamberlain. The first half of his career was spent in business and, after 1911, in the city government of Birmingham, of which he became lord mayor in 1915. In 1917 he served as director of national service, supervising conscription, and the following year, at the age of 50, he was elected to Parliament as a Conservative. During the 1920s he served both as chancellor of the exchequer (1923-24) and minister of health (1923, 1924-29). In the latter position, he enacted a series of important reforms that simplified the administration of Britain's social services and, simultaneously, systematized local government. In 1931 he again became chancellor of the exchequer and held that office until he succeeded Stanley Baldwin as prime minister in 1937. Chamberlain's belief that the German leader, Hitler, was a rational statesman like himself (and who, therefore, could not want another general war), resulted in the policy of "appeasement" that culminated in the MUNICH PACT. However, as German aggression continued, he changed his views and in March, 1939, pledged support to Poland in the event of German invasion. After the outbreak of World War II, Chamberlain remained as prime minister until, after the British debacle in Norway, he was forced to resign in May, 1940. He was lord president of the council under Winston Churchill until Oct., 1940, and died a few weeks later. See his *In Search of Peace* (1939), biographies by Keith Feiling (1946, repr. 1970), Iain Macleod (1961), and William R. Rock (1969).

Chamberlain, Wilton Norman (Wilt Chamberlain), 1936-, American basketball player, b. Philadelphia. At the Univ. of Kansas he was twice named to the All-America basketball team. He left (1958) college to join the Harlem Globetrotters. Beginning in 1959 he played a total of 14 seasons in the National Basketball Association (NBA) with the Philadelphia

Warriors, San Francisco Warriors, Philadelphia 76ers, and Los Angeles Lakers. He broke almost every scoring record. With his great height (over 7 ft 1 in./216 cm) and unusual agility he was the top NBA scorer in 7 consecutive seasons (1959-65) and led the league in field goal percentage for 9 seasons and in rebounds for 11. He scored more points than any other player (31,419) and achieved the highest scoring average in the game's history. Among his records are the most points (100) scored in one game and the most free throws (28) in one game. In 1973 he became player-coach of the San Diego Conquistadors of the American Basketball Association but was prevented from playing because of a legal dispute. He announced his retirement in 1974. See his autobiography (1973), biography by George Sullivan (rev. ed. 1971).

Chamberlain's Men, Elizabethan theatrical company for which Shakespeare wrote his plays and served as actor. Organized in 1594, they performed at the Globe Theatre and at the Blackfriars Theatre. Under the patronage of James I they became c. 1603 the King's Men. The members shared in the ownership of the theater and the profits, and usually all took part in the performances. Richard BURBAGE and Will Kemp were the most famous players. The most important rival company was the ADMIRAL'S MEN. See also QUEEN'S MEN.

Chamberlin, Thomas Chrowder, 1843-1928, American geologist, b. Mattoon, Ill., grad. Beloit College, 1866. He was professor of geology at Beloit (1873-82), president of the Univ. of Wisconsin (1887-92), and professor of geology and director of the Walker Museum at the Univ. of Chicago (1892-1919). Chamberlin was chief geologist of the geological survey of Wisconsin (1873-82) and the founder (1893) of the *Journal of Geology*. While studying glaciation and climates in past geologic times he noted defects in the nebular hypothesis of Laplace that led him to formulate, with the American astronomer F. R. Moulton, the planetesimal hypothesis of the origin of the SOLAR SYSTEM. Chamberlin wrote *The Geology of Wisconsin* (1873-82), *A Contribution to the Theory of Glacial Motion* (1904), *A General Treatise on Geology* (with Rollin D. Salisbury, 1906), *The Origin of the Earth* (1916), and *Two Solar Families* (1928).

chamber music, ensemble music for small groups of instruments, with only one player to each part. Its essence is individual treatment of parts and the exclusion of virtuosic elements. Originally played by amateurs in courts and aristocratic circles, it began to be performed by professionals only in the 19th cent. with the rise of the concert hall. In the broadest sense it existed as early as the Middle Ages. The *ricercare* and the concerted canzone of the 16th cent. are properly chamber music, although unlike later forms they were not for specific instruments but were usually performed by voices and whatever instruments were at hand. During the baroque period the chief type was the trio SONATA. About 1750 the string quartet with its related types—trio, quintet, sextet, septet, and octet—arose. As developed by Haydn and Mozart the quartet became the principal chamber-music form. It was used by Beethoven and Schubert, whose quartets are the last of the classical period, and by the chief composers of the romantic period—Mendelssohn, Schumann, Brahms, Dvořák, Franck, d'Indy, and Reger. In the early 20th cent. the coloristic possibilities of the quartet were exploited by Debussy and Ravel. More recently the different forms of chamber music have been used extensively for experiments in atonality, percussive rhythms, and serial techniques by such composers as Schoenberg, Bartok, Webern, Berg, Stravinsky, Sessions, and Piston. See D. F. Tovey, *Essays in Musical Analysis*, *Chamber Music* (1944, 4th impression 1956), W. W. Cobbett, ed., *Cyclopedic Survey of Chamber Music* (3 vol., 2d ed. 1963), H. E. Ulrich, *Chamber Music* (2d ed. 1966).

chamber of commerce, local association of businessmen organized to promote the welfare of their community, especially its commercial interests. Each chamber of commerce usually has a board of directors elected by the members, and work is done through committees. Among the activities frequently carried on by these committees are industrial surveys and efforts to attract new industries to the city, housing surveys, efforts to provide parking space and promote safety, and advertising the advantages of the city to tourists and to organizations as a convention site. The *chambre de commerce* of Marseilles (1599) was the first organization to use the name, the idea spread through France in the 17th and 18th cent. The first to be formed in Great

Britain was on the island of Jersey (1768). In America the first was the Chamber of Commerce of the State of New York, organized in 1768. By 1870 there were 40 throughout the United States. The local chambers are federated in the Chamber of Commerce of the United States (founded 1912), which maintains at its Washington, D.C., headquarters a technical staff and lobbies in the interests of its member organizations. Its organ is the *Nation's Business*. The International Chamber of Commerce (founded 1920) has its headquarters in Paris. See also TRADE ASSOCIATION.

Chambers, Sir Edmund Kerchever, 1866–1954, English literary critic and Shakespearean scholar. He wrote *The Mediaeval Stage* (1903), *The Elizabethan Stage* (1923), *Arthur of Britain* (1927), *William Shakespeare* (1930), and studies of S. T. Coleridge (1938) and Matthew Arnold (1947).

Chambers, Robert, 1802–71. See CHAMBERS, WILLIAM.

Chambers, Whittaker, 1901–61, U.S. journalist and spy, b. Philadelphia. He joined the U.S. Communist party in 1925 and wrote for its newspaper before engaging (1935–38) in espionage work for the USSR. He left the party in 1939 and began working for *Time* magazine. In 1948 he testified before the House Un-American Activities Committee (later House Committee on Internal Security) and accused Alger Hiss, then president of the Carnegie Endowment for International Peace and a former State Dept. official, of being a Communist party member. Hiss sued for libel, and Chambers then accused him of having been part of an espionage ring. Chambers led investigators to his Maryland farm where he produced from a hollowed out pumpkin State Dept. documents that he alleged were given to him by Hiss. This led to an indictment against Hiss for perjury, and after two trials he was found guilty (1950) and imprisoned. The case was extremely controversial, and both men were vehemently attacked and defended. See Chambers's autobiography, *Witness* (1952, repr. 1968), Alistair Cooke, *A Generation on Trial* (1950, 2d ed. 1952), Ronald Seth, *The Sleeping Truth* (1968).

Chambers, Sir William, 1723–96, English architect, b. Gothenburg, Sweden. He traveled extensively in the East Indies and in China making drawings of gardens and buildings, many of which were later published. He studied architecture in France and Italy and established (1755) his practice in England where he designed decorative architecture for Kew Gardens. From the founding (1768) of the Royal Academy to the end of his life, Chambers was a dominant figure in its councils. His *Treatise on the Decorative Part of Civil Architecture* (1759) became a standard and influential work on classic design. The foremost official architect of his day in England, he continued the neo-Palladian tradition, which he adapted to the prevailing classical taste. His chief work, Somerset House, is an extensive block of government offices, begun in 1776. He also had charge of various alterations at Trinity College, Dublin, and designed additions to Blenheim Palace, the observatory in Richmond Park, and casinos in many parks of the nobility. He became private architect to King George III and was made (1782) surveyor general. Chambers was buried in Westminster Abbey.

Chambers, William, 1800–1883, and **Robert Chambers**, 1802–71, Scottish authors and publishers. Their firm of W and R Chambers is best known for *Chambers's Edinburgh Journal*, which William started in 1832 and for which both brothers wrote, and *Chambers's Encyclopaedia* (10 vol., 1859–68), which has gone through several editions. Robert published several books on history and in geology, including the anonymous *Vestiges . . . of Creation* (1844), a forerunner of Darwin's *Origin of Species*. William, always interested in public improvement, was lord provost of Edinburgh, 1865–69.

Chambersburg, borough (1970 pop. 17,315), seat of Franklin co., 5 Pa., in a fertile farm area, settled 1730, inc. 1803. Food products, steam and pneumatic hammers, sheet-metal goods, clothing, and concrete and lumber products are manufactured. Chambersburg was the headquarters of abolitionist John Brown in 1859 and of Confederate Gen. Robert E. Lee before the battle of Gettysburg. The town was raided by Confederate cavalry in 1862 and again in July, 1864, when it was burned after refusing to pay an indemnity of \$100,000 in gold. It is the seat of Wilson College and of an adjoining junior college and girls' preparatory school. Caledonia State Park is to the east.

Chambéry (shānbārē'), town (1968 pop. 58,813), capital of Savoie dept., E France, in the Alpine trough. It is a communications center with many manufactures. An archiepiscopal see from the 5th

cent., it was the capital of Savoy from 1232 to 1562. Among its old edifices is a 16th-century cathedral.

Chambly (shānblyē'), city (1971 pop. 11,469), 5 Que., Canada, on the Richelieu River, E of Montreal. **Chambly Fort** was built in 1665 and was a strategic point in the defense of New France against the British and the Iroquois. The British captured it in 1760. It was seized by the invading Americans in 1775 and burned when they withdrew in 1776. The partially restored fort is a national historic site.

Chambord, Henri Charles Ferdinand Marie Dieudonné, comte de (ānrē' shārl fērdinān' mārē' dyōdōnā' kōntē dā shānbōr'), 1820–83, BOURBON claimant to the French throne, posthumous son of Charles Ferdinand, duc de BERRY. His original title was duke of Bordeaux. His grandfather, Charles X, abdicated in his favor during the Revolution of 1830, and he is known to the legitimists as Henry V, although he never held the throne. He accompanied Charles into exile and spent most of the rest of his life at Frohsdorf, Austria. In 1832 his mother, Caroline de BERRY, made an unsuccessful attempt to overthrow Louis Philippe. Efforts to reconcile his claims with those of the Orleanist pretender, Louis Philippe Albert d'ORLÉANS, after the February Revolution of 1848, met with little success. In 1871, after the fall of the Second Empire, Chambord's prospects improved, and in 1873 the Orleanist pretender relinquished his claims in Chambord's favor. However, his stubborn adherence to the Bourbon flag in preference to the national flag, the tricolor of the French Revolution, destroyed his chance of recognition. He died without issue, and his claims passed to the house of Bourbon-Orléans.

Chambord, château, park, and village (1968 pop. 267), all owned by the state, in Loir-et-Cher dept., N central France. The huge Renaissance château, built by Francis I and set in an immense park and forest (c. 13,600 acres/5,500 hectares), was used chiefly by Louis XIV and by Stanislaus I of Poland. Louis XV gave Chambord to Maurice de Saxe, who died there in 1750. Napoleon I later presented it to Marshal Berthier, and in 1821 it went by national subscription to the duke of Bordeaux, who took the title count of Chambord. Repurchased by the state in 1932, Chambord is now open to the public.

chameleon (kāmē'lēan, -mēl'yān), small- to medium-sized lizard of the family Chamaeleonidae. About eighty species are found in sub-Saharan Africa, with a few in S. Asia. The so-called common chameleon, *Chamaeleo chamaeleon*, is found around the Mediterranean. Chameleons have laterally flattened bodies and bulging, independently rotating eyes. They are variously ornamented with crests, horns, and spines. The toes are united into one bunch on either side of the foot, forming a pair of grasping tongs. Chameleons feed on small animals, chiefly insects, and they are unique among lizards in possessing very long, sticky tongues with which they capture their prey. Typical chameleons (members of the very large genus *Chamaeleo*) are arboreal and have long, prehensile tails. They move very slowly, with a rocking movement, grasping a branch with feet and tail. The changes in skin color, seen in certain other lizards as well, are under hormonal and nervous control. They are not affected by the color of the background but by stimuli such as light, temperature, and emotion. However, the shades of brown, gray, and green assumed by chameleons do generally blend with the forest surroundings. The American chameleon, or anole (*Anolis carolinensis*), is not a true chameleon, but a small lizard of the iguana family, found in the SE United States and noted for its color changes. True chameleons are classified in the phylum CHORDATA, subphylum Vertebrata, class Reptilia, order Squamata, family Chamaeleonidae.

Chamfort, Sébastien Roch Nicolas (sābāstyān' rōk nēkōlā' shānfōr'), 1740–94, French writer. He is remembered only for his maxims and epigrams. His acute observations on literature, morals, and politics made him popular at court, despite his republican beliefs. In the Reign of Terror Chamfort was denounced, and he committed suicide.

Chamillart or Chamillard, Michel (both mēshēl' shāmēyār'), 1652–1721, French statesman. He was named controller general of finances (1699), minister of state (1700), and minister of war (1701). To raise funds Chamillart resorted to the sale of offices and titles, loans, lotteries, manipulation of the currency, and anticipation of revenues. To these means he added a wartime capitation tax, imposed from 1695 to 1698 and again after 1701, but he could not meet the mounting expenses of the government, especially after the outbreak (1701) of the War of the

Spanish Succession. The deficit and the national debt grew huge, and the marquis de Vauban censured the disorder of the tax system. Chamillart resigned the finances to Nicolas DESMARETS in 1708 and gave up his other offices in 1709.

Chaminade, Cécile Louise Stéphanie (sāsēl' lwēz stāfānē' shāmēnād'), 1857–1944, French composer and pianist, pupil of Benjamin Godard in composition. She was a popular concert pianist and wrote many graceful, romantic piano pieces and songs. Among her more ambitious compositions are a lyric symphony, *Les Amazones*, and a ballet, *Callirhoé* (both 1888), which includes *Scarif Dance*.

Chamisso, Adelbert von (Louis Charles Adelaide de Chamisso), (ā'dalbert fən shamī'sō), 1781–1838, German poet and naturalist, b. France. He served as page at the court of William II and, after army service and travels, became keeper of the royal botanical gardens. He edited (1804–6) the *Musen Almanach* and was a member of Mme de Staël's circle. His sentimental poetic cycle *Frauenliebe und Leben* (1830) was set to music by Schumann. *Peter Schlemihls wundersame Geschichte* (1814), his tale of a man who sold his shadow to the devil, has become legend. He also wrote plays, an account of his travels in the Pacific (1836), and a work on linguistics (1837).

Chamizal National Memorial: see NATIONAL PARKS AND MONUMENTS (table).

chamois (shām'ē), hollow-horned, hoofed mammal, *Rupicapra rupicapra*, found in the mountains of Europe and the E Mediterranean. It is about the size of a large goat and is light brown with a black tail, a black back stripe, and black markings on its face. In winter its coat is darker. Its uniquely shaped horns are erect, with terminal hooks pointed backward. The hooves can cling to rocky surfaces because of their elasticity, and the animal is able to leap with agility. It ranges to the snow line in summer, but in winter stays in lower areas. In autumn the adult males, which live apart from the herds of females and young, return for mating. The young are born in spring. The skin was the original chamois leather, but the name is now applied also to leather made from the skins of other animals. The chamois has been introduced into New Zealand. Chamois are classified in the phylum CHORDATA, subphylum Vertebrata, class Mammalia, order Artiodactyla, family Bovidae.

chamomile or camomile (both kām'əmīl) [Gr., = ground apple], name for various related plants of the family Compositae (COMPOSITE family), especially the perennial *Anthemis nobilis*, the English, or Roman, chamomile, and the annual *Matricaria chamomilla*, the German, or wild, chamomile. Both are European herbs with similar uses. The former has an applelike aroma and is the chamomile most frequently grown for ornament (often as a ground cover) and for chamomile tea, made from the dried flower heads, which contain a volatile oil. The oil from the similar flowers of the wild chamomile was most often used medicinally, particularly as a tonic, today its chief use is as a hair rinse. Chamomile is classified in the division MAGNOLIOPHYTES, class Magnoliopsida, order Asterales, family Compositae.

Chamonix (shāmōnē'), town (1968 pop. 8,403), Haute-Savoie dept., E France, at the foot of Mont Blanc. The principal base for climbing Mont Blanc and for visiting the Mer de Glace, it is a popular summer and winter resort. It has the world's highest (12,605 ft/3,842 m) aerial cable car and is linked by tunnel with Courmayeur, Italy.

Chamorro, Emiliano (āmēlyā'nō chāmō'rō), 1871–1966, president of Nicaragua (1917–20, 1926). A conservative army chief, Chamorro supported the revolt (1909) against José Santos Zelaya. Originally at odds with the United States, he was a signer of the Bryan-Chamorro Treaty, which granted the United States an option on the NICARAGUA CANAL. He opposed all liberal regimes, including that of Anastasio Somoza.

Chamoun, Camille (kāmē'yā shāmōn'), 1900–, Lebanese political leader. First elected to parliament in 1934, Chamoun held a variety of governmental posts before serving as president of Lebanon (1952–58). A Maronite Christian, Chamoun was opposed by Muslim leaders who disliked his pro-Western policies. The Muslim groups openly rebelled against Chamoun's government in 1958, and, in response to Chamoun's request for help, U.S. marines were sent to support the government. After 1958, Chamoun served as leader of Lebanon's Liberal Nationalist party.

Champa, the kingdom of the Chams, which flourished in Vietnam from the 2d cent. A.D. until the

17th cent. It was probably of Indian cultural origin, and at its greatest extent occupied ANNAM as far north as S North Vietnam. In its early period, Champagne mainly warred with China and was forced to change its capital several times, late in the 9th cent its capital was established in the neighborhood of Hue, and the later capital was Vijaya, farther south. Champa repeatedly made war on its stronger neighbor, Annam, it was sometimes allied and sometimes opposed to the KHMER EMPIRE. In the 12th cent the Chams invaded Cambodia and sacked Angkor, subsequently they fell for a time under Khmer rule. Decisively defeated by the Annamese in 1472, the Chams were forced to yield most of their territory N of Tourane (Da Nang). In the 17th cent the rest of the Cham kingdom fell to the Annamese, and the remnants of the people were scattered. Chams still form small, impoverished minorities in South Vietnam, but in Cambodia a large colony prospers. Although most of those in Annam worship Hindu gods, those of Cambodia are Muslim. Ruins of Cham temples, adorned with bas-reliefs and with statues, are found in 5 Annam. See Georges Maspero, *The Kingdom of Champa* (tr., 1949).

Champagne, Philippe de: see CHAMPAIGNE

Champagne (shaNpā'nyā), region and former province, NE France, consisting mainly of Aube, Marne, Haute-Marne, and Ardennes depts. The region is almost, but not fully, coextensive with the former provinces of Champagne and Brie. Abutting in the west on the Paris basin, Champagne is a generally arid, chalky plateau, cut by the Aisne, Marne, Seine, Aube, and Yonne rivers. Agriculture, except in the Ardennes dept., is mostly confined to the valleys. Crests divide the plateau from northwest to southeast into several areas. In the east, bordering on Lorraine, is the so-called Champagne Humide [wet Champagne], largely agricultural, and the Langres Plateau. In the center is the Champagne Pouilleuse [Champagne badlands], a bleak and eroded plain, traditionally used for sheep grazing, however, Troyes and Châlons-sur-Marne, its principal towns, are located in fertile valleys and are centers of the wool industry. A narrow strip along the westernmost crest of Champagne is extremely fertile, and the small area around Rheims and Eprenay furnishes virtually all of the champagne wine exported by France. Other fertile districts are around Reims and Sens. Champagne's central and open location made it a major European battlefield from the invasion by Attila's Huns, whom Aetius defeated at Châlons in 451, to World War I, which left vast areas scorched. Yet the same geographic position gave the towns of Champagne a commercial prosperity in direct contrast to the bleakness of the countryside. In the Middle Ages, Champagne was famous for its great fairs, held at Troyes (the capital), Provins, Lagny-sur-Marne, and Bar-sur-Aube. Merchants from all over western Europe met six times each year. Their laws regulating trade had a profound influence on later commercial customs, the troy weight for precious metals is still used. Prosperity was accompanied by cultural brilliance, culminating in the work of Chretien de Troyes and in the Gothic cathedral at Rheims. The county of Champagne had passed to the counts of Blois in the 11th cent., the main branch held Champagne after 1152. The domain was greatly extended, large parts of France, including Blois, Touraine, and Chartres, were dependent upon the Champagne counts. Most famous of the counts was Thibaut IV, who in 1234 inherited the crown of Navarre from his uncle Sancho VII. In 1286 the daughter and heir of Henry III, Count of Champagne and King of Navarre, married Philip IV of France. When their son ascended the French throne (as Louis X) in 1314, Champagne was incorporated into the royal domain. The bishoprics of Rheims and Langres were added later. Champagne declined in prosperity thereafter, however, the enduring popularity of its sparkling wine, which was developed at the end of the 17th cent., somewhat revitalized its economy. More recently, efforts have been made to reforest the area and reclaim it from erosion.

champagne (shāmpān'), sparkling white wine made from grapes grown in the old French province of Champagne. The best champagne is from that part of the Marne valley whose apex is Rheims, the center of the industry. Champagne was reputedly developed by a monk, Dom Pérignon, in the 17th cent. It is a mixture of black Pinot Noir and white Chardonnay grapes and is named for the vintners and shippers responsible for each blend. The small, slightly acid grapes are laboriously cultivated. After the first fermentation the wine is blended, it undergoes a

secondary fermentation, then is drawn off into bottles reinforced to withstand high internal pressure, and is sweetened to induce further fermentation. The carbonic acid retained in the bottle after the final fermentation renders champagne sparkling. The wine is matured in the labyrinthine tunnels of the old chalk quarries of Rheims. The sediment formed is collected on the cork by tilting the bottle neck downward and frequently rotating it by hand. After fermentation comes the *dégorgement* process, whereby the neck of the bottle is frozen and the cork is removed, the lump of frozen sediment shoots out, propelled by the pressure in the bottle. The space left is filled with the proper dosage of cane sugar dissolved in wine and usually fortified with cognac. Brut champagne is theoretically not sweetened, extra dry champagne, very lightly. An American sparkling wine called champagne is made in New York and California.

Champaign (shāmpān'), city (1970 pop. 56,532), Champaign co., E central Ill., inc. 1860. It adjoins the city of Urbana and is a commercial and industrial center in a fertile farm area. Its manufactures include metal products, academic apparel, and electrical equipment. The Univ. of Illinois at Urbana-Champaign and Parkland College are there. Champaign, founded in 1855 with the arrival of the Illinois Central RR, was first called West Urbana.

Champaigne or Champagne, Philippe de (both fēlēp' də shaNpā'nyā), 1602-74, French painter, b. Brussels, of Flemish parents. In 1621 he went to Paris, where he worked with Poussin on the Luxembourg Palace. In 1628 he became painter to the queen, Marie de' Medici. For her and for Richelieu he executed many religious paintings, still to be seen in French churches, and numerous portraits. From 1640 on he became absorbed in the Jansenist movement and has been called the painter of Port-Royal. His later work is characterized by sober realism, simplicity, and austerity. His best-known paintings include his frescoes at Vincennes and in the Tuileries, his portrait of his daughter, a nun at Port-Royal (1662), and a penetrating study of Richelieu (both Louvre). Basing his portrait style on patterns established by Rubens and Van Dyck, he rendered his subjects with an air of static majesty.

Champ-de-Mars (shaN-də-mars), former parade ground of Paris, France, between the École militaire and the Seine River. There, at the Fête de la Fédération (July 14, 1790), Louis XVI took an oath to uphold the new constitution. On its vast grounds several expositions were held, notably that of 1889, when the Eiffel Tower was erected there.

Champeaux, William of: see WILLIAM OF CHAMPEAUX

Champfleury: see HUSSON, JULES

Championnet, Jean Étienne (zhaN ätyēn' shaN-pyōnē'), 1762-1800, French general in the FRENCH REVOLUTIONARY WARS. Placed in command of the Army of Rome in 1798, he captured (1799) Naples from the Second Coalition and set up the PARTHENOPEAN REPUBLIC. However, he got into trouble with the Directory by denouncing the malpractices of one of its agents in Naples, moreover, his harsh rule caused popular discontent, and he was recalled in disgrace. Later acquitted, he commanded the Army of the Alps, but was unable to win success with this badly organized unit and resigned. He died shortly after.

Champlain, Samuel de (shāmplān', Fr. samuēl' də shaNplān'), 1567-1635, French explorer, the chief founder of New France. After serving in France under Henry of Navarre (King Henry IV) in the religious wars of the period, he was given command of a Spanish fleet sailing to the West Indies, Mexico, and the Isthmus of Panama. He described this three-year tour to the French king in *Bref Discours* (1859). In 1603 he made his first voyage to New France as a member of a fur-trading expedition. He explored the St. Lawrence River as far as the rapids at Lachine and, after his return to France, described his voyage in *Des Sauvages* (1603). With the sieur de Monts, who had a monopoly of the trade of the region, Champlain returned in 1604 to found a colony, which was landed at the mouth of the St. Croix River. In 1605 the colony moved across the Bay of Fundy to Port Royal (now Annapolis Royal, N.S.), and in the next three years Champlain explored the New England coast to Martha's Vineyard, discovering Mt. Desert Island and most of the larger rivers of Maine and making the first detailed charts of the coast. After the sieur de Monts's privileges had been revoked, the colony had to be abandoned, and through the efforts of Champlain a new one was established on the St. Lawrence River. In 1608, in the ship *Le Don de Dieu*, he brought his colonists to the

site of Quebec, where they started what was to be the capital of a great colony. In the spring of 1609, accompanying a war party of Huron Indians against the Iroquois, Champlain discovered the lake that bears his name, and near Crown Point, N.Y., the Iroquois were met and routed by French troops. The incident is believed to be largely responsible for the later hatred of the French by the Iroquois. In 1612, Champlain returned to France, where he received a new grant of the fur-trade monopoly. Returning in 1613, he set off on a journey to the Western lakes. He reached only Allumette Island in the Ottawa River that year, but in 1615 he went with Étienne Brule and a party of Huron Indians to Georgian Bay on Lake Huron, returning southeastward by way of Lake Ontario. Accompanying another Huron war party to an attack on an Onondaga village in present-day New York, Champlain was wounded and forced to spend the winter with the Indians. Thereafter he made no more explorations but devoted all his time to the welfare of the colony, of which he was the virtual governor. He helped to persuade Richelieu to found the Company of One Hundred Associates, which was to take over the interests of the colony. In 1629, Quebec was suddenly captured by the English, and Champlain was carried away to four years of exile in England, there he prepared the third edition of his *Voyages de la Nouvelle France* (1632). When New France was restored to France in 1632, Champlain returned. In 1634 he sent Jean NICOLET into the West, thus extending the French explorations and claims as far as Wisconsin. He died on Christmas Day, 1635, and was buried in Quebec. His works were issued by the Champlain Society (1922-36) with English and French texts. See C. W. Colby, *The Founder of New France* (1915), biographies by N. E. Dionne (1905, repr. 1963), Ralph Flinley (1924), L. H. Sharp (1944), Morris Bishop (1948), and S. E. Morison (1972).

Champlain, Lake, 125 mi (201 km) long and from 0.5 to 14 mi (0.8-23 km) wide, forming part of the N.Y.-Vt. border and extending into Quebec. It is the fourth-largest freshwater lake in the United States (490 sq mi/1,269 sq km). Lake Champlain lies in a broad valley between the Adirondacks and the Green Mts. A link in the Hudson-Saint Lawrence waterway, the lake is connected with the Hudson (at Fort Edward) by the Champlain division of the Barge Canal, the Richelieu River connects the lake with the St. Lawrence. Lake George drains into it through a narrow channel, and many islands dot its surface, including Grand Isle, Isle La Motte, and Valcour Island. The region is noted for its beautiful scenery and has many resorts. Plattsburgh, N.Y., and Burlington, Vt., are the largest cities on the lake's shores. The lake, discovered by Samuel de Champlain in 1609, was the scene of battles in the French and Indian War and the American Revolution at Crown Point and Ticonderoga, of a naval engagement in 1776, and of the important American victory of Thomas MACDONOUGH in the War of 1812.

champlevé (shaNlāvā'), technique for the ENAMEL decoration of metal objects. It was used by the Celts and Romans and employed by medieval metalworkers for jewelry and RELIQUARIES until the 14th cent. Champlevé is produced by hollowing out parts of a design in metal and filling in the hollows with enamel. The technique has been revived by 20th-century craftsmen.

Champney, Benjamin (chāmp'nē), 1817-1907, American painter, b. New Ipswich, N.H. Champney studied drawing and was apprenticed to a lithographer in Boston. He traveled to Europe in 1846, painting panoramic vistas of the Rhine and scenes of the Revolution of 1848.

Champollion, Jean François (zhaN fraNswā' shaNpōlyōN'), 1790-1832, French Egyptologist. He is considered the founder of the science of Egyptology. His first important accomplishment was his two-volume work on the geography of ancient Egypt, which appeared when he was 24. In 1821 by use of the Rosetta stone (see under ROSETTA) he established the principles for deciphering the Egyptian hieroglyphics. Champollion became director of the Egyptian museum at the Louvre and professor at the Collège de France. He is sometimes called Champollion le Jeune to distinguish him from his elder brother, who gave him his early training. Jean Jacques Champollion-Figeac (-fēzhak'), 1778-1867, was an archaeologist, a professor at Grenoble, and a curator of manuscripts at the Bibliothèque nationale. He also served as a professor of paleography at the École des Chartes and librarian at the Palace of Fontainebleau.

Champs Élysées (shāN zālēzā'), avenue of Paris, France, leading from the Place de la Concorde to the

Arc de Triomphe It is celebrated for its tree-lined beauty, its commodious breadth, the elegance of its cafes, theaters, and shops, and the fountain display at its center Begun by Louis XIV and completed by Louis XV, it led through open country until the early 19th cent

Chanaan (kǎ'nan), variant of CANAAN 2

Chanakkale, Turkey see ÇANAKKALE

Ch'an Buddhism: see ZEN BUDDHISM

Chancay (chǎng-kí'), archaeological site in central Peru, center of the ancient Cuismancu empire Culturally influenced by the CHIMU, the Cuismancu dominated less territory and were not as powerful Nonetheless they built sizable cities and were somewhat more materially advanced than their southern neighbors, the Chincha (see ICA) The Cuismancu were conquered by the Inca in the 15th cent

chance, in mathematics see PROBABILITY

chancel, primarily that part of the church close to the altar and used by the officiating clergy In the early churches it was separated from the nave by a low parapet or open railing (*cancellus*), its name being thus derived San Clemente at Rome has one of the few preserved examples With the development of the choir, additional space was taken, between the SANCTUARY and the nave, for the accommodation of the canons and singers The chancel rail was moved forward, and the entire space became known as the choir, although it is also termed the chancel, there is no strict differentiation in the usage In the Middle Ages the chancel rail was replaced by lofty choir screens (see ROOD), especially in English cathedrals and in monastic churches

Chancellor, Richard, d 1556, English navigator When, largely under the inspiration of Sebastian Cabot, a group of men in England undertook to finance a search for the Northeast Passage to Asia, Chancellor was chosen as second in command under Sir Hugh Willoughby They sailed in 1553, and Chancellor and Stephen Borough, in the *Edward Bonaventure*, managed to get through dangerous arctic waters to the White Sea Chancellor then traveled overland across Russia to Moscow at the invitation of Ivan IV His negotiations prepared the way for trade with Russia and the formation of the MUSCOVY COMPANY Returning from a second voyage to Russia, he was shipwrecked and perished off the coast of Scotland Since Willoughby had earlier come to grief, it was Stephen Borough who continued the work of opening the northern route to Russia for the Muscovy Company

Chancellorsville, battle of, May 2-4, 1863, in the American Civil War Late in April, 1863, Joseph Hooker, commanding the Union Army of the Potomac, moved against Robert E Lee, whose Army of Northern Virginia (less than half the size of Hooker's) had remained entrenched on the south side of the Rappahannock River after the battle of FREDERICKSBURG Hooker, with four corps, crossed the river above Fredericksburg and took up a strong position near Chancellorsville, located 10 mi (16 km) W of Fredericksburg, he sent John Sedgwick, with two corps, to cross below Chancellorsville, with two corps, Lee did not retreat but, leaving 10,000 men under Jubal A Early to watch Sedgwick, moved on Hooker, who fell back to a defensive position in the wilderness around Chancellorsville Lee attacked on May 2 T J (Stonewall) JACKSON led his 2d Corps on a brilliant 15-mi (24-km) flanking movement against the Union right, while Lee, with his small remaining force, feinted along the rest of the line Jackson fell upon and routed the surprised Union troops but, unfortunately for the South, was mortally wounded by his own men The next day the Confederate wings united (James Ewell Brown STUART succeeding Jackson) and drove Hooker back further Hooker failed to use his superior forces, but called for Sedgwick, who drove Early from Marye's Heights (May 3) and reached Salem Church, 5 mi (8 km) W of Fredericksburg There part of Lee's force joined Early and repulsed Sedgwick (May 4-5) Sedgwick and Hooker then withdrew across the river Chancellorsville, Lee's last great victory, led to his invasion of the North in the GETTYSBURG CAMPAIGN See John Bigelow, *The Campaign of Chancellorsville* (1910), E J Stackpole, *Chancellorsville Lee's Greatest Battle* (1958)

chancery: see EQUITY

Chan Chan (chān chān), ruins of an ancient Indian city near Trujillo, N Peru The city was probably begun in the period from A.D. 800 to 1000, and it is estimated that it once contained 200,000 people Chan Chan is generally accepted as the capital of the CHIMU, a pre-Inca civilization It is on a large

plain of the coastal desert, which was made arable by ambitious and extensive irrigation works Covering c 11 sq mi (28 sq km), the city comprised at least 10 self-contained, walled-in units The walls, built of adobe brick, are decorated with relief designs

Chan-chiang or **Chankiang** (both chān-jēāng), Cantonese *Tsamkong*, official Chinese name for the former French territory of Kwangchowan (325 sq mi/840 sq km) on Kuang-chow Bay, S Kwangtung prov, China It was leased from China in 1898 for 99 years but was returned in 1945 Its chief city, Fort-Bayard, was renamed **Chan-chiang** (1970 est pop 220,000) and since 1955 has been developed as a major seaport, servicing ships up to 10,000 tons, and as a regional trade center The city has textile, chemical, shipbuilding, and electric power industries, and is linked by rail to Kwangsi prov

chancree: see SYPHILIS

chancroid: see VENEREAL DISEASE

Chanda (chān'dā), town, Maharashtra state, central India, on the Irar River It is a district administrative center Chanda is near the Wardha valley coal fields Its chief industries are rice milling and pig-iron casting The town is surrounded by a wall that acts as a flood barrier Chanda was the capital of the Gond kingdom from the 12th to the 18th cent The tombs of the Gond kings and several temples are in the town

Chandernagor (chūn'dərnəgôr') or **Chandan-nagar** (shāndərnāgôr'), town (1971 pop 75,960), West Bengal state, E India, on the Hooghly River, a suburb of Calcutta Founded by the French in 1686, it was of great commercial importance until the 19th cent It was ceded by France and became part of India in 1951

Chandigarh (chūn'dēgar), union territory (1971 pop 256,972), 44 sq mi (114 sq km) and city (1971 pop 218,807), NW India The city is the capital of both Haryana and Punjab states It was designed by the architect Le Corbusier and built largely in the 1950s on a site chosen for its healthy climate and plentiful water supply The city was constructed because the capital of Punjab in British India, Lahore, was given to Pakistan when India was partitioned in 1947 Punjab Univ is in Chandigarh The union territory is administered by the central government of India

Chandler, Albert Benjamin, 1898-, U.S. baseball commissioner (1945-51) and politician, b Corydon, Henderson co., Ky "Happy" Chandler was a lawyer in Versailles, Ky, when he went into politics He served as lieutenant governor (1931-35), governor (1935-39), and U.S. Senator (1939-45), before becoming baseball commissioner He retired after major league club owners refused to renew his contract From 1955 to 1959, Chandler was again governor of Kentucky

Chandler, Raymond Thornton, 1888-1959, American detective-story writer, b Chicago, educated in England After serving with the Canadian forces in World War I, he entered the oil business in California Bankrupt during the depression, he began writing and published his first detective story, *The Big Sleep*, in 1939 Subsequent novels include *Farewell My Lovely* (1940), *The High Window* (1942), *The Lady in the Lake* (1943), *The Little Sister* (1949), *The Long Goodbye* (1953), and *Playback* (1958) Well plotted and brutally realistic, Chandler's novels convincingly depict California's seedy lowlife They all feature Philip Marlowe, a tough yet honorable private detective with a brash sense of humor

Chandler, Zachariah, 1813-79, U.S. Senator from Michigan (1857-75, 1879) and Secretary of the Interior (1875-77), b Bedford, N.H. He moved to Detroit in 1833 and through merchandising, land speculation, and banking became a millionaire Mayor of Detroit (1851-52), he helped organize and was long the boss of the Republican party in Michigan Old Zack, as he was called, was an able and uncompromising abolitionist A leading radical Republican, most closely associated with Benjamin F. WADE, he was a member of the congressional committee on the conduct of the war, and he violently opposed Lincoln's Reconstruction program Chandler remained a powerful figure in the Senate until he was turned out by the Democratic landslide of 1874 He then entered the cabinet of President Grant and was also chairman of the Republican National Committee in the disputed election of 1876 See biographies by W.C. Harris (1917) and M.K. George (1969), T.H. Williams, *Lincoln and the Radicals* (1941)

Chandler, city (1970 pop 13,763), Maricopa co., S central Ariz., in the Salt River valley, inc 1920 It is a residential community in an area that produces cotton, alfalfa, and citrus fruit Sugar is processed, and

computer components, mobile homes, and containers are produced in Chandler Williams Air Force Base is nearby and contributes to the city's economy, as do tourists, who are especially attracted by the San Marcos Golf Resort Many of Chandler's citizens work in nearby Phoenix

Chandos, Sir John, d 1370, English soldier and administrator of English territories in France A friend of Edward the Black Prince, he won distinction in the Hundred Years War by his bravery at Poitiers (1356) and by his capture (1364) of Bertrand DU GUESCLIN at Auray He was made constable of Guienne in 1362 and seneschal of Poitiers in 1365 In the Spanish campaign of the Black Prince he again defeated and captured (1367) Du Guesclin at Najera He was mortally wounded in a battle with Gascon nobles at Lussac, near Poitiers.

Chandragupta (Chandragupta Maurya)(chāndragōp'tā), fl c 321 B.C.-c 298 B.C., Indian emperor, founder of the MAURYA dynasty and grandfather of Asoka The Greek form of his name is Sandracottus or Sandrocottus It is possible that he expelled the last of the garrisons Alexander the Great had established in NW India He conquered the Magadha kingdom (in modern Bihar) and eventually controlled all India N of the Vindhya Hills In c 305, Chandragupta, with a huge army, defeated SELEUCUS I (Nicator) who had invaded NW India in an attempt to regain Alexander's Indian provinces Seleucus had to yield parts of Afghanistan to Chandragupta, and some sort of marriage alliance followed From Megasthenes, a Seleucid envoy at the court of Chandragupta, comes much of the information about the period The emperor dwelt in an enormous, ornate palace at Pataliputra (Patna) and administered a highly bureaucratic government, which controlled the entire economic life of N India He was advised by Kautilya (also called Chanakya), a very able but unscrupulous Brahman, who is known as the author of the *Arthashastra*, a Machiavellian political tract Chandragupta established a vast secret service system and, fearing assassination, rarely left his palace Jain tradition says that he abdicated his throne, became a Jain monk, and fasted to death

Chandragupta I and II, two Indian emperors See GUPTA

Chanel, Gabrielle (Coco) see under FASHION

Chaney, Lon (chā'nē), 1883-1930, American film actor, b Colorado Springs, Colo Chaney was the son of deaf-mute parents He made more than 150 silent films A master of the use of grotesque, distorting makeup, he is best remembered for his work in horror films such as *The Phantom of the Opera* (1925) His son, Lon Chaney, Jr (1907-), made many horror films and westerns

Changarnier, Nicolas (nēkōlā' shāNgārn'yā'), 1793-1877, French general and politician He served in Algeria and was briefly (1848) governor general of Algeria, succeeding Louis Cavaignac Elected to the constituent assembly in 1848 after the FEBRUARY REVOLUTION, he resigned after the rising of the June Days to head the Paris national guard Later the regular army troops in Paris were added to his command A monarchist and Orleanist, Changarnier came to oppose the policies of Louis Napoleon and was exiled after the coup d'état of 1851 He returned in 1859 and took part in the defense of Metz (1870) in the Franco-Prussian War Again elected a deputy in 1871, he opposed a republic He was made a life senator in 1875

Chang-chia-k'ou or **Changkiakow** (both chāng-jēā-kou), Mongolian Kalgan, city (1970 est pop 1,000,000), NW Hopeh prov, China, near a gateway of the Great Wall and on the Peking-U55R RR A major trade center for N China and Mongolia, it has food-processing plants, machine shops, and tanneries The meeting place of caravans traveling from Peking to Ulan Bator, it was an important military center under the Manchu dynasty but declined somewhat after the opening (1905) of the Trans-Siberian RR In 1928 it became the capital of Chahar prov, which was abolished in 1952

Chang Chih-tung (jāng jūr-dōng), 1837-1909, Chinese Ch'ing dynasty statesman and educational reformer He occupied the high post of governor-general for over two decades, first of Kwangtung and Kwangsi provs (1884-89), and later of Hunan and Hubei provs (1889-1907) In that position he vigorously pressed the late Ch'ing self-strengthening program, establishing an arsenal, iron- and steelworks, military and naval academies, and schools of mining, agriculture, commerce, and industry Chang encouraged the early reform movement between 1895 and 1898 (see KANG YU-WEI), advocating a balance

between study of the Chinese heritage and adoption of Western scientific and technical knowledge. In the end, however, he supported the coup of Empress Dowager Tzu Hsi against the Hundred Days' Reform (1898), convinced that K'ang was surrendering too much to Western culture. After the disastrous Boxer Uprising he urged radical educational change including a public school system from kindergarten to university and abolition of the traditional civil service CHINESE EXAMINATION SYSTEM. He was appointed (1907) head of the new ministry of education. See W. Ayers, *Chang Chih-tung and Educational Reform in China* (1971).

Ch'ang-chou or **Changchow** (both *jang-jō*), city, S Kiangsu prov., E central China, on the Grand Canal. It is a food and textile center. Other manufactures include fertilizer, machine tools, and motor vehicles. Ch'ang-chou became industrialized in the late 19th cent. It was called Wutsin prior to 1949.

Changchow: see CH'ANG-CHOU, China

Ch'ang-ch'ün or **Changchün** (both *chang'-chōn*), city (1970 est. pop. 1,500,000), capital of Kirin prov., China, on the railroad between Harbin and Lu-ta. An industrial city, it is the country's major center of motor vehicle production, with enormous truck and tractor works. Railroad cars, tires, pharmaceuticals, and textiles are also manufactured. An aluminum plant is west of the city. Ch'ang-ch'ün is the "Hollywood" of China, with government-owned motion picture studios that produce propaganda films. As Hsinking [Chin. = new capital], it was the capital of the former state of Manchukuo (1932-45). During this period the city was rebuilt along modern lines. Many of the large administrative buildings have been converted into universities, these include Kirin Univ., a polytechnical university, a medical college, and several technical institutes.

changeling, in popular superstition, a fairy child substituted for a human baby. It was believed that evil fairies stole healthy unbaptized infants and left in their place a fairy child. Hence, sickly and peevish babies were sometimes called changelings.

change ringing: see BELL

Chang Hsueh-liang (chang' shue'-lyang'), 1898-, Chinese war lord, son of CHANG TSO-LIN. On the death (1928) of his father, he succeeded as military governor of Manchuria. He was then known as Chang Hsiao-liang but later changed his name. He supported Chiang Kai-shek against a rebellious northern army in 1929-30 and was made vice commander in chief of all Chinese forces and a member of the central political council. Ousted (1931) by the Japanese from Manchuria, he suffered loss of prestige. In 1936, with the help of Chinese Communists, he had Chiang kidnapped at Sian, allegedly to compel cooperation between the Kuomintang and the Communists and to force a declaration of war against Japan. Chiang Kai-shek was released unconditionally a few weeks later. Chang, tried and sentenced for his part in the affair, was pardoned but kept in custody. He was taken to Taiwan when the Nationalist regime fled there in 1949.

Ch'ang-hua or **Changhwa** (both *chang-hwa*), city (1969 pop. 133,514), central Taiwan. It is a transportation center as well as a market for rice, oranges, and pineapples. The city's industries produce wood and paper products, textiles, canned food, refined sugar, and machinery. Settled in the 17th cent., Ch'ang-hua was once an important port.

Changkiakow: see CHANG-CHIA-K'OU, China

Ch'ang-pai (chang'bi'), or **Changpai** mountain range, largely in NE China and partly in North Korea, Paitou Shan (9,003 ft/2,744 m) is the highest peak. The Ch'ang-pai range is economically important for timber and coal deposits. The Yalu, Tumen, and Sungari rivers rise there.

Ch'ang-sha or **Changsha** (both *chang-sha*), city (1970 est. pop. 850,000), capital of Hunan prov., S China, on the Hsiang River. The name, which means "long sandbank," is derived from an island in the river. Ch'ang-sha is an agricultural distribution and market center, an important stop on the Peking-Canton RR, and a river port. Rice is processed, meats are canned, and paper products, fertilizer, trucks, ceramics, and a wide variety of handicrafts are made. The city was founded in the early 3d cent. B.C. and has long been noted as a literary and educational center. As Tanchow it was the capital of the Chu kingdom (10th cent.). It became a treaty port in the early 1900s. Mao Tse-tung was educated in Ch'ang-sha, and in 1927 he led a Communist uprising there. The city is the birthplace of many notable Chinese literary figures and statesmen, including Chia Yi, a Han dynasty essayist, and Tseng Kuo-fan,

a 19th-century diplomat and general. Ch'ang-sha is the seat of several institutions of higher learning, notably Hunan Univ. and a medical college. An important Chinese air force base is there.

Ch'ang-te or **Changteh** (both *chang-dū*), city (1970 est. pop. 225,000), N Hunan prov., China, on the Yuan River. Formerly a treaty port, it is now a storage and shipping point for tung oil, medicinal herbs, and wood. Manufactures include ceramics, machine tools, textiles, leather, and processed foods. The city was founded during the Han dynasty.

Chang Tso-lin (jang dzō-līn), 1873-1928, Chinese general. Chang was of humble birth. As the leader of a unit of Manchurian militia he assisted (1904-5) the Japanese in the Russo-Japanese War. He held various military posts under the Chinese republic. From his appointment (1918) as inspector general of Manchuria until his death he controlled Manchuria, and from 1920 he constantly warred to extend his rule southward, joining in a three-way struggle with WU PEI-FU and FENG YU-HSIANG for control of the Peking government. His Fengtien army occupied the Peking-Tientsin area (1926) until driven out by the NORTHERN EXPEDITION OF CHIANG KAI-SHEK (1928). Chang died when the train in which he was retreating to Mukden before the Kuomintang army was bombed (for reasons still unclear) by officers of the Japanese army in Manchuria. His son, CHANG HSUEH-LIANG, succeeded to control of Manchuria.

Chankiang: see CHAN-CHIANG, China

channeling: see QUARRYING

Channel Islands, archipelago (1971 pop. 125,243), 75 sq mi (194 sq km), 10 mi (16 km) off the coast of Normandy, France, in the English Channel. The main islands are JERSEY, GUERNSEY, ALDERNEY, and SARK, and there are several smaller islands, including Herm, Jethou, and Lithou, all the islands are dependencies of the British crown. The mild and sunny climate (35-40 in./89-102 cm rainfall a year) and the fertile soil have made the islands chiefly agricultural. Large quantities of vegetables, fruits, and flowers are shipped to English markets. Dairying is the chief occupation of the islanders. The famous Jersey and Guernsey breeds of cattle are kept pure by local laws. The islands are a favorite resort of tourists and vacationers. The chief ports are ST. HELIER (Jersey) and ST. PETER PORT (Guernsey). The islands are divided into two administrative bailiwicks, one of which, Jersey, has more than half the total population. The other, Guernsey, includes all the islands except Jersey. Each bailiwick has its own lieutenant governor appointed by the crown, its own chief magistrate and legislature, and its own judicature. The inhabitants are mostly of Norman descent, but on Alderney the stock is mainly English. The English language is spoken everywhere, although French is the official language of Jersey. A Norman patois and Norman customs are still maintained by the natives. Christianization took place in the 6th cent., largely through the efforts of St. Helier and St. Sampson. In the 10th cent. the isles became possessions of the duke of Normandy. At the Norman conquest they were joined to the English crown, they remained under the control of King John and England in 1204 when Philip II of France confiscated the duchy of Normandy. The French attempted unsuccessfully to reestablish control in the 14th cent. and later. In World War II, after the evacuation of some 10,000 military and civilian personnel, the islands were occupied (1940) by German forces. See study by John Uttley (1966).

Channel Islands National Monument see NATIONAL PARKS AND MONUMENTS (table), SANTA BARBARA ISLANDS

Channing, Edward, 1856-1931, American historian, b. Dorchester, Mass., son of William Ellery Channing (1818-1901). He was a prominent teacher at Harvard from 1883 until his retirement in 1929, holding a professor's rank from 1897. Channing wrote *English History for American Readers* (with Thomas W. Higginson, 1893), *The United States of America, 1765-1865* (1896, 2d ed. 1930, repr. 1941), *Guide to the Study and Reading of American History* (with Albert B. Hart, 1896, rev. and augmented ed. by Channing, Hart, and Frederick J. Turner, 1912), an excellent brief bibliography of American history, *Students' History of the United States* (1898, 5th ed., rev. 1924), and *The Jeffersonian System, 1801-1811* ("American Nation" series, 1906, repr. 1968). Most of these books were, however, either incidental to, or preparation for, the great work to which Channing devoted most of his life—*A History of the United States* (6 vol., 1905-25), embracing the years from 1000 to 1845. Based throughout on the author's ex-

tensive knowledge of the sources, remarkably accurate in fact, and excellently written, it is generally considered one of the finest histories of the United States ever produced by one man. The final volume on the Civil War won a Pulitzer Prize in 1926.

Channing, William Ellery, 1780-1842, American Unitarian minister and author, b. Newport, R.I. At 23 he was ordained minister of the Federal St. Congregational Church in Boston, where he served until his death. He was a leader among those who were turning from Calvinism, and his sermon at Jared Sparks's ordination in Baltimore (1819) earned him the name "the apostle of Unitarianism." In 1820 he organized the Berry St. Conference of Ministers, which in 1825 formed the American Unitarian Association. Channing's plea was for humanitarianism and tolerance in religion rather than for a new creed. Not only a great preacher but a lucid writer, Channing influenced many American authors, including Emerson and other transcendentalists and Holmes and Bryant. Channing was not by nature a controversialist and never allied himself with the abolitionists, but his writings on slavery helped prepare for emancipation. In his denunciations of war, his discussion of labor problems, and his views on education, he was ahead of his time. His works (6 vol., 1841-43) passed through many editions. See his *Life with Extracts from His Correspondence* (ed. by W. H. Channing, 3 vol., 1848), biographies by J. W. Chadwick (1903), M. H. Rice (1961), and Jack Mendelsohn (1971), R. L. Patterson, *The Philosophy of William Ellery Channing* (1952, repr. 1972).

chansons de geste (shaNsōN' də zhěst) [Fr. = songs of deeds], a group of epic poems of medieval France written from the 11th through the 13th cent. Varying in length from 1,000 to 20,000 lines, assananced or (in the 13th cent.) rhymed, the poems were composed by trouvères and were grouped in cycles about some great central figure such as Charlemagne. The origin of the form is disputed, but probably the first chansons were composed after the year 1000 by the joint efforts of wandering clerks and jongleurs (itinerant minstrels) to attract pilgrims to shrines where heroes of the chansons were supposedly buried. Sung by jongleurs to the accompaniment of a primitive viol, they spread to England, Germany, Italy, and Iceland. The earlier chansons—epic, aristocratic, and militantly Christian—passed as real history to their medieval listeners, though much of the material was legendary. Some later chansons utilize fantastic adventure or reflect bourgeois elements. The oldest extant chanson, and also the best and most famous, is the *Chanson de Roland*, composed c. 1098-1100 (see ROLAND), others are *Raoul de Cambrai*, *Huon de Bordeaux*, *Aliscans*, and *Renaud de Montauban*. See W. C. Calin, *The Epic Quest: Studies in Four Old French Chansons de Geste* (1966) and Jessie Crosland, *The Old French Epic* (1971).

chant, general name for one-voiced, unaccompanied, liturgical music. Usually it refers to the liturgical melodies of the Orthodox, Roman Catholic, and Anglican branches of Christianity. Roman Catholic chant, commonly called Gregorian or PLAINSONG, is diatonic, modally organized (see MODE), and has a free rhythm determined by the text. Anglican chant is a harmonized, metrical adaptation to English texts of the Gregorian method of psalm singing, in which a short melody is adjusted to the length of different psalm verses by repeating one tone, the recitation tone, for any number of words in the text. The texts of Anglican chant, used in many Protestant churches, are from the BOOK OF COMMON PRAYER.

Chantaburi see CHANTHABURI, Thailand

chanter: see BAGPIPE

chanterey or **shanty** (both *shān'tē*), work song with marked rhythm, particularly one sung by a group of sailors while hoisting sail or anchor or pushing the capstan. Often it has solo stanzas sung by a leader, the chantereyman, with a chorus repeated after each by the entire group. Similar songs are sung by shore gangs and lumbermen, and all are related to the work chanting of group labor throughout the world, such as the barcaroles of Italian boatmen, the songs of West Indian shoremen, or the Oriental rope chants. Many universally known chantereyms, such as *Way, Haul Away* and *Wide Missouri*, are of American origin. See Robert Frothingham, ed., *Songs of the Sea and Sailor's Chantereyms* (1924), Frank Shay, ed., *American Sea Songs and Chantereyms* (1948), Stan Hugill, ed., *Shantereyms from the Seven Seas* (1961).

Chanthaburi (chantā'bōōrē'), town (1960 pop. 10,795), capital of Chanthaburi prov., SE Thailand, near the Gulf of Siam. It is an agricultural trade center in an area growing rice, pepper, and coffee. Pre-

cious gems (principally rubies and sapphires) are mined nearby. Originally part of the Khmer Empire, the town passed to Thailand in 1576. It was occupied by French forces from 1893 to 1905.

Chantrey, Sir Francis Legatt, 1781–1841, English sculptor, famous for his portrait busts and statues. Among his many well-known works are equestrian statues of Wellington and George IV (London), and a statue of George Washington (Statehouse, Boston).

Chanukah: see HANUKKAH

Chanute, city (1970 pop. 10,341), Neosho co., SE Kansas, on the Neosho River, inc. 1873 following the consolidation of four contiguous towns. It is a processing and trade center for a rich agricultural region, with a great variety of manufactures. A junior college is there. Nearby is the site of a mission (1824–29), the first in Kansas.

Chany (chānē'), saltwater lake, 1,280 sq mi (3,315 sq km), 5 Siberian USSR, in the Baraba Steppe. The Chulym River flows into the lake.

Chanzy, Antoine Eugène Alfred (aŋtwaŋ' ozhēŋ' alfréd' shānzē'), 1823–83, French general. After service in Algeria, Italy, and Syria, he was refused a major command in the FRANCO-PRUSSIAN WAR because he was distrusted by the emperor Napoleon III. After the fall of the empire he was put in command of the Army of the Loire and opposed the Prussians with great skill. Chanzy was elected to the national assembly. Captured by the Commune of Paris in 1871, he was detained for several days. Chanzy was later governor general of Algeria (1873–79) and ambassador to Russia (1879–81), and in 1875 he was made senator for life. Nominated for president without his approval in 1879, he received a large vote in the election.

Ch'ao-an or **Chaoan** (both chou-an), city, E Kwangtung prov., China, on the Han River. It is also called Chaochow (Ch'ao-chou). It is a trade center with textile, machinery, porcelain, and sugar-refining industries.

Chaochow: see CH'AO-AN, China

Chao K'uang-yin (iou kwang-yin), Chinese emperor (960–79), founder of the SUNG dynasty. A leading general during the short-lived Later Chou dynasty (951–60), he usurped the throne, and by the time of his death he had reunited most of China. Proper Chao's reign followed the FIVE DYNASTIES period (907–60), an era of frequent political change. His greatest accomplishment, and the reason for the longevity of the Sung, was his replacement of the system of autonomous local military commanders with large professional armies under the control of the central government.

Chao Phraya (chou praya'), **Mae Nam Chao Phraya**, or **Menam Chao Phraya** (both mā-nam'), chief river of Thailand, c 140 mi (230 km) long, formed by the confluence of the Ping (c 300 mi/480 km long) and the Nan (c 500 mi/800 km) rivers at Nakhon Sawan, W central Thailand. It flows 5 past Bangkok to the Gulf of Siam and is navigable for its entire length. With its tributaries, the Chao Phraya drains most of W Thailand, its valley is the country's main rice-producing region. The many distributaries of the Chao Phraya delta are interconnected by canals that serve both for irrigation and for transportation.

Chaos (kā'ōs), in Greek mythology, vacant, unfathomable space. From it arose all things, earthly and divine. There are various legends explaining it. In the Pelagian creation myth, EURYNOME rose out of Chaos and created all things. In the Olympian myth, Gaea sprang from Chaos and was the mother of all things. Eventually the word chaos came to mean a great confusion of matter out of which a supreme being created all life.

Chapais, Sir Thomas (shapā'), 1858–1946, Canadian politician and historian, b. Quebec prov., son of Jean Charles Chapais (1811–85). Thomas Chapais became professor of history at Laval Univ. He was appointed to the legislative council of Quebec in 1892, became speaker in 1895, and president of the executive council in 1896. In 1919 he was appointed to the Canadian Senate, and in 1930 he represented Canada in the Assembly of the League of Nations. He served as a cabinet minister in 1897 and from 1936 to 1939. A noted French Canadian historian, his most important works were his biographies *Jean Talon* (1904), *The Great Intendant* (1914), and *Montcalm* (1911), and his *Cours d'histoire du Canada* (8 vol., 1919–34). He was knighted in 1935.

Chapala (chāpālā), lake, c 50 mi (80 km) long and 8 mi (12.8 km) wide, W Mexico, in Jalisco and Michoacán states. It is the largest lake in Mexico. Set in a depression on the central plateau, Lake Chapala is

fed by the Lerma River, which flows into it from the east, and is drained by the Río Grande de Santiago, which flows out by the northeastern corner. It is a popular scenic resort. Fishing is an important native occupation. Since the early 1950s the waters have been receding at an alarming rate and the lake is rapidly becoming choked with water hyacinths; studies have been initiated to determine an effective conservation program. Towns along the shore range from Indian villages to American retirement colonies.

chaparral (chāpārāl'), type of plant community in which shrubs are dominant. It occurs usually in regions having from 10 to 20 in. (25–50 cm) of rainfall annually, which are thus more dry than forest regions and less dry than deserts. Where the rate of evaporation is high, chaparral may be found where the rainfall is well above 20 in. Generally chaparral country has most of its rainfall in the winter. The vegetation includes both evergreen and deciduous forms, the dominant species varying in different areas. Chaparral is well exemplified in parts of the W and SW United States, although similar growth is found in many parts of the world. Climax areas (see ECOLOGY) are well represented by the largely deciduous growths in Colorado, E Utah, and N New Mexico. A subclimax area extends from South Dakota to Texas and through part of the Great Basin. Among the chief species of plants in these regions are Gambel oak (*Quercus utahensis*), mountain mahogany (*Cercocarpus parvifolius*), squawbush (*Rhus trilobata*), western chokeberry (*Prunus demissa*), western serviceberry (*Amelanchier alnifolia*), and mesquite (*Prosopis glandulosa*). Evergreen shrubs are characteristic of the chaparral found in the southern half of California, especially near the coast, and extending into Nevada and Arizona. Among the dominant forms are several species of buckthorn (*Ceanothus*), manzanita (*Arctostaphylos tomentosa* and *A. pungens*), and the holly-leaved cherry (*Prunus ilicifolia*). A species of scrub oak (*Quercus dumosa*) is the chief deciduous form. Chaparral growth is sometimes so dense that it is almost impenetrable.

chapbook, one of the pamphlets formerly sold in Europe and America by itinerant agents, or "chapmen." Chapbooks were inexpensive—in England often costing only a penny—and, like the broadside, they were usually anonymous and undated. The texts were similar to those of current tabloid newspapers and therefore reveal much about the popular taste of the 16th, 17th, and 18th cent. The term is occasionally used to refer to old manuscripts showing national character through the use of vernacular expressions.

Chapei: see SHANGHAI, China

chapel, subsidiary place of worship. It is either an alcove or chamber within a church, a separate building, or a room set apart for the purpose of worship in a secular building. A movable shrine containing the *cappa*, or cloak, of ST MARTIN was first called a *cappella*, hence a sanctuary that is not called a church. Though the churches of the early Middle Ages possessed only the single altar of the apse, chapels became necessary with the increase of relics and of devotions at altars sacred to numerous saints. At first they appeared as minor apses, flanking the main apse. After the 10th cent., in order to accommodate the increasing number of pilgrims, a complex series of radiating chapels was developed behind the high altar. In the 13th cent. chapels were added to the side-aisle bays of choir and nave. In England the strongly projecting transepts provided the favored space for a relatively small number of chapels. In France the Lady Chapel (dedicated to the Virgin) is the central chapel of the chevet and is sometimes larger than the others, while in England it occurs directly behind the high altar. Peculiar to English cathedrals are the small chantry chapels, mostly of the 14th and 15th cent., either built and endowed by individuals for their private Masses or serving to enclose the tombs of bishops and other churchmen. From the early Middle Ages, members of royalty had the right to an independent private chapel. Such are the separate building of the Sainte-Chapelle, Paris, St. George's Chapel at Windsor, and Henry VII's magnificent chapel at Westminster, London. In addition, there were royal mortuary chapels, the most celebrated being that of Charlemagne (795–804), at Aachen, since converted into a cathedral. Numerous lords of medieval castles and manor houses established private chapels, over which episcopal jurisdiction was enforced as completely as possible. The two main chapels at the Vatican are the Pauline Chapel (1540), designed by Antonioda SANGALLO for Paul III, and the Sixtine Chapel (1473),

built by Sixtus IV and celebrated for its great fresco decorations by MICHELANGELO and other masters. Two of the most famous French modern chapels (built in the 1950s) are the chapel at Vence designed by Matisse and the one at Ronchamp by Le Corbusier, both are freestanding buildings.

Chapelain, Jean (zhaN shaplāN'), 1595–1674, French critic and poet. His works include *Pucelle* (1656), an epic poem about Joan of Arc. Chapelain was a founding member of the French Academy, for which he composed a celebrated attack upon Pierre Corneille's *Le Cid*.

Chapel Hill, town (1970 pop. 25,537), Orange co., central N.C., at the edge of the Piedmont, founded 1792, inc. 1851. It is the seat of the Univ. of North Carolina, which is the mainstay of the town's economy.

Chapin, Schuyler G., 1923–, American operatic manager, b. New York City. He studied music with Nadia Boulanger. In 1953 he joined Columbia Artists as tour manager, he also served with Columbia Records as director of artists and repertoire. From 1964 until 1969 he was vice president in charge of programming of Lincoln Center for the Performing Arts. Upon the death (1972) of Goeran Gentele (whose assistant he had been), Chapin succeeded him, first as acting general manager and then as general manager of the Metropolitan Opera.

Chaplin, Charlie (Sir Charles Spencer Chaplin), 1889–, English film actor, director, producer, writer, and composer, b. London. After appearing in London music halls, in 1910 Chaplin joined a pantomime troupe. While touring the United States, he was noticed by Mack Sennett. For the Keystone Company (1914–15) he created the famous wistful tramp characterized by derby, moustache, baggy trousers, and awkward walk. In 1918 Chaplin became an independent producer, releasing his films through United Artists, which he founded in 1919 with D. W. Griffith, Douglas Fairbanks, and Mary Pickford. Chaplin often composed his films' background music. His major films include *The Kid* (1920), *The Gold Rush* (1924), *The Circus* (1928), *City Lights* (1931), *Modern Times* (1936), *The Great Dictator* (1940, his first speaking part), *Monsieur Verdoux* (1947), and *Limelight* (1952). In 1966 he directed *A Countess from Hong Kong*. After much American press and government criticism of his politics and personal behavior, Chaplin settled in Switzerland in 1952. In 1975 he was knighted by Queen Elizabeth II. He is married to Oona O'Neill, daughter of Eugene O'Neill. See his *My Trip Abroad* (1922) and autobiography (1964), biographies by Charles Chaplin, Jr. (1960) and Parker Tyler (1947, repr. 1972), G. D. McDonald et al., *The Films of Charlie Chaplin* (1965).

Chapman, George, 1559?–1634, English dramatist, translator, and poet. His great contributions to English literature are his poetic translations of Homer's *Iliad* (1612) and *Odyssey* (1614–15). Chapman was a classical scholar, and his work shows the influence of the Stoic philosophers, Epictetus and Seneca. In his best-known tragedies, *Bussy D'Ambois* (1607) and *The Conspiracy and Tragedy of Byron* (1608), the hero is destroyed by his inability to control his inward passions and resist outward temptation. Chapman wrote and collaborated on nearly a dozen comedies, the most notable being *All Fools* (1605) and *Eastward Ho!* (1605), the latter written with Ben Jonson and John Marston. Included among his other works are several metaphysical poems, a completed version of Marlowe's *Hero and Leander* (1598), and translations of Petrarch and Hesiod. See studies by Millar MacLure (1966) and Charlotte Spivack (1967).

Chapman, John, 1774–1845, American pioneer, more familiarly known as Johnny Appleseed, b. Massachusetts. From Pennsylvania—where he had sold or given saplings and apple seeds to families migrating westward—he traveled c 1800 to present-day Ohio, sowing apple seeds as he went. For over 40 years Johnny Appleseed continued to wander up and down Ohio, Indiana, and W Pennsylvania, visiting his forest nurseries to prune and care for them and helping hundreds of settlers to establish orchards of their own. His ragged dress, eccentric ways, and religious turn of mind attracted attention, and he became a familiar figure to settlers. Scores of legends were told of him after he died. However, it was verified that in the War of 1812 he traveled 30 mi (48 km) to summon American troops to Mansfield, Ohio, thus forestalling a raid by Indian tribes who were allied with the British. He died near Fort Wayne, Ind. See biographies by H. A. Pershing (1930) and Robert Price (1954).

Chapman, John Gadsby, 1808–90, American painter, b. Alexandria, Va. Chapman is noted for his col-

ored etchings of the Roman compagna and the American landscape His historical painting *The Baptism of Pocahontas* is in the Capitol in Washington, D C

Chapman, John Jay, 1862-1933, American essayist and poet, b New York City, grad Harvard He was admitted to the bar in 1888 but after 10 years abandoned law for literature A friend of William James and other Boston intellectuals of the time, Chapman was a fiery and pertinent observer of his environment Among his works are *Emerson and Other Essays* (1898), *Memories and Milestones* (1915), *Greek Genius and Other Essays* (1915), *Songs and Poems* (1919), and *New Horizons in American Life* (1932) He also wrote several plays, including *The Treason and Death of Benedict Arnold* (1910) See his selected writings ed by J Barzun (new ed 1968), studies by R B Hovey (1959) and M H Bernstein (1964)

Chapman, Maria Weston, 1806-85, American abolitionist, b Weymouth, Mass In 1834 she became a close associate of William Lloyd Garrison, helped organize the Boston Female Anti-Slavery Society, and for several years was treasurer of the Massachusetts Anti-Slavery Society She edited (1877) the autobiography of her friend Harriet Martineau

Chapra (chā'pra), city (1971 pop 83,166), Bihar state, NE India, on the Gogra River near its junction with the Ganges It is a rail and road junction In the 18th cent the French, Dutch, Portuguese, and British had factories in the area that were destroyed by floods In the early 20th cent the city was ravaged by plague Chapra has two colleges affiliated with Bihar Univ

Chaptal, Jean Antoine (zhāN aNtwān' shaptāl'), 1756-1832, French chemist, industrialist, and statesman He became (1781) professor of chemistry at Montpellier, and during the Revolution he was active in gunpowder production Later, as minister of the interior (1801-9) and director general of commerce and manufactures (1815) under Napoleon I, he introduced far-reaching reforms in medicine, industry, and public works Chaptal's writings pioneered in the application of chemical principles to industrial processes

chapter house, a building in which the chapter of the clergy meets Its plan varies, the simplest being a rectangle At Worcester, England, the Norman builders created a circular chapter house (c 1100), with vaulting springing from a central pillar Subsequent examples, adopting this central support for their vaulted roofs but frequently having a polygonal plan, are among the most distinctive achievements of the English Gothic builders Those at Salisbury, Wells, and Westminster Abbey (1250) are octagonal, while that at Lincoln is decagonal At York, the octagonal room (c 1300) exhibits a departure in that it dispenses with the central column and is covered with a vaulted wooden roof

Chapultepec (chapōōl'tāpēk') [Aztec, = grasshopper hill], rocky hill S of Mexico City It was originally developed as a playground for Aztec emperors A castle built there in the late 18th cent as a summer home for the Spanish viceroys later became the traditional home of the rulers of Mexico Chapultepec, heavily fortified, was the scene of spectacular fighting during the MEXICAN WAR, US Gen Winfield SCOTT ordered the storming of Chapultepec on Sept 12, 1847, and it fell the next day Nevertheless, its heroic defenders, particularly the "boy heroes" from the adjoining military college who preferred death to surrender, became for Mexicans a symbol of glory Both Emperor Maximilian and, later, Porfirio Diaz, beautified the grounds and embellished the castle In 1937, Mexican President Lázaro Cardenas declared the castle a museum of colonial history and ethnography The Inter-American Conference on the Problems of War and Peace, which met in 1945, is commonly called the Chapultepec Conference (see PAN-AMERICANISM)

Chapultepec, Act of: see PAN-AMERICANISM

char: see SALMON

characin (kār'āsīn), common name for members of the Characidae, a large and diverse family comprising 700 species of freshwater fishes The characins are related to the carp and the catfish They are found in Africa and in tropical America, especially in the Amazon Most species are active and predacious Most notorious are the piranhas, or caribes (*Serrasalmus* species), with their powerful jaws and razor-sharp triangular teeth, capable of killing humans and cattle Various small, colorful characin species, called tetras, are used in aquariums A small characin found in Mexican streams is interesting for the stages of blindness it exhibits those which live

far back in caves are eyeless, those found near the entrance have imperfect eyes, and the specimens living in open water have normal eyes A cross of a blind with a normal specimen produces offspring with varying degrees of eye degeneracy Characins are classified in the phylum CHORDATA, class Osteichthyes, order Cypriniformes

charade (shārad'), verbal, written, or acted representation of a word, its syllables, or a number of words The object is to guess the idea being conveyed Winthrop M PRAED wrote many of the well-known charades, and a good description of the acted charade is found in Thackeray's *Vanity Fair* In the United States a charade acted in pantomime and having a set time limit had considerable popularity in the 1930s and 40s and is still a popular form of home amusement

Charashim (kāf'ashīm) (Heb, =craftsmen, cf Neh 11 35), unidentified valley, Palestine, probably near Lydda 1 Chron 4 14

Charbray cattle (shar'brā') see BRAHMAN CATTLE

Charcas (char'kas), Spanish colonial AUDIENCIA and presidency in South America, known also as Upper Peru and Chuquisaca Charcas roughly corresponded to modern Bolivia but included parts of present Argentina, Chile, Peru, and Paraguay, encompassing a territorial expanse that led to disputes and wars after independence had been won It was established in 1559 and was attached to the viceroyalty of Peru until joined (1776) to the newly created viceroyalty of La Plata The prosecutor of Charcas, Jose de Antequera y Castro, led (1721) the first major creole uprising against viceregal authority The city of SUCRE was sometimes called Charcas

charcoal, substance obtained by partial burning or destructive distillation of organic material It is largely pure CARBON The most common variety, wood charcoal, was formerly prepared by piling wood into stacks, covering it with earth or turf, and setting it on fire In this process volatile compounds in the wood (e.g., water) pass off as vapors into the air, some of the carbon is consumed as fuel, and the rest of the carbon is converted into charcoal In the modern method, wood is raised to a high temperature in an iron retort, and industrially important by-products, e.g., methanol (wood alcohol), acetone, and acetic acid, are saved by condensing them to their liquid form Charcoal, being almost pure carbon, yields a larger amount of heat in proportion to its volume than is obtained from a corresponding quantity of wood, as a fuel it has the further advantage of being smokeless Charcoal is also obtained from substances other than wood, that obtained from bones is called bone black, animal black, or animal charcoal Because of its porous structure, finely divided charcoal is a highly efficient agent for filtering the adsorption of gases and of solids from solution It is used in sugar refining, in water purification, in the purification of factory air, and in gas masks By special heating or chemical processes the adsorptive property can be greatly increased, charcoal so treated is known as activated charcoal

Charcot, Jean Baptiste (zhāN batēst' sharkō'), 1867-1936, French neurologist and explorer in the antarctic region, son of Jean Martin Charcot He became (1896) director of clinics at the Univ of Paris but soon gave up medicine for exploration In two voyages (1903-7, 1908-10) he surveyed the coast of Antarctica from Palmer Peninsula to Charcot Land, obtaining valuable scientific data After 1920, Charcot made seven scientific voyages to Greenland aboard his ship, the *Pourquoi Pas?* In 1935 he came out of retirement for a final expedition to Greenland Crashing into a reef, Charcot went down with his celebrated ship off the coast of Iceland His antarctic voyages were recorded in his *Le Pourquoi Pas? dans l'Antarctique* (1910, tr *The Voyage of the Why Not? in the Antarctic*, 1911)

Charcot, Jean Martin (zhāN martāN' sharkō'), 1825-93, French neurologist He developed at the Salpêtrière in Paris the greatest clinic of his time for diseases of the nervous system He made many important observations on these diseases, described the characteristics of tabes dorsalis, differentiated multiple sclerosis and paralysis agitans, and wrote on many neurological subjects Charcot's insight into the nature of hysteria is credited by Sigmund Freud, his pupil, as having contributed to the early psychoanalytic formulations on the subject See biography by Georges Guillain (1959), study by A R Owen (1971)

chard: see ARTICHOKE, BEET

Chardin, Jean-Baptiste-Siméon (zhāN-bātēst'-sēmāōN' shārdāN'), 1699-1779, French painter He was a major figure of 18th-century painting While

the Académie royale still advocated history painting as the noblest form of art, Chardin painted simple still lifes and domestic interiors His ability to evoke textures was extraordinary, as were his muted tones, delicate touch, and unusually abstract compositional skill His particular ability to render still-life forms naturalistically and simple genre scenes without sentimentality ensured his reputation A number of modern schools of painting are indebted to the abstract nature of Chardin's compositions The Louvre has many of his oils and pastel portraits, including *Benediction* and *Return from Market* *Blowing Bubbles* and a portrait of Mme Chardin are at the Metropolitan Museum Other paintings are in the National Gallery of Art, Washington, D C, and in the Museum of Fine Arts, Boston See studies by H E A Furst (1907) and G Wildenstein (1963, repr 1969)

Chardzhou (chārjō'ōō), city (1970 pop 96,000), capital of Chardzhou oblast, SW Central Asian USSR, in the Turkmen Republic, on the Amu Darya River An inland port, it has shipyards and is a cotton and silk manufacturing center Its superphosphate plant produces fertilizer for much of Central Asian USSR Chardzhou was founded in the late 19th cent as a fortress

Charente (sharaNt'), department (1968 pop 331,016), W France The capital is Angoulême The brandy distilled at COGNAC is world renowned

Charente, river, 220 mi (354 km) long, rising near Limoges, W France, and flowing W to the Bay of Biscay The river flows past Angoulême (the head of navigation), Cognac, Saintes, and Rochefort, and through an important cattle-raising region Along its western course are the celebrated vineyards from which cognac brandy is made The Charente carries little commercial traffic

Charente-Maritime (sharaNt'-marētēm'), department (1968 pop 483,622), W France, on the Atlantic coast, formerly Charente-Inférieure La Rochelle is the capital

Chares (kār'ēz, kā'-), fl 3d cent B C, Greek worker in bronze from Lindus, Rhodes, pupil of Lysippos He was the sculptor of the COLOSSUS of Rhodes and is said to have founded the Rhodian school of sculpture No known works have survived

charge, property of matter that gives rise to all electrical phenomena (see ELECTRICITY) The basic unit of charge, usually denoted by *e*, is that on the PROTON or the ELECTRON, that on the proton is designated as positive (+ *e*) and that on the electron is designated as negative (- *e*) All other charged ELEMENTARY PARTICLES have charges equal to + *e*, - *e*, or some whole number times one of these, with the possible exception of the quark, a hypothetical particle whose charge could be $\frac{1}{3}e$ or $\frac{2}{3}e$ Every charged particle is surrounded by an electric FIELD OF FORCE such that it attracts any charge of opposite sign brought near it and repels any charge of like sign, the magnitude of this force being described by COULOMB'S LAW (see ELECTROSTATICS) This force is much stronger than the gravitational force between two particles and is responsible for holding protons and electrons together in atoms and for chemical bonding When equal numbers of protons and electrons are present, the atom is electrically neutral, and more generally, any physical system containing equal numbers of positive and negative charges is neutral Charge is a conserved quantity, the net electric charge in a closed physical system is constant (see CONSERVATION LAWS) Whenever charge is created, as in the decay of a neutron into a proton, an electron, and an antineutrino, equal numbers of positive and negative charges must be created Although charge is conserved, it can be transferred from one body to another Electric current, on which much of modern technology is dependent, is a flow of charge through a conductor (see CONDUCTION) Although current is usually treated as a continuous quantity, it actually consists of the transfer of millions of individual charges from atom to atom, typically by the transfer of electrons A precise description of the behavior of electric charge in crystals and in systems of atomic and molecular dimensions requires the use of the QUANTUM THEORY

charge d'affaires: see DIPLOMATIC SERVICE

Chari or Shari (both shār'rē), longest river of interior drainage in Africa, c 650 mi (1,050 km) long, rising in the uplands of the Central African Republic, N central Africa It flows NW across 5 Chad, past Sarh (Fort Archambault), Bousso, and Ndjamena (Fort-Lamy), and enters Lake Chad through a wide delta The Logone River is its chief tributary During the summer rainy season, the river floods much of the surrounding area

Charikar (chā'rikār), city (1969 est. pop. 90,000), NE Afghanistan. It is noted for its pottery and high-quality grapes. During the 1960s Afghanistan's largest textile factory was built nearby, bringing a great increase in Charikar's population.

chariot, earliest and simplest type of carriage and the chief vehicle of many ancient peoples. The chariot was known among the Babylonians before the introduction of horses c. 2000 B.C. and was first drawn by asses. The chariot and horse introduced into Egypt c. 1700 B.C. by the Hyksos invaders undoubtedly contributed to their military success. Simultaneously the use of the chariot spread over the Middle East, chiefly as a war machine. The Assyrians are credited with introducing chariots with scythes mounted on the wheels as weapons, a type later adopted by the Persians. In Greece and Rome the chariot was never used to any extent in war, possibly because of generally unfavorable topography. It was, however, prominent in games and processions, becoming in Rome the inevitable carriage of the triumphal procession. Here also the chariot races of the circus were developed. The ancient chariot was a very light vehicle, drawn by two or more horses hitched side by side. The car was little else than a floor with a waist-high semicircular guard in front. British chariots were open in front, had a curved wall behind, often had seats, and sometimes had scythes on the wheels.

Charites: see **GRACES**

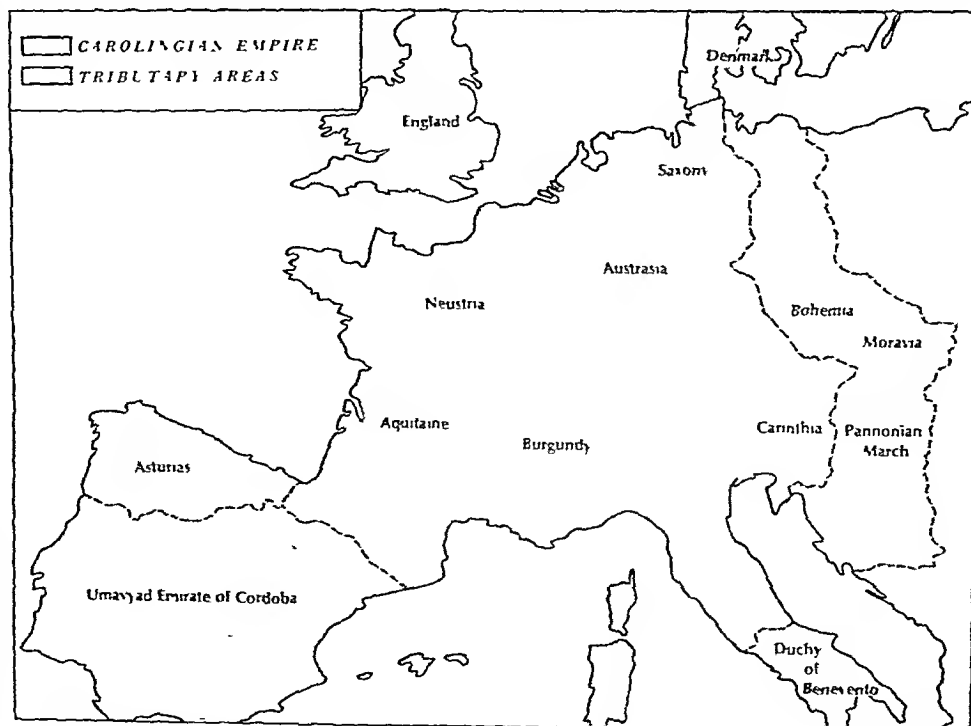
Charlemagne (Charles the Great or Charles I) (shār'-lamān) [O Fr. = Charles the great], 742–814, emperor of the West (800–814), Carolingian king of the Franks (768–814). Elder son of PEPIN THE SHORT and a grandson of CHARLES MARTEL, he shared with his brother CARLOMAN in the succession to his father's kingdom. At Carloman's death (771), young Charles annexed his brother's lands, disinheriting Carloman's two young sons, who fled with their mother to the court of DESIDERIUS, king of the Lombards. When Desiderius conquered part of the papal lands and attempted to force Pope ADRIAN I to recognize Carloman's sons, Charles intervened (773) on the side of the pope and defeated the Lombards. At Rome, Charles was received by Adrian as patrician of the Romans (a title he had received with his father in 754), and he confirmed his father's donation to the Holy See. Shortly afterward he took Pavia, the Lombard capital, and assumed the iron crown of the Lombard kings of Italy. In 778 he invaded Spain, hoping to take advantage of civil war among the Muslim rulers of that kingdom, but was repulsed at Saragossa. In later campaigns conducted by local counts, Barcelona was captured (801) and a frontier established beyond the Pyrenees. Charles's struggle with the pagan Saxons, whose greatest leader was WIDUKIND, lasted from 772 until 804. By dint of forced conversions, wholesale massacres, and the transportation of thousands of Saxons to the interior of the Frankish kingdom, Charles made his domination over Saxony complete. In 788 he annexed the semi-independent duchy of Bavaria, after deposing its duke, Tassilo. He also warred successfully against the Avars and the Slavs, establishing a frontier south of the Danube. Meanwhile the new pope, LEO III, was threatened with deposition by the Romans and in 799 appealed to Charles. Charles hastened to Rome to support Leo, and on Christmas Day, 800, was crowned emperor by the pope. His coronation legitimized Charles's rule over the former Roman empire in W. Europe and finalized the split between the Byzantine and Roman empires. After years of negotiation and war, Charles received recognition from the Byzantine emperor Michael I in 812, in return Charles renounced his claims to Istria, Venice, and Dalmatia, which he had held briefly. The end of Charles's reign was troubled by the raids of Norse and Danish pirates (see **NORSEMEN**), and Charles took vigorous measures for the construction of a fleet, which his successors neglected. His land frontiers he had already protected by the creation of marches. In his government he continued and systematized the administrative machinery of his predecessors. He permitted conquered peoples to retain their own laws, which he codified when possible, and he issued many **CAPITULARIES** (gathered in the **MONUMENTA GERMANIAE HISTORICA**). A noteworthy achievement was the creation of a system by which he might personally supervise his administrators in even the most distant lands, his *missi dominici* were personal representatives with wide powers who regularly inspected their assigned districts. He maintained contact with the lesser magnates through annual consultative assemblies. He tried to

help the poorer freemen by reducing their military obligations and by removing their obligation to attend county assemblies. He strove to educate the clergy and exercised more direct control over the appointment of bishops. Like the Byzantine emperors, he acted as arbiter in theological disputes by summoning councils, notably that at Frankfurt (794), where **ADOPTIOINISM** was rejected and the decrees of the Second Council of Nicaea (see **NICAEA SECOND COUNCIL OF**) were condemned. He stimulated foreign trade and entertained friendly relations with England and with HAPUN AR-RASHID. In 813, Charlemagne designated his son LOUIS I as co-emperor and his successor and crowned him at AACHEN. Charlemagne's court at Aachen was the center of an intellectual renaissance. The palace school, under the leadership of ALCUIN, became particularly famous; numerous schools for children of all classes were also established throughout the empire during Charles's reign. The preservation of classical literature was due almost entirely to his initiative. Prominent figures of the Carolingian renaissance, other than Alcuin, included PAUL THE DEACON and EINHARD. Charlemagne himself, although scarcely to be considered educated by later standards, showed great taste for learning and strove for purity in his Latin. In his daily life he affected the simple manners of his Frankish forebears, wore Frankish clothes, and led a frugal existence, except for his habit of keeping several wives and concubines. He was beatified after his death and in some churches has been honored as a saint. His physical appearance probably differed vastly from the bearded and patriarchal figure of the legend. Indeed, Charlemagne's actual achievements and prestige were of such magnitude that later generations enlarged them to fantastic proportions. Surrounded by his legendary 12 peers, he became the central figure of a cycle of romance. At first, legend pictured him as the champion of Christendom, later he appeared as a vacillating old man, almost a comic figure. His characterization in the *Chanson de Roland* (see **ROLAND**) has impressed itself indelibly on the imagination of the Western world. The vogue of the Charlemagne epic ebbed somewhat after the Renaissance but was revived again in the 19th cent. by Victor Hugo and other members of the Romantic school. Charlemagne's creation (or re-creation) of an empire was the basis of the theory of the HOLY ROMAN EMPIRE; it was his example that Napoleon I had in mind when he tried to assume his succession in 1804. Einhard wrote a contemporary biography of Charlemagne. See Heinrich Fichtenau, *The Carolingian Empire* (1949, tr. 1957), Donald Bullough, *The Age of Charlemagne* (1966), Jacques Boussard, *The Civilization of Charlemagne* (tr. 1968). For the literary aspect, see Thomas Bulfinch, *Legends of Charlemagne* (1863), and J. L. Weston, *The Romance Cycle of Charlemagne and His Peers* (1901).

Charleroi (shār'lər-wā'), town (1970 pop. 23,689), Hainaut prov., S Belgium, on the Sambre River and on the Charleroi-Brussels Canal. It is a commercial and industrial center and a rail junction. Manufactures include steel, glass, machinery, processed food, and chemicals. Coal and iron are mined in the region. Charleroi was founded in 1666 and named for Charles II of Spain. It was of strategic importance in the wars of the 17th and 18th cent. The Germans won a battle there (1914) in World War I. It is noted for its modern public buildings, such as the town hall (1936), and is the seat of a technical university. **Charles I**, emperor of the West and Frankish king; see **CHARLEMAGNE**.

Charles II or Charles the Bald, 823–77, emperor of the West (875–77) and king of the West Franks (843–77), son of Emperor LOUIS I by a second marriage. The efforts of Louis to create a kingdom for Charles were responsible for the repeated revolts of Louis's elder sons that disturbed the latter part of Louis's reign. When LOTHAR I, the eldest and heir to the imperial title, attempted to reunite the empire after Louis's death (840), Charles and LOUIS THE GERMAN marched against their brother and defeated him at Fontenoy (841). Reaffirming their alliance in 842 (see **STRASBOURG OATH OF**), they signed (843) with Lothair the Treaty of Verdun (see **VERDUN TREATY OF**), which divided the empire into three parts. The part roughly corresponding to modern France fell to Charles. He was almost continuously at war with his brothers and their sons, with the Norsemen (or Normans, as they came to be known in France), and with rebellious subjects. When Charles's nephew LOTHAR, son of Lothair I and king of Lotharingia, died in 869, Charles seized his kingdom but was forced by the Treaty of MERSEN (870) to divide it with Louis the German. In 875, at the death of his nephew Louis II, who had succeeded Lothair I as emperor, Charles secured the imperial crown. His reign witnessed the growth of the power of the nobles at the expense of the royal power and thus marked the rise of local feudalism. Charles's chief adviser was Archbishop HINCMAR.

Charles III or Charles the Fat, 839–88, emperor of the West (881–87), king of the East Franks (882–87), and king of the West Franks (884–87), son of LOUIS THE GERMAN, at whose death he inherited Swabia (876). He succeeded to the East Frankish or German kingship after the deaths of his brothers Carloman (880) and Louis the Younger (882), with whom he had shared the kingdom of Louis the German. He had also gained Italy from Carloman and was crowned emperor by Pope John VIII in 881. After the death of the heirs of CHARLES II in France, he became (884) West Frankish king, thus reuniting briefly the empire of Charlemagne. A weak ruler, he was unable to protect his lands from invasion and in 886,



Carolingian Empire (814)

when he went to relieve Paris, which was besieged by the NORSEMEN, he ransomed the city instead of fighting and allowed the invaders to ravage Burgundy. He was deposed in 887 and was succeeded in Germany by ARNULF and briefly in France by EUDÉS.

Charles IV, 1316–78, Holy Roman emperor (1355–78), German king (1347–78), and king of Bohemia (1346–78). The son of JOHN OF LUXEMBOURG, Charles was educated at the French court and fought the English at CRÉCY, where his father's heroic death made him king of Bohemia. Pope CLEMENT VI, to whom he had promised far-reaching concessions, helped secure his election (1346) by the imperial electors as antiking to Holy Roman Emperor LOUIS IV. Louis's death (1347), the popular desire for peace, which was fostered by the ravages of the Black Death (bubonic plague), and the absence of a strong leader to unite the opposition enabled Charles to make good his claim to the crown by 1349. In 1355 he journeyed to Rome, where, on Easter Sunday, he was crowned emperor by the papal legate (the pope was then residing at Avignon). His coronation with papal approval ended years of conflict between popes and emperors, during which time the imperial rulers had tried to regain control of Italy and the papacy. Although the emperors continued to be crowned at Rome, they were excluded from Italian affairs. At the same time, Charles's Golden bull of 1356 ended papal interference in the Holy Roman Empire by eliminating the need for papal approval and confirmation of emperors. Although he had virtually renounced imperial pretensions in Italy through his treaty with Clement VI, Charles supported the plans of Urban V to return the papacy from Avignon to Rome. Charles's major concern was to strengthen his dynasty. Through skillful diplomacy he acquired Brandenburg (1373) and added to his territories in Silesia and Lusatia. He ensured the succession of his son WENCESLAUS by bribing the electors to name him German king (1376). To raise the money for the bribes, he imposed even higher taxes on the cities. This led to a revolt by a league of Swabian cities. Charles obtained peace (1378) by granting concessions. During Charles's reign Bohemia flourished. His imperial capital was at Prague, where he founded (1348) CHARLES UNIVERSITY (the oldest in Central Europe) and rebuilt the Cathedral of St. Vitus. By introducing new agricultural methods and by expanding industries, he fostered economic life. He drew up a code of laws, the *Majestas Carolina* (1350)—which, however, was rejected by the diet—and he protected the lower classes by giving them courts in which to sue their overlords. Through Charles's efforts as margrave of Moravia, Prague was elevated (1344) to an archbishopric, thus gaining ecclesiastic independence. By the Golden Bull, which strengthened the electors at the expense of the emperor, he confirmed Bohemia's internal autonomy. As Holy Roman emperor, his reputation rests mainly on the Golden Bull, which, although it confirmed the weakness of the imperial power, provided a stable constitutional foundation for its exercise. See biographies by G. G. Walsh (1924) and Bede Jarett (with a translation of Charles's autobiography, 1935).

Charles V, 1500–1558, Holy Roman emperor (1519–58) and, as Charles I, king of Spain (1516–56), son of PHILIP I and JOANNA of Castile, grandson of Ferdinand II of Aragon, Isabella of Castile, Holy Roman Emperor Maximilian I, and Mary of Burgundy. He inherited a vast empire. The Netherlands, Luxembourg, Artois, and Franche-Comté (or Free County of Burgundy) came to him on the death (1506) of his father Aragon, Navarre, Granada, Naples, Sicily, Sardinia, Spanish America, and joint kingship with his mother (who was insane) over Castile devolved upon him at the death (1516) of Ferdinand II. On the death (1519) of Maximilian I he inherited the Hapsburg lands in Austria. Born at Ghent, Charles was brought up in Flanders by his aunt, MARGARET OF AUSTRIA, who was regent for him in the Netherlands. She and his tutor, Adrian of Utrecht (later Pope ADRIAN VI), were the chief influences in his youth. Arriving in Spain in 1517, Charles was distrusted as a foreigner. His initial actions only heightened the resentment against him. He brusquely dismissed Cardinal Jimenez de Cisneros, who was regent of Castile after Ferdinand's death, appointed Flemish favorites to high office, and increased taxation to finance his imperial ambitions. After bribing the ELECTORS, he was chosen Holy Roman emperor in succession to his grandfather Maximilian I, and in 1520 he departed for Germany. Charles sought to become leader of a universal empire. His imperial

dreams were encouraged by M. A. di GATTINARA, whose influence replaced that of Charles's Flemish advisers.

Struggle for Empire. The chief problems Charles faced were the Protestant REFORMATION in Germany, the dynastic conflict with King FRANCIS I of France, particularly for supremacy in Italy, and the advance of the Ottoman Turks. Shortly after his election Charles began his lifelong struggle with France (see ITALIAN WARS), which required immense expenditures. In 1520 he signed the Treaty of Gravelines with King HENRY VIII of England, and in 1521 he invaded N Italy, then controlled by France. The fiscal onus for the war rested on Spain and provoked violent reaction, particularly in Castile, which resented Charles's high-handedness in obtaining funds from the Castilian Cortes. Toledo, Segovia, and other Castilian cities revolted in the brief war (1520–21) of the *comuneros*. Initially aimed at limiting the royal power, the uprising was later marked by violent class warfare. It was put down at the battle of Villalar, Juan de PADILLA and other leaders were executed. Charles later won the loyalty of his Spanish subjects. In Germany, at the fateful Diet of Worms (see WORMS, DIET OF) in 1521, Charles secured a satisfactory compromise regarding the REICHSREGIMENT but unyieldingly opposed the doctrines of Martin Luther. In his written opinion, Charles declared himself ready to stake his dominions, friends, blood, life, and soul on the extinction of heresy. Late in May, 1521, he signed the Edict of Worms, outlawing Luther and his followers. However, Charles's preoccupation with the war with France prevented him from checking the spread of Luther's doctrines. Also, Charles was not always supported by the popes, who were concerned with the threat to their temporal power and independence posed by imperial domination of Italy. After the French defeat at Pavia (1525) and the capture of Francis I, Charles seemed triumphant in Italy. Francis signed (1526) the humiliating Treaty of Madrid, by which he renounced his Italian claims and ceded Burgundy to Charles. On his release, however, Francis repudiated the treaty and organized the anti-imperial League of Cognac. The pope, Venice, Milan, and Florence joined the league. Charles sent an imperial army to Italy composed mostly of German Lutherans. Led first by Georg von FRUNDSBERG and then by Charles de BOURBON, the army defeated the league and then marched on Rome, where the force sacked (1527) the city and besieged Pope CLEMENT VII. Although the "German Fury" was disavowed by Charles, he profited from the outrage, extorting large sums of money from the pope. The Treaty of Cambrai (see CAMBRAI, TREATY OF) with France and the Peace of Barcelona with the pope (both 1529) confirmed Charles's position in Italy and secured his coronation as Holy Roman emperor at Bologna (1530). Charles was the last German emperor to be crowned by the pope. His brother Ferdinand, king of Bohemia and Hungary (later Holy Roman Emperor FERDINAND II), was elected king of the Romans, or German king, in 1531. Charles, who had awarded Ferdinand the Austrian duchies in 1521, delegated increasing authority to him in Germany, which was then torn by religious and social struggles. The rebellion (1522–23) of Franz von SICKINGEN was followed by the more serious PEASANTS' WAR (1524–26), and the Swabian League in 1531 made way for the Lutheran SCHMALKALDIC LEAGUE. The Reformation progressed, and the breach between Catholics and Protestants widened. Before dealing with the religious problem, Charles had to make peace abroad. Ottoman assaults in Austria and Hungary and along the Mediterranean coast posed a serious threat to the Hapsburg lands. In 1535, Charles launched a successful expedition against Tunis. In E Europe, Ferdinand attempted to hold back the Ottomans. In 1536, war broke out with Francis I over the succession to Milan. Intent on recouping in Italy, Francis allied himself with the Ottoman sultan, SULAYMAN I. Although a truce ended the fighting with Francis in 1538, the Ottomans continued their assaults on the Italian coast. A second expedition by Charles, this time to Algiers, was unsuccessful (1541). In 1542, Francis, again allied with Sulayman, renewed warfare. Charles joined (1543) with Henry VIII and in 1544 forced Francis to make peace at CRÉPY. A subsequent truce with the Ottomans, however humiliating, gave Charles and Ferdinand some respite. At last the way opened for the Catholic Reformation, ardently desired by Charles and forwarded by St. Ignatius of Loyola, when the Council of Trent (see TRENT, COUNCIL OF) convened in 1545. Turning on the Protestant princes of Germany, Charles split their ranks by winning over MAURICE of Saxony and others, attacked

the Schmalkaldic League in 1546, defeated (1547) JOHN FREDERICK of Saxony at Muhlberg, and imprisoned PHILIP OF HESSE. At the Diet of Augsburg (1547) he secured the incorporation of the Netherlands into the Hapsburg hereditary possessions and forced through the Augsburg Interim (1548), a compromise profession of doctrine that he then tried to impose on the Protestants with the help of Spanish troops. In 1552, Maurice of Saxony changed sides again, called in Henry II of France, Francis's successor, and even attempted to capture Charles at Innsbruck.

Withdrawal from Power. Balked in his efforts to recapture Metz, which had been seized by Henry II, and realizing the necessity of compromising with Protestantism, Charles preferred to empower Ferdinand to treat, and he left Germany, never to return. Ferdinand negotiated the religious Peace of Augsburg (see AUGSBURG PEACE OF), but war with France continued. It ended after Charles's death, with the Treaty of CATEAU-CAMBRESIS (1559), a triumph for Spain. In his remaining years Charles made a series of abdications that left the Hapsburg dominions divided between Austria and Spain. In 1554 he gave Naples and Milan to his son Philip, whom he married to Queen Mary I of England, in 1555 he turned over the Netherlands to Philip, and in 1556 he made him king of Spain and Sicily as Philip II. In 1556 also, he practically surrendered the empire to Ferdinand, and in 1558 he formally abdicated as emperor. Although he retired (1556) to the monastery of Yuste, he took an active interest in politics until his death. Two of his illegitimate children were Don JOHN OF AUSTRIA and MARGARET OF PARMA. During Charles's rule the Spanish Empire was tremendously expanded in the New World. In Italy, Spanish power had become paramount. Even England seemed about to fall to Spain through Philip's marriage, and Charles's own marriage with Isabella of Portugal brought the Portuguese crown to Philip in 1580. Yet Charles failed in his purpose to return the Protestants to the Roman Catholic Church, and the human and financial cost of constant warfare drained Spanish resources; moreover, Charles's hopes for a universal empire were thwarted by the political realities of Western Europe. His integrity, strength of will, and sense of duty were conspicuous. His appearance has been made familiar by two portraits by TITIAN. The classic works on Charles V are the biography by Karl Brandt (1937, tr. 1939, repr. 1968) and R. B. Merriman, *The Rise of the Spanish Empire in the Old World and the New*, Vol. III (1926, repr. 1972), see also biographies by Gertrude von Schwarzenfeld (tr. 1957) and Otto von Hapsburg (tr. 1970).

Charles VI, 1685–1740, Holy Roman emperor (1711–40), king of Bohemia (1711–40) and, as Charles III, king of Hungary (1712–40), brother and successor of Holy Roman Emperor Joseph I. Charles was the last Holy Roman emperor of the direct Hapsburg line. In 1700 he was designated successor in Spain to King Charles II, who was childless. On his deathbed, however, Charles II left his throne to Philip of Anjou (PHILIP V), grandson of King LOUIS XIV of France. Philip was proclaimed king in Nov., 1700. War broke out immediately against Louis XIV and Philip (see SPANISH SUCCESSION, WAR OF THE). Although Charles, with the aid of British troops, invaded Spain and proclaimed himself king as Charles III in 1704, he was able to maintain himself only in Catalonia, with his capital at Barcelona. When Charles's brother Joseph I died (1711), Charles succeeded him as Holy Roman emperor. His accession led to England's withdrawal from the war since the English did not wish to see the reunification of the empire of CHARLES V. A treaty (see UTRECHT, PEACE OF, 1713) was signed between France and Charles's former allies, Holland and England. Charles continued fighting. He finally concluded peace in 1714. By the terms of the peace Philip V remained king of Spain and Charles received most of the Spanish possessions in the Low Countries and in Italy. Philip's subsequent attempt to overthrow the settlement in Italy resulted (1718) in the formation of the QUADRUPE ALLIANCE against him. The war was ended by the Treaty of The Hague (1720), which repeated the terms of 1713–14, except that Charles obtained Sicily from Savoy in exchange for Sardinia. In E Europe, Charles continued to defend his lands against Turkish invasions (1716–18). In a campaign against the Turks the imperial commander EUGENE OF SAVOY obtained for Hungary the Banat and N Serbia. Charles was later forced to return these lands to the Ottoman Empire (Turkey) after several defeats in the Turkish war of 1736–39. Near the end of his reign in the War of the

POLISH SUCCESSION (1733–35) Charles was again involved in a conflict with France and Spain. By the Treaty of Vienna (1738) he was forced to give up Sicily and Naples to Spain, but received Parma and Piacenza. Since Charles had no male heirs, one of his chief concerns was to secure the succession to the Hapsburg lands for his daughter, MARIA THERESA. His last years were spent in an effort to win European approval of the PRAGMATIC SANCTION of 1713, which made Maria Theresa his heir. Although the Pragmatic Sanction was guaranteed by the Treaty of Vienna, the succession was contested on his death (see AUSTRIAN SUCCESSION, WAR OF THE). Charles was a patron of learning and the arts, particularly of music. A mercantilist, he encouraged commerce and industry.

Charles VII, 1697–1745, Holy Roman emperor (1742–45) and, as Charles Albert, elector of Bavaria (1726–45). Having married a daughter of Holy Roman Emperor Joseph I, he refused to recognize the PRAGMATIC SANCTION of 1713 by which Holy Roman Emperor Charles VI (his wife's uncle) reserved the succession to the Hapsburg lands for his daughter, MARIA THERESA. On Charles VI's death (1740) he advanced his own claim and joined with Frederick II (of Prussia), France, Spain, and Saxony to attack Maria Theresa (see AUSTRIAN SUCCESSION, WAR OF THE). In 1742 he was elected Holy Roman emperor, but Bavaria was overrun by Austrian troops. Shortly before his death he regained his territories. Francis I, husband of Maria Theresa, was elected emperor to succeed him.

Charles I, 1887–1922, last emperor of Austria and, as Charles IV, king of Hungary (1916–18), son of Archduke Otto and grandnephew and successor of Emperor Francis Joseph. He married ZITA of Bourbon-Parma. The death (1914) of his uncle, FRANCIS FERDINAND, made Charles heir to the throne. He showed skill as a commander in World War I. After his accession he put out peace feelers. His correspondence with his brother-in-law, Prince SIXTUS OF BOURBON-PARMA, justified French claims to Alsace-Lorraine. The Allies published (April, 1918) the correspondence, thus causing friction between Austria and Germany and diminishing Charles's popularity. Charles vainly tried to save the Austro-Hungarian monarchy by proclaiming (Oct. 16, 1918) an Austro-Italian federative state. Hungary and Czechoslovakia declared their independence, and on Nov. 3, Charles had to consent to unconditional surrender in the armistice concluded with General Armando Diaz. Charles abdicated as emperor of Austria on Nov. 11 and as king of Hungary on Nov. 13, early in 1919 he and his family went into exile in Switzerland. After the triumph of the monarchists in Hungary in 1920, he attempted unsuccessfully to regain the Hungarian throne in March, 1921, and again in October, when the regent, HORTHY, had him arrested. Charles was exiled to Madeira and there died of pneumonia. His son, Archduke Otto, inherited his claim to the throne. See biographies by Herbert Vivian (1932) and Gordon Shepherd (1968).

Charles I, 1600–1649, king of England, Scotland, and Ireland (1625–49), second son of James I and Anne of Denmark. He became heir to the throne on the death of his older brother Henry in 1612 and was made prince of Wales in 1616. The negotiations for his marriage to the Spanish infanta were unpopular in England, and Charles himself turned against Spain after his unhappy visit to Madrid (1623) in the company of George Villiers, 1st duke of BUCKINGHAM. Apart from these negotiations, he took little part in politics before he succeeded (Feb., 1625) his father as king. A shy and dignified figure, he was popular at that time, but he immediately offended his Protestant subjects by his marriage to the Catholic HENRIETTA MARIA, sister of Louis XIII of France. Charles's favorite, Buckingham, was unpopular, and the foreign ventures under Buckingham's guidance were unfortunate, particularly the unsuccessful expedition to Cadiz (1625) and the two disastrous attempts to relieve French Protestants in La Rochelle (1627 and 1628). Nor would Parliament willingly grant money to help Charles's sister, Elizabeth of Bohemia, and the Protestants in the Thirty Years War. The reign quickly resolved itself into the bitter struggle for supremacy between the king and Parliament that finally resulted in the ENGLISH CIVIL WAR.

The Struggle with Parliament Parliament had the whip hand in its control of money grants to the king and adopted the tactic of withholding grants until its grievances were redressed. The Parliament of 1625 refused money, demanded ministers it could trust, and was soon dissolved by Charles. That of 1626 was dissolved when it started impeachment

proceedings against Buckingham. Charles, to meet his needs for money, resorted to quartering troops upon the people and to a forced loan, which he attempted to collect by prosecutions and imprisonments. Forced to call Parliament again in 1628, he was compelled to agree to the PETITION OF RIGHT, in return for a badly needed subsidy. Charles prorogued Parliament when it declared that his continued collection of customs duties was a violation of the Petition. Although Buckingham was assassinated (1628), the parliamentary session of 1629 was bitter. It closed dramatically with a resolution condemning unauthorized taxation and attempts to change existing church practices. Charles then governed without Parliament for 11 years, which were marked by popular opposition to strict enforcement of the practices of the Established Church by Archbishop William LAUD and to the ingenious devices employed by the government to obtain funds. The royally controlled courts of high commission and Star Chamber waged a harsh campaign against nonconformists and recusants, and large emigrations to America, of both Puritans and Catholics, took place. The trial (1637–38) of John HAMPDEN for refusal to pay a tax of ship money, greatly increased public indignation. Meanwhile Charles's deputy in Ireland, Thomas Wentworth, earl of STRAFFORD, was carrying out a wide program of reforms through his oppressive policy of "Thorough."

The Supremacy of Parliament Conditions in England reached a crisis when Charles attempted (1637) to force episcopacy upon the Scots, an attempt that was violently opposed by the Scottish COVENANTERS and that resulted in the BISHOPS WARS. Unable to wage war effectively, Charles summoned (1640) the so-called Short Parliament, which demanded redress of grievances before granting funds and was dissolved. Another attempt to carry on the war without Parliament failed, and the famous Long Parliament was summoned (1640). Under the leadership of John PYM, John Hampden, and Sir Henry VANE (the younger), Parliament secured itself against dissolution without its own consent and brought about the death of Strafford, the abolition of the courts of high commission and Star Chamber, and the end of unparliamentary taxation. Charles professed to accept the revolutionary legislation, though he was known to hold strong views on the divine right of monarchy. Parliament's trust in the king was further undermined when his queen was implicated in the army plot to coerce Parliament, and Charles was, quite unjustly, suspected of complicity in the Irish massacre (1641) of Protestants in Ulster. In 1641, Parliament presented its Grand Remonstrance, calling for religious and administrative reforms and reciting in full its grievances against the king. Charles repudiated the charges, and his unsuccessful attempt to seize five opposition leaders of Commons in violation of traditional privilege was the fatal blunder that precipitated civil war.

Civil War and Defeat There were no decisive victories in the war until Charles was defeated at Marston Moor (1644) and Naseby (1645). In 1646 he gave himself up to the Scottish army, which delivered him to Parliament. He was ultimately taken over by the English army leaders, who were now highly suspicious of Parliament. He escaped (Nov., 1647) to Cairnbrooke, on the Isle of Wight, where he concluded an alliance with the discontented Scots, which led to the second civil war (1648) and another royalist defeat. Parliament, now reduced in number by Pride's Purge (see under PRIDE, THOMAS) and controlled by Charles's most powerful enemies, established a special high court of justice (see REGICIDES), which tried Charles and convicted him of treason for levying war against Parliament. He was beheaded on Jan. 30, 1649. To the royalists he became the martyred king who wrote the Eikon Basilike. By his opponents he was considered a double-dealing tyrant. He was in some ways a stupid and obstinate man, unable to understand, much less control, the intense religious passions and rapid political development of his age. He listened to the foolish advice first of Buckingham and then of his wife but never gave his full trust to his ablest servants, Laud and Wentworth, and he indulged in dangerous halfway measures that undermined confidence in him. His downfall was as much due to the weakness of his character as to his sincere religious and political beliefs. See biographies by E. J. Simpson (1952) and Christopher Hibbert (1968), H. Ross Williamson, *Charles and Cromwell* (1946), Godfrey Davies, *The Early Stuarts, 1603–1660* (2d ed. 1959), Christopher Hill, *The Century of Revolution, 1603–1714* (1961), C. V. Wedgwood, *The Great Rebellion: The King's Peace, 1637–1641* (1955) and *A Coffin for King Charles* (1964).

Charles II, 1630–85, king of England, Scotland, and Ireland (1660–85), eldest surviving son of CHARLES I and Henrietta Maria. Prince of Wales at the time of the English civil war, Charles was sent (1645) to the W of England with his council, which included Edward Hyde (later 1st earl of CLARENDON) and Thomas Wriothsley, 4th earl of SOUTHAMPTON. In 1646, Charles was forced to escape to France, where he stayed with his mother and was tutored by the philosopher Thomas Hobbes. In 1649, Charles vainly attempted to save his father's life by presenting to Parliament a signed blank sheet of paper, thereby granting whatever terms might be requested. After his father's execution (1649), Charles was proclaimed king in Scotland and in parts of Ireland and England. He accepted the terms of the Scottish COVENANTERS and went (1650) to Scotland, where he was crowned (1651), after agreeing to enforce Presbyterianism in England as well as Scotland. In 1651 he marched into England but was defeated by Oliver Cromwell at the battle of Worcester. Charles then escaped to France, where he lived in relative poverty. The Anglo-French negotiations of 1654 forced Charles into Germany, but he moved to the Spanish Netherlands after he had concluded (1656) a treaty with Spain. In 1660 Gen. George MONCK engineered Charles's RESTORATION to the throne, and the king returned to England. Charles had promised a general amnesty in his conciliatory Declaration of Breda, and he and Clarendon, who became first minister, acted immediately to secure passage of the Act of Indemnity, pardoning all except the REGICIDES. Charles also favored religious toleration (largely because of his own leanings toward Roman Catholicism), but the strongly Anglican Cavalier Parliament, which first convened in 1661, passed the series of statutes known as the CLARENDON CODE, which was designed to strike at religious nonconformity. The king attempted unsuccessfully to suspend these statutes by the declaration of indulgence of 1662, which he was forced (1663) to withdraw. Charles's government endorsed the foreign policy of the Commonwealth with its NAVIGATION ACTS, which contributed to the outbreak (1664) of the second of the DUTCH WARS. While the war was being waged, London suffered the great plague of 1665 and the fire of 1666. Clarendon fell from power in 1667, the year the war ended, to be replaced by the CABAL ministry. Charles then took England into the Triple Alliance (1668) with Holland and Sweden, but he simultaneously sought the support of Louis XIV of France, with whom he negotiated the secret Treaty of Dover (1670). By this treaty, designed to free the king from dependence on Parliament, Charles was to adopt Roman Catholicism, convert his subjects, and wage war against the Dutch, for which Louis was to advance him a large subsidy and 6,000 men. In 1672 the third Dutch War began. Many suspected it to be a cloak for the introduction of arbitrary government and Roman Catholicism. Charles was forced to rescind (1672) his second declaration of indulgence toward dissenters, to approve (1673) the TEST ACT, and to sign (1674) a peace with the Dutch. Thomas Osborne, earl of DANBY, became chief minister on the disintegration of the Cabal and inaugurated a foreign policy friendly to Holland. Charles, unable to secure money from an increasingly hostile Parliament, signed a series of secret agreements with Louis XIV, by which he received large French subsidies in return for a pro-French policy, although he feigned sympathy with the anti-French movement at home. His alliance with Louis, however, was broken (1677) by the marriage of his niece Mary to his nephew (and Louis's archenemy) William of Orange (later William III). Anti-Catholic feeling in England exploded (1678) in the affair of the Popish Plot (see OATES, TITUS), in which Charles did not intervene until his wife, CATHERINE OF BRAGANZA, was accused. However, the affair was made use of by the 1st earl of SHAFTESBURY, who led a movement to exclude Charles's brother, the Catholic duke of York (later JAMES II), from succession to the throne, promoting instead the claim of Charles's illegitimate son the duke of MONMOUTH. In 1681 the king dissolved Parliament to block passage of Shaftesbury's Exclusion Act, and thenceforth Charles ruled as an absolute monarch, without a Parliament. His personal popularity increased after the exclusion crisis and particularly after the unsuccessful RYEHOUSE PLOT. He took steps to root out the supporters of exclusion (now known as the Whigs) from positions of power, coercing municipal governments into obedience by the threat that he would rescind the city charters. Charles died a Roman Catholic and was succeeded by his brother James. He had no legitimate offspring.

but many children by his various mistresses, who included Lucy WALTER, Barbara Villiers (duchess of CLEVELAND), Louise Keroualle (duchess of PORTSMOUTH), and Nell GWYN. Charles was a ruler of considerable political skill. His reign was marked by a gradual increase in the power of Parliament, which he learned to circumvent rather than manipulate. The period also saw the rise of the great political parties, WHIG and TORY, the advance of colonization and trade in India, America, and the East Indies, and the great progress of England as a sea power. The pleasure-loving character of the king set the tone of the brilliant Restoration period in art and literature. See contemporaneous accounts by Gilbert Burnet, John Evelyn, and Samuel Pepys, letters ed. by Arthur Bryant (rev. ed. 1955) and Hesketh Pearson (1960), G. N. Clark, *The Later Stuarts* (2d ed. 1956), David Ogg, *England in the Reign of Charles II* (2 vol., 2d ed. 1962), studies by D. T. Witcombe (1966), M. P. Ashley (1971), and Christopher Falkus (1972).

Charles I, Frankish king. See CHARLEMAGNE.

Charles II, French king. See CHARLES II, emperor of the West.

Charles III or **Charles the Fat**, French king. See CHARLES III, emperor of the West.

Charles III (Charles the Simple), 879-929, French king (893-923), son of King Louis II (Louis the Stammerer). As a child he was excluded from the succession at the death (884) of his half brother Carloman and at the deposition (887) of King CHARLES III (Charles the Fat), who succeeded Carloman. Instead, Eudes, count of Paris, succeeded Charles the Fat. In 893, however, Charles was crowned by a party of nobles and prelates and became sole king at the death of Eudes in 898. He put an end to Norse raids by the Treaty of Saint-Clair-sur-Epte (911), ceding to the Norse leader Rollo part of the territory later known as Normandy, and in 911 Charles acquired Lorraine. In 922 some of the barons revolted and crowned Robert I, brother of Eudes, king. In 923, at the battle of Soissons, Robert was killed, but Charles was defeated. RAOUL of Burgundy was elected king, and Charles was imprisoned.

Charles IV (Charles the Fair), 1294-1328, king of France (1322-28), youngest son of Philip IV, brother and successor of Philip V. Charles continued his brother's work of strengthening the royal power. He also increased the royal revenues, notably by debasing the coinage. Pope John XXII, having declared Holy Roman Emperor Louis IV deposed, offered (1324) to support Charles for emperor, but the plan came to nothing. Charles invaded (1324) Guienne (Aquitaine), a possession of the English king, and in 1327 he compelled England to cede to France the Guienne districts around Agen and Bazas and to pay a large indemnity. The English, however, retained the rest of Guienne. Charles, the last king of the Capetian dynasty, was succeeded by Philip VI, of the Valois line.

Charles V (Charles the Wise), 1338-80, king of France (1364-80). Son of King JOHN II, Charles became the first French heir apparent to bear the title of dauphin after the addition of the region of Dauphine to the royal domain in 1349. Regent during his father's captivity in England (1356-60, 1364), Charles dealt successfully with the JACQUERIE revolt, with the intrigues of King CHARLES II of Navarre, and with the popular movement headed by Etienne MARCEL, who had armed Paris against the dauphin. Becoming king in 1364, Charles stabilized the coinage and took steps to rid France of the companies of *eorcheurs*, marauding bands of discharged soldiers. Aided by his great general, Bertrand DU GUESCLIN, he almost succeeded in driving the English from France. Charles and his ministers, the MARMOUSETS, strengthened the royal authority, introduced a standing army, built a powerful navy, and instituted reforms that put fiscal authority more firmly in the hands of the crown. A patron of the arts and of learning, he established the royal library and interested himself in the embellishment of the Louvre and in the construction of the palace at Saint-Pol. However, his love of pomp and his lack of economy put a severe economic burden on the country. In the last year of his life he sided with Pope Clement VII against Pope Urban VI at the beginning of the Great Schism (see SCHISM GREAT). His son, Charles VI, succeeded him.

Charles VI (Charles the Mad or Charles the Well Beloved), 1368-1422, king of France (1380-1422), son and successor of King Charles V. During his minority he was under the tutelage of his uncles (particularly PHILIP THE BOLD, duke of Burgundy), whose policies drained the royal treasury and provoked popular uprisings in France and in Flanders. Charles

freed himself of this influence in 1388, took as his counselor his brother Louis, duc d'ORLÉANS, and recalled his father's ministers, the MARMOUSETS. After 1392, Charles suffered from recurrent insanity and was not active in the government. Philip of Burgundy returned to power. His rule was challenged by Louis d'Orléans and the conflict eventually resulted in war between Philip's successor, JOHN THE FEARLESS, and supporters of the Orleanists, known as Armagnacs (see ARMAGNACS AND BURGUNDIANS). The struggle was complicated by the invasion of France by King Henry V of England. In 1420, under the influence of the Burgundians, who were allied with Henry V and his wife ISABEL OF BAVARIA, Charles accepted the Treaty of TROYES, recognizing Henry V as his successor.

Charles VII (Charles the Well Served), 1403-61, king of France (1422-61), son and successor of Charles VI. His reign saw the end of the HUNDRED YEARS WAR. Although excluded from the throne by the Treaty of TROYES, Charles took the royal title after his father's death (1422) and ruled S of the Loire, while John of Lancaster, duke of BEDFORD, who was regent for King Henry VI of England, controlled the north and Guienne (Aquitaine). Vacillating and easily influenced by corrupt favorites, particularly Georges de LA TRÉMOILLE, Charles waged only perfunctory warfare against the English. He was prodded into action by the siege of Orleans (1429) in which JOAN OF ARC helped save the city from the English. After the capture of Orleans, Charles was crowned (1429) at Rheims. He reverted to his earlier inactivity until 1433, when La Tremoille was replaced by more scrupulous and energetic advisers, such as the comte de Richemont (later ARTHUR III, duke of Brittany) and the comte de DUNOIS. In 1435, Charles agreed to the Treaty of ARRAS, which reconciled him with the powerful duke, PHILIP THE GOOD of Burgundy, who had been an ally of the English. He recovered Paris the following year. In 1440, Charles suppressed the PRAGUERIE, and in 1444 a truce was signed with England, which lasted until 1449. By the battle of Formigny and the capture of Cherbourg (1450) the English were expelled from Normandy, and the battle of Castillon (1453) resulted in their withdrawal from Guienne. Charles, although dominated by his mistress, Agnes SOREL, proved an able administrator. He reorganized the army and remodeled French finances, established heavy taxation, particularly through the *taille*, a direct land tax. In 1438, Charles issued the PRAGMATIC SANCTION of Bourges, which established the liberty of the French Roman Catholic Church from Rome. In his reign commerce was expanded by the enterprise of Jacques CŒUR. The end of Charles's rule was disturbed by the intrigues of the dauphin, who succeeded him as LOUIS XI.

Charles VIII, 1470-98, king of France (1483-98), son and successor of Louis XI. He first reigned under the regency of his sister ANNE DE BEAUJEU. After his marriage (1491) to ANNE OF BRITTANY, he freed himself from the influence of the regency and prepared to conquer the kingdom of NAPLES, to which his father had acquired a claim through Charles, duke of Maine, from RENÉ of Naples. Urged by Ludovico SFORZA, he invaded (1494) Italy, after a triumphal march through Pavia, Florence, and Rome, he took (Feb., 1495) Naples. A league against him, formed by Milan, Venice, Spain, Holy Roman Emperor Maximilian I, and Pope Alexander VI, forced his hasty retreat, in which he distinguished himself against odds at the battle of Fornovo (July, 1495). His remaining troops in Naples were defeated, and at the time of his death he was forming new plans of conquest. He left no male heir and was succeeded by his cousin Louis XII. The conflict of France and Spain in Italy marked the beginning of the ITALIAN WARS. Charles's expedition fostered the introduction of the Italian Renaissance in France. The history of his reign was recorded by his contemporary, Philippe de COMINES. See J. S. C. Bridge, *A History of France from the Death of Louis XI*, Vol. I-II (1922-24).

Charles IX, 1550-74, king of France. He succeeded (1560) his brother FRANCIS II under the regency of his mother, CATHERINE DE MEDICI. She retained her influence throughout his reign. After 1570, however, Charles was temporarily under the sway of the French Huguenot leader Gaspard de COLIGNY. Catherine, fearing for her power, persuaded her weak son to approve the massacre of SAINT BARTHOLOMEW'S DAY in which Coligny and thousands of other Huguenots were murdered. Charles IX was succeeded by his brother Henry III.

Charles X, 1757-1836, king of France (1824-30), brother of King Louis XVI and of King Louis XVIII, whom he succeeded. As comte d'Artois he headed

the reactionary faction at the court of Louis XVI. He left France (July, 1789) at the outbreak of the French Revolution and became a leading spirit of the ÉMIGRÉ party. After his failure to aid the VENDÉE insurrection, he stayed in England until the Bourbon restoration (1814). During the reign of LOUIS XVIII he headed the ultraroyalist opposition, which triumphed after the assassination (1820) of Charles's son the duc de BERRY. The event caused the fall of the ministry of Élie DECAZES and the advent of the comte de VILLELE, who continued as chief minister after Charles's accession. Among the many attempts of Charles and Villele to reestablish the ancien régime, as the prerevolutionary order is called, the law (1825) indemnifying the émigrés for lands confiscated during the Revolution and measures increasing the power of the clergy met with particular disapproval. The bourgeoisie and the liberal press joined in attacking the Villele cabinet, which resigned in 1827. Villele's successor, the vicomte de MARTIGNAC, vainly tried to steer a middle course, and in 1829 Charles appointed an uncompromising reactionary, Jules Armand de POLIGNAC, as chief minister. To divert attention from internal affairs, Polignac initiated the French venture in ALGERIA. However, his dissolution (March, 1830) of the liberal chamber of deputies and his drastic July Ordinances, establishing rigid control of the press, dissolving the newly elected chamber, and restricting suffrage, resulted in the JULY REVOLUTION. Charles abdicated in favor of his grandson, the comte de CHAMBORD, and embarked for England. However, the duc d'Orléans, whom Charles had appointed lieutenant general of France, was chosen "king of the French" as LOUIS PHILIPPE. See studies by V. W. Beach (1967 and 1971).

Charles I, 1288-1342, king of Hungary (1308-42), founder of the ANGEVIN dynasty in Hungary, grandson of Charles II of Naples, who had married a daughter of Stephen V of Hungary. On the death (1301) of Andrew III, last of the Arpad dynasty, Charles was the candidate of Pope Boniface VIII for the crown of St. Stephen, but the Hungarians elected WENCESLAUS III of Bohemia, in 1308 the Hungarian diet at last chose Charles, who was crowned in 1310. He reorganized the army on a feudal basis, using the nobility for its personnel, and taxed the bourgeoisie. Silver and gold mines became state monopolies, and in 1338 gold became the accepted currency. He encouraged trade and increased the privileges of the cities. He married his second son to Joanna I of Naples and took as his second wife Elizabeth, daughter of King Ladislaus I of Poland. In 1339 he secured the succession to Casimir III of Poland for his eldest son, later Louis I of Hungary.

Charles II, king of Hungary. See CHARLES III, king of Naples.

Charles III, king of Hungary. See CHARLES VI, Holy Roman emperor.

Charles IV, king of Hungary. See CHARLES I, emperor of Austria.

Charles I (Charles of Anjou), 1227-85, king of Naples and Sicily (1266-85), count of Anjou and Provence, youngest brother of King Louis IX of France. He took part in Louis's crusades to Egypt (1248) and Tunisia (1270). After obtaining Provence by marriage (1246), he extended his influence into Piedmont. He became senator of Rome (1263, 1265-78) and undertook to champion the papal cause against MANFRED in the kingdom of Naples and Sicily. In reward, he was crowned king (1266) by Pope Clement IV. Charles defeated (1266) Manfred at Benevento and defeated and executed CONRADIN in 1268. As leader of the Guelphs, or papal faction, he gained political hegemony in Italy and won suzerainty over several cities in Tuscany, Piedmont, and Lombardy, but his overbearing policies led to a cooling of his relations with the papacy. Planning to establish his own empire, he allied himself with the deposed Byzantine emperor, BALDWIN II, against MICHAEL VIII and fought for years in the Balkans. Corfu, Epirus, and Albania were taken, but the crushing taxes necessitated by his wars and his appointment of oppressive French officials to exact them led to the SICILIAN VESPERS (1282). The ensuing war against the Sicilian rebels and PETER III of Aragon, chosen by the rebels as king of Sicily, continued under Charles's son and successor, Charles II. Charles I was the founder of the first ANGEVIN dynasty in Naples.

Charles II (Charles the Lame), 1248-1309, king of Naples (1285-1309), count of Anjou and Provence, son and successor of CHARLES I. In the war of the SICILIAN VESPERS between CHARLES I and Peter III of Aragon for possession of Sicily, Charles was captured (1284) in a naval battle by the Aragonese. His father died while he was in captivity and Charles

succeeded to the Neapolitan throne, although he was not crowned until 1289, following his release. The war in Sicily against James (JAMES II of Aragon), son and successor of Peter III, continued until James's renunciation of Sicily and recognition of Charles II as king in 1295. The Sicilians, however, refused to accept the reestablishment of French rule and set up James's brother, FREDERICK II, as king, war was resumed. Finally, in 1302, after the failure of a French expedition to Sicily sponsored by Pope Boniface VIII, the Peace of Caltabellotta was signed, Charles II and Pope Boniface VIII agreed that Frederick II would remain king, but Sicily was to go to Charles or his heir on Frederick's death.

Charles III (Charles of Durazzo), 1345-86, king of Naples (1381-86) and, as Charles II, of Hungary (1385-86), great-grandson of Charles II of Naples. Adopted as a child by JOANNA I of Naples, he later lived at the court of Louis I of Hungary. In 1380, Pope Urban VI summoned Charles to dethrone Joanna because of her support of the antipope, Clement IV. Joanna repudiated Charles as her heir in favor of Louis of Anjou (see LOUIS I, king of Naples). Charles conquered Naples, imprisoned Joanna, and was crowned (1381) by the pope. Joanna died by his order. Charles repulsed attacks on Naples by Louis of Anjou. In 1385, elected king of Hungary over SIGISMUND, Charles was crowned but was soon assassinated. He was succeeded in Naples by his son, Lancelot, and in Hungary by Sigismund.

Charles II (Charles the Bad), 1332-87, king of Navarre (1349-87), count of Évreux, grandson of King Louis X of France. He carried on a long feud with his father-in-law, John II, king of France, procuring the assassination (1354) of John's favorite, Charles de la Cerda, and forming an alliance with King Edward III of England. In 1356 Charles was treacherously seized by John and imprisoned, but he was rescued after the capture of John at Poitiers. He helped to suppress (1358) the JACQUERIE revolt and was chosen by Étienne MARCEL to defend Paris against the dauphin (later King Charles V), but he betrayed this trust. Until his death he was involved in quarrels with Charles V and with Castile and in intrigues with England.

Charles III (Charles the Good), 1361-1425, king of Navarre (1387-1425), count of Évreux, son and successor of Charles II. He settled (1404) his inherited differences with France and later tried to negotiate between the Armagnacs and Burgundians. His reign was peaceful and beneficent. His daughter Blanche and her husband, John (later John II of Aragon), succeeded him.

Charles I, 1863-1908, king of Portugal (1889-1908), son and successor of Louis I. A cultured man, learned in language and oceanography, Charles had little opportunity to display his administrative talents in a reign beset by political stagnation and financial troubles. Portuguese and British ambitions clashed over Africa, and in 1890, Great Britain issued an ultimatum demanding that the Portuguese cease attempts to expand their African empire. The Portuguese complied, but the issue raised strong feeling against Charles's rule. Financial affairs grew worse, and Germany sought to obtain part of the Portuguese African empire. After a revolt in 1906, Charles empowered João Franco, head of the Regenerator (conservative) party, to establish a dictatorial government. This provoked another revolt in 1908, in the course of which Charles and his eldest son were assassinated in a public square in Lisbon. Charles's second son, MANUEL II, succeeded to the throne.

Charles I and Charles II, kings of Rumania. see CAROL I and CAROL II.

Charles I, king of Spain. see CHARLES V, Holy Roman emperor.

Charles II, 1661-1700, king of Spain, Naples, and Sicily (1665-1700), son and successor of Philip IV. The last of the Spanish Hapsburgs, he was physically crippled and mentally retarded. His mother, Mariana of Austria, was regent for him and continued to rule after his majority. Her bias in favor of Austria aroused opposition, and she was forced into exile (1677) by Charles's illegitimate brother, JOHN OF AUSTRIA. After John's death (1679) she again exercised power. Charles's reign saw the continued loss of Spanish foreign power, as was evident in the War of Devolution and the War of the Grand Alliance, and a severe decline in Spain's economy, society, and intellectual life. The indolent grandees and the clergy regained a political role. Tax exemptions for privileged groups brought high taxes on industry and agriculture, and emigration increased. Before his death the childless Charles named Philip of Anjou as his heir. Philip's succession (as Philip V) provoked the War of the SPANISH SUCCESSION.

Charles III, 1716-88, king of Spain (1759-88) and of Naples and Sicily (1735-59), son of Philip V and ELIZABETH FARNESSE. Recognized as duke of Parma and Piacenza in 1731, he relinquished the duchies to Austria after conquering (1734) Naples and Sicily in the War of the POLISH SUCCESSION. His reign in Naples was beneficent. In 1759 he succeeded his half brother, Ferdinand VI, to the Spanish throne, Naples and Sicily passing to his third son, Ferdinand (later Ferdinand I of the Two Sicilies). Charles at first was neutral in the SEVEN YEARS WAR, but after concluding the FAMILY COMPACT of 1761 with France, he involved Spain in the war in time to share France's defeat. By the Treaty of Paris of 1763 he ceded Florida to England but received Louisiana from France. Territorial disputes with Portugal in the Rio de la Plata region were settled by the Treaty of San Ildefonso (1777). In the American Revolution, Charles entered (1779) the war on the American side and by the Treaty of Paris of 1783 regained Florida and Minorca. Spain prospered under the rule of Charles, who is regarded as the greatest Bourbon king of Spain and one of the "enlightened despots." His reign is noted for economic and administrative reforms and for the expulsion of the Jesuits (1767). Charles was ably assisted by ARANDA, FLORIDABLANCA, Campomanes, and Jovellanos. He was succeeded by his son Charles IV. See biography by C. A. Petrie (1971).

Charles IV, 1748-1819, king of Spain (1788-1808), second son of Charles III, whom he succeeded in place of his imbecile older brother. Unlike his father, Charles IV was an ineffective ruler and in 1792 virtually surrendered the government to GODÓY, his chief minister and the lover of his wife, Maria Luisa. Spain entered the French Revolutionary Wars in 1793, but in 1795 made peace with France in the second Treaty of Basel. By the Treaty of San Ildefonso (1796) Spain allied itself with France and became involved in the war with England. It suffered major naval defeats at Cape St. Vincent (1797) and Trafalgar (1805). The convention of Fontainebleau (1807) precipitated the events leading to the PENINSULAR WAR. As French troops marched on Madrid in March, 1808, a popular uprising led to a coup d'état at Aranjuez, the king was forced to abdicate in favor of his son, FERDINAND VII. Napoleon I tricked both father and son into a meeting with him at Bayonne, France, and forced them to abdicate in turn. The royal family was held captive in France until 1814, while Joseph Bonaparte was king of Spain. Charles IV and his family have been frankly portrayed by Goya, who enjoyed their favor.

Charles IX, 1550-1611, king of Sweden (1604-11), youngest son of Gustavus I. He was duke of Södermanland, Närke, and Värmland before his accession. During the reign of his brother, John III (1568-92), he opposed John's leanings toward Catholicism. After John's death he acted as regent, summoned (1593) an assembly of clergy and nobles to Uppsala, and had it establish Lutheranism as the state religion. This measure was passed in anticipation of the arrival (1594) of John III's Catholic son and heir, King SIGISMUND III of Poland, who was obliged to pledge himself to uphold Protestantism in Sweden as a condition for his coronation. Sigismund left Sweden in the same year, and Charles summoned the Riksdag, was made regent against the king's wishes, and ousted all Catholic officials. The Swedish nobles were loyal to Sigismund, but the people supported Charles. Sigismund landed an army at Kalmar (1598), was defeated by Charles at Stangebro, and was deposed by the Riksdag in 1599. To consolidate his power Charles had most of his opponents executed, but he refused to accept the Swedish crown until Sigismund's brother, John, renounced it in 1604. In 1600 he invaded Livonia and thus began the long Polish-Swedish wars that ended only with the Peace of OLIVA in 1660. Charles's claim to Lapland involved him in the unsuccessful Kalmar War (1611-13) with CHRISTIAN IV of Denmark. He died before the conclusion of the war and was succeeded by his son, Gustavus II.

Charles X, 1622-60, king of Sweden (1654-60), nephew of Gustavus II. The son of John Casimir, count palatine of Zweibrücken, he brought the house of Wittelsbach to the Swedish throne when his cousin, Queen CHRISTINA, abdicated in his favor. Before his accession, Charles had gained both military and diplomatic experience, fighting under TORSTENSSON in the Thirty Years War and serving under Chancellor OXENSTIERNA. As king Charles remedied Christina's loss of crown lands by securing their restitution at the Riksdag of 1655. He reopened hostilities with Poland and took Warsaw and Kraków

in 1655, but Polish resistance became formidable after the heroic and successful defense of CZĘSTOCHOWA. Charles's position deteriorated quickly. Czar Alexis of Russia invaded Livonia, FREDERICK III of Denmark declared war (1657) on Sweden, and Frederick William of Brandenburg deserted his alliance with Sweden. Charles hastened to Denmark, crossed the frozen sea to threaten Copenhagen, and forced the Danes to make peace. By the Treaty of Roskilde (1658) Sweden's southern boundary was extended to the sea, Denmark ceded to Sweden the provinces of Skåne, Halland, Blekinge, and Bohuslän and also Bornholm and part of Norway. Denmark's refusal to renounce an alliance with the Netherlands caused Charles to resume the war in 1658. England, the Netherlands, and France intervened in favor of Denmark. Charles, after concluding a truce with Russia (1658), began to negotiate for a general peace. He died suddenly before the negotiations were ended and was succeeded by his son, Charles XI. His wars were settled to the advantage of Sweden. By the Treaty of Copenhagen (1660) Sweden regained its four southern provinces from Denmark and by the Treaty of Kardis (1661) with Russia the two countries returned to the *prewar status quo* (FOR the settlement with Poland, see OLIVA, PEACE OF). During Charles's reign Sweden lost NEW SWEDEN in America to the Dutch.

Charles XI, 1655-97, king of Sweden (1660-97), son and successor of Charles X. Charles ascended the throne at the age of five, so a council of regency ruled until 1672. The regency ended Swedish wars with favorable peace treaties (see CHARLES X), but mismanaged internal affairs. On reaching his majority Charles obtained from the Riksdag the restitution of the crown lands that had been given away. Sweden was involved in the third of the DUTCH WARS as an ally of Louis XIV. Charles was defeated (1675) at Fehrbellin by FREDERICK WILLIAM of Brandenburg, who overran Swedish Pomerania, known also as Hither Pomerania. Against Denmark Charles was more successful, particularly at Landskrona (1677). At the Treaty of Saint-Germain (1679) with Brandenburg, Charles, through the influence of Louis XIV, regained Hither Pomerania. The Peace of Lund (1679) with Denmark drew the Scandinavian nations closer together, and in 1680, Charles married Princess Ulrika of Denmark. In Sweden Charles set about increasing the royal power at the expense of the nobles. The Riksdag of 1682 gave him absolute power, which he used efficiently. His son succeeded him as Charles XII.

Charles XII, 1682-1718, king of Sweden (1697-1718), son and successor of Charles XI. The regency under which he succeeded was abolished in 1697 at the request of the Riksdag. At the coronation he omitted the usual oath and crowned himself. Charles's youth and inexperience invited the coalition (1699) of PETER I of Russia, AUGUSTUS II of Poland and Saxony, and FREDERICK IV of Denmark that challenged Swedish supremacy in the Baltics. The resulting NORTHERN WAR quickly revealed Charles's abilities. In one of the most brilliant campaigns in history, Charles forced Denmark to make peace (Aug., 1700), defeated Peter I at Narva (Nov., 1700), subjugated Courland (1701), invaded Poland and, declaring Augustus II dethroned, secured the election (1704) of STANISLAUS I as king of Poland. In 1706 he invaded Saxony and forced Augustus to recognize Stanislaus as king, end his alliance with Russia, and surrender his adviser, PATKUL, whom Charles then had broken on the wheel. Charles then concentrated on his chief enemy, Peter I. He secured the alliance of the Cossack leader MAZIPEA and invaded Russia in 1708. The Swedish army was outnumbered, weakened by long marches and a cold winter, and without the active leadership of Charles, who was wounded, it suffered a disastrous defeat by the Russians at Poltava. Much of the army was captured, and Charles fled to Turkey, where he persuaded Sultan AHMAD III to declare war (1710) on Russia. After the Peace of the Pruth (1711) between Russia and Turkey, Charles, who had taken residence near Bender in Bessarabia, became an increasingly unwelcome guest. He was requested to leave Turkey but obstinately refused. A whole Turkish army was sent (1713) to dislodge him from his house, Charles defended it with a handful of men for several hours until he was forced by fire to make a sortie. Taken prisoner and detained near Adrianople, he feigned sickness for over a year. Late in 1714 he unexpectedly arrived at Swedish-occupied Stralsund and defended it against the Prussians and the Danes until Dec., 1715. When it fell he escaped to Sweden and proceeded to invade (1716) Norway. He was killed

in the Swedish trenches while besieging the fortress of Fredrikssten. He was succeeded by his sister, Ulrica Leonora, who was forced to recognize a new constitution that gave most of the power to the nobles and clergy. During her reign the Northern War ended (1721) with substantial Swedish losses. Charles's amazing military ability, his grandiose ambitions, and his perseverance through the greatest hardships have made him one of the heroes of modern times. His final failure cost Sweden its rank as a great power. The classic biography is Voltaire's *History of Charles XII*. See also biographies by R. N. Bain (1895, repr. 1969), J. A. Gade (1916), F. G. Bengtsson (tr. 1960), and R. M. Hutton (1968).

Charles XIII, 1748–1818, king of Sweden (1809–18) and Norway (1814–18). He became regent for his nephew, GUSTAVUS IV, after the assassination (1792) of his brother Gustavus III. He introduced some liberal policies, but these were abandoned at the end of his regency (1796). Called to the throne at the forced abdication (1809) of his nephew, Charles accepted a new constitution that limited the monarch's power, and he signed treaties with Denmark and France and a treaty ceding Finland to Russia. In 1810 he adopted the French marshal Bernadotte (later King Charles XIV) as his heir, and thereafter left all affairs in his hands.

Charles XIV (Charles John, Jear Baptiste Jules Bernadotte) (zhaN baptēs't' zhul bērnadōt'), 1763–1844, king of Sweden and Norway (1818–44), French Revolutionary general. Bernadotte rose from the ranks, served brilliantly under Napoleon Bonaparte in the Italian campaign (1796–97), was French ambassador at Vienna (1798), and was minister of war (1799). He had a prominent part in the victory of Austerlitz in 1805. Napoleon made him marshal of the empire (1804) and prince of Ponte Corvo (1806). However, his relations with the emperor were cool. While commanding in N. Germany he negotiated with the Swedes, who were impressed by his generous conduct. In 1809, GUSTAVUS IV of Sweden abdicated and was succeeded by his aged and childless uncle, Charles XIII. In need of both a suitable successor to Charles and an alliance with Napoleon, Sweden turned to Bernadotte. After receiving the support of Napoleon and joining the Lutheran Church the marshal accepted. He was elected crown prince by the Riksdag and adopted (1810) by Charles XIII as Charles John. The infirmity of the old king and the dissensions in the council of state put the reins of government in the hands of the crown prince. He favored the acquisition of Norway from Denmark rather than the reconquest of Finland from Russia, and thus he threw in his lot with Russia and England against Napoleon and Denmark. His Swedish contingent played an important part in the defeat of Napoleon at the battle of Leipzig (1813), and in 1814, having marched his army into Denmark, he forced the Danes to cede Norway in the Treaty of Kiel. Norway, which had declared its independence, was subdued, and by a majority vote of the Norwegian Storting (1814) the country was united with Sweden under a single king. The Congress of Vienna confirmed the union but restored the town of Ponte Corvo to the pope. He succeeded to the throne in 1818 as Charles XIV. He maintained peace throughout his reign, which was marked by internal improvements, notably the completion of the Gota Canal and a reform of the school system. However, his increasing opposition to the liberals made him unpopular by the end of his reign. The founder of the present Swedish dynasty, he was succeeded by his son, Oscar I. See D. P. Barton, *Bernadotte: The First Phase* (1914), *Bernadotte and Napoleon* (1920), and *Bernadotte, Prince and King* (1925), F. D. Scott, *Bernadotte and the Fall of Napoleon* (1935).

Charles XV, 1826–72, king of Sweden and Norway (1859–72), son and successor of Oscar I. A liberal and popular ruler, he consented to many reforms, including the creation of a bicameral parliament. He was succeeded by his brother, Oscar II.

Charles XVI Gustavus (Carl Gustaf), 1946–, king of Sweden (1973–), grandson and successor of Gustavus VI, son of Prince Gustaf Adolf of Sweden and Princess Sibylla of Saxe-Coburg-Gotha. Brought up by his grandfather and mother after the death of his father in 1947, he attended a Swedish boarding school, served in the armed forces, and studied for a year at Uppsala Univ. A new constitution, passed shortly before his grandfather's death and effective in 1975, made the king a ceremonial figurehead, divesting him of traditional status as supreme commander of the armed forces and of the right to formally nominate new premiers and to open the Swedish parliament.

Charles (Charles Philip Arthur George), 1948–, prince of Wales, eldest son of Queen Elizabeth II of Great Britain and heir apparent to the British throne. He was created prince of Wales in 1958 and invested with that title in a colorful ceremony at Caernarvon Castle in 1969. A graduate of Cambridge Univ., Charles entered the Royal Navy in 1971.

Charles, 1771–1847, archduke of Austria, brother of Holy Roman Emperor Francis II. Despite his epilepsy, he was the ablest Austrian commander in the French Revolutionary and Napoleonic wars, however, he was handicapped by unwise decisions imposed on him from Vienna. After the disastrous campaign of 1805, Charles was appointed minister of war and chief commander of the Austrian forces. He reorganized the army and headed the patriotic faction at court. In 1809 he defeated Napoleon I at Aspern (May) but was beaten at Wagram (July). In both battles he exacted a heavy toll from the French. Shortly afterward he retired because of political differences with Francis. He was also called Charles Louis. See F. L. Petre, *Napoleon and the Archduke Charles* (1908).

Charles I, 953–992?, duke of Lower Lorraine (977–91), younger son of King Louis IV of France. He claimed the French throne when his nephew, Louis V of France, died (987) without issue, but he was set aside in favor of HUGH CAPET. Charles seized Laon (988) and Rheims (989), but was betrayed (991) by the bishop of Laon, who turned him over to Hugh. Charles died in prison. With the death of his sons the French Carolingian dynasty ended.

Charles IV, 1604–75, duke of Lorraine. He succeeded to the duchy in 1624 but was to lose it several times because of his anti-French policy. In 1633, French troops invaded Lorraine in retaliation for Charles's support of Gaston d'ORLÉANS. Forced to make humiliating concessions to France, he abdicated (1634) in favor of his brother and entered the imperial service in the Thirty Years War. He briefly recovered his lands in 1641 and 1644, but he was excluded from the Peace of Westphalia (1648) at the war's conclusion. Although he joined the Spanish during the FRONDE, he communicated with the French government and as a result was imprisoned by the Spanish (1654–59). In 1661, at the price of heavy concessions to King Louis XIV, Charles recovered Lorraine and the duchy of Bar. Expelled once more by the French in 1670, Charles later helped to instigate the alliance of Spain and the Holy Roman emperor with the Dutch in the third of the DUTCH WARS. In 1675 he defeated François de Créqui at Konzer Brück.

Charles V (Charles Leopold), 1643–90, duke of Lorraine, nephew of Duke Charles IV. Deprived of the rights of succession to the duchy, he was forced to leave France and entered the service of the Holy Roman emperor. He was twice a candidate for the Polish crown (1669 and 1674). Although he took the ducal title on his uncle's death in 1675, France still held Lorraine. He was commander of the imperialist forces in the third of the Dutch Wars. At Nijmegen he refused (1678) to accept Lorraine on King Louis XIV's terms. He took part in the defense of Vienna (1683) and in expelling the Turks from Hungary. Charles V married (1678) Eleanor Maria, sister of Holy Roman Emperor Leopold I.

Charles, Jacques Alexandre Cesar (zhak alēksāN'drā sāzar' sharl'), 1746–1823, French physicist. He confirmed Benjamin Franklin's electrical experiments, became interested in aeronautics, and was the first to use hydrogen gas in balloons. In this type of balloon, known as the *Charlière*, he made an ascent in 1783 of almost 2 mi (3.2 km). He became professor of physics at the Conservatoire des Arts et Métiers, Paris. Inventor of a thermometric hydrometer, he also improved various devices, the *Gravésande* heliostat and Fahrenheit's aerometer among others, and anticipated Gay-Lussac's law of the expansion of gases. For Charles's law, see GAS LAWS.

Charles, Thomas, 1755–1814, Welsh nonconformist clergyman. He was brought up under Methodist influence, attended Oxford (1775–78), and was ordained in the Church of England. He held curacies in Somersetshire but resigned them and returned to Bala, Wales, where in 1784 he joined the CALVINISTIC METHODIST CHURCH. Gifted in working with children, he began (1785) to establish Welsh language schools. He secured and distributed thousands of Welsh Bibles and helped to found the British and Foreign Bible Society (see BIBLE SOCIETIES). At Bala in 1803, Charles established a printing press for Welsh textbooks. See William Hughes, ed., *Life and Letters of the Rev. Thomas Charles* (1881).

Charles, William, 1776–1820, American cartoonist, etcher, and engraver, b. Edinburgh, Scotland. He

probably came to the United States to avoid prosecution for his satirical drawings. He is best known for his cartoons of the War of 1812, in which he mocked the English in the rough, biting style of Gillray. An example of his work is *Admiral Cockburn Burning and Plundering Havre-de-Grace* (Maryland Historical Society).

Charles, river, c. 60 mi (97 km) long, rising in E. Mass. and flowing generally NE to Boston Bay. Boat races are held on the river.

Charles Albert, 1798–1849, king of Sardinia (1831–49), first king of the Savoy-Carignano line (see SAVOY, HOUSE OF). Although not entirely unsympathetic to the revolutionary movement in Sardinia, Charles Albert nevertheless informed his relative, King VICTOR EMMANUEL I, of the impending uprising of 1821. Upon Victor Emmanuel's subsequent abdication in favor of his brother Charles Felix, Charles Albert was temporarily appointed regent pending the new ruler's arrival. He granted a constitution, which Charles Felix repudiated. Having fallen into royal disfavor for this liberalism, Charles Albert went into exile and in 1823 participated in crushing a liberal regime in Spain to regain Charles Felix's good graces. After Charles Felix died, Charles Albert acceded to the throne. He issued a new code of law, abolished internal tariffs, and, to forestall a revolution, granted (1848) a constitution. He twice declared war on Austria, fighting two campaigns (1848, 1849) during the RISORGIMENTO. Successful at first, he was routed at Custoza (1848) and again at Novara (1849). Charles Albert then abdicated in favor of his son, Victor Emmanuel II, and went into exile in Portugal, where he soon died.

Charles Augustus, 1757–1828, duke and, after 1815, grand duke of Saxe-Weimar-Eisenach, friend and patron of Goethe, Schiller, and Herder. Though his duchy was small, he was important in German politics. He helped FREDERICK II of Prussia form (1785) the *Fürstentum* [league of princes] to check Austria's attempt under Holy Roman Emperor JOSEPH II to expand Austrian influence in the empire. He fought in the French Revolutionary Wars and against Napoleon I until 1806, when he was forced to join the CONFEDERATION OF THE RHINE. At the Congress of Vienna after Napoleon's defeat his duchy was enlarged and he was raised to a grand duke. Assisted by Goethe, he made WEIMAR a center of literature, science, art, and liberal political thought. In 1816 he introduced a constitution.

Charles Borromeo, Saint (bōrōmē'ō), 1538–84, Italian churchman, b. near Lago Maggiore. His uncle, PIUS IV, summoned Charles, a student at Pavia, to Rome in 1560. In rapid order he was made cardinal-deacon, administrator of the Papal States and of the archdiocese of Milan, and papal secretary of state. Despite a large personal fortune, St. Charles lived a simple, ascetic life. He was most zealous in encouraging reform in the church and was largely responsible for reopening (1560) the Council of Trent, of which he was the guiding spirit. In 1563 he was ordained priest, consecrated bishop, and then received the pallium for the see of Milan. He was 28 years old when, at Milan, he began introducing vigorous reforms, especially in the education of the clergy, enforcing the council's decrees for the institution of diocesan seminaries. He was exceedingly strict with the clergy, and he met much opposition. In 1569 some disaffected men tried to assassinate him. He worked untiringly to alleviate suffering in the pestilence of 1576. He was an exemplary pastor. There is a huge statue of him near Lago Maggiore and a monument to him in the cathedral at Milan, which he had completely redecorated. Feast Nov. 4.

Charlesbourg (sharl'bōōrg), city (1971 pop. 33,443), S. Que., Canada. It is a northern suburb of Quebec city. One of the oldest parishes in the province, it includes part of the seigniorie first granted to the Jesuits in 1626 and was settled in 1659. Its earlier name was Bourg Royal.

Charles d'Orléans· see ORLÉANS, CHARLES, DUC D'

Charles Edward Stuart· see STUART, CHARLES EDWARD

Charles Emmanuel I, 1562–1630, duke of Savoy (1580–1630), son and successor of EMMANUEL PHILIP BERT. He continued his father's efforts to recover territories lost to the duchy, but his reckless, although cunning, diplomacy undermined many of the sound economic and political achievements of the previous decades. His goal to incorporate Geneva, Saluzzo, and MONTFERRAT into Savoy caused him to oscillate in his alliances between France and Spain. In the long run he met with only limited success. In 1602 he tried unsuccessfully to reconquer Geneva.

by surprise attack. He recovered Saluzzo from the French by the Treaty of Lyons (1601), giving up, in exchange, Bresse, Bugey, Gex, and Pinerolo, but he lost Saluzzo just before his death. He waged war over the succession to Montferrat for much of the first quarter of the 16th cent. At the time of his death his duchy was overrun by the French. Charles Emmanuel, called the Great, was succeeded by his son, Victor Amadeus I.

Charles Martel (martēl') [O Fr. = Charles the Hammer], 688?-741, Frankish ruler, illegitimate son of PEPIN OF HERISTAL and grandfather of Charlemagne. After the death of his father (714) he seized power in Austrasia from Pepin's widow, who was ruling as regent for her grandsons, and became mayor of the palace. He subsequently subdued the W Frankish kingdom of Neustria and began the reconquest of Burgundy, Aquitaine, and Provence. Having subjugated many of the German tribes across the Rhine, he encouraged the activities of St. BONIFACE and other missionaries among them; he did not, however, support the papacy against the LOMBARDS. Charles Martel halted the advance of the Muslims of Spain by his victory in the battle of Tours (732). Although he never assumed the title of king, he divided the Frankish lands, like a king, between his sons Pepin the Short and Carloman. See Ferdinand Lot, *The End of the Ancient World and the Beginnings of the Middle Ages* (1927 tr 1961).

Charles Mound, hill, 1,241 ft (378 m) high, NW 1/4, near the Wis. line, highest point in the state.

Charles of Blois (Charles of Châtillon) (blwa, shā'tēyōn'), c.1319-1364, duke of Brittany, nephew of Philip VI of France. He was one of the chief participants in the War of the BRETON SUCCESSION and was killed at the battle of Auray. An extremely pious man, he has been beatified.

Charles of Valois (valwä'), 1270-1325, French prince and military leader, third son of Philip III and father of Philip VI. He dominated the reign in France of his nephew Louis X. On the excommunication (1284) of PETER III of Aragón, Pope Martin IV made Charles of Valois king of Aragón and Sicily. Charles, however, was defeated and in 1290 renounced his claim. In return he received Anjou and Maine as part of the dowry of his first wife (the daughter of Charles II of Naples). Later he unsuccessfully sought to obtain the crowns of the Byzantine and Holy Roman empires, which he held claim to through his second wife. At different times he also tried to secure the crowns of Arles and France, where he hoped to be regent after the death of Louis X. He campaigned for Pope Boniface VIII in Italy and took Florence in 1301.

Charles of Viana (vēā'nā), 1421-61, Spanish prince, heir of Navarre, son of Blanche of Navarre and John (later JOHN II) of Aragón. After his mother's death (1441) he ruled Navarre for his father, but serious differences between the two soon plunged the country into civil war. He was twice imprisoned by his father and died shortly after an uprising in Catalonia had forced John to recognize him as his heir.

Charles River Bridge Case, decided in 1837 by the U.S. Supreme Court. The Charles River Bridge Company had been granted (1785) a charter by the state of Massachusetts to operate a toll bridge. The state later authorized (1828) a competing bridge that would eventually be free to the public. The Charles River Bridge Company brought suit against the competing company, claiming that the state charter had given it a monopoly. The court upheld the state's authorization to the other company, holding that since the original charter did not specifically grant a monopoly, the ambiguity in the contract would operate in favor of the public, thus allowing a competing bridge. The holding modified the DARTMOUTH COLLEGE CASE, which held that a state could not unilaterally amend a charter.

Charles's law. see GAS LAWS

Charles the Bad. see CHARLES II, king of Navarre

Charles the Bald, French king. see CHARLES II, emperor of the West

Charles the Bold, 1433-77, last reigning duke of Burgundy (1467-77), son and successor of PHILIP THE GOOD. As the count of Charolais before his accession, he opposed the growing power of King LOUIS XI of France by joining (1465) the League of Public Weal. In 1468 he had Louis arrested during their interview at Peronne and compelled him to help in subduing Liege, where Louis had incited a revolt. Charles allied himself with England by his marriage (1468) to Margaret, the sister of King Edward IV. Master of the Low Countries, Charles ruled Burgundy, Flanders, Artois, Brabant, Luxembourg, Hol-

land, Zeeland, Friesland, and Hainault; he dreamed of reestablishing the kingdom of LOTHARINGIA. He needed Alsace, Lorraine, and a royal title to achieve his goal. In 1473 he met Holy Roman Emperor Frederick III at Trier to arrange a marriage between his daughter Mary and Frederick's son, the future Maximilian I. Charles was to have been crowned king of Lotharingia. However, the emperor broke off negotiations, the marriage took place (1477) only after Charles's death. Meanwhile, Charles continued to conquer the lands that separated his possessions. His struggles with the Alsatian towns and his occupation (1473) of Lorraine alienated the Swiss cantons, which were allied with France. In 1474 war broke out between Charles and the Swiss. Charles's English ally, Edward IV, invaded France (1475), but accepted a bribe from Louis XI and ceased hostilities. Charles was routed (1476) by the Swiss at Grandson and Morat. Early in 1477, at Nancy, Charles was defeated utterly and killed by the Swiss and the Lorrainers. His heiress, MARY OF BURGUNDY, lost part of her possessions to France, the rest passing to the Hapsburgs through her marriage with Maximilian. Once powerful Burgundy ceased to exist as a state. Charles, who earned his surname by his impetuous gallantry, was a capable, though harsh, ruler, however, his achievements were short-lived. See the chronicles of Philippe de COMINES, biographies by J. F. Kirk (3 vol., 1863-68) and Richard Vaughan (1974), J. L. A. Calmette, *The Golden Age of Burgundy* (tr 1962).

Charles the Fat, French king. see CHARLES III, emperor of the West

Charles the Great, Frankish king, emperor of the West. see CHARLEMAGNE

Charleston. 1 City (1970 pop. 16,421), seat of Coles co., E Ill., inc. 1835. Shoes, electronic equipment, farm buildings, and tools are manufactured in this industrial, rail, and trade center located in an agricultural area, and Eastern Illinois Univ. is there. A Lincoln-Douglas debate was held in Charleston on Sept. 8, 1858. Local attractions include an enormous statue of Lincoln and nearby Lincoln Log Cabin State Park (the site of Thomas Lincoln's reconstructed farmhouse) and Fox Ridge State Park. 2 City (1970 pop. 66,945), seat of Charleston co., SE S.C., founded 1680, inc. 1783. The oldest city in the state and one of the chief ports of entry in the SE United States, Charleston lies on a low, narrow peninsula between the Ashley and Cooper rivers at the head of the bay formed by their confluence. In the bay, or bordering on it, are Sullivan's Island, site of Fort Moultrie, James Island, Morris Island, with a lighthouse, Fort Sumter, and Castle Pinckney. Many transportation routes converge at Charleston, and through its excellent, almost landlocked harbor an extensive coastal and foreign trade is carried on. Among the city's many and varied manufactures are fertilizers, chemicals, steel, asbestos, cigars, pulp and paper, and textiles and clothing. Charleston is the headquarters for the 6th U.S. naval district and for the U.S. air force defense command. The extensive military facilities include a Polaris submarine base and a huge navy yard (est. 1901). The English under William Sayle settled (1670) at Albemarle Point, on the western bank of the Ashley River, c. 7 mi (11 km) from modern Charleston. They later moved (1680) to Oyster Point, where their capital, Charles Town (as it was first called) had been laid out. The city, surviving Spanish and Indian threats, became the most important seaport in the Southern colonies (exporting indigo, rice, and deerskins) and the leading center of wealth and culture in the South. Non-English immigrants, among whom the French Huguenots were most prominent, added a cosmopolitan touch. Charleston was an early theatrical center, and the Dock Street Theatre (opened 1736) was one of the first theaters to be established in the country. In the American Revolution, after being successfully defended (1776, 1779) by William Moultrie, Charleston was surrendered (May 12, 1780) by Benjamin Lincoln to the British under Sir Henry Clinton, who held it until Dec. 14, 1782. The capital was moved to Columbia in 1790, but Charleston remained the social and economic center of the region. The South Carolina ordinance of secession (Dec., 1860) was passed in Charleston, and the city was the scene of the precipitating act of the Civil War, the firing on Fort Sumter (April 12, 1861). With its harbor blockaded and the city itself under virtual siege by Union forces (1863-65), Charleston suffered partial destruction but did not fall until Feb., 1865, after it had been isolated by Sherman's army. A violent earthquake on Aug. 31, 1886, took many lives and made thousands homeless, and peri-

odic hurricanes and tornadoes (one in 1938 was particularly severe) have also caused great damage. Despite these repeated devastations, many of the charming colonial buildings survive, outstanding among them are St. Michael's Episcopal Church (begun 1752), noted for its chimes, and the Miles Brewton house (1765-69). Among the many other points of interest are the Old Powder Magazine (1719), the Old Slave Mart Museum and Gallery, the Gibbes Art Gallery, the Charleston Museum (1773), one of the oldest museums in the country, and Fort Sumter National Monument (see NATIONAL PARKS AND MONUMENTS, table). The waterfront, called the Battery, and the Grace Memorial Bridge over the Cooper River are famous Charleston landmarks. Cabbage Row surrounds a court that was the original Catfish Row of DuBose Heyward's novel *Porgy*. The city's picturesque old homes and winding streets, historic attractions, and unique charm, together with its pleasant climate, nearby beaches, and beautiful gardens (especially the Middleton Place, Magnolia Gardens, and Cypress Gardens) attract thousands of visitors each year. The annual azalea festival is an important event. The city is the seat of the Citadel, the Medical Univ. of South Carolina, the Baptist College at Charleston, and the College of Charleston (1790), which in 1837 became the first municipal college in the United States. The Isle of Palms, a resort island E of Charleston, is noted for its fine ocean beaches. See R. G. Rhett, *Charleston: An Epic of Carolina* (1940), Robert Molloy, *Charleston: A Gracious Heritage* (1947), *This is Charleston* (rev. ed. by S. G. Stonery, 1970). 3 City (1970 pop. 71,505), state capital and seat of Kanawha co., W. central W. Va., on the Kanawha River where it is joined by the Elk River, inc. 1794. The second largest city in the state, Charleston is an important transportation and trading center for the highly industrialized Kanawha valley and a major chemical, glass, and metal production area. Additional manufactures are based on the salt, coal, natural gas, clay, sand, timber, and oil of the region. The city grew around the site of Fort Lee (1788). Daniel Boone lived there from 1788 to 1795. The capital was transferred there from Wheeling in 1870, moved back to Wheeling in 1875, then returned to Charleston in 1885 after an election to determine the permanent site. The capitol building (completed 1932) was designed by Cass Gilbert. The city is the seat of Morris Harvey College. The Sunrise cultural center contains an art gallery, museum, planetarium, and notable gardens. West Virginia State College is nearby.

Charleston, social dance of the United States popular in the mid-1920s. The Charleston is characterized by outward heel kicks combined with an up-and-down movement achieved by bending and straightening the knees in time to the syncopated 4/4 rhythm of ragtime JAZZ. The steps are thought to have originated with the Negroes living on a small island near Charleston, S.C. Performed in Charleston as early as 1903, the dance made its way into Harlem stage shows by 1913. It gained popularity when it was performed in the Negro musical *Runnin' Wild* on Broadway in 1923. The show's male chorus line danced and sang James P. Johnson's "Charleston" to the accompaniment of Southern-style clapping and stomping. Both dance and song became the rage throughout the United States. The dance was thought to express the reckless daring, abandon, and restlessness of the jazz-age flappers. During the peak of the Charleston craze a policeman in St. Louis performed the dance while directing traffic.

Charlestown, former city, now part of Boston, Middlesex co., E. Mass., on Boston Harbor, between the Mystic and the Charles rivers, settled 1629, included in Boston 1874. The oldest part of Boston, it was the site of the U.S. navy yard (est. 1801, closed 1973) where the U.S. Constitution was moored. The battle of BUNKER HILL was fought at Charlestown on June 17, 1775. Samuel Morse was born in Charlestown. **Charlestown**, town (1970 est. pop. 2,800) on the island of Nevis, British West Indies. It is a port that ships goods to St. Kitts. Cotton, sugarcane, livestock, and some food crops are raised. Alexander Hamilton was born in Charlestown.

Charles University, at Prague, Czechoslovakia, also called University of Prague. The oldest and one of the most important universities of central Europe, it was founded in 1348 by Holy Roman Emperor Charles IV, for whom it is named. The faculty was organized in four so-called nations, the Czech, Saxon, Bavarian, and Polish. The struggle between the German and Czech nationalities in Bohemia was reflected in the university when, in 1403, the Czech nation, including Jan HUS, was outvoted by the

three other nations in a controversy regarding John Wyclif's doctrines. When in 1409 the three foreign nations opposed the request of Holy Roman Emperor WENCESLAUS to take a neutral attitude between the two rival popes in the Great Schism, Wenceslaus changed the statutes of the university. By the Decree of Kutna Hora he gave three votes to the Czech nation and one vote to the other three nations. Shortly after that Czech victory, Huss himself became rector of the university. As a result of the Decree of Kutna Hora the Germans left the university and founded the Univ of Leipzig. The Germanization of the university, which began after the battle of the White Mt (1620), reached its peak in 1774 when German was made the language of instruction. In 1882 the university was divided into two branches—Charles Univ, which was Czech, and Ferdinand Univ, which was German. After the creation of independent Czechoslovakia in 1918 this division was maintained, although the Czech university received the greater facilities. The German university was abolished after World War II.

Charles William Ferdinand, 1735–1806, duke of Brunswick (1780–1806), Prussian field marshal. He had great success in the Seven Years War (1756–63) and was commander in chief (1792–94) of the Austro-Prussian armies in the FRENCH REVOLUTIONARY WARS. Although he sympathized with some of the goals of the Revolution, he led the German army in its ill-fated march into France in 1792 and issued a manifesto threatening severe reprisals against the revolutionaries. Defeated at Valmy (1792), in 1793 he routed the French at Kaiserslautern and Pirmasens. He again commanded the Prussian armies in 1806 and was defeated by the French marshal Davout at Auerstedt. He was blinded in the battle and died soon after. His son was FREDERICK WILLIAM, duke of Brunswick.

Charlet, Nicolas Toussaint (nēkōlā' tōōsān' sharlā'), 1792–1845, French lithographer and painter. He was famous for his lithographs depicting political and social subjects. Those concerning the Napoleonic Wars are among his best known. Charlet was an influential teacher as well as one of the most popular printmakers of his day.

Charleville-Mézières (sharlävēl'-māzyēr'), town (1968 pop 58,872), capital of Ardennes dept, NE France, on the Meuse River, in Champagne. It was formed in 1966 when the twin cities of Charleville and Mézières were merged, along with three small communities. It is a commercial and metalworking center. Mézières was an old fortified town, founded in the 9th cent. Charleville was founded (1606) by, and named for, Charles de Gonzague, duke of RetHEL. The area has often been captured by the Germans (1815, 1870, 1914, 1940), and Mézières in particular suffered heavy damage in both World Wars. Its recovery (1918) by the Allies marked the last major battle of World War I.

Charlevoix, Pierre François Xavier de (pyēr fraNswā' zavvā' də sharlāvwa'), 1682–1761, French Jesuit traveler and historian. He taught at the Jesuit college in Quebec and at the College Louis le Grand in Paris. In 1720 he journeyed to America to explore the West and visit the Jesuit missions. Voyaging up the St. Lawrence, through the Great Lakes, and along the Illinois River, he reached the Mississippi and descended it to New Orleans. After a shipwreck in the Gulf of Mexico he returned to France. In 1744 he issued his *Histoire de la Nouvelle France* (tr, 6 vol., 1900), which in a valuable appendix contains a detailed journal of his trip, the only full description of the interior of America in the first third of the 18th cent.

charlock: see MUSTARD

Charlotte (Charlotte Sophia), 1744–1818, queen consort of George III of England. The niece of Frederick, duke of Mecklenburg-Strelitz, she was married to George in 1761 and bore him 15 children. When the king became permanently insane in 1810, she was given charge of his person and his household.

Charlotte, 1896–, grand duchess of Luxembourg (1919–64). The second daughter of Duke William of Nassau-Weilburg and a Portuguese princess, Marie Anne of Braganza, she succeeded her sister, Marie-Adelaide, who had abdicated in her favor. In Nov., 1919, Charlotte married Prince Felix of Bourbon-Parma. During the German occupation in World War II, the grand duchess and her family went into exile, eventually settling in Montreal. They returned home in April, 1945. In Nov., 1964, Charlotte abdicated in favor of her son, Jean.

Charlotte (shar'lāt), city (1970 pop 241,178), seat of Mecklenburg co., S N C, inc. 1768. The largest city of the state and the foremost commercial and in-

dustrial center of the Piedmont region, Charlotte is a transportation hub and distribution point for the Carolina manufacturing belt, now the nation's leading textile area. The bountiful hydroelectric power from the Catawba River serves the city's industries. Its products include textiles, chemicals, apparel, machinery, food, and printed materials. Charlotte, named for Queen Charlotte, wife of King George III of England, was settled c 1750. The citizens of the county were among the most outspoken in their opposition to the British government, and it was at Charlotte that the MECKLENBURG DECLARATION OF INDEPENDENCE was signed in May, 1775. Hezekiah Alexander, a leading citizen of Charlotte, was the chief advocate of the declaration, his colonial home, the Rock House, is a historical museum. In his brief occupation of the city (Sept–Oct, 1780), British Gen. Charles Cornwallis called it a "hornet's nest of rebellion." The Univ of North Carolina at Charlotte, Queens College, Johnson C. Smith Univ, and a junior college are in the city. The Mint Museum of Art is a reproduction of the US Mint, located there from 1837 until 1913. The Charlotte Coliseum has one of the largest steel, aluminum, and precast concrete domes in the world. President James K. Polk was born in Charlotte.

Charlotte Amalie (əmal'ē), town (1970 pop 12,372), capital of the VIRGIN ISLANDS of the United States, on St. Thomas Island. It is the commercial center of the islands, a free port, and a popular tourist resort. Founded in the late 17th cent., Charlotte Amalie was a center of Danish colonial life. It became important as a trading center during the American Civil War. It was renamed St. Thomas in 1921, but the former Danish name was restored in 1937. The town still retains a Danish flavor in its architecture and street names.

Charlotte Elizabeth: see ELIZABETH CHARLOTTE OF BAVARIA

Charlottenburg: see BERLIN, Germany

Charlottesville (shar'latsvīl'), city (1970 pop 38,880), seat of Albemarle co., central Va., on the Rivanna River, in a Piedmont farm region known for its apples, founded 1762, chartered as a city 1888. Textiles are made there. Charlottesville is the seat of the Univ of Virginia. British Gen. John Burgoyne's captured army was quartered nearby in 1779–80, and in 1781 Sir Banastre Tarleton raided the city. Nearby are Monticello, home of Thomas Jefferson, Ash Lawn, home of James Monroe, the birthplaces of Meriwether Lewis and George Rogers Clark, and Michie Tavern Museum.

Charlottetown, city (1971 pop 19,133), capital and chief port of Prince Edward Island, E Canada, on the southern coast. Food processing and tourism are the main industries. The French established (c 1720) a fort and settlement across the harbor, known as Port la Joie. Charlottetown was laid out by the British in 1768 and named for Queen Charlotte, consort of George III. Its growth was slow until the middle of the 19th cent., when it became noted for the sailing vessels it built for fishing and lumber transport. In the city is the Univ of Prince Edward Island. The Charlottetown Conference of the Maritime Provs (1864) was the first step toward Canadian confederation.

Charlton, Bobby (Robert Charlton), 1937–, English soccer (football) player. He joined the Manchester United team in 1954, playing inside forward and was a vital power behind the team's successes. Holder of numerous championship medals, he wrote several books about the sport including *My Soccer Life* (1965), *Forward for England* (1967), *This Game of Soccer* (1967), and *The Book of European Football* (1969).

charm, magical formula or INCANTATION, spoken or sung, for the purpose of securing blessing, good fortune, or immunity from evil. It presupposes a belief in demons or malignant spirits. The formula was frequently inscribed upon an AMULET, talisman, or trinket to be worn for protection.

Charolais (sharōlā'), small region, Saône-et-Loire dept., E central France, in Burgundy, in the Massif Central, named after the town of Charolles. Cattle breeding is the chief occupation. The countship of Charolais was acquired by Philip the Bold, Duke of Burgundy, in 1390. In 1477 the county passed to the Hapsburgs, from then on it shared the fortunes of FRANCHE-COMTÉ until it was acquired from Spain by Louis XIV and was definitively united with France and incorporated into Burgundy in 1761.

Charolais cattle (shār'alā'), breed of beef animal with a rugged, muscular appearance and solid creamy to wheat-colored coat. Originated in France,

it was first imported to the United States in 1936 by way of Mexico.

Charon: see HADES

Charondas (kārōn'dās), 6th cent B C., Sicilian lawgiver, a native of Catana. His laws, which were admired by Aristotle, were used by the cities of Chalcidian foundation in Sicily and Italy.

Charpentier, Gustave (gustav' sharpaNtyā'), 1860–1956, French composer, pupil of Massenet. His best-known works are the opera *Louise* (1900), portraying bohemian Parisian life, and his orchestral suite *Impressions d'Italie* (1892).

Charran (kār'ān), variant of HARAN, the place Acts 7:24.

Charron, Pierre (pyēr sharōN'), 1541–1603, French Roman Catholic theologian and philosopher. He was an important contributor to 17th-century theological thought, combining an individual form of skepticism with a strict adherence to Catholicism based on the emphasis of the importance of faith over reason. After practicing law for several years, he took orders and soon gained a reputation as an eloquent preacher. He became chaplain to Margaret, wife of Henry IV. His *Traite des trois verites* (1594) set forth proofs, first, that there is a God and that a true religion exists, second, that no other religion than that of the Christians is true, and, third, that in the Roman Catholic Church alone is salvation found. In 1600 he published a collection of 16 sermons. In his most famous work, the *Traite de la sagesse* (1601), the influence of Montaigne, with whom he had a close relationship, appears. The skepticism of that work awoke criticism and later a summary and apology, *Petit traite de la sagesse*, was published.

chart, term referring to MAPS prepared for marine navigation and for air navigation. All charts show, in some convenient SCALE, geographic features useful to the navigator, as well as indications of direction, e.g., true north (the direction of the geographic North Pole), magnetic north (the direction indicated by the north-seeking end of a magnetic compass needle), and magnetic declination (the difference between these two directions). Data shown on marine charts include the outline and nature of coasts, with landmarks, currents and undercurrents (both direction and force), winds, tides, location and type of lighthouses, buoys, beacons, and lightships, position of rocks, bars, reefs, shoals, wrecks, or other dangers, contour and nature of bottom (mud, sand, rock, or gravel), and depth. Depth is indicated in great detail in harbors and shallow and intricate waterways, the value indicated is usually that at mean low water. Most national governments publish charts of their coasts and harbors, the British admiralty has done the most work along these lines. In the United States the Coast and Geodetic Survey and the Hydrographic Office of the Dept of the Navy issue charts, these are drawn using the gnomonic or Mercator MAP PROJECTIONS. Aeronautical charts show natural or man-made surface features by the use of various symbols. These charts give locations of radio-navigation stations and graphic representations of the directional information they broadcast, radio communication channels of airports and spacecraft centers, standard flight paths, and dangerous or forbidden areas (e.g., certain military installations). Elevations on the earth's surface are indicated by contour lines. The U.S. Coast and Geodetic Survey issues many kinds of aeronautical charts.

charter, document granting certain rights, powers, or functions. It may be issued by the sovereign body of a state to a local governing body, university, or other corporation or by the constituted authority of a society or order to a local unit. The term was widely applied to various royal grants of rights in the Middle Ages and in early modern times. The most famous political charter is the MAGNA CARTA of England. Chartered companies held broad powers of trade and government by royal charter. In colonial America, chartered colonies were in theory, and to an extent in fact, less subject to royal interference than were royal colonies.

chartered companies, associations for foreign trade, exploration, and colonization that came into existence with the formation of the European nation states and their overseas expansion. An association received its charter from the state and sometimes had state support. In the regulated company each member was an independent trader operating with his own capital and bound only by the general rules of the company charter. In the joint stock company the organization itself transacted the business, oper-

ating on the joint capital invested by members, each of whom shared proportionately in the profits and losses. The company received a monopoly of trade or colonization in a certain region and customarily exercised lawmaking, military, and treaty-making functions, subject to the approval of the home government, besides other privileges. The English Merchants Adventurers (1359) was more of a guild organization, but it foreshadowed such companies as England's Muscovy (1555), Levant (1581), East India (1600, perhaps the greatest of them all), and Hudson's Bay (1670) and Holland's Dutch East India (1602). Such colonizing companies as the Virginia Company (1606), the Massachusetts Bay Company (1629), the French Royal West Indian Company (1664-74), the Santo Domingo Company (1698), and the Dutch West India Company (1621) were more quickly taken over by their governments. Later 19th-century colonizing and trading companies, such as the British North Borneo (1881), Royal Niger (1886), British South Africa (1888), and German East Africa (1884), did not last long and had more restricted powers, but attested to the continuing significance of the chartered company. In a technical sense, the modern corporation is a chartered company. See George Cawston, *The Early Chartered Companies, 1296-1858* (1896, repr. 1968), Rudolph Robert, *Chartered Companies and their Role in the Development of Overseas Trade* (1969).

Charterhouse [Fr. = Chartreuse], in London, England, once a Carthusian monastery (founded 1371), later a hospital for old men and then a school for boys, endowed in 1611. The school, which became a large public school, was removed (1872) to Godalming, Surrey. W. M. Thackeray, a pupil at the school, describes it in *The Newcomes*.

Charter Oak, white oak tree that until 1856 stood in Hartford, Conn., and was thought to be 1,000 years old. There is a tradition that when Sir Edmund Andros, as governor general of New England, demanded (1687) that the charter of Connecticut be surrendered by the colonists at Hartford, the document was hidden in a hollow of the tree.

Chartier, Alain (ālān' shāryā'), b. c. 1385, d. c. 1433, French writer, secretary to Charles VII. His most popular work was the love poem *La Belle Dame sans mercy* (1424), which provided Keats with a title. *Le Quadrilogue invectif* (1422), a political pamphlet in vigorous prose, called for French solidarity to combat the turmoil of the Hundred Years War.

Chartier, Émile Auguste (āmēl' ōgüst'), 1868-1951, French essayist and philosopher who wrote under the pseudonym Alain. He is best known for thousands of aphoristic essays, called *propos*, which he contributed to his own weekly *Libres Propos* and other journals. These essays cover a variety of literary and political topics, many of them expressing Chartier's commitment to pacifism and distrust of official power. His many other works include *Système des beaux arts* (1920) and *Histoire de mes pensées* (1936). See *Alain on Happiness* (1973).

Chartism, workingmen's political reform movement in Great Britain, 1838-48. It derived its name from the People's Charter, a document published in May, 1838, that called for voting by ballot, universal male suffrage, annual Parliaments, equal electoral districts, no property qualifications for members of Parliament, and payment of members. The charter was drafted by the London Working Men's Association, an organization founded (1836) by William Lovett and others, but the movement gathered momentum largely because of the fervor and rhetorical talents of Feargus O'CONNOR. He traveled widely, especially in the north, where recurrent economic depressions and the constraints of the new POOR LAW (1834) had bred especially deep discontent, and recruited support for the charter. In Aug., 1838, the charter was adopted at a national convention of workingmen's organizations in Birmingham. The following February another convention, calling itself the People's Parliament, met in London. A Chartist petition was presented to Parliament (and summarily rejected), but the convention rapidly lost support as the multiplicity of aims among its members and rivalries among its leaders became apparent. Riots in July and a confrontation between Chartist miners and the military at Newport, Wales, in November led to the arrest of most of the Chartist leaders by the end of 1839. In 1840, O'CONNOR founded the National Charter Association (NCA) in an attempt to centralize the organization of the movement, but most of the other leaders refused to support his efforts. It was the NCA that drafted and presented to Parliament the second Chartist petition in 1842. It too was overwhelmingly rejected. By this time the vitality of

Chartism was being undermined by a revival of trade unionism, the growth of the Anti-Corn Law League, and a trend toward improvement in working-class economic conditions. O'CONNOR himself began to devote himself to a scheme for settling laborers on the land as small holders. The last burst of Chartism was sparked by an economic crisis in 1847-48. In April, 1848, a new convention was summoned to London to draft a petition and a mass demonstration and procession planned to present the petition to Parliament. The authorities took extensive precautions against trouble, but the demonstration was rained out and the procession, which had been forbidden, did not take place. This fiasco marked the end of Chartism in London, although the movement survived for a while in some other parts of the country. See G. D. H. Cole, *Chartist Portraits* (1941, repr. 1965), Asa Briggs, ed., *Chartist Studies* (1959), Mark Hovell, *The Chartist Movement* (3d ed. 1967), Dorothy Thompson, ed., *The Early Chartists* (1971), J. T. Ward, *Chartism* (1973).

Chartres, Robert d'Orléans, duc de: see ORLÉANS, family.

Chartres (shār'trā), city (1968 pop. 34,469), capital of Eure-et-Loir dept., NW France, in Orléanais, on the Eure River. Chartres is of great historic and artistic interest; it is also a regional market with many industries, including metallurgy, and the production of chemicals and electronic equipment. An ancient town, it was the probable site of the great assemblies of the DRUIDS. The Normans burned it in 858. During the Middle Ages Chartres was the seat of a countship, it became a possession of the French crown in 1286. Francis I made it a duchy in 1528. Chartres' fame today stems largely from its magnificent Gothic Cathedral of Notre Dame (12th to 13th cent.), remarkable for its two spires (375 ft/114 m and 350 ft/107 m), its stained glass windows, and its superb sculpture. Henry Adams in *Mont-Saint-Michel and Chartres* made it a symbol of the medieval spirit. Inside the cathedral St. Bernard of Clairvaux preached the Second Crusade (1146) and Henry IV was crowned king of France (1594).

chartreuse (shar'trōz'), LIQUEUR made exclusively by Carthusians at their monastery, La Grande Chartreuse, France, until their expulsion in 1903. The French distillery and trademark were sold, and the order set up a new plant in Tarragona, Spain. The monks' product is identified by the name *Liqueur des Peres Chartreux*. Readmitted to France in 1941, the Carthusians resumed manufacture there. Green chartreuse contains about 57% alcohol, the sweeter yellow variety, about 43%.

Chartreuse, Grande (grā'nd shānrōz'), mountainous massif, Isère dept., SE France, in the Dauphiné Alps, Chamechaude Peak (6,847 ft/2,087 m) is the highest point. There is a high valley St. Bruno founded (1084) the famous monastery, La Grande Chartreuse, the principal seat of the Carthusians until 1903, when the order was expelled from France. The Carthusians returned to their monastery in 1941. The monastery was destroyed several times, the present buildings (now a museum) date mainly from the 17th cent. Chartreuse liqueur originated there.

Charvaka (chār'vākā) see INDIAN PHILOSOPHY.

Charvadis (chār'b'dīs), in Greek mythology, a female monster. Because she stole Hercules' cattle, Zeus hurled her into the sea. There she lay under rocks across from Scylla and sucked in and spewed out huge amounts of water, creating a whirlpool.

Chase, Mary Ellen, 1887-1973, American educator and writer, b. Blue Hill, Maine, grad. Univ. of Maine, 1909. She taught (1918-26) English at the Univ. of Minnesota, where she received her Ph.D. in 1922. Her works set in Maine, excellent in their regional fidelity, include a biography and the novels *Mary Peters* (1934), *Silas Crockett* (1935), and *Windswept* (1941). She also wrote biblical studies such as *Life and Language in the Old Testament* (1955) and children's books like *The Story of Lighthouses* (1965). Her autobiographical volumes are *A Goody Heritage* (1932), *A Goody Fellowship* (1939), and *The White Gate* (1954). See biography by P. D. Westbrook (1965).

Chase, Philander, 1775-1852, American Episcopal bishop, b. Cornish, N.H. After experience as a missionary in the West, he was elected (1818) first bishop of Ohio, where he founded Kenyon College in 1824 with funds that he secured largely in England. In 1835, Chase became bishop of Illinois, from 1843 he was presiding bishop of the church. See his *Reminiscences* (2 vol., 2d ed. 1848), biography by L. C. Smith (1903).

Chase, Salmon Portland, 1808-73, American public official and jurist, 6th Chief Justice of the United States (1864-73), b. Cornish, N.H. Admitted to the bar in 1829, he defended runaway Negroes so often that he became known as "attorney general for fugitive slaves." Chase became prominent in the Liberty party and later in the Free-Soil party, and was elected by a coalition of Free-Soilers and antislavery Democrats to the U.S. Senate, where (1849-55) he eloquently opposed such proslavery measures as the Compromise of 1850 and the Kansas-Nebraska Act. He was elected governor of Ohio in 1855 at the head of a Republican ticket that was dominated by Know-Nothings, by 1857, when he was reelected, he was a leading member of the new Republican party. Chase was a splendid figure of a man, a "sculptor's ideal of a President," and few Americans have ever gone after that high office with more determination—or less success. He sought the Republican nomination in 1860, but since he lacked the full support of even his own state's delegation and since many considered him an extreme abolitionist, his chance passed quickly. Again elected to the Senate, he served only two days in March, 1861, before resigning to become Lincoln's Secretary of the Treasury. In that difficult position he took part in framing for Congress the new fiscal legislation necessitated by the Civil War, collected new taxes, placed unprecedentedly large loans with reluctant investors, and directed vast expenditures. To assist in government financing and also to improve the status of the currency, he proposed the national bank system (established in Feb., 1863), which is generally considered his greatest achievement. Ambition and a high regard for his own worth made Chase a difficult man to work with, after refusing four previous attempts, Lincoln finally accepted Chase's resignation on June 29, 1864. Chase failed in his effort to secure the presidential nomination, but he remained an important national figure, and on Dec. 6, 1864, after the death of Roger B. Taney, Lincoln appointed him Chief Justice of the United States. He took a moderate stand in most of the important Reconstruction cases. His dissenting opinion in the SLAUGHTERHOUSE CASES subsequently became the accepted position of the courts as to the restrictive force of the Fourteenth Amendment. On the other hand, his decision (1870) in *Hepburn vs. Griswold* (see LEGAL TENDER CASES) was soon reversed. For his fairness in presiding over the Senate in the impeachment trial of President Andrew Johnson, he was furiously denounced by his old radical friends. Chase persisted in seeking the presidency, but neither the Democrats in 1868 nor the Liberal Republicans in 1872 were interested in him. See biography by A. B. Hart (1899, repr. 1969), David Donald, ed., *Inside Lincoln's Cabinet: The Civil War Diaries of Salmon P. Chase* (1954, repr. 1970), J. W. Schuckers, *Life and Public Services of Salmon P. Chase* (1874, repr. 1970).

Chase, Samuel, 1741-1811, political leader in the American Revolution, signer of the Declaration of Independence, Associate Justice of the U.S. Supreme Court (1796-1811), b. Somerset co., Md. A lawyer, he participated in pre-Revolutionary activities and was a delegate to the First and Second Continental Congresses. In 1776 he was appointed, together with Benjamin Franklin and Charles Carroll of Carrollton, to win Canada over to the Revolutionary cause, but the plan failed. Chase helped to influence Maryland opinion to support independence from Great Britain. Although he opposed adoption of the U.S. Constitution, he later became a strong Federalist and President Washington appointed him (1796) to the U.S. Supreme Court. A series of brilliant and influential decisions established his leadership in the court until he was eclipsed by the rising genius of John Marshall. Chase was impeached (1804) by the U.S. House of Representatives for discrimination on the bench against Jeffersonians. Tried before the Senate (1805), he was found not guilty. This verdict discouraged further attempts to impeach justices for purely political reasons.

Chase, Stuart, 1888-, American economist and author, b. Somersworth, N.H., studied (1907-8) at Massachusetts Institute of Technology, grad. Harvard, 1910. He worked (1910-17) as a certified public accountant and later investigated (1917-22) the meat-packing industry for the Federal Trade Commission. He served as a consultant with the National Resources Committee (1934), the Resettlement Administration (1935), the Securities Exchange Commission (1939), the Tennessee Valley Authority (1940-41), and the United Nations Educational, Scientific, and Cultural Organization (1949). He is the author

of many articles and books on economics. Among his best-known works are *The Tragedy of Waste* (1925), *Your Money's Worth* (with F. J. Schlink, 1927), *Men and Machines* (1929), *The Economy of Abundance* (1934), *Rich Land, Poor Land* (1936), *Democracy under Pressure* (1945), *The Proper Study of Mankind* (1948), *Live and Let Live* (1960), *Money to Grow On* (1964), and *The Most Probable World* (1968).

Chase, William Merritt, 1849–1916, American painter, b. Williamsburg, Ind., studied in Indianapolis and in Munich under Piloty. In 1878 he began his long career as an influential teacher at the Art Students League of New York and later established his own summer school of landscape painting in the Shinnecock Hills on Long Island. Proficient in many media, Chase is best known for his spirited portraits and still lifes in oil. His *Carmencita*, *Lady in Black*, and portrait of Whistler (all Metropolitan Mus.) and *My Daughter Alice* (Cleveland Mus.) are characteristic. He was president of the Society of American Artists for 10 years and a member of the National Academy of Design. See K. M. Roof, *Life and Art of William M. Chase* (1917).

Chassériau, Théodore (tāōdōr' shasārēō'), 1819–56, French painter, b. Santo Domingo. He entered Ingres's studio at the age of 12, five years later he gained immediate recognition with the exhibition of his *Cain, Cursed and Return of the Prodigal*. Chassériau was the only artist of the age who successfully combined Ingres's sense of line and Delacroix's rich color and vitality and, at the same time, created his own personal style. After his visit to Algeria in the 1840s, he emphasized the exotic, romantic elements in his painting, while still adhering to classical techniques. Among his best-known works are the *Two Sisters*, *Arabian Challenge*, and *Tepidarum* (all Louvre). His mural decorations for the Cour des Comptes of the Palais d'Orsay, Paris, were destroyed except for a few fragments preserved in the Louvre. His untimely death cut short a brilliant career.

Chassidim, see HASIDIM.

Chastelard, Pierre de Boscosel de (pyēr dā bōskōzēl' dā shatālār'), c. 1540–1563, French gallant. Madly in love with Mary Queen of Scots, who exchanged verses with him, he hid in her bedchamber and was discovered and forgiven. When he repeated the offense, he was executed. The story was dramatized by Swinburne.

Chastellain, Georges (zhōrzh shatēlān'), c. 1405–1475, French chronicler, historiographer to the dukes of Burgundy. The surviving fragments of his *Grande Chronique* are a valuable 15th-century source.

chat, name applied to several Old World perching birds, such as the wheatear (see THRUSH), the whinchat, and the stonechat, and to a common American WARBLER.

château (shātō', Fr. shatō'), royal or seigniorial residence and stronghold of medieval France—the counterpart of the English CASTLE of the period. In such a fortress, peasants of the surrounding country took refuge during time of war. The early fortified château, called a *château-fort*, reached its culmination in the late 15th cent., when the magnificent feudal Pierrefonds was built near Compiègne. The 16th-century château, with its gardens and outbuildings, was usually surrounded by a moat, but was only lightly fortified. Notable châteaux of the transition period between the military château and the later country estate with extensive landed property are those of the Loire, Indre, and Cher valleys, such as Chambord, Amboise, Blois, Chenonceaux, Azay-le-Rideau, and Chaumont. See study by François Gebelin (tr. 1964).

Chateaubriand, François René, vicomte de (fraNswā' ranā' vëkōNī' dā shatōbrēāN'), 1768–1848, French writer. Chateaubriand was a founder of ROMANTICISM in French literature. Of noble birth, he grew up in his family's isolated castle of Combourg. In 1791 he visited the United States, supposedly to search for the Northwest Passage, although he apparently did not go beyond Niagara Falls. He returned to France but became an émigré and lived in England until 1800. There he published his first book, *Essai historique, politique, et moral sur les révolutions* (1797). *The Genius of Christianity* (1802, tr. 1856) made Chateaubriand the most important author of his time in France. Two tragic love stories included in this volume, "Atala" (1801) and "Rene" (1802), exemplify the melancholy, exotic description of nature and the evocative language that became a trademark of romantic fiction. His other works in-

clude *The Martyrs* (1809, tr. 1812, 1859), which celebrated the victory of Christianity over paganism, and *Les Aventures du dernier Abencérage* (1826), a narrative of romance set in Spain. In 1803, Napoleon appointed Chateaubriand secretary of the legation to Rome and then minister to Valaise, but in 1804, upon the execution of the duc d'Enghien, he resigned and became a bitter anti-Napartist. Later he supported the Bourbons and became a peer (1815), ambassador to London (1822), and minister of foreign affairs (1823–24). In 1830 he abandoned political affairs and spent his final years with Mme Recamier composing his *Memoires d'outre-tombe* [memoirs from beyond the tomb] (1849–50). Chateaubriand's musical prose enriched the French language. Although his accounts of travel were plagiaristic and partly imaginary, they were rich and moving. See his *Travels in America* tr. by R. Switzer (1968), his memoirs (ed. by Robert Baldick, 1961), biographies by Andre Maurois (1938) and Friedrich Sieburg (1961).

Château d'If (shatō'dēf'), castle built in 1524 on the small rocky isle of If, in the Mediterranean Sea off Marseilles, SE France. Long used as a state prison, it was made famous by Alexandre Dumas's *Count of Monte Cristo*.

Chateaugay, river, c. 50 mi (80 km) long, rising in Chateaugay Lake in the Adirondacks, NE NY, and flowing through Quebec to empty into the St. Lawrence 10 mi (16 km) below Montreal, opposite the mouth of the Ottawa River. In the War of 1812 the battle of Chateaugay was fought (1813) on the banks of the river in Quebec between an American invading force of 7,000 under Gen. Wade Hampton and some 750 Canadians and Indians. The Americans were defeated and had to abandon their plan to attack Montreal.

Château-Renault, François Louis Rousselet, marquis de (fraNswā' lwē rōōsēlā' markē' dā shatō'-ranō'), 1637–1716, French vice admiral and marshal. He escorted the deposed king of England, James II, to Ireland (1689), fought against the Anglo-Dutch fleet at Beachy Head (1690), and commanded the Franco-Spanish fleet that was destroyed (1702) at Vigo.

Châteauroux (shatōrōō'), city (1968 pop. 51,201), capital of Indre dept., central France, on the Indre River. It has textile, metal, and food-processing industries. Châteauroux grew around a 10th-century castle built by the lords of Deols. Historic buildings in the city include the Église des Cordeliers (a former church that is now a jewelry museum) and the church of St. Martial (12th–16th cent.).

Château-Thierry (shatō'-tyērē'), town (1968 pop. 11,629), Aisne dept., N France, on the Marne River. The town was the focal point of the second battle of the Marne (1918), which ended the last German offensive of World War I. An imposing monument to the U.S. soldiers who fought in the battle is just outside the town. The birthplace of Jean de La Fontaine is preserved as a museum.

Châtellerauld (shatēlrō'), town (1968 pop. 36,642), Vienne dept., W central France. It is an industrial center where armaments, cutlery, camping equipment, plywood, and clothing are produced. There are many buildings dating from the 15th to the 17th cent. in the old part of town, including the house (now a museum) where René Descartes spent his childhood.

Chatham, William Pitt, 1st earl of (chāt'am), 1708–78, British statesman, known as the Great Commoner. A member of a family whose wealth had been made in India, he entered Parliament in 1735. With his older brother he became a member of a group known as "Cobham's cubs" (after their leader Lord Cobham) or the "boy patriots," who opposed the ministry of Sir Robert Walpole, particularly its foreign policy, and supported Frederick Louis, prince of Wales, in his quarrel with King George II. After the fall (1742) of Walpole, Pitt was the leading critic of Lord Carteret (later earl of GRANVILLE) in his conduct of the War of the Austrian Succession. Although detested by the king, Pitt entered the government as postmaster general of the forces in 1746 and won great popularity by his unusual honesty in refusing the usual perquisites of that office. He was dismissed in 1755, but the early disasters in the SEVEN YEARS WAR gave him such an opportunity to denounce government policies in his eloquent speeches that in 1756 George II was forced to call on him to become a secretary of state. The next year he formed a coalition ministry with Thomas Pelham-Holles, duke of NEWCASTLE. Pitt wished to conduct the war primarily against the French to win imperial supremacy, a policy popular with the mercantile in-

terests and with the generally anti-French public. His subsidies to Frederick II of Prussia, his efficient handling of military supplies, his shrewd choice of commanders, his insistence on naval expansion, and his ability to raise English morale resulted in the defeat of the French power in India and the capture of the French provinces in Canada. After the accession of GEORGE III, however, Pitt was forced to resign (1761), and he fiercely denounced the terms of the Treaty of Paris (1763), by which the war was concluded. He joined the opposition in protesting the prosecution (1763) of John Wilkes and the imposition of the STAMP ACT (1765) on the American colonies. In 1766, Pitt was recalled to office as lord privy seal, accepted the title earl of Chatham, and formed such a broadly based ministry that it was soon impossibly divided. Troubled by increasing mental illness and gout, Chatham exercised little control over this administration, and his chancellor of the exchequer, Charles TOWNSHEND, not only sabotaged his plans to reorganize the East India Company but passed the ill-fated TOWNSHEND ACTS (1767). In virtual retirement from 1767, he resigned office in 1768. In his rare speeches in the House of Lords thereafter, he urged conciliation of the American colonies, and after the outbreak of the American Revolution he favored any peace settlement short of granting the colonies independence. On this issue he broke with the Whigs, and his last speech was a plea against the disruption of the empire he had done so much to build. At its conclusion he collapsed and was carried home to die. Proud, dramatic, and patriotic, Chatham excelled as a war minister and orator. He was the father of William Pitt. See biographies by Basil Williams (1913, repr. 1966), O. A. Sherred (1952), J. H. Plumb (1953, repr. 1965), and J. W. Derry (1962), D. A. Winstanley, *Lord Chatham and the Whig Opposition* (1912, repr. 1966).

Chatham, city (1971 pop. 35,317), S Ont., Canada, E of Detroit, Mich., on the Thames River. It is an industrial center in a rich mixed farming and fruit-raising region.

Chatham, municipal borough (1971 pop. 56,921), Kent, SE England, on the Medway River. Chatham, Rochester, and Gillingham form a contiguous urban area known as the Medway Towns. Chatham is a great naval station, with well-equipped dockyards, dry docks, and shipbuilding and repairing equipment. The Royal Naval Dockyard is the largest installation. The first dockyard was established by Elizabeth I in 1588. There are also flour mills and timber works. The Roman WATLING STREET ran through Chatham.

Chatham Island, see SAVAI.

Chatham Islands, island group (1968 est. pop. 500), 373 sq. mi (966 sq. km), South Pacific, c. 425 mi (680 km) E of New Zealand, to which it belongs. The two largest islands are Chatham Island, which has a large central lagoon, and Pitt Island. The chief town is Waitangi, on Chatham Island. The inhabitants engage mainly in sheep raising, sealing, and fishing. The islands were discovered by Britons in 1791. The native Moriori population was nearly exterminated when Maoris from New Zealand invaded in 1830.

Châtillon, Sébastien, see CASTILLON, SÉBASTIEN.

Châtillon-sur-Seine (shatēyōN'-sur-sēn), town (1968 pop. 6,746), Côte d'Or dept., N central France, in Burgundy, on the Seine River. It was a residence of the early dukes of Burgundy and has a 10th-century church. The town was the site of unsuccessful peace negotiations (1814) between Napoleon I and his opponents.

Chatsworth, estate, Derbyshire, central England, near Chesterfield. It is the seat of the dukes of Devonshire. The present Chatsworth House was begun in 1687. Its gardens, libraries, picture galleries, and collections of sculpture are noted.

Chattahoochee, river, 436 mi (702 km) long, rising in N Ga., and flowing generally south to join the Flint River in Lake Seminole on the Ga.-Fla. line, the combined waters form the Apalachicola River, c. 90 mi (140 km) long, which flows S to Apalachicola Bay, NW Fla. The Jim Woodruff Dam impounds Lake Seminole and has a capacity of 30,000 kw of electricity. The Columbia, Walter F. George, Bartlett's Ferry, and Goat Rock dams produce power and regulate navigation on the Chattahoochee. Buford Dam forms Lake Sidney Lanier (used for recreation) and is the source of Atlanta's water supply. The Flint River, 330 mi (531 km) long, rising in W central Georgia, is navigable to Bainbridge, Ga., and is a valuable source of power in W Georgia.

Chattanooga (chātānōō'gā), city (1970 pop. 119,082), seat of Hamilton co., E Tenn., on both sides of the Tennessee River near the Georgia line, inc.

1839 It is a port of entry and an important manufacturing and marketing center for a widespread area. Foremost among its many manufactures are textile and metal products, chemicals, and primary metals. It is also a resort center, almost entirely surrounded by mountains, with many historical and tourist attractions on or near Lookout Mt., Missionary Ridge, and Signal Mt. West of the city, the Tennessee River cuts through the Cumberland Plateau in a magnificent gorge, c 1,000 ft (300 m) deep. The Cherokees were defeated on this site in 1794, and a trading post was established in 1810, followed by the Brainerd mission in 1817. Regular steamship service began in 1835. A center first of salt shipping and then of cotton shipping, the city expanded with the arrival of the railroads in the 1840s and 50s. It was of great strategic importance in the Civil War (see CHATTANOOGA CAMPAIGN). Northern industrialists developed the iron industry there during the 1870s. Electric power, augmented by the Tennessee Valley Authority project after 1933, has played an important role in the city's development. Chickamauga Dam is nearby. Southeast and southwest of the city lies Chickamauga and Chattanooga National Military Park (est. 1890), part of which lies in Georgia. Other points of interest include the Rock City Gardens, with unusual lichen-covered sandstone formations, a wildlife sanctuary, historic cemeteries, and numerous old buildings. A U.S. coast guard station is on Lake Chickamauga. The Univ. of Tennessee at Chattanooga is there. Adolph S. Ochs owned the *Chattanooga Times* from 1878 until his death.

Chattanooga campaign, Aug.-Nov., 1863, military encounter in the American Civil War. Chattanooga, Tenn., which commanded Confederate communications between the East and the Mississippi River and was also the key to loyal E. Tennessee, had been an important Union objective as early as 1862 (see BUELL, DON CARLOS). In 1863, the Union general William ROSECRANS, commanding the Army of the Cumberland, forced Braxton BRAGG to withdraw his Confederate army from middle Tennessee (June-Aug.) and maneuvered him out of Chattanooga (Aug. 16-Sept. 8). Deceived into believing that Bragg was retreating upon Atlanta, Rosecrans pursued and was trapped by the Confederates at Chickamauga Creek, c 12 mi (20 km) S of Chattanooga. Strengthened by James Longstreet's corps, which had traveled some 650 mi (1,050 km) from Lee's army through Virginia and the Carolinas to join him, Bragg routed the Union right at the Battle of Chickamauga (Sept. 19-20). He could not crush the Union left under George H. THOMAS, however. Thomas held off the enemy until Rosecrans ordered him to withdraw to Chattanooga. Bragg then took up a position extending along Missionary Ridge across Chattanooga Valley to Lookout Mt. and laid siege to the town. In a historic movement, Joseph Hooker and two corps from the Army of the Potomac circled nearly 1,200 mi (1,900 km) via Indianapolis to bolster the Union forces. But Rosecrans had lost control of the situation, and an alarmed Federal administration at Washington called for U.S. GRANT, who arrived at Chattanooga on Oct. 23, 1863. Generals W. F. Smith and Joseph Hooker executed a coup (Oct. 26-29) that restored a sorely needed supply line on the Tennessee River, so Grant was ready to move by late November. Sherman, who had brought up reinforcements from Vicksburg, commanded the left, Thomas, the center, and Hooker, the right. Bragg's forces had been weakened by the departure of Longstreet on an unsuccessful expedition to Knoxville. On Nov. 24, Hooker drove the Confederates from Lookout Mt. in the Battle above the Clouds. On Nov. 25, Sherman could make no headway against Missionary Ridge from its northern end, so Grant ordered the center to advance. Thomas's men—Philip Sheridan conspicuous among them—displayed great courage and boldness, proceeding to carry Bragg's position at the top, where Hooker's forces joined them in routing the Confederates. By nightfall Bragg was in full retreat to Georgia. The victory left Chattanooga in Union hands for the rest of the war. See study by M. H. Fitch (1971), Fairfax Downey, *Storming of the Gateway* (1960, repr. 1969).

chattel (chăt'al), in law, any property other than a freehold estate in land (see TENURE). A chattel is treated as personal property rather than real property regardless of whether it is movable or immovable (see PROPERTY). Certain uses of the term (e.g., chattel mortgage) refer only to movable property. Otherwise the term also includes chattels real, i.e., those estates in land that do not constitute a freehold.

Chatterjee, Bankim Chandra (bang'kīm chūn'dra chā'tarjē), 1838-94, Indian nationalist writer, b. Bengal. He popularized a Bengali prose style that became the vehicle of the major nationalist literature of the region. Born a Brahman, he received an English education and his first novel was written in English. In 1872 he founded the *Bangadarshan*, a journal modeled on the *Spectator*. Chatterjee, who frequently used the pseudonym Ramchandra, wrote many novels that wedded political and philosophical commentary with historical romance. His favorite theme—India as a divine motherland—did much to reinforce Hindu orthodoxy and alienate the Indian Muslims. *Bandemataram* (Hail to the Mother), the title of a song in his novel *Anandamath* (1882), became a slogan of the Indian National Congress. The song was ultimately adopted as the Indian national anthem. Other writings include *The Poison Tree* (tr. 1884) and *Krishna Kanta's Will* (tr. 1895).

Chatterton, Thomas, 1752-70, English poet. The posthumous son of a poor Bristol schoolmaster, he was already composing the "Rowley Poems" at the age of 12, claiming they were copies of 15th-century manuscripts at the Church of St. Mary Redcliffe, Bristol. In 1769 he sent several of these poems to Horace Walpole, who was enthusiastic about them. When Walpole was advised that the poems were not genuine, he returned them and ended the correspondence. After this crushing defeat, Chatterton went to London in 1770, trying, with small success, to sell his poems to various magazines. On the point of starvation, too proud to borrow or beg, he poisoned himself and died at the age of 17. An original genius as well as an adept imitator, Chatterton used 15th-century vocabulary, but his rhythms and his approach to poetry were quite modern. The "Rowley Poems" were soon recognized as modern adaptations written in a 15th-century style, but the vigor and medieval beauty of such poems as "Mynstrelles Song" and "Bristowe Tragedie" revealed Chatterton's poetic genius. This gifted, rebellious youth later became a hero to the romantic and Pre-Raphaelite poets, several of whom, notably Keats and Coleridge, wrote poems about him. See his complete works, ed. by D. S. Taylor with B. B. Hoover (2 vol., 1971), biographies by E. H. W. Meyerstein (1930, repr. 1972) and John C. Nevill (1948, repr. 1973).

Chaucer, Geoffrey (jā'f'rē chōs'ər), c 1340-1400, English poet, one of the most important figures in English literature. The known facts of Chaucer's life are fragmentary and are based almost entirely on official records. He was born in London between 1340 and 1344, the son of John Chaucer, a vintner. In 1357 he was a page in the household of Prince Lionel, later duke of Clarence, whom he served for many years. In 1359-60 he was with the army of Edward III in France, where he was captured by the French but ransomed. By 1366 he had married Philippa Roet, who was probably the sister of John of Gaunt's third wife; she was a lady-in-waiting to Edward III's queen. During the years 1370 to 1378, Chaucer was frequently employed on diplomatic missions to the Continent, visiting Italy in 1372-73 and in 1378. From 1374 on he held a number of official positions, among them comptroller of customs on furs, skins, and hides for the port of London (1374-86) and clerk of the king's works (1389-91). The official date of Chaucer's death is Oct. 25, 1400. He was buried in Westminster Abbey. Chaucer's literary activity is often divided into three periods. The first period includes his early work (to 1370), which is based largely on French models, especially the *ROMAN DE LA ROSE* and the poems of Guillaume de Machaut. Chaucer's chief works during this time are the *Book of the Duchess*, an allegorical lament written in 1369 on the death of Blanche, wife of John of Gaunt, and a partial translation of the *Roman de la Rose*. Chaucer's second period (up to c 1387) is called his Italian period because his works then were modeled primarily on Dante and Boccaccio. His major works of the second period include *The House of Fame*, recounting the adventures of Aeneas after the fall of Troy, *The Parliament of Fowls*, which tells of the mating of fowls on St. Valentine's Day and is thought to celebrate the betrothal of Richard II to Anne of Bohemia, a prose translation of Boethius' *De consolazione philosophiae*, the unfinished *Legend of Good Women*, a poem telling of nine classical heroines, which introduced the heroic couplet (two rhyming lines of iambic pentameter) into English verse, the prose fragment, *The Treatise on the Astrolabe*, written for his son Lewis, and *Troilus and Criseyde*, based on Boccaccio's *Filostato*, one of the great love poems in the English language

(see *TROILUS AND CRESSIDA*). In *Troilus and Criseyde*, Chaucer perfected the seven-line stanza later called rhyme royal. To Chaucer's final period, in which he achieved his fullest artistic power, belongs his masterpiece, *The Canterbury Tales* (written mostly after 1387). This unfinished poem, about 17,000 lines, is one of the most brilliant works in all literature. The poem introduces a group of pilgrims journeying from London to the shrine of St. Thomas à Becket at Canterbury. To help pass the time they decide to tell stories. The pilgrims together represent a wide cross section of 14th-century English life. Their tales include a variety of medieval genres from the humorous fabliau to the serious homily, and they vividly indicate medieval attitudes and customs in such areas as love, marriage, and religion. Through Chaucer's superb powers of characterization the pilgrims—such as the earthy wife of Bath, the gentle knight, the worldly prioress, the evil summoner—come intensely alive. Chaucer was a master storyteller and craftsman, but because of a change in the language after 1400, his metrical technique was not fully appreciated until the 18th cent. Only in Scotland in the 15th and 16th cent. did his imitators understand his versification. The best editions of Chaucer's works are those of F. N. Robinson (1933) and W. W. Skeat (7 vol., 1894-97), of *The Canterbury Tales*, that of J. M. Manly and Edith Rickert (8 vol., 1940), of *Troilus and Criseyde*, that of R. K. Root (1926). See Charles Muscatine, *Chaucer and the French Tradition* (1960), G. G. Coulton, *Chaucer and his England* (1950, repr. 1963), M. A. Bowden, *A Reader's Guide to Geoffrey Chaucer* (1964), G. G. Williams, *A New View of Chaucer* (1965), Maurice Hussey et al., *Introduction to Chaucer* (1965), D. W. Robertson, Jr., *Chaucer's London* (1968), G. L. Kitzredge, *Chaucer and His Poetry* (1915, repr. 1970), Ian Robinson, *Chaucer's Prosody* (1971) and *Chaucer and the English Tradition* (1972), P. M. Kean, *Chaucer and the Making of English Poetry* (2 vol., 1972). Bibliographies for 1908 to 1953 by D. D. Griffith (rev. ed. 1954) and for 1954 to 1963 by W. R. Crawford (1967).

Chaudière (shōdyēr'), river, 115 mi (185 km) long, rising in Lac Mégantic, SE Que., Canada, near the Maine-Que. boundary and flowing generally N to the St. Lawrence River opposite the city of Quebec. A hydroelectric power plant at Chaudière Falls (130 ft/40 m high) supplies electricity to the Quebec city region.

Chaudière Falls, in the Ottawa River in the heart of the city of Ottawa, Ont., Canada. The river is narrowed by rocky cliffs to a width of c 200 ft (60 m) and drops 50 ft (15 m) in a series of cascades. Several bridges cross the river there, passing over the falls.

Chauliac, Guy de (gē da shōlyāk'), c 1300-1368, French surgeon. At Avignon he was physician to Pope Clement VI and to two of his successors. His *Chirurgia magna* (1363) was used as a manual by physicians for three centuries.

Chaumette, Pierre Gaspard (pyēr gāspār' shō-mēt'), 1763-94, French Revolutionary. A member of the *CORDELIERS*, he collaborated with Jacques HÉBERT to eliminate the royalists and to introduce (1793) the cult of Reason. Chaumette was general prosecutor (1792-94) and a chief leader of the Commune of Paris. Although he instituted social and moral reforms, his private life is reputed to have been less than pure. When Maximilien Robespierre turned upon the Hébertists, Chaumette tried in vain to escape the guillotine by renouncing Hébert.

Chaumonot, Joseph Marie (zhōzēf' mārē' shōmōnō'), 1611-93, French Jesuit missionary to the New World. He arrived in 1639 in Quebec. He worked first with BRÉBEUF among the Huron Indians near Georgian Bay until the time of the massacres and destruction by the Iroquois (1649), he escaped and led 400 Huron to the reservation appointed for them on the Île d'Orléans at Quebec. He next went into central New York to preach to the Iroquois (1655-58) and then returned to Quebec, where he remained. His autobiography is important, and his Huron grammar is unique.

Chaumont (shōmōn'), town (1968 pop. 27,569), capital of Haute-Marne dept., NE France, in Champagne, at the confluence of the Marne and Saône rivers. It is a railroad and light industrial center. Iron is mined nearby. The Treaty of Chaumont, signed on March 1, 1814, by England, Russia, Prussia, and Austria, laid the foundation for the HOLY ALLIANCE.

Chauncy, Charles, 1705-87, American Congregational clergyman, b. Boston. He was ordained as a minister of the First Church, Boston, in 1727 and remained in that pulpit for 60 years. Next to Jonathan Edwards, his great opponent, Chauncy was

probably the most influential clergyman of his time in New England. As an intellectual he distrusted emotionalism and opposed the revivalist preaching of the GREAT AWAKENING in his *Seasonable Thoughts on the State of Religion in New England* (1743) and other pamphlets. He became the leader of the "Old Lights" or liberals in theology in the doctrinal disputes following the Great Awakening. He was also the leader in the opposition to the establishment of an Anglican bishopric in the American colonies, writing his *Complete View of Episcopacy* (1771) and other works on the subject. A firm believer in the colonial cause, he clearly set forth the political philosophy of the American Revolution in sermons and pamphlets during the period. After the war he defended the doctrine of Universalism in two anonymous tracts *Salvation for All Men* (1782) and *The Mystery Hid from Ages and Generations* (1784). See Williston Walker, *Ten New England Leaders* (1901, repr. 1969).

Chausson, Ernest Amédée (ěrněš' amādă' shōsōn'), 1855-99, French composer. His various compositions reflect the influence of Cesar Franck and also suggest Debussy. Of his songs, perhaps the best known are *Les Heures* (1896) and *Oraison* (1896). His *Symphony in B Flat Major* is popular, and his *Jardin aux lilas* has been used for a ballet. He also wrote chamber music, church music, and poetic pieces for violin and for piano. See biography by J. P. Barricelli (1955, repr. 1973).

Chautauqua Lake, 18 mi (29 km) long and from 1 to 3 mi (1.6-4.8 km) wide, W N.Y., near Lake Erie, in a resort area. Grapes and other fruits are grown in the region.

Chautauqua movement, development in adult education somewhat similar to the LYCEUM movement. It derived its name from the institution at Chautauqua, N.Y. There, in 1873, John Heyl VINCENT and Lewis Miller proposed to the Methodist Episcopal camp meeting they were attending that secular as well as religious instruction be included in the summer Sunday-school institute. Established on that basis in 1874, the institute developed into an eight-week summer program, offering courses to adults in the arts, sciences, and humanities. Thousands attended the institution each year. For those who could not attend, there were courses for home study groups, and lecturers were sent out to supplement the material furnished from the organization's publishing house. Other communities were inspired to form local Chautauquas, and possibly two or three hundred were organized, though few were so successful as the original. To lecture to their members these local groups brought authors, explorers, musicians, and political leaders, and a variety of entertainment was furnished. The Chautauquas had something of the spirit of the revival meeting and something of the county fair. In 1912 the movement was organized commercially, and lecturers and entertainers were furnished to local groups on a contract basis. This commercial endeavor was extremely successful, persisting until c. 1924, soon after that the circuits ended, although the assembly at Chautauqua continued with a diminished membership. See J. H. Vincent, *The Chautauqua Movement* (1886, repr. 1971), A. E. Bestor, *Chautauqua Publications* (1934), Rebecca Richmond, *Chautauqua: an American Place* (1934), Gay McLaren, *Morally We Roll Along* (1938), Victoria Case and R. O. Case, *We Called It Culture: The Story of Chautauqua* (1948, repr. 1970), J. E. Gould, *The Chautauqua Movement* (1961).

Chautemps, Camille (kamě'ya shōtan'), 1885-1963, French politician. A Radical Socialist leader, he was premier in 1930 and in 1933-34, when the STAVISKY AFFAIR (in which he was not directly implicated) caused his resignation. A member of the first Popular Front cabinet of Socialists and Communists (1936-37) under Leon Blum, he headed the second, less radical, Popular Front cabinet (1937-38). Vice premier of the Vichy government, Chautemps came (1940) to the United States on a mission and did not return to France. He was subsequently expelled from the Radical party. In 1947 he was tried and convicted in absentia for collaborating with the Vichy regime. In 1954 his sentence was voided by the *statute of limitations*.

Chauveau, Pierre Joseph Olivier (pyě zhōzě' ôlěvya' shōvō'), 1820-90, French Canadian educator and politician, prime minister of Quebec (1867-73), b. Quebec. He became superintendent of education (1855) in Lower Canada. During his tenure normal schools were established and separate schools were created for English-speaking and French-speaking students. With the achievement of confederation

(1867), Chauveau became the first prime minister of the province of Quebec. He also held the portfolios of minister of education and provincial secretary. In 1873 he was appointed to the Canadian Senate, of which he was speaker (1873-74). In 1878 he became professor of Roman law at Laval Univ. Chauveau wrote the novel *Charles Guern* (1852), several biographies, poetry, and essays, including *L'Instruction publique du Canada* (1876).

chauvinism (shō'vānizəm), word derived from the name of Nicolas Chauvin, a soldier of the First French Empire. Used first for a passionate admiration of Napoleon, it now expresses exaggerated and aggressive nationalism. As a social phenomenon, chauvinism is essentially modern, becoming marked in the era of acute national rivalries and imperialism beginning in the 19th cent. It has been encouraged by mass communication, originally by the cheap newspaper. Chauvinism exalts consciousness of nationality, spreads hatred of minorities and other nations, and is associated with militarism, imperialism, and racism. In the 1960s, the term "male chauvinist" appeared in the women's liberation movement, it is applied to males who refuse to regard females as equals.

Chaux-de-Fonds, La (la shō-dā-fōn'), city (1971 pop. 42,347), Neuchâtel canton, NW Switzerland, in the Jura mts., near the French border. It is one of the largest watch-manufacturing centers in Switzerland.

Chavannes, Puvis de: see PUVIS DE CHAVANNES

Chávez, Carlos (kar'lōs sha'vās), 1899-, Mexican composer and conductor. In 1928, Chavez established the Symphony Orchestra of Mexico, which he conducted until 1949. He was also director (1928-34) of the National Conservatory of Music, where he radically reformed the curriculum. He used elements of Mexican Indian music and Indian instruments in his *Xochipilli Maculxochitl* (1940). The influence of Stravinsky is evident in several of his strongly rhythmic works. His most important compositions include the ballet *El fuego nuevo* (1921), the ballet-symphony *H.P. [horsepower]* (1926-27), *Sinfonia Antígona* (1933), a piano concerto (1938-40), a violin concerto (1948-50), the Fourth and Fifth symphonies (both 1953), and *Invention*, for string trio (premiere, 1965). Chávez is the author of *Toward a New Music* (1937) and *Musical Thought* (1961).

Chavez, Cesar Estrada (sā'sar āstrā'tha sha'vās), 1927-, American agrarian labor leader, b. near Yuma, Ariz. A migrant worker, he became involved (1952) in the self-help Community Service Organization (CSO) in California, working among Mexicans and Mexican-Americans, from 1958 to 1962 he was its general director. In 1962, he left the CSO to organize wine grape pickers in California and formed the National Farm Workers Association. Using strikes, fasts, picketing, and marches, he was able to obtain contracts from a number of major growers. In 1966 his organization merged with the Agricultural Workers Organizing Committee of the AFL-CIO to form the United Farm Workers Organizing Committee of the AFL-CIO. Chavez also launched (1968) a boycott against the table grape growers, mobilizing consumer support throughout the United States. In 1972 the United Farm Workers (UFW), with Chavez as president, became a member union of the AFL-CIO. Chavez expanded its efforts to include all California vegetable pickers and launched a lettuce boycott, as well as extending his organizational efforts to Florida citrus workers. His successes in California were sharply diminished, however, as the result of a jurisdictional dispute with the International Brotherhood of Teamsters over the organization of field workers, in 1973 the Teamsters cut heavily into UFW membership by signing contracts with former UFW grape growers, but Chavez renewed the grape workers' strike.

Chavin de Huantar (chavēn' dā wan'tar), archaeological site in the northeastern highlands of Peru. It was probably the chief ceremonial and urban center of the earliest civilization (fl. c. 700 B.C. - c. 200 B.C.) of the Andes, now called the Chavín. Highly developed and sophisticated, the Chavín built large temples with painted relief sculpture of mythical beasts, and produced boldly designed ceramics, gold objects, and textiles. See J. Alden Mason, *Ancient Civilizations of Peru* (1961), J. H. Rowe, *Chavin Art: An Inquiry into Its Form and Meaning* (1962), E. P. Benson, ed., *Dumbarton Oaks Conference on Chavin*, 1968 (1971).

Chaykovsky, Nikolai Vasilyevich (nyikālī' vasē-lyavich chikō'skē), 1850-1926, Russian socialist. As a student in St. Petersburg he joined (1869) a utopian socialist student group (later known as the "Chay-

kovsky circle") that influenced the development of the Narodniki (populist) movement. He emigrated to the United States and established (1875) a utopian community in Kansas. It failed, and Chaykovsky moved (1880) to England, becoming active in radical émigré activities but also coming under the influence of western notions of liberal democracy. In 1905 he returned to Russia and devoted himself to promoting the cooperative movement, also becoming a leader of the People's Socialist party. After the Bolshevik revolution he headed (1918-19) the anti-Bolshevik government at Archangel under the auspices of the Allied expeditionary force. He died in exile in Paris. The name is variously spelled Chaykovsky, Tchaikovsky, and Tschaykovsky.

Chazars: see KHAZARS

Cheadle and Gatley (chē'dal, gāt'lē), urban district (1971 pop. 60,648), Cheshire, NW England. The district is both residential and industrial. Industries include engineering works and the manufacture of chemicals, drugs, and bricks. It has a 17th-century hall and a church with a 16th-century nave and two chapels. In 1974, Cheadle and Gatley became part of the new metropolitan county of Greater Manchester.

Cheaha (chē'hō), peak, 2,407 ft (734 m) high, E Ala., in the Talladega Mts., highest point in Alabama. It is included in Talladega National Forest.

Cheb (khēp), Ger. Eger, city (1970 pop. 26,051), NW Czechoslovakia, in Bohemia, near the West and East German borders. A commercial and manufacturing center in a lignite-mining area, Cheb has industries producing woolen textiles, machinery, watches, and optical goods. The city is also an important railroad junction, serving Karlovy Vary and other famous spas nearby. Originally a Slavic village, Cheb was contested and alternately ruled (12th-14th cent.) by Bohemia and by the German emperors. It was finally incorporated into Bohemia in 1322 by John of Luxembourg. The city, which suffered greatly during the Hussite Wars, retained a privileged status until the 16th cent. Industrialization and the coming of the railroad stimulated rapid growth in the 19th cent. Present-day landmarks include the ruins of a 12th-century castle, two 13th-century monasteries, and the 17th-century castle in which Wallenstein was murdered in 1634.

Chebar (kē'bar), river of Mesopotamia, by which captive Jews were settled. Ezek. 1:3, 3:15.

Cheboksary (chēbōksa'rē), city (1970 pop. 216,000), capital of Chuvash Autonomous SSR, NW European USSR, a port on the Volga River. It is the center of an agricultural region and the site of a hydroelectric station. Founded in the 14th cent. as a fortress, the city has a 17th-century cathedral.

Chechaouen (shīshō'wān) or **Xauen** (hou'ān), town (1960 pop. 13,712), N Morocco, in the Rif Mts. Because Chechaouen is a holy city of Islam, its people long discouraged Christian visitors. It was founded c. 1471 as a bulwark against the Portuguese in Ceuta. Captured by the Spanish in 1920, the town fell (1924) to Abd el-Krim in the Rif War.

Chechen-Ingush Autonomous Soviet Socialist Republic (chichēn'-inggōsh'), autonomous republic (1970 pop. 1,065,000), 7,452 sq mi (19,301 sq km), SE European USSR, in the N Caucasus. GROZNY is the capital. The Grozny fields represent a major source of Soviet oil; the republic also has sizable deposits of natural gas, limestone, marl, gypsum, alabaster, and sulfur. Mineral waters make the region an important health center. Agriculture is concentrated mainly in the valleys of the Terek and the Sunzha, the republic's chief rivers. The republic's industries include oil refining, food processing, wine and cognac making, fruit canning, and the manufacture of chemicals and oil field equipment. The population, which is concentrated in the mountain foothills, consists of Russians, Chechen, and Ingush. More than 40% of the population is urban. Both the Chechen and Ingush are Sunni Muslims and speak a Caucasian language. Known since the 17th cent., the Chechen became the most active opponents of czarist Russia's conquest and occupation (1818-1917) of the Caucasus. They fought the Russians bitterly during the SHAMYL rebellion until its collapse in 1859. The Ingush, who first settled in the lowlands in the 17th cent., were for a long time not distinguished from the Chechen. The Bolsheviks seized the region in 1918 but were dislodged the following year by counterrevolutionary forces under Gen. A. I. Denikin. With Soviet power reestablished, the area was included in 1921 in the Mountain People's Republic. The Chechen Autonomous Oblast was created in 1922 and the Ingush Autonomous Oblast in

1924, the two were joined in 1934 to form the Chechen-Ingush Autonomous Oblast, which became an autonomous republic in 1936. As a result of collaboration by Chechen and Ingush units with the invading Germans during World War II, many Chechen and Ingush were deported (1944) to Central Asia after Soviet forces drove the Germans out of the Caucasus. The deportees were returned to the Caucasus in 1956, and the republic was reestablished in 1957.

Che-chiang: see CHEKIANG, province, China

check or cheque, bill of exchange (see DRAFT) drawn upon a bank or trust company or broker connected with a clearinghouse (see CLEARING). Upon presentation of a check, the bank or other drawee pays cash to the bearer or to a specified person. Payment is made from those funds of the maker or drawer that are in a primary demand deposit account (checking account) with the drawee. The check is intended for prompt presentation, rather than for use as a continuing currency. When the check is presented, the drawee pays the designated sum to the holder and cancels the check, which is then returned to the drawer as his receipt. To prevent fraud, checks are usually of tinted paper and are filled in with ink, the figures may be punched out of the paper or embossed. Many checks also have identifying code numbers that have been printed with magnetically active ink. The numbers enable banks to clear checks mechanically and thereby speed up operations. Whether or not the check will be paid by the bank depends upon its recognition of the drawer's signature and upon the bank's confidence in the person presenting the check for payment. A bank becomes primarily liable for payment only when it "certifies" on a check that the necessary funds are in the bank to the credit of the drawer. However, a bank is usually responsible to its depositor for paying forged checks. All local checks accepted by a bank are turned over daily to a clearinghouse, which cancels checks due from and to all banks of a given neighborhood, the balances alone being paid in cash. Banks settle out-of-town checking claims by means of entries made in the books of the appropriate Federal Reserve banks. Checks were probably used in Italy in the 15th cent. and in Holland in the 16th, from where their use spread to England and the American colonies in the 17th cent. Their rise to first place as a medium of exchange in industrialized nations took place in the 19th cent., their importance varying with differences in banking facilities, the density of population, and commercial activity. About 90 percent of all transactions in the United States are said to be effected by checks.

checkerberry: see WINTERGREEN

checkers, game for two players, known in England as draughts. It is played on a square board, divided into 64 alternately colored—usually red and black or white and black—square spaces, identical with a chessboard. Each player is provided with 12 pieces (in the form of disks) of his own color, and all play is conducted on the black squares. Players sit on opposite sides of the board and alternately move their pieces diagonally in a forward direction. Upon reaching the last rank of the board, pieces are "crowned," and the kings may move both backwards and forwards diagonally. The object is to eliminate from play the opponent's pieces by "jumping" them. The game has been played in Europe since the 16th cent., and the ancients played a similar game. See Edward Lasker, *Chess and Checkers: The Way to Mastery* (3d ed. 1960), Thomas Wiswell, *The Science of Checkers and Draughts* (1973).

Cheddar, village, Somerset, SW England. It is chiefly a tourist center. Limestone is quarried, and straw-berries are grown. Nearby Cheddar Gorge towers c 400 ft (120 m) high, with imposing limestone cliffs and numerous caves from which relics of prehistoric man have been excavated. The town gives its name to the famous cheese, which has been made there since at least the 16th cent.

Cheddar cheese, hard rennet cheese. It has been a noted product of Cheddar, district of Somerset, England, for over three centuries and is now made in many other countries, especially Australia, Canada, New Zealand, and the United States.

Chedorlaomer (kēd'arī'ōmār, -lāō'-), king of Elam. With him were allied Amraphel, king of Shinar, Arioch, king of Ellasar, and Tidal, "king of nations." They attacked the Cities of the Plain and were pursued and slain by Abraham. Gen. 14:1-16.

Cheektowaga (chēk'tōwā'gə), uninc. town (1970 pop. 113,844), Erie co., W. N.Y., E. of Buffalo.

cheese, food known from ancient times and consisting of the curd of milk separated from the whey. The milk of various animals has been used in the making of cheese: the milk of mares and goats by the ancient Greeks, camel's milk by the early Egyptians, and reindeer's milk by the Laplanders. Sheep's milk and goat's milk are still widely used, but cow's milk is most common. The milk may be raw or pasteurized, sweet or sour, whole, skimmed, or with cream added. The chief milk protein, casein, is coagulated by the enzyme action of RENNET or pepsin, by lactic acid produced by bacterial action, or by a combination of the two. The draining off of the whey (milk serum) is facilitated by heating, cutting, and pressing the curd. The yield of cheese is usually about 10 lb per 100 lb of milk and is higher for the soft cheeses, which retain more moisture. The numerous cheeses (often named for their place of origin) depend for their distinctive qualities on the kind and condition of the milk used, the processes of making, and the method and extent of curing. They may be divided into two classes, hard cheeses, which improve with age under suitable conditions, and soft cheeses, intended for immediate consumption. Very hard cheeses include PARMESAN and Romano, among the hard cheeses are CHEDDAR, Edam, Emmental, Gouda, Gruyere, Provolone, and Swiss. The semisoft cheeses include brick, Gorgonzola, Limburger, ROQUEFORT, Muenster, and STILTON, some of the soft cheeses are Brie, CAMEMBERT, COTTAGE, Neufchâtel, and ricotta. Microorganisms introduced, or permitted to develop, in cheese during the ripening process impart distinctive flavors and textures. Roquefort, Stilton, and Gorgonzola owe their bluish marbling to molds, Emmental and brick are ripened by bacteria that produce gas, which is entrapped in the curd and thus forms holes. Limburger attains a creamy consistency through bacteria-ripening. During the curing period the casein is broken down into a more digestible form by enzyme action. Cheese is valuable in the diet as a source of protein, fat, insoluble minerals (calcium, phosphorus, sulfur, and iron), and, when made from whole milk, vitamin A. Process cheese is a blend of young and ripened cheeses or of different varieties, ground, heated with water and up to 3% of emulsifying salts, and poured into molds, usually loaf-shaped. It is often homogenized and pasteurized. Cheese, especially in the United States, is increasingly made in the factory by application of the principles of microbiology and chemistry. Wisconsin is the largest producer of cheese in the United States. Whey, a by-product of cheese making, consists of water, lactose, albumin, soluble minerals, fats, and proteins. Formerly wasted or used in livestock feeding, whey is now used for the preparation of milk sugar, lactic acid, glycerin, and alcohol, or is condensed and added to process cheese. It may be made into cheese such as the Scandinavian primost and mysost. See A. L. Simon, *Cheeses of the World* (2d ed. 1965), B. H. Axler, *The Cheese Handbook* (1968).

cheetah (chē'tā), carnivore of the CAT family, *Acinonyx jubatus*, found in Africa S of the Sahara and in SW Asia as far east as India. The cheetah's method of hunting deviates from that of most cats in that it runs down its prey, rather than stalking it and pouncing upon it for the kill. This doglike method of hunting is suited to its habitat, which is open grassland. The swiftest four-footed animal alive, it can achieve bursts of speed of over 60 mi (95 km) per hr and is the only animal capable of running down black bucks and gazelles. It is also unique among cats in having nonretractile claws. An average cheetah is about 2½ ft (75 cm) tall at the shoulder and weighs about 100 lb (45 kg). It has long legs and a tawny coat with closely spaced round black spots. Cheetahs are tamable and have been used for centuries in India for hunting game, they are sometimes called hunting leopards. Formerly numerous all over their range, they are now nearly extinct in India. Cheetahs are classified in the phylum CHORDATA, subphylum Vertebrata, class Mammalia, order Carnivora, family Felidae.

Cheever, John, 1912-, American author, b. Quincy, Mass. His expulsion from Thayer Academy was the subject of his first short story, published by the *New Republic* when he was 17. With meticulously rendered detail, Cheever writes about life in the affluent American suburbs. Although his works are usually comic, his view is that of a moralist, and he finds disintegration and evil in the world of plaid stamps and cocktail parties. There is often a surreal element in his stories. Among his works are the novels *The Wapshot Chronicle* (1957), *The Wapshot Scandal* (1964), and *Bullet Park* (1969), and the

short-story collections *The Brigadier and the Golf Widow* (1964) and *The World of Apples* (1973).

Chefoo: see YEN-T'AI, China

Cheju (chā'jōō), Jap. Saishu, island and province of South Korea (1970 pop. 365,522), c 700 sq mi (1,810 sq km), c 60 mi (100 km) SW of the Korean peninsula. Korea's largest island, Cheju is of volcanic origin and rises to c 6,400 ft (1,950 m) in Halla-san, an extinct volcano. Fishing, dairy farming, and livestock breeding are the chief occupations on the mountainous, heavily wooded island, agriculture is practiced on the slopes and in the valleys. The island was often used as a place of exile. After the Korean War it became a haven for refugees.

Cheka: see SECRET POLICE

Cheke, Sir John, 1514-57, English scholar. As professor of Greek at Cambridge he taught Roger Ascham and later was tutor to Edward VI. A Protestant, he was imprisoned by Mary I. Although most of his works are Latin translations from the Greek, his works in English are noted for their simple, lucid prose.

Chekhov, Anton Pavlovich (chēk'ōf, Rus. antōn' pāv'lavich chē'khav), 1860-1904, Russian short-story writer, dramatist, and physician, b. Taganrog. The son of a grocer and grandson of a serf, Chekhov earned enduring international acclaim for his stories and plays. His early works, broad humorous sketches and tales published under a pseudonym, were written to support himself and his family while he studied for his medical degree in Moscow. Under this strain he contracted tuberculosis, which ravaged him all his life. Chekhov's first large collection, *Motley Stories* (1886), brought him critical respect, it was followed by the collections *At Twilight* (1887) and *Stories* (1888), from which "The Steppe" won for him the Pushkin Prize. Chekhov's many hundreds of stories concern human folly, the tragedy of trivialities, and the oppression of banality. His characters are drawn with compassion and humor in a clear, simple style noted for realistic detail. In his plays as well as his stories Chekhov emphasizes character and mood, his plots describe the desolation of lonely men and the misunderstandings that accrue from self-absorption and desperation. His focus on internal drama was an innovation that had enormous influence on both Russian and foreign writing. Chekhov was an active humanitarian. In 1890 he wrote *The Island of Sakhalin*, a study of the lives of convicts that helped to effect social reform, as a physician he fought two cholera epidemics. Chekhov wrote several farces related to his early stories, but his first major drama to be produced was *Ivanov* (1887). His success as a dramatist was assured when the burgeoning Moscow Art Theatre took his works for their own and built superb productions of them, beginning with *The Seagull* in 1898. They followed this with his masterpieces *Uncle Vanya* (1899), *The Three Sisters* (1901), and *The Cherry Orchard* (1904), his last great work. Among the finest works of Chekhov's later years are his hundreds of letters to notable contemporaries. For the final three years of his life Chekhov was happily married to Olga Knipper, an actress with the Moscow Art company, and although they were often separated, they were together at a German health resort when he died, at 44. Most of Chekhov's works are available in English. Several lesser-known works appear in Avrahm Yarmolinsky, *The Unknown Chekhov* (1954). See his letters, ed. by Simon Karlinsky (1973) and Avrahm Yarmolinsky (1973), biographies by David Magarshack (1952, repr. 1960), E. J. Simmons (1962), and Daniel Gilles (tr. 1968), studies of his prose by T. G. Winner (1966) and V. L. Smith (1973), studies of his plays by Maurice Valency (1966), J. L. Styan (1971), and David Magarshack (1973), critical essays, ed. by R. L. Jackson (1967).

Chekiang (chē'kyāng', jū'jēang'), Mandarin *Che-chiang*, province (1968 est. pop. 31,000,000), c 40,000 sq mi (103,600 sq km), SE China, on the East China Sea. The capital is HANGCHOW. The province includes many islands, notably the CHOU-SHAN ARCHIPELAGO. Except for the level area in the north, which is part of the Yangtze deltaic region, Chekiang is mountainous, with only a few breaks to the heavily indented coast, chiefly at Ning-po and Wenchow. The province is drained by numerous rivers, including the Ch'ien-t'ang (the main river), the Wu, and the Ling. Over one third of the area is forested, pine and bamboo predominate. Most of Chekiang has a wet climate, with a long frost-free period and high summer temperatures. Rice is the leading food crop and tea the major industrial crop. The plains N of Hangchow receive less precipitation and have high cotton, wheat, and hemp production, most of the cotton is woven in Shanghai, although there are tex-

tile mills in Hangchow, the only population center in the province with any significant industry. Rape-seed, corn, and sweet potatoes are also grown. There are tung and mulberry trees, and silk is produced, although nowhere near prewar levels when Chekiang was the country's major silk-producing province. Fishing is extensive, with motorized junks now in use, the Chou-shan island area is one of the richest fishing grounds in China. Iron, aluminum, coal, and fluorspar are mined in the province. Chekiang is served by the Shanghai-Hangchow-Nanch'ang RR, which has a branch to Ning-po. Chekiang, part of the kingdom of Wu, passed into the Chinese orbit in the 3d cent. B.C. It flourished in the 12th and 13th cent. as the center of the Southern Sung dynasty. Originally called Yueh for its local tribes, Chekiang received its present name (the ancient name of the Ch'ien-t'ang River) in the Ming dynasty (1368-1644). It passed to Manchu control in 1645. Chekiang was devastated in the Taiping Rebellion (1850-65), was partly occupied by the Japanese in the Second Sino-Japanese War, and fell to the Communists in 1949. T'ienmu Mt. is a tourist and pilgrimage center, with many temples. Chekiang Univ. is in Hangchow.

Chelal (kē'lāl), Israelite of the return who married a foreign wife. Ezra 10:30.

Chelan, Lake, 55 mi (89 km) long and from 1 to 2 mi (1.6-3.2 km) wide, located in a deep narrow gorge in the Cascade Range, NW Wash., third-deepest freshwater lake in the United States. Fed by streams from the Cascade Range, the lake flows into the Columbia River via the Chelan River. Lake Chelan Dam, built at the lake's outlet, generates electricity. The northern part of the lake is part of the Lake Chelan National Recreation Area (see NATIONAL PARKS AND MONUMENTS, table).

chelating agents. Certain organic compounds are capable of forming coordinate bonds (see CHEMICAL BOND) with metals through two or more atoms of the organic compound, such organic compounds are called chelating agents. The compound formed by a chelating agent and a metal is called a chelate. A chelating agent that has two coordinating atoms is called bidentate, one that has three, tridentate, and so on. EDTA, or ethylenediaminetetraacetate, $(\text{O}_2\text{CH}_2)_2\text{NCH}_2\text{CH}_2\text{N}(\text{CH}_2\text{CO}_2^-)_2$, is a common hexadentate chelating agent. Chlorophyll is a chelate that consists of a magnesium ion joined with a complex chelating agent, heme, part of the hemoglobin in blood, is an iron chelate. Chelating agents are important in textile dyeing, water softening, and enzyme deactivation and as bacteriocides.

Chélif (shā'lēf'), river, c. 420 mi (680 km) long, N Algeria. It rises in the Amour mts. of the Saharan Atlas and empties into the Mediterranean Sea near Mostaganem. The Chélif, the longest river in Algeria, is not navigable, but its waters are used for irrigation and hydroelectric power.

Chellean-Abbevillian. see PALEOLITHIC PERIOD.

Chellean man: see HOMO ERECTUS.

Chelluh (kē'lā), Jew who married a foreign wife. Ezra 10:35.

Chelm (khēlm), Rus. *Kholm*, city (1970 pop. 38,789), E Poland. It is a railway junction and has industries manufacturing metals, farm tools, machinery, furniture, and liquors. An old Slavic settlement, Chelm was chartered in 1233. It passed to Poland in 1377, to Austria in 1795, and to Russia in 1815. The Treaty of Brest-Litovsk (1918) transferred the city to Ukraine, but it passed to Poland in 1921. After Chelm was freed from German occupation in World War II, the new Polish republic was proclaimed there (July 22, 1944) by the Polish Committee of National Liberation. Chelm is noted for its cathedral.

Chelmno, (khēlm'nō), Ger. *Kulm*, city (1970 pop. 38,800), N central Poland. Its industries manufacture metals, bricks, and farm tools. Chartered in 1223, it was transferred to the Teutonic Knights in 1228, passed to Poland in 1466, and was included in Prussia in 1772. It reverted to Poland in 1919. Among its historic buildings are two Gothic churches and a 16th-century town hall.

Chelmsford, Frederic John Napier Thesiger, 3d Baron and 1st Viscount (nā'pēār, thēs'ijār, chēlms'fārd), 1868-1933, British colonial administrator. After serving as governor of Queensland and New South Wales in Australia (1905-13), he went to India, becoming viceroy in 1916. His regime was noteworthy for the Montagu-Chelmsford Report (1918), produced in collaboration with Edwin Montagu, secretary of state for India, which recommended a large measure of self-government for the Indians. The ensuing reforms were limited, however,

dividing responsibility so as to make government difficult, and were opposed by Mohandas Gandhi. Before the reforms were implemented, growing disorders led to the massacre at AMRITSAR (1919). Chelmsford returned to England in 1921 and was created a viscount. He served as first lord of the admiralty in the Labour government of 1924.

Chelmsford, municipal borough (1971 pop. 58,125), county town of Essex, SE England. It is a market center (especially for cattle) for the surrounding agricultural district. Manufactures include electrical equipment, radios, ball bearings, rope, and agricultural equipment. Other industries are milling and malting. A Roman town on this site was excavated in 1849.

Chelmsford (chēmz'fārd, chēlmz'-), town (1970 pop. 31,432), Middlesex co., NE Mass., inc. 1655. It is chiefly a residential town with wool and nylon industries and granite quarries.

Chelsea, England. see KENSINGTON AND CHELSEA.

Chelsea, city (1970 pop. 30,625), Suffolk co., E Mass., a suburb of Boston, settled 1624, inc. as a town 1739, as a city 1857. Its industries include printing and the manufacture of rubber and plastic products, electrical machines, shoes and shoe accessories, and paint. Oil storage tanks line Chelsea's docks, which connect with the Atlantic by way of the Chelsea River. From 1624 to 1739, Chelsea was part of Boston and was called Winnisimmet. At the battle of Chelsea Creek (1775) Revolutionary forces made one of their first captures of a British ship. During the siege of Boston (1775-76), one wing of George Washington's army was stationed at Chelsea. George Washington slept at the Cary-Bellingham House, which was built in 1659 and remains standing.

Chelsea ware, chinaware made in the mid-18th cent. at a factory in Chelsea, London. The earliest specimens extant are dated 1745 and have the potter's mark of a triangle and the word *Chelsea*. Nicholas Sprimont in the late 1740s directed the factory's production. An extremely fine ware was developed, inspired perhaps by Sevres porcelain. The mid-1750s, during which a red anchor mark was employed, saw the production of what are considered to be among the best of European porcelains. They are often based on designs of Meissen ware and have a soft, clear white body and clean soft colors. There was also a deep blue, gold-decorated type. Characteristic figure subjects were produced, as were miniatures for curtain tiebacks, scent bottles, dressing-table accessories, and toys. The soft paste of which the china was made lent itself to both modeling and painting. The plant was merged with the Derby factory in 1770. See study by William King (1922).

Cheltenham (chēlt'nəm), municipal borough (1971 pop. 69,734), Gloucestershire, W central England. It has been a health and holiday resort since the discovery of mineral springs in 1716. Products include bricks, beer, rubber goods, and anesthetics. There are numerous Regency houses, Georgian squares, and parks and gardens. Cheltenham has three famous schools for boys and one for girls and two teacher training colleges. Cheltenham is the site of an annual Festival of British Contemporary Music, a Festival of Literature, and several other similar events.

Chelub (kē'lāb) 1. Judahite. 1 Chron. 4:11. 2. Father of David's officer Ezri. 1 Chron. 27:26.

Chelubai (kēlyōō'bī), the same as CALEB.

Chelyabinsk (chēlyā'bīnsk), city (1970 pop. 875,000), capital of Chelyabinsk oblast, W Siberian USSR, in the southern foothills of the Urals and on the Mias River. It also lies on the Trans-Siberian RR. One of the major metallurgical and industrial centers of the USSR, Chelyabinsk produces steel and agricultural machinery and processes ore. Founded in 1736 as a Russian frontier outpost, it was chartered in the 1740s and grew into an agricultural and coal-trading town. Its industrial growth began with the building of its first steel plant in 1930.

Chelyuskin, Cape (chēlyōō'skīn), northernmost point (lat. 77°43'N) of Asia, Krasnoyarsk Krai, N central Siberian USSR. It is named after the Russian navigator who discovered it in 1742.

Chemarims (kēm'ārims), Gentile priests, a term left untranslated in Zeph. 1:4 only.

chemical analysis, the study of the chemical composition and structure of substances. More broadly, it may be considered the corpus of all techniques whereby any exact chemical information is obtained. There are two branches in analytical chemistry: qualitative analysis and quantitative analysis. Qualitative analysis is the determination of those

elements and compounds that are present in a sample of unknown material. Quantitative analysis is the determination of the amount by weight of each element or compound present. The procedures by which these aims may be achieved include testing for the chemical reaction of a putative constituent with an admixed reagent or for some well-defined physical property of the putative constituent. Classical methods include use of the analytical balance, gas manometer, buret, and visual inspection of color change. Gas and paper chromatography are particularly important modern methods. Physical techniques such as use of the mass spectrometer are also employed. For samples in the gaseous state, optical spectroscopy provides the best technique for determining which atomic and molecular species are present.

chemical bond, mechanism whereby atoms combine to form MOLECULES. There is a chemical bond between two atoms or groups of atoms when the forces acting between them are strong enough to lead to the formation of an aggregate with sufficient stability to be regarded as an independent species. The number of bonds an atom forms corresponds to its VALENCE. The amount of energy required to break a bond and produce neutral atoms is called the bond energy. All bonds arise from the attraction of unlike charges according to Coulomb's law, however, depending on the atoms involved, this force manifests itself in quite different ways. The principal types of chemical bond are the ionic, covalent, metallic, and hydrogen bonds. The ionic bond results from the attraction of oppositely charged ions. The atoms of metallic elements, e.g., those of sodium, lose their outer electrons easily, while the atoms of nonmetals, e.g., those of chlorine, tend to gain electrons. The highly stable ions that result retain their individual structures as they approach one another to form a stable molecule or crystal. In an ionic crystal like sodium chloride, no discrete diatomic molecules exist; rather, the crystal is composed of independent Na^+ and Cl^- ions, each of which is attracted to neighboring ions of the opposite charge. Thus the entire crystal is a single giant molecule. A single covalent bond is created when two atoms share a pair of electrons. There is no net charge on either atom, the attractive force is produced as the electron pair shuttles back and forth between the two atoms. If the atoms share more than two electrons, double and triple bonds are formed, because each shared pair produces its own bond. By sharing their electrons, both atoms are able to achieve a highly stable electron configuration corresponding to that of an INERT GAS. For example, in methane (CH_4), carbon shares an electron pair with each hydrogen atom, the total number of electrons shared by carbon is eight, which corresponds to the number of electrons in the outer shell of neon, each hydrogen shares two electrons, which corresponds to the electron configuration of helium. In most covalent bonds, each atom contributes one electron to the shared pair. In certain cases, however, both electrons come from the same atom. As a result, the bond has a partly ionic character and is called a coordinate link. Actually, the only purely covalent bond is that between two identical atoms. The ionic and covalent bonds are idealized cases, most bonds are of an intermediate type. Covalent bonds are of particular importance in organic chemistry because of the ability of the carbon atom to form four covalent bonds. These bonds are oriented in definite directions in space, giving rise to the complex geometry of organic molecules. If all four bonds are single, as in methane, the shape of the molecule is that of a tetrahedron. The importance of shared electron pairs was first realized by the American chemist G. N. Lewis (1916), who pointed out that very few stable molecules exist in which the total number of electrons is odd. His octet rule allows chemists to predict the most probable bond structure and charge distribution for molecules and ions. With the advent of quantum mechanics, it was realized that the electrons in a shared pair must have opposite spin, as required by the PAULI EXCLUSION PRINCIPLE. THE MOLECULAR ORBITAL THEORY was developed to predict the exact distribution of the electron density in various molecular structures. The American chemist Linus Pauling introduced the concept of resonance to explain how stability is achieved when more than one reasonable molecular structure is possible. The actual molecule is a coherent mixture of the two structures and oscillates rapidly between them. Unlike the ionic and covalent bonds, which are found in a great variety of molecules, the metallic and hydrogen bonds are highly specialized. The metallic bond is responsible

for the crystalline structure of pure metals. This bond cannot be ionic because all the atoms are identical, nor can it be covalent, in the ordinary sense, because there are too few valence electrons to be shared in pairs among neighboring atoms. Instead, the valence electrons are shared collectively by all the atoms in the crystal. The electrons behave like a free gas moving within the lattice of fixed positive ionic cores. The extreme mobility of the electrons in a metal explains its high thermal and electrical conductivity. Hydrogen bonding is a strong electrostatic attraction between two independent polar molecules, i.e., molecules in which the charges are unevenly distributed, usually containing nitrogen, oxygen, or fluorine. These elements have strong electron-attracting power, and the hydrogen atom serves as a bridge between them. The hydrogen bond, which plays an important role in molecular biology, is much weaker than the ionic or covalent bonds. It is responsible for the structure of ice. See Linus Pauling, *The Nature of the Chemical Bond* (3d ed. 1960).

chemical engineering: see **ENGINEERING**

chemical equation, group of symbols representing a **CHEMICAL REACTION**. The chemical equation $2\text{H}_2 + \text{O}_2 \rightarrow 2\text{H}_2\text{O}$ represents the reaction of hydrogen and oxygen to form water. The arrow points in the direction of the reaction—from the reactants (substances that react) toward the product or products. In this case the reactants are hydrogen (written H_2 because each molecule consists of two atoms of hydrogen) and oxygen (written O_2 because each molecule consists of two atoms of oxygen) and the product is water. The coefficient 2 before the H_2 indicates that two molecules of hydrogen take part in the reaction, and the 2 before the H_2O indicates that two molecules of water are produced. When no number is written, as in front of the O_2 , a one is assumed, one molecule of oxygen takes part in the reaction. The equation shows that two molecules of hydrogen react with one molecule of oxygen to form two molecules of water. Because of the relationship between molecules and the **MOLE**, the equation also shows that two moles of hydrogen react with one mole of oxygen to form two moles of water. The same sort of relationship holds with the **GRAM-FORMULA WEIGHT**. There are three steps involved in writing a chemical equation. The first step is to decide which substances are the reactants and which are the products. For example, natural gas (cooking gas) burns in air, providing heat and producing no visible products. The natural gas is principally methane, and the portion of the air that reacts (supports combustion) is oxygen. These are the reactants. Products of the reaction are heat and two invisible gases, carbon dioxide and water vapor. We can now write the word equation methane + oxygen → carbon dioxide + water vapor + heat. The next step is to determine the correct formula for each substance and substitute it for the name. The equation now becomes $\text{CH}_4 + \text{O}_2 \rightarrow \text{CO}_2 + \text{H}_2\text{O}$ (A notation for heat is often omitted.) The final step is to balance this equation. As the equation is now written, three oxygen atoms are produced from two, and four hydrogen atoms become only two. This cannot occur, since atoms are not created or destroyed in chemical reactions. The equation is already balanced for carbon, since there is one carbon atom on the reactant side and one carbon atom on the product side. There are four hydrogen atoms in the methane molecule on the reactant side, so there must be four hydrogen atoms in water molecules on the product side (since water is the only product containing hydrogen), thus there must be two water molecules, each containing two hydrogen atoms. The equation can now be written $\text{CH}_4 + \text{O}_2 \rightarrow \text{CO}_2 + 2\text{H}_2\text{O}$. It is not yet balanced, since there are only two oxygen atoms shown as reactants and four as products. The equation is completely balanced by showing two oxygen molecules (four atoms) as reactants $\text{CH}_4 + 2\text{O}_2 \rightarrow \text{CO}_2 + 2\text{H}_2\text{O}$. There are a number of other symbols used in chemical equations. A symbol written above or below the reaction arrow indicates special reaction conditions. For example, when mercuric oxide is heated it decomposes into mercury metal and oxygen gas, this reaction is shown by the equation $2\text{HgO} \xrightarrow{\Delta} 2\text{Hg} + \text{O}_2 \uparrow$. The Greek letter delta under the arrow represents the heating. The upward-pointing arrow after the O_2 indicates that this product is gaseous and escapes. When a precipitate is formed by a reaction, the substance that precipitates is often followed by a downward-pointing arrow, e.g., $\text{AgNO}_3 + \text{NaCl} \rightarrow \text{AgCl} \downarrow + \text{NaNO}_3$. The H_2O above the arrow shows that the reaction takes place in the presence of water—in this case, in water solution. The formulas AgNO_3 , NaCl , and NaNO_3 do not

represent molecules, since these substances are almost completely ionized in water solution (See **ION**). When **CHEMICAL EQUILIBRIUM** occurs in a reaction, the double arrow (\rightleftharpoons) is used instead of the single arrow. For example, liquid water dissociates to form hydronium ions (H_3O^+) and hydroxide ions (OH^-). These ions exist in equilibrium with water molecules. The equation is $2\text{H}_2\text{O} \xrightleftharpoons{\text{H}_2\text{O}} \text{H}_3\text{O}^+ + \text{OH}^-$. The sign \rightleftharpoons is sometimes used in place of the double arrow.

chemical equilibrium, state of balance in which two opposing reversible **CHEMICAL REACTIONS** proceed at constant equal rates with no net change in the system. For example, when hydrogen gas, H_2 , and iodine gas, I_2 , are mixed, and gaseous hydrogen iodide, HI , is formed according to the equation $\text{H}_2 + \text{I}_2 \rightarrow 2\text{HI}$, no matter how long the reaction is allowed to proceed some quantity of hydrogen and iodine will remain unreacted. The reason reactants in a reversible reaction are never completely converted to product is that an opposing reaction is taking place simultaneously, i.e., some of the newly formed HI is being converted back into hydrogen and iodine. For any particular temperature, a point of equilibrium is reached at which the rates of the two opposing reactions are equal and there is no further change in the system. This equilibrium point is characterized by specific relative concentrations of reactants and products and will also be reached from the opposite direction, i.e., if one starts with hydrogen iodide and allows it to decompose into hydrogen and iodine. The equilibrium point can be described by the mass action expression, which defines the equilibrium constant, K_{eq} , in terms of the ratio of the molar concentrations of the products to those of the reactants. For the reversible reaction used as an example, the equilibrium constant is $K_{eq} = [\text{HI}]^2 / [\text{H}_2][\text{I}_2]$, for the general reversible reaction $n\text{A} + m\text{B} \rightleftharpoons p\text{C} + q\text{D}$, the equilibrium constant is

$$K_{eq} = \frac{[\text{C}]^p [\text{D}]^q \dots}{[\text{A}]^n [\text{B}]^m}$$

where $[\text{A}]$, $[\text{B}]$, $[\text{C}]$, $[\text{D}]$, are the molar concentrations of the substances and n , m , p , q , are the coefficients of the balanced chemical equation. The larger the equilibrium constant for a given reaction, the more the reaction is favored, since a larger value of K_{eq} means larger concentrations of the products relative to the reactants. The equilibrium constant is related to the change in the standard free energy, G° , of the system by the equation $\Delta G^\circ = -RT \ln K_{eq}$, where R is a constant, T is the temperature in degrees Kelvin, and $\ln K_{eq}$ is the natural logarithm of the equilibrium constant. Chemical equilibrium can be defined for many types of chemical processes, such as dissociation of a weak acid in solution, solubility of slightly soluble salts, and oxidation-reduction reactions. In all of these cases, the equilibrium constant or its analogue is defined for certain conditions of temperature and other factors. If any of these factors change, the system will respond to establish a new equilibrium, in accordance with **LE CHÂTELIER'S PRINCIPLE**.

chemical kinetics: see **CHEMICAL REACTION**

chemical reaction, process by which one or more substances may be transformed into one or more new substances. Energy is released or is absorbed, but no loss in total molecular weight occurs. When, for example, water is decomposed, its molecules, each of which consists of one atom of oxygen and two of hydrogen, are broken down, the hydrogen atoms then combine in pairs to form hydrogen molecules and the oxygen atoms to form oxygen molecules. In a chemical reaction, substances lose their characteristic properties. Water, for example, a liquid which neither burns nor supports combustion, is decomposed to yield flammable hydrogen and combustion-supporting oxygen. In some reactions heat is given off (exothermic reactions), and in others heat is absorbed (endothermic reactions). Furthermore, the new substances formed differ from the original substances in the energy they contain. Chemical reactions are classified according to the kind of change that takes place. When a compound, which consists of two or more elements or groups of elements, is broken down into its constituents, the reaction is called simple decomposition. When two compounds react with one another to form two new compounds, the reaction is called double decomposition. In so-called replacement reactions the place of one of the elements in a compound is taken by another element reacting with the compound. When elements combine to form a compound, the reaction is termed chemical combina-

tion. **OXIDATION AND REDUCTION** reactions are extremely important. Reversible reactions are those in which the chemical change taking place may be paralleled by another change back to the original substances. The rates at which chemical reactions proceed depend upon various factors, e.g., upon temperature, pressure, and the concentration of the substances involved and, sometimes, upon the use of a chemical called a **CATALYST**. In some chemical reactions, such as that of photographic film, light is an important factor. The changes taking place in a chemical reaction are represented by a **CHEMICAL EQUATION**. An element's activity, i.e., its tendency to enter into compounds, varies from one element to another.

chemical warfare, employment in war of flame, incendiaries, smoke, poison gases, and other toxic substances. In earliest recorded history, armies attacking or defending fortified cities threw burning oil and flaming fireballs upon each other. A primitive type of **FLAMETHROWER** was employed as early as the 5th cent. B.C., modern types are still in use. In the Middle Ages before the introduction of gunpowder a flammable composition known as **GREEK FIRE** was widely used. Smoke from burning straw or other material was employed in early times, but its effectiveness is uncertain. By the middle of the 19th cent. the potentialities of **POISON GAS** were envisioned. It was effectively employed during World War I, when the Germans released (April, 1915) chlorine gas against the Allies. The Germans also introduced **MUSTARD GAS** later in the war. Afterward, the major powers continued to stockpile gases for possible future use. Lethal types were not employed during World War II. The Germans did, however, invent and stockpile a form of nerve gas during the war, it is odorless and colorless and attacks the body muscles, including the involuntary muscles. It is the most lethal and insidious weapon of chemical warfare. Besides potentially lethal gases, which attack the skin, blood, or nervous or respiratory system and require hospitalization of the victim, there are also nonlethal incapacitating agents, which, like **TEAR GAS**, cause temporary physical disability or, like **LSD-25**, produce temporary mental effects, such as confusion, fright, or stupor. Such agents may be employed in riot control as well as in warfare. Various forms of defoliants can also be used to destroy crops or clear away heavy vegetation, the latter operation was employed by the United States as an antiguerrilla tactic during the Vietnam War. The potential effectiveness of chemical warfare is increased by the development of modern methods of dissemination, e.g., chemical agents can be disseminated in artillery shells, grenades, or missiles, or by burning-type generators that use heat to vaporize and spread the chemical. See Stockholm International Peace Research Institute (SIPRI), *The Problems of Chemical and Biological Warfare* (Vols. I, IV, V, 1971-).

chemin de fer (shāmān' də fūr, Fr. shāmāN' də fēr) [Fr. = railroad], gambling card game popular in France. It differs from **BACCARAT**, which it replaced in popularity, in that there are usually ten or more players and the bank moves from player to player in rotation.

Chemin des Dames (shāmāN' də dam) [Fr. = ladies' road], road running along a crest between the Aisne and Ailette rivers, N. France. Built during Roman times, the road was the site of the battle (57 B.C.) in which Julius Caesar defeated the Gauls. Chemin des Dames received its name in the 18th cent. when Louis XV's daughters traveled along the road to Bove Castle with their ladies-in-waiting. During World War I the Germans held the road.

chemistry, branch of **SCIENCE** concerned with the properties, composition, and structure of substances and the changes they undergo when they combine or react under specified conditions. Chemistry can be divided into branches according to either the substances studied or the types of study conducted. The primary division of the first type is between inorganic and **ORGANIC CHEMISTRY**. Divisions of the second type are physical chemistry and analytical chemistry. The original distinction between organic and inorganic chemistry arose as chemists gradually realized that compounds of biological origin were quite different in their general properties from those of mineral origin, organic chemistry was defined as the study of substances produced by living organisms. However, when it was discovered in the 19th cent. that organic molecules can be produced artificially in the laboratory, this definition had to be abandoned. Organic chemistry is most simply defined as the study of the compounds of carbon.

Physical chemistry is concerned with the physical properties of materials, such as their electrical and magnetic behavior and their interaction with electromagnetic fields. Subcategories within physical chemistry are thermochemistry, ELECTROCHEMISTRY, and chemical kinetics. Thermochemistry is the investigation of the changes in ENERGY and ENTROPY that occur during chemical reactions and phase transformations (see STATES OF MATTER). Electrochemistry concerns the effects of electricity on chemical changes and interconversions of electric and chemical energy such as that in a voltaic cell. Chemical kinetics is concerned with the details of chemical reactions and of how equilibrium is reached between the products and reactants. Analytical chemistry is a collection of techniques that allows exact laboratory determination of the composition of a given sample of material. In qualitative analysis, all the atoms and molecules present are identified, with particular attention to trace elements. In quantitative analysis, the exact weight of each constituent is obtained as well. Stoichiometry is the branch of chemistry concerned with the weights of the chemicals participating in chemical reactions. The earliest practical knowledge of chemistry was concerned with METALLURGY, pottery, and dyes, these crafts were developed with considerable skill, but with no understanding of the principles involved, as early as 3500 B.C. in Egypt and Mesopotamia. The basic ideas of element and compound were first formulated by the Greek philosophers during the period from 500 to 300 B.C. Opinion varied, but it was generally believed that four elements (fire, air, water, and earth) combined to form all things. Aristotle's definition of a simple body as "one into which other bodies can be decomposed and which itself is not capable of being divided" is close to the modern definition of element. About the beginning of the Christian era in Alexandria, the ancient Egyptian industrial arts and Greek philosophical speculations were fused into a new science. The beginnings of chemistry, or ALCHEMY, as it was first known, are mingled with occultism and magic. Interests of the period were the transmutation of base metals into gold, the imitation of precious gems, and the search for the elixir of life, thought to grant immortality. Muslim conquests in the 7th cent. A.D. diffused the remains of Hellenistic civilization to the Arab world. The first chemical treatises to become well known in Europe were Latin translations of Arabic works, made in Spain A.D. c. 1100, hence it is often erroneously supposed that chemistry originated among the Arabs. Alchemy developed extensively during the Middle Ages, cultivated largely by itinerant scholars who wandered over Europe looking for patrons. In the hands of the "Oxford Chemists" (Robert Boyle, Robert Hooke, and John Mayow) chemistry began to emerge as distinct from the pseudoscience of alchemy. Boyle (1627-91) is often called the founder of modern chemistry (an honor sometimes also given Antoine Lavoisier, 1743-94). He performed experiments under reduced pressure, using an air pump, and discovered that volume and pressure are inversely related in gases (see GAS LAWS). Hooke gave the first rational explanation of COMBUSTION—as combination with air—while Mayow studied animal respiration. Even as the English chemists were moving toward the correct theory of combustion, two Germans, J. J. Becher and G. E. Stahl, introduced the false phlogiston theory of combustion, which held that the substance phlogiston is contained in all combustible bodies and escapes when the bodies burn. The discovery of various gases and the analysis of air as a mixture of gases occurred during the phlogiston period. Carbon dioxide, first described by J. B. van Helmont and rediscovered by Joseph Black in 1754, was originally called fixed air. Hydrogen, discovered by Boyle and carefully studied by Henry Cavendish, was called inflammable air and was sometimes identified with phlogiston itself. Cavendish also showed that the explosion of hydrogen and oxygen produces water. C. W. Scheele found that air is composed of two fluids, only one of which supports combustion. He was the first to obtain pure oxygen (1771-73), although he did not recognize it as an element. Joseph Priestley independently discovered oxygen by heating the red oxide of mercury with a burning glass, he was the last great defender of the phlogiston theory. The work of Priestley, Black, and Cavendish was radically reinterpreted by Lavoisier, who did for chemistry what Newton had done for physics a century before. He made no important new discoveries of his own, rather, he was a theoretician. He recognized the true nature of combustion, introduced a new chemical nomenclature, and wrote the first

modern chemistry textbook. He erroneously believed that all acids contain oxygen. The assumption that compounds were of definite composition was implicit in 18th century chemistry. J. L. Proust formally stated the law of constant proportions in 1797. C. L. Berthollet opposed this law, holding that composition depended on the method of preparation. The issue was resolved in favor of Proust by John Dalton's atomic theory (1808). The atomic theory goes back to the Greeks, but it did not prove fruitful in chemistry until Dalton ascribed relative weights to the atoms of chemical ELEMENTS. Electrochemical theories of chemical combinations were developed by Humphry Davy and J. J. Berzelius. Davy discovered the alkali metals by passing an electric current through their molten oxides. Michael Faraday discovered that a definite quantity of charge must flow in order to deposit a given weight of material in solution. Amedeo Avogadro introduced the hypothesis that equal volumes of gases at the same pressure and temperature contain the same number of molecules. William Prout suggested that all elements are composed of hydrogen atoms. Organic chemistry developed extensively in the 19th cent., prompted in part by Friedrich Wohler's synthesis of urea (1828), which disproved the belief that only living organisms could produce organic molecules. Other important organic chemists include Justus von Liebig, C. A. Wurtz, and J. B. Dumas. In 1852, Edward Frankland introduced the idea of valency (see VALENCE), and in 1858 F. A. Kekule showed that carbon atoms are tetravalent and are linked together in chains. Kekule's ring structure for benzene opened the way to modern theories of organic chemistry. Henri Louis Le Châtelier, J. H. van't Hoff, and Wilhelm Ostwald pioneered the application of thermodynamics to chemistry. Further contributions were the phase rule of J. W. Gibbs, the ionization equilibrium theory of S. A. Arrhenius, and the heat theorem of Walther Nernst. Ernst Fischer's work on the amino acids marks the beginning of molecular biology. The PERIODIC TABLE of the elements is the culmination of a long effort to find regular, systematic properties among the elements. PERIODIC LAWS were put forward almost simultaneously and independently by J. L. Meyer in Germany and D. I. Mendeleev in Russia (1869). An early triumph of the new theory was the discovery of new elements that fit the empty spaces in the table. William Ramsay's discovery, in collaboration with Lord Rayleigh, of argon and other inert gases in the atmosphere extended the periodic table. At the end of the 19th cent., the discovery of the ELECTRON by J. J. Thomson and of RADIOACTIVITY by A. E. Becquerel revealed the close connection between chemistry and PHYSICS. The work of Ernest Rutherford, H. G. J. Moseley, and Niels Bohr on atomic structure (see ATOM) was applied to molecular structures. G. N. Lewis, Irving Langmuir, and Linus Pauling developed the electronic theory of CHEMICAL BONDS, directed valency, and molecular orbitals (see MOLECULAR ORBITAL THEORY). Transmutation of the elements, first achieved by Rutherford, has led to the creation of elements not found in nature, in work led by Glenn Seaborg, elements heavier than uranium have been produced. See Linus Pauling, *College Chemistry* (3d ed 1964), J. H. Hildebrand and R. E. Powell, *Principles of Chemistry* (7th ed 1964), Isaac Asimov, *A Short History of Chemistry* (1965), J. R. Partington, *A Short History of Chemistry* (3d ed 1960, repr 1965), A. J. Berry, *From Classical to Modern Chemistry* (1954, repr 1968), J. V. Quagliano and L. M. Vallarino, *Chemistry* (3d ed 1969), L. P. Eblin, *The Elements of Chemistry* (2d ed 1970), M. J. Sienko and R. A. Plane, *Chemistry* (4th ed, 1971).

Chemnitz or **Kemnitz**, Martin (both kēm'nīts), 1522-86, German Lutheran theologian. Under the tutelage of Philip MELANCHTHON, he accepted and defended Lutheran doctrine, both in lecturing and in writing. Largely through his endeavors the Formula of Concord, one of the nine creeds of the Book of Concord, was adopted by the Lutherans of Saxony and Swabia.

Chemnitz: see KARL MARX STADT, East Germany.

Chemosh (kēm'ōsh), god of the Moabites. Solomon erected an altar to him at Jerusalem, Josiah destroyed it. Num. 21:29, 1 Kings 11:7, 2 Kings 23:13, Jer. 48:7,13,46. See MILCOM.

chemosphere: see ATMOSPHERE.

chemosynthesis: see AUTOTROPH.

chemotaxis: see TAXIS.

chemotherapy, treatment of disease with chemicals or DRUGS. One chemotherapeutic approach is the development of selectively toxic substances, i.e., substances that can destroy or inhibit infecting or-

ganisms or, as in cancer, malignant tissue, but do not damage normal host tissue. In treating infection, selectively toxic agents may block a biochemical reaction necessary to the viability of the pathogen but not to that of the host, for example, PENICILLIN blocks synthesis of bacterial cell walls, a component animal cells lack. Other chemotherapeutic substances differentially affect biochemical reactions in different tissues, thus antimetabolites such as METHOTREXATE and CYTOXAN are more toxic to rapidly proliferating cells such as those associated with cancer than to normal cells. Other drugs act in various ways to produce effects that initiate or enhance some normal body function, for instance, neostigmine blocks the action of an enzyme limiting transmission of nerve impulses and thereby acts as a nervous system stimulant. The usefulness of chemotherapeutic agents also depends on their pharmacological action, e.g., their rate of absorption, rapidity of action and rate of excretion, degree of storage in the body, effects of products of their metabolic breakdown, and potential for causing HYPERSENSITIVITY reactions. Some drugs are given prophylactically, to prevent infection, e.g., penicillin is given to rheumatic fever patients to prevent reinfection by the causative organism, the streptococcal bacterium.

chemotroph: see AUTOTROPH.

Chemulpo: see INCHON, Korea.

Chemung (shīmūng'), river, c. 45 mi (70 km) long, formed in S central N.Y. by the junction of the Cohocton and Tioga rivers near Corning, N.Y., and flowing SE past Elmira to the Susquehanna River near Sayre, Pa. The Chemung valley was the scene of fighting in the Revolutionary campaign of John Sullivan, the battle of Newtown occurred in 1779 near the site of Elmira.

chemurgy (kēm'arjē), branch of applied chemistry concerned with preparing industrial products from agricultural raw materials. Among such products are plastics manufactured from casein and soybean, soaps derived from animal and vegetable fats, cellulose fiber products made from, for example, straws, stubble, cobs, and hulls, and starches derived from surplus grains. Chemurgy is a wide-ranging discipline involving chemistry, genetics, bacteriology, and physics.

Chenaanah (kēnā'ānā, -nā-ā'-) 1 'Benjamite' 1 Chron 7:10. 2 Father of Zedekiah, Ahab's false prophet. 1 Kings 22:11,24, 2 Chron 18:10,23.

Chenab (chēnāb'), one of the "five rivers" of the Punjab, 675 mi (1,086 km) long, rising in the Punjab Himalayas, W Kashmir, and flowing NW, then SW through Pakistan; Punjab to join the Sutlej River. The Ravi and Jhelum rivers are the chief tributaries. The Chenab supplies water for an important irrigation system.

Chenanai (kēnā'nī), Levite. Neh 9:4.

Chenaniah (kēnānī'ā), Levite. 1 Chron 15:22, 26:29.

Chen-chiang (jūn-jāng) or **Chinkiang** (chīn'-kyāng', jīn-jāng'), city (1970 est. pop. 250,000), S Kiangsu prov., China, a port at the junction of the Grand Canal with the Yangtze River. It is also on the Shanghai-Nanking RR. An important commercial and industrial center, it is known for its silk, vinegar, and pickled vegetables. Other processed foods, pharmaceuticals, machine tools, and paper products are also made. Chen-chiang was known in the Sung dynasty (12th cent.), flourished under the Ming and Manchu dynasties, was held by the Taipings and ravaged (1857), and was opened to foreign trade in 1859. It was a British concession until 1927 when it was returned to China. It declined in the late 19th cent. when the Grand Canal lost its importance, but flourished again as capital (1928-49) of Kiangsu. The Kiangsu medical college is there.

cheng, Chinese stringed instrument similar to the zither. It is also spelled *jeng* and *tseng*. See also SHENG, an altogether different instrument for which the spelling *cheng* is occasionally used.

Cheng, Chi (jē jūng), 1943-, Taiwanese track athlete. Considered the best woman athlete in Taiwan at age 18, she went to the United States to train and study. She was bronze medal winner in the 1968 Olympic games, and in 1970 she set the women's world record for the 100-meter hurdles (26.2 sec), the 100-yd/91-m dash (10 sec), and the 200-yd/183-m dash (22.6 sec).

Cheng-chou or **Chengchow** (both jūng-jō), city (1970 est. pop. 1,500,000), capital of Honan prov., E central China. An important railroad center, the city is at the junction of the Lung hai (east-west) and the Peking-Canton (north-south) railroads. The textile center of Honan prov., and a flourishing industrial city, Cheng-chou has grown about sevenfold since 1949. In addition to textiles, manufactures include

chemicals, aluminum, fertilizer, processed meats, agricultural machinery, and electrical equipment. An opencut coal mine is nearby. An agricultural institute and a medical college are in the city. Chengchow was formerly called Chenghsien.

Chengchow: see CHENG-CHOU, China

Chenghsien: see CHENG-CHOU, China

Ch'eng-te or **Chengteh** (both chūng-dū), city (1970 est. pop. 200,000), N Hopeh prov., China, near the Luan River. It is a distribution center for lumber products, fruits, and pharmaceuticals, and has an iron mine. The city is N of Peking, with which it is connected by rail. The former summer capital of the Ch'ing dynasty (1644-1911), Ch'eng-te is surrounded by large parks with lakes, palaces, and pavilions. The most notable building is a Lamaist temple duplicating the main shrine in Lhasa, Tibet. Until 1956 the capital of former Jehol prov., Ch'eng-te was formerly called Jehol.

Ch'eng-tu (chūng-dōo) or **Chengtu**, city (1970 est. pop. 2,000,000), capital of Szechwan prov., SW China, on the Min River. It is a port and the commercial center of the Ch'eng-tu plain, the main farming area of Szechwan. Products include textiles, processed foods, chemicals, machinery, and paper. High-grade iron ore is mined at nearby Lu-ku. Ch'eng-tu, an old walled city, was in existence during the Ch'un-ch'iu period (770-475 B.C.). It was the capital of the Shu Han dynasty (3d cent. A.D.) and one of the earliest (9th cent. A.D.) printing centers in China. A cultural seat since ancient times, it is commonly called "little Peking." Its numerous institutions of higher learning include Szechwan Univ., Ch'eng-tu Technical Univ., and two medical colleges. The cottage where Tu Fu wrote his poetry (8th cent.) was restored in 1955.

Chénier, André (āndrā' shānyā'), 1762-94, French poet, by some critics considered the greatest in 18th-century France. He was born in Constantinople, where his father was consul general, and was educated in France. From 1787 to 1790 he was attached to the French embassy in London. Active in the early phase of the French Revolution, he was later horrified by Jacobin excesses. In 1792 he contributed denunciatory pamphlets to the *Journal de Paris*, organ of moderate royalism. He was arrested in March, 1794, by order of Robespierre, and was guillotined only three days before the end of the Terror. Chénier vivified the French classical tradition in his *Élégies* and *Bucoliques*. The fables are stirring political satires in verse. Most of his works were published after his death. *La Jeune Captive*, one of his most moving poems, appeared in 1795 and the first collected edition of his works in 1819. His life inspired the opera *Andrea Chénier* by Umberto Giordano. See biographies by V. Loggins (1965) and F. Scarfe (1965).

Chénier, Marie Joseph (mārē zhōzēf'), 1764-1811, French poet and dramatist, b. Constantinople, brother of André Chénier. A member of the Convention, the Council of Five Hundred, and the Tribunate during the French Revolution, he wrote a number of political and historical plays, notably *Charles IX* (1789). Besides the comprehensive *Tableau historique de l'état et des progrès de la littérature française depuis 1789* (1816), he is famous for his songs of the Revolutionary period, particularly the *Chant du départ*.

Chennault, Claire Lee (shēn'ōit'), 1890-1958, American general, b. Commerce, Texas. In World War I he was a pioneer in air pursuit tactics. Retired (1937) from the army, he went to China and organized air defenses for Chiang Kai-shek. He formed there (1941) the American Volunteer Group (known as the Flying Tigers). Recalled (1942) to duty, he headed the U.S. air task force in China and retired (1945) as a major general. See biography by R. L. Scott (1959, repr. 1973), study by his wife Anna Chennault (1963).

Chenonceaux (shānōNsō'), village, Indre-et-Loire dept., W central France, on the Cher River. It is famous for its château (built 1515-22), the residence, successively in the 16th cent., of Diane de Poitiers and Catherine de' Medici. The wing of the château over the river was added by Catherine in 1560.

Ch'en Tu-hsiu (chūn dōo-shyō), 1879-1942, Chinese educator and Communist party leader. He was active in the republican revolution of 1911 and was forced to flee to Japan after taking part in the abortive "second revolution" of 1913 against YUAN SHIH-KAI. In 1915 he founded the journal *New Youth* in Shanghai. Articles by Ch'en, LI TA-CHAO, HU SHIH, and others encouraged Chinese youth to create a new culture free from Confucianism. He was dean of the school of arts and sciences of Peking Univ. from

Jan., 1917, until forced to resign under conservative pressure in March, 1919. Ch'en was converted to Marxism in the period following the student-led intellectual revolution known as the MAY FOURTH MOVEMENT (1919). He founded (1920) two Marxist groups, and in 1921 representatives of these groups met with representatives of groups organized by LI TA-CHAO (neither Ch'en nor Li were present) to found the Communist party. He was dismissed from party leadership and withdrew from the party in 1927 over his opposition to the COMINTERN-ordered policy of armed insurrection.

Ch'en Yi (chūn yē), 1901-72, Chinese Communist general and statesman. Ch'en was a political instructor (1925) in the Kuomintang Whampoa Military Academy and participated in the NORTHERN EXPEDITION. After the Kuomintang-Communist alliance collapsed (1927), he joined the Fourth Red Army (1928) and was an early supporter of Mao Tse-tung. One of the outstanding Communist military commanders, Ch'en became acting commander (1941) and then commander (1946) of the New Fourth Army. After 1949 he was mayor of Shanghai and a dominant figure in E. China. He succeeded CHOU EN-LAI as foreign minister (1958), serving during a period of intense rivalry between China and Russia for influence among the nations of the Middle East, Africa, and Latin America. Ch'en was severely criticized during the CULTURAL REVOLUTION. After 1967 his role was eclipsed by Chou, who resumed direction of foreign policy in his capacity as prime minister.

Cheops: see KHUFU

Chephar-haamonai (kē'fār-hāām'ōnā), town of Benjamin. Joshua 18:24

Chephirah (kēfī'ra), town of Benjamin, NW of Jerusalem. Joshua 9:17, 18:26, Ezra 2:25, Neh. 7:29

Chephren: see KHAFRE

cheque: see CHECK

Cher (shēr), department (1968 pop. 304,601), central France, in BERRY. Chief cities are VIERZON and BOURGES, the capital.

Cher, river, c. 200 mi (320 km) long, rising in the Massif Central and flowing generally NW across central France to join the Loire below Tours. The Berry Canal parallels part of the river.

Cheran (kēr'ān), Horite. Gen. 36:26, 1 Chron. 1:41

Cherbourg (shērbōōr'), city (1968 pop. 38,243), Manche dept., NW France, in Normandy, on the English Channel, at the tip of the Cotentin peninsula. It is a naval base and seaport with related industries. The site has been settled since ancient times and was frequently fought over by the French and English because of its strategic value. Fortifications were begun under Louis XIV.

Cherchel or **Cherchell** (both shērshēl'), town (1966 pop. 11,667), N Algeria, a port on the Mediterranean Sea. Settled by Carthaginians, it became the capital of Mauretania before and during Roman times and was named Caesarea in 25 B.C. It remained an important military and commercial port under the Romans. Taken by Barbarossa (1516), it became a corsair refuge. French forces occupied the town in 1832. Cherchel is rich in relics, especially of the Roman period.

Cheremiss: see MARI AUTONOMOUS SOVIET SOCIALIST REPUBLIC, USSR

Cheremkhovo (chērīmkō'vā), city (1970 pop. 99,000), SE Siberian USSR, on the Trans-Siberian RR. The center of the Cheremkhovo coal basin, the city forms part of an industrial complex based mainly on coal, oil refining, and chemical production.

Cherenkov, Pavel Alekseyevich (pā'vil ālyīksyā'yāvīch chārēng'kaf), 1904-, Soviet physicist. He shared with the Soviet physicists I. M. Frank and I. Y. Tamm the 1958 Nobel Prize in Physics for his discovery (1934) of CHERENKOV RADIATION. His research opened the way to new studies of high-energy subatomic particles and of cosmic rays.

Cherenkov radiation or **Cerenkov radiation** (for P. A. Cherenkov), light emitted by a transparent medium when charged particles pass through it at a speed greater than the speed of light in the medium. The effect, discovered by Cherenkov in 1934 while he was studying the effects of gamma rays on liquids and explained in 1937 by I. E. Tamm and I. M. Frank, is analogous to the creation of a SONIC BOOM when an object exceeds the speed of sound in a medium, and the light is emitted only in directions inclined at a certain angle to the direction of the particles' motion, just as the sonic shock wave is restricted to certain angles. Cherenkov radiation is produced by electrons of the transparent medium that have been displaced by gamma rays rather than by the gamma rays themselves, and it is not depen-

dent on temperature. It is used in the Cherenkov counter, a device for detecting fast particles and determining their speeds or distinguishing between particles of different speeds.

Cherepovets (chērīpavyēts', chērīpō'vyīts), city (1970 pop. 188,000), NE European USSR, on the Rybinsk Reservoir. A rail and water transportation center of the Volga-Baltic Waterway, it has an iron and steel complex that supplies Leningrad's metallurgical industries. Chemical plants for the production of fertilizers are also there. Cherepovets arose (14th cent.) as a settlement around a monastery.

Chéret, Jules (zhūī shārā'), 1836-1932, French painter and draftsman, originator of the modern POSTER. His colorful, sophisticated designs for the theater and opera influenced Toulouse-Lautrec. Chéret introduced color lithography into France in 1866.

Cherethims (kēr'āthīmz), the same as the Cherethites.

Cherethites and **Peletithes** (kēr'āthīts, pēl'āthīts), David's officers. 2 Sam. 8:18, 15:18, 20:7, 23, 1 Kings 1:38, 44, 1 Chron. 18:17. The Cherethites, or Cherethims, are mentioned alone in 1 Sam. 30:14, Ezek. 25:16, and Zeph. 2:5.

Cheribon: see TJIREBON, Indonesia

Cherith (kērīth), brook flowing into the Jordan opposite Samaria. 1 Kings 17:3, 5

Cherkassy (chīrkā'sē), city (1970 pop. 158,000), capital of Cherkassy oblast, in Ukraine, S European USSR, a port on the Dnepr River. Situated on the shore of the Kremenchug Reservoir, Cherkassy has important chemical-fiber and fertilizer industries. Founded at the end of the 13th cent., Cherkassy was a fortress in the 14th cent. and served as the seat of the Ukrainian hetmans of right-bank UKRAINE from 1386 to 1694. The city passed to Russia in 1793.

Cherkess Autonomous Oblast: see KARACHAY-CHERKESS AUTONOMOUS OBLAST

Cherkessk (chīrkā'sē), city (1970 pop. 67,000), capital of Karachayevo-Cherkess Autonomous Oblast, Stavropol' Kray, SE European USSR, on the Kuban River. Founded in 1825 as Batalpashinsk, it manufactures electrical equipment and shoes and has food-processing plants.

Chernigov (chīmyē'gaf), Ukr. *Chernihiv*, city (1970 pop. 159,000), capital of Chernigov oblast, W central European USSR, in the Ukraine, on the Desna River. It is a rail junction, a river port, and an air and highway transport hub. Industries include ship repairing, woodworking, food and wool processing, and the manufacture of metal goods and machinery. First mentioned in 907, Chernigov is one of the oldest cities of Kievan Russia. From the 11th to 13th cent., Chernigov was the capital of a principality of the same name, but the city declined after the Mongol invasion of 1239. It passed to Lithuania in the 14th cent. and to Russia in the 16th cent. It was under Polish control during part of the 17th cent. Chernigov's architectural monuments include the 11th-century Spasski Cathedral, the Church of the Assumption in the Yelets Monastery (11th cent.), and Ivan Mazepa's baroque army building (17th-18th cent.).

Chernov, Viktor (vēk'tar chīrnōf'), 1876-1952, Russian revolutionary. One of the founders of the SOCIALIST REVOLUTIONARY PARTY, he served as minister of agriculture under Kerensky in the provisional government set up after the overthrow of the czar in Nov., 1917 (Oct., 1917, O.S.). He was president of the short-lived constituent assembly (Jan., 1918). After its dissolution, Chernov headed an anti-Bolshevik government in Samara (now Kuibyshev). Early in 1921 he fled abroad. He died in New York City. Chernov wrote *The Great Russian Revolution* (tr. 1936).

Chernovtsy (chīrnōf'tsē), Ger. *Czemowitz*, Rumanian *Cernăuți*, city (1970 pop. 187,000), capital of Chernovtsy oblast, SW European USSR, in the Ukraine, on the Prut River and in the Carpathian foothills. It is a rail junction and the economic, cultural, and scientific center of the region of Bukovina. Industries include woodworking, food processing, and the manufacture of machinery, textiles, chemicals, footwear, and hosiery. One of Russia's oldest towns, Chernovtsy was part of Kievan Russia. It passed to Austria in 1775 and in 1849 became the capital of Bukovina. During the 19th and early 20th cent., the city was a center of the Ukrainian national movement. With the dissolution of Austria-Hungary in 1918, Chernovtsy was transferred to Rumania, which held it until the USSR seized N Bukovina in 1940. The city has a university (est. 1875), a 13th-century fortified castle, a 17th-century wooden church, and a 19th-century Orthodox Eastern cathedral.

chernozem (chĕr'nazĕm'') or **black earth**, variety of soil rich in organic matter in the form of HUMUS. It is generally a modified type of LOESS. True chernozem is black in color, but there are various grades, shading off into gray and chestnut-brown soils. It forms in areas that have cold winters, hot summers, and rapid evaporation of precipitation, generally only tall grass is found native on chernozem. It has large quantities of nutrients, excellent structure, and good water-holding capacity, making it very suitable for agriculture. It is most widely distributed in Russia, where it forms a large part of the good agricultural soil, but soils similar to the Russian are also found in India and the central and N central United States.

Chernyaiev, Mikhail Grigoryevich: see TCHERNAIEV

Chernyshevsky, Nikolai Gavrilovich (nyĭkāl'i' gavrĕ'lovich chĕrnĭshĕf'skĕ), 1828-89, Russian socialist reformer. He was the leading disciple of Visarion BELINSKY inside Russia, from 1853 to 1857 he wrote for the radical journal *Contemporary*, presenting and expanding the principles of Belinsky, who himself also wrote for the journal. Chernyshevsky advocated basic agrarian reform and emancipation of the serfs, and he envisioned the village commune as a transition to socialism. In 1862 he was arrested and was later sent to Siberia. In prison he formulated his ideas in the vastly influential novel *What Is to Be Done?* (1863, rev. tr. 1961). His *Selected Philosophical Works* was published in English in Moscow in 1953. Chernyshevsky is looked upon as a forerunner of the Russian revolutionary movement. See biographies by F. B. Randall (1967) and W. F. Woehrlin (1971).

Cherokee (chĕr'akĕ), language belonging to the Iroquoian branch of the Hoka-Siouan linguistic family. See AMERICAN INDIAN LANGUAGES.

Cherokee Indians, largest and most important single Indian group in the SE United States, formerly occupying the mountain areas of North and South Carolina, Georgia, Alabama, and Tennessee. The Cherokee language belongs to the Iroquoian branch of the Hoka-Siouan linguistic stock (see AMERICAN INDIAN LANGUAGES). By the 16th cent. they had a settled, advanced culture based on agriculture. Hernando de Soto visited them in 1540. They were frequently at war with the Iroquois tribes of New York, but generally sided with the British against the French and proved valuable allies. Soon after 1750 they suffered a severe smallpox epidemic that destroyed almost half the tribe. Formerly friendly with the Carolina settlers, the Cherokee were provoked into war with the colonists in 1760, and two years of warfare followed before the Cherokee sued for peace. In 1820 they adopted a republican form of government and in 1827 established themselves as the Cherokee Nation under a constitution. This instrument provided for an elective principal chief, a senate, and a house of representatives. Much of their progress was due to the invention of a Cherokee syllabary or syllabic alphabet by SEQUOYAH, also known as George Guess. Its 85 characters represented all the sounds in the Cherokee language and permitted the keeping of tribal records and, later, the publication of newspapers in Cherokee. The discovery of gold in Cherokee territory resulted in pressure by the whites to obtain their lands. A treaty was extracted from a small part of the tribe, which bound the whole tribe to move beyond the Mississippi River within three years. Although the Cherokees overwhelmingly repudiated this document and the U.S. Supreme Court upheld the nation's autonomy, the state of Georgia secured an order for their removal, which was accomplished by military force. President Andrew Jackson refused to intervene, and in 1838 the tribe was deported to the Indian Territory (later in Oklahoma). Their leader at this time and until 1866 was Chief John Ross. Thousands died on the march or from subsequent hardships. They made their capital at Tahlequah, instituted a public school system, published newspapers, and were the most important of the Five Civilized Tribes. In the U.S. Civil War their allegiance was divided between North and South, large contingents serving on each side. By a new treaty at the close of the war they freed their Negro slaves and admitted them to tribal citizenship. In 1892 they sold their western territorial extension, known as the Cherokee Strip, and in 1906 disbanded as a tribe, becoming then U.S. citizens. About 4,500 Cherokee are still in W North Carolina, the descendants of the few who successfully resisted removal or returned after the removal. See M. L. Starkey, *The Cherokee Nation* (1946, repr. 1972), H. T. Malone, *Cherokees of the Old South* (1956), John Gulick, *Cherokees at the Crossroads*

(1960), D. H. Corkran, *The Cherokee Frontier: Conflict and Survival, 1740-1762* (1962), G. S. Woodward, *The Cherokee* (1963), Irvin Peithmann, *Red Men of Fire* (1964), Thurman Wilkins, *Cherokee Tragedy* (1970).

cheroot (shar'oot') see CIGAR AND CIGARETTE

cherry, name for several species of trees or shrubs of the genus *Prunus* (a few are sometimes classed as *Padus*) of the family Rosaceae (ROSE family) and for their fruits. The small round red to black fruits are botanically designated drupes, or stone fruits, as are those of the closely related peach, apricot, and plum. The cherry is one of the most commonly grown home-orchard fruits. About 600 varieties are cultivated, practically all derived from two species—*P. avium* (sweet cherries) and *P. cerasus* (sour cherries). Both are believed to be native to Asia Minor and have long been cultivated; they were mentioned in the writings of the ancients. Sour cherries are harder and more easily grown than sweet cherries and are mostly self-fertile, while many sweet cherries must be cross-pollinated to bear well. The fruit is popular raw, in preserves, and in pies, cherry cider and liqueurs (see MARASCHINO) are also made. Europe is the largest producing area. Several species of the flowering cherry, many native to the Far East, are cultivated as weeping or erect trees for their beautiful, usually double flowers. The Japanese make a national festival of cherry-blossom time, the city of Tokyo presented a number of trees to Washington, D.C., where they have become a popular spring attraction. The species of American wild cherry include the chokecherry, pin cherry, and wild black cherry. These have smaller fruits than the cultivated cherries and are seldom used except for jelly. Wood of the wild black cherry, or rum cherry (*P. serotina*), usually reddish in color, is fine grained and of high quality. It takes a high polish and is prized for cabinetwork. The aromatic bark and leaves contain hydrocyanic acid, characteristic of many cherries. The cherry laurel (*P. laurocerasus* or *Laurocerasus officinalis*) is an Old World evergreen species cultivated elsewhere in many varieties as an ornamental. The leaves are sometimes used as a flavoring and in making cherry laurel water. The American cherry laurel (*P. or L. caroliniana*), called mock orange in the South, is similar but larger. For the cherry plum, or myrobalan, see PLUM. Cherries are classified in the division MAGNOLIOPHYTES, class Magnoliopsida, order Rosales, family Rosaceae.

Chersiphron (kŭr'sīfrŏn), fl. 6th cent. B.C., Cretan architect. According to tradition he was the builder of the original archaic Ionic temple of Artemis at Ephesus in Asia Minor (550 B.C.). He and his son Metagenes were said to be coauthors of a treatise on architectural engineering.

Cherson: see SEVASTOPOL, USSR

Chersonese (kŭrsŏnĕs') or **Chersonesus** (-nĕ'səs) [Gr. = peninsula], name applied in ancient geography to several regions. See CRIMEA (Chersonesus Taurica or Scythia), GALLIOLI PENINSULA (Chersonesus Thracica), MALAY PENINSULA (Chersonesus Aurea), JUTLAND (Chersonesus Cimbrica).

chert. see FLINT

Chertsey (chŭrt'sĕ), urban district (1971 pop. 44,886), Surrey, SE England. Its market gardens serve London. There are varied engineering works.

cherub, plural **cherubim**, kind of ANGEL. Cherubim were probably thought of, anciently, as composite creatures like the winged creatures of Assyria. In Jewish tradition, they are described (Ezek. 10) as having four faces and four wings and also as beautiful young men, but late Christian art made plump children of them, as in Raphael's *Sistine Madonna*. With the seraphim (see SERAPH) they are said to be in the very presence of God. The color surrounding them is traditionally blue. See Gen. 3:24, Ex. 25:18-22, 37:6-9, 1 Kings 6:23-28, Pss. 18:10, 80:1.

Cherubini, Luigi (lwĕ'jĕ kĕrŏbĕ'nĕ), 1760-1842, Italian composer, who lived in Paris after 1788. Before he was 16 he wrote masses and other sacred works, and he later composed Italian opera. In Paris he assimilated French operatic tradition and wrote operas of broad dramatic scope with rich orchestration, such as *Medee* (1797) and *Les Deux Journées* (1800), which influenced Beethoven's vocal music. In 1816 he became professor of composition at the Paris Conservatory and in 1822 its director. Renowned for his contrapuntal skill, in his later years he wrote mostly sacred music, including his masses in F Major (1809) and A Major (1825) and his Requiem in D Minor (1836).

chervil, name for two similar edible Old World herbs of the family Umbelliferae (CARROT family).

The salad chervil is *Anthriscus cerefolium*. Its leaves, like those of the related dill and parsley, are used for seasoning. The turnip-rooted chervil (*Chaerophyllum bulbosum*) is cultivated for its edible root. Other species of *Chaerophyllum* [Gr. = gladdening leaf, for the fragrant foliage] are also called chervil, e.g., the native American *C. procumbens*. Chervil is classified in the division MAGNOLIOPHYTES, class Magnoliopsida, order Umbellales, family Umbelliferae.

Chesalon (kĕs'ālŏn), town of Judah, called also Mt. Jearim, W of Jerusalem. Joshua 15:10.

Chesapeake (chĕs'apĕk), city (1970 pop. 89,580), independent and in no county, SE Va., inc. 1963. Chesapeake was created (1963) by merging the former city of South Norfolk with all of Norfolk co. Within its vast area are residential sections, much farmland, with related agricultural industries, and a large part of the Great Dismal Swamp. There are also industries manufacturing a great variety of products, including fertilizer, chemicals, lumber and wood items, steel equipment, and cement. The Battle of Great Bridge was fought (1775) in Chesapeake. The Dismal Swamp Canal was completed in 1822.

Chesapeake, U.S. frigate, famous for her role in the Chesapeake affair (June 22, 1807) and for her battle with the H.M.S. *Shannon* (June 1, 1813). The *Chesapeake* left Norfolk, Va., for the Mediterranean under the command of James BARRON in June, 1807. Just outside U.S. territorial waters the H.M.S. *Leopard* stopped her and demanded the right to search her for British deserters. Barron refused to allow this, and shortly afterwards the *Leopard* opened fire. Unprepared for action, Barron was forced to submit and allow the impressment of four of his crew (two of whom were American-born). The incident caused intense indignation, and war seemed imminent. In the War of 1812, the refitted *Chesapeake*, commanded by James LAWRENCE, engaged (June 1, 1813) the H.M.S. *Shannon* outside Boston harbor. Lawrence was mortally wounded, and his last command is reportedly the famous "Don't give up the ship!" The *Chesapeake* was, however, captured. See studies by Kenneth Poolman (1961), Peter Padfield (1968), and H. F. Pullen (1970).

Chesapeake and Delaware Canal, sea-level canal, 19 mi (31 km) long, 250 ft (76 m) wide, and 27 ft (8.2 m) deep, connecting the head of Chesapeake Bay with the Delaware River. Built in 1824-29, the canal was bought by the Federal government in 1919 and later was enlarged and modernized. It is part of the Intracoastal Waterway and can accommodate oceangoing vessels. See study by R. D. Gray (1967).

Chesapeake and Ohio Canal, former waterway, c. 185 mi (300 km) long, from Washington, D.C., to Cumberland, Md., running along the north bank of the Potomac River. A successor to the Potomac Company's (1784-1828) navigation improvement project, the Chesapeake and Ohio Canal was planned to extend W to Pittsburgh. Work was begun in 1828, but financial and labor problems (leading in 1834 to the first use of Federal troops to settle a labor dispute), as well as opposition from the rival Baltimore and Ohio RR, delayed completion to Cumberland until 1850. Although extension to Pittsburgh proved impractical, the canal experienced a busy period in the 1870s carrying coal from the Cumberland mines. The canal was used until it was damaged by floods in 1924. It was sold in 1938 to the U.S. government. The canal, partially restored, was made a national monument in 1961. In 1971 it became a national historic park. See study by G. W. Ward (1899, repr. 1973).

Chesapeake & Ohio Railway (C&O), U.S. transportation company with railroad lines in eight states, Washington, D.C., and Ontario, Canada. Founded as the Louisa RR Company in Virginia in 1836, the railroad changed its name to the Virginia Central Company in 1850. It served the Confederate armies during the Civil War and was severely damaged by Union raids. In 1869 financier Collis P. Huntington purchased the line, it received its present name in 1878. The C&O, one of the most solvent railroads in the United States, receives nearly all of its net income from carrying freight and is the nation's largest carrier of bituminous coal. In 1963 the C&O acquired control of the BALTIMORE & OHIO RR.

Chesapeake Bay, inlet of the Atlantic Ocean, c. 200 mi (320 km) long, from 3 to 30 mi (4.8-48 km) wide, and 3,237 sq mi (8,384 sq km), separating the Delmarva Peninsula from the mainland, E Md. and E Va. The bay is the drowned mouth of the Susquehanna River and also is fed by many other rivers including the Potomac, Rappahannock, and James. Chesapeake Bay is entered from the Atlantic Ocean through a 12-mi-wide (19-km) gap between capes

Henry and Charles, Va. The CHESAPEAKE BAY BRIDGE-TUNNEL runs across the mouth of the bay. An important part of the Intracoastal Waterway, the bay is linked with the Delaware River by the Chesapeake and Delaware Canal. Baltimore, Md., is the largest city and main port on the bay. Norfolk, Va., is an important port and naval base. Commercial fishing (oysters and crabs) is important; the bay is also used for recreation. The English colonist John Smith explored and charted Chesapeake Bay in 1608, a year after the first white settlement at Jamestown, Va., was established.

Chesapeake Bay Bridge-Tunnel, 18 mi (29 km) long, across the mouth of Chesapeake Bay, E Va., connecting Cape Charles with Norfolk, Va. Opened in 1964, the complex consists of a chain of low trestle bridges, two high bridges, and two tunnels (each 1 mi/1.6 km long) under the shipping channels. The tunnels are anchored on four man-made islands.

Chesapeake Bay retriever, breed of large SPORTING DOG developed in the United States. It stands about 24 in. (61 cm) high at the shoulder and weighs about 65 lb (29.5 kg). Its thick, short double coat ranges in color from a very dark brown to the faded tan called deadgrass. Webbed feet, powerful shoulders and hindquarters, and an oily outercoat that tends to shed water, combine to make the Chesapeake a very efficient retriever in the iciest water. Although bred to retrieve ducks, it is also widely used to hunt on land and has been trained as a guide dog. See DOG.

Chesed (kě'sēd), nephew of Abraham. Gen. 22:22.

Chesha Bay (chě'shā), Rus. *Cheshskaya Guba*, inlet of the Barents Sea, 84 mi (135 km) wide and 62 mi (100 km) long, Nenets National Okrug, N central European USSR. It receives the Chesha, Vizhas, Oma, and Pesha rivers.

Cheshire (chě'shā) or **Chester**, county (1971 pop. 1,542,624) W central England. The county town is CHESTER. The terrain is generally low, flat, and fertile. Its chief rivers are the Mersey and the Dee, which separates Cheshire from Wales. The Wirral peninsula separates the estuaries of the two rivers. The county is important agriculturally and industrially. It engages extensively in dairy farming and grows potatoes and wheat. The chief industries are engineering, salt mining, shipbuilding, oil refining, and the manufacture of railroad cars, textiles, textile machinery, soap, paper, and chemicals. The principal industrial centers are NORTHWICH, BIRKENHEAD, STOCKPORT, CREWE, and MACCLESFIELD. Communication by road, rail, and canal (the MANCHESTER SHIP CANAL) is excellent. Cheshire was made a palatinate by William I and maintained some of its privileges as such until 1830. The numerous black-and-white-timbered manor houses attest to the county's prosperity in the 16th and 17th cent. In the last century the population of the county greatly increased with the industrialization and suburbanization of the Wirral peninsula and the part of Cheshire just S of Manchester. In 1974, most of Cheshire became part of the new nonmetropolitan county of Cheshire, NW Cheshire (including Birkenhead) became part of the new metropolitan county of Merseyside, and NE Cheshire (including Stockport) became part of the new metropolitan county of Greater Manchester.

Cheshire, town (1970 pop. 19,051), New Haven co., S central Conn., in a farm area, settled 1695, inc. 1780. It is chiefly residential, with some machine shop manufactures. The painter John Frederick Kensett was born in Cheshire.

Cheshunt (chě'shənt), urban district (1971 pop. 44,947), Hertfordshire, SE England. A suburb of London, it is a prominent market-gardening district. Theobalds Park, an 18th-century mansion, is noteworthy.

Chesil (kě'sil), the same as BETHEL 2.

Chesney, Francis Rawdon, 1789-1872, British soldier and explorer in Asia. His examination of a route for the Suez Canal (1829) demonstrated the feasibility of building a canal and led the vicomte de LESSEPS to undertake the project. In 1835, Chesney commanded an expedition to survey N Syria. He proved the navigability of the Tigris and Euphrates and urged the adoption of a Euphrates route to India. In 1856 and 1862 he was associated with a Euphrates valley railroad project, but the scheme fell through. His works include *The Expedition for the Survey of the Rivers Euphrates and Tigris* (2 vol., 1850) and *Narrative of the Euphrates Expedition* (1868). See biography by his wife and his daughter (ed. by Stanley Lane-Poole, 1885).

Chesnut, Charles Waddell, 1858-1932, American author, b. Cleveland, Ohio. In 1887 he was admitted to the Ohio bar. Chesnut is considered the first

American Negro novelist. He is best known for *The Conjure Woman* (1899), a series of dialect stories about Negro slave life. His other works include *The Wife of His Youth* (1899), a group of stories, a biography of Frederick Douglass (1899), and several novels.

Chess, game for two players played on a square board composed of 64 square spaces, alternately dark (commonly designated as Black) and light (White) in color. The board is placed so that a light-colored square is in the corner to the right of each player, who is provided with 16 pieces, or chessmen, of his own color. At the outset of the game eight pieces are set down in the horizontal row of squares, or rank, nearest each player. The pieces (and their abbreviations) are two rooks (R), or castles, in the corner squares, two knights (N, Kt, or S) in the adjoining squares, two bishops (B) next to the knights, the queen (Q) on the remaining square corresponding to her color, and the king (K) on the other remaining center square, one pawn (P) is placed immediately in front of each of these pieces. Each type of piece is moved according to specific rules and is removed from the board when it is displaced by the move of one of the opposing pieces into its square. The object in chess is to trap, or checkmate, the opponent's king. Several systems of notation are used to describe the moves of the pieces. The most popular one is the descriptive system, also called English notation. According to that system each vertical row of squares, or file, is named for the pieces on it at the beginning of the game. The ranks are numbered 1 through 8 away from the player, either White or Black, who is moving. A move is described by naming the piece that is moved and the square that it is moved to. The square is designated by the name of its file and the number of its rank, with each player counting from his side of the board. When only one piece of a kind can make a particular move, the piece's original position is not specified in the notation. The symbol - means "to" and the symbol x means "takes," indicating a capture. If, for example, White's first move were to advance the pawn in front of his king two squares, the notation would read P-K4. Various players are known for their openings, middle games, or end games, with many of the moves named for the great players who have originated them or for countries, as in the Ruy Lopez opening or the Sicilian defense. Chess has fascinated people for centuries, and there is evidence that a game similar to modern chess was played in the 6th and 7th cent. It probably originated in India, spreading to Persia and then to the Levant, and it may have been introduced into Europe by the Muslims. By the 13th cent., it was played all over Western Europe and had undergone little change from the game as played by the Persians. Outstanding players of their day who were considered world champions were 1747-95, François Philidor of France, 1815-20, Alexandre Deschappelles of France, 1820-40, Louis de la Bourdonnais of France, and 1843-51, Howard Staunton of England. The first modern international chess tournament was held in London in 1851. Since then official world champions have been 1851-58 and 1862-66, Adolph Anderssen of Germany, 1858-62, Paul C. Morphy of the United States, 1866-94, Wilhelm Steinitz of Austria, 1894-1921, Emanuel Lasker of Germany, 1921-27, Jose R. Capablanca of Cuba, 1927-35 and 1937-46, Alexander A. Alekhine of France, 1935-37, Max Euwe of the Netherlands, 1948-57, 1958-60, 1961-63, Mikhail Botvinnik of the USSR, 1957-58, Vasily Smyslov of the USSR, 1960-61, Mikhail Tal of the USSR, 1963-69, Tigran Petrosian of the USSR, 1969-72, Boris Spassky of the USSR, and 1972-74, Robert J. Fischer of the United States. The 1972 World Chess Championship match, held in Reykjavik, Iceland, received unprecedented worldwide coverage and brought Fischer, the winner, a purse of over \$156,000. Fischer resigned the title in 1974, the first player ever to do so. Chess has an extensive literature. A good book for beginners is Capablanca's *A Primer of Chess* (1935, repr. 1963). See H. J. R. Murray, *A History of Chess* (1913, repr. 1962), H. A. Davidson, *A Short History of Chess* (1949, repr. 1968), Fred Reinfeld, *Complete Book of Chess Stratagems* [1958, repr. 1972], Israel A. Horowitz and P. L. Rothenberg, *Complete Book of Chess* (1969), Anne Suencks, ed., *Encyclopedia of Chess* (1970), Larry Evans, *Chess World Championships 1972 Fischer-Spassky* (1972), Edward Lasker, *The Game of Chess* (1972), H. C. Schonberg, *Grandmasters of Chess* (1973).

Chester, county borough (1971 pop. 62,696), county town of Cheshire, W central England, on a sandstone height above the Dee River. It is a railroad

junction. Its manufactures include electrical switchgear, paint, and window panes. Tourism is also economically important. Formerly Chester had great military importance, and it was a significant port for centuries. Under the name Castra Devana or Deva it was the headquarters of the Roman 20th legion. It was ravaged by Æthelfrith of Northumbria in the 7th cent. and the Danes in the 9th cent. Æthelflaed of Mercia fortified Chester again in the 10th cent. William I took it in 1070 and the following year granted it to his nephew, Hugh Lupus, as a palatine earldom. Chester served the English crown as a defensive bastion and was used as a base for operations against Wales from 1275 to 1284. During the ENGLISH CIVIL WAR Parliamentarians took Chester by siege in 1646. Ireland was the town's primary trading partner. Its role as a port peaked from c. 1350 to 1450, silting and the rise of Liverpool contributed to the end of this role by the late 18th cent. Modern Chester is medieval in appearance. It is the only city in England that still possesses its entire wall. Interesting features are the red sandstone wall with a walk along the top, Agricola's Tower, 15th- and 16th-century timbered houses, the cathedral, with architecture of styles from Norman to Late Perpendicular, the Roodee, on which races have been held since 1540, St. John's Church (formerly a cathedral), Grosvenor Museum, and "The King's School," a public school founded by Henry VIII in 1541. Characteristic of Chester are the Rows, a double tier of shops formed by recessing the second stories of the buildings along the main streets. This creates a sheltered walk upon the roofs of the street-level stores. The Chester Plays (see MIRACLE PLAY) originated in the town. In 1974, Chester became part of the new nonmetropolitan county of Cheshire.

Chester, city (1970 pop. 56,331), Delaware co., SE Pa., on the Delaware River, an industrial suburb of Philadelphia, settled c. 1644 by Swedes, inc. as a city 1866. It is a port of entry and has an important shipbuilding industry that dates from before the Civil War. In addition to one of the largest shipyards and drydocks in the United States, there are steel mills, oil refineries, automobile assembly plants, and factories making a huge variety of products, including aircraft parts, chemicals, and electrical equipment. The oldest city in the state, Chester (established as Upland) was the site of William Penn's first landing (1682) in America. Penn renamed the settlement and convened (1682) the first assembly of the province there. Historic attractions include the foundations of the original settlement, in Governor Printz Park, the Morton Homestead (1654), the Caleb Pusey House, at Landingford Plantation (1683), the old courthouse (1724), and the Washington House (1747), where Washington wrote his report (1777) on the battle of Brandywine.

Chesterfield, Philip Dormer Stanhope, 4th earl of, 1694-1773, English statesman and author. A noted wit and orator, his long public career, begun in 1715, included an ambassadorship to The Hague (1728-32), a seat in Parliament, and a successful tenure as lord lieutenant of Ireland (1745-46). His literary fame rests upon his letters to his illegitimate son, Philip Stanhope (first pub. 1774), designed for the education of a young man, and upon his letters to his godson (pub. 1890). See edition of his letters by Bonamy Dobree (6 vol., 1932) and additional letters edited by S. L. Gulick, Jr. (1938), study by Samuel Shellabarger (rev. ed. 1951, repr. 1971).

Chesterfield, municipal borough (1971 pop. 70,153), Derbyshire, central England. An important industrial center, the borough produces mining equipment, railroad cars, metal products, and many other goods. Of interest are the Stephenson Memorial Hall (named in honor of the inventor George Stephenson, who lived and is buried in Chesterfield), the 16th-century grammar school, and the 14th-century church with a twisted spire.

Chesterfield Inlet, Canadian government post in the Keewatin dist., Northwest Territories, at the mouth of Chesterfield Inlet of Hudson Bay.

Chester Plays: see MIRACLE PLAY.

Chesterton, Gilbert Keith, 1874-1936, English author. Conservative, even reactionary, in his thinking, Chesterton was a convert (1922) to Roman Catholicism and its champion. He has been called the "prince of paradox" because his dogma is often hidden beneath a light, energetic, and whimsical style. A prolific writer, Chesterton wrote studies of Browning (1903) and Dickens (1906), several novels including *The Napoleon of Notting Hill* (1904) and *The Man Who Was Thursday* (1908), a noted series of crime stories featuring Father Brown as detective, many poems, collected in 1927, and his famous es-

says, collected in *Tremendous Trifles* (1909), *Come to Think of It* (1930), and other volumes. He was the editor of *G. K.'s Weekly*, an organ of the Distributist League, which advocated the small-holding system. An amusing artist, he illustrated books by Hilaire BELLOC, his friend and collaborator. See his autobiography (1936), biography by Dudley Barker (1973), studies by Christopher Hollis (1970), A. M. Bogaerts (1940, repr. 1972), and Julius West (1915, repr. 1973).

chestnut, name for any species of the genus *Castanea*, deciduous trees of the family Fagaceae (BEECH or oak family) widely distributed in the Northern Hemisphere. They are characterized by thin-shelled, sweet, edible nuts borne in a bristly bur. The common American chestnut, *C. dentata*, is native E of the Mississippi but is now nearly extinct because of the chestnut blight, a disease from Asia caused by the fungus *Endothia parasitica*. Efforts are being made to breed a type of American chestnut resistant to the disease, by crossing it with the blight-resistant Chinese and Japanese chestnuts, in order to replace the old chestnut forests, some of which are still standing as dead, or "ghost," forests. The dead and fallen logs are still the leading domestic source of tannin. Chestnut wood is porous, but it is very durable in soil and has been popular for fence posts, railway ties, and beams. Edible chestnuts are now mostly imported from Italy, where the Eurasian species (*C. sativa*) has not been destroyed. The CHIN QUAPIN belongs to the same genus. Chestnuts are classified in the division MAGNOLIOPHYTES, class Magnoliopsida, order Fagales, family Fagaceae.

Chesulloth (kēsūl'ōth), town, N Palestine, the same as CHISLOTH-TABOR. Joshua 19:18.

Chesuncook Lake (chēsūn'kōōk), 22 mi (35 km) long and from 1 to 4 mi (1.6–6.4 km) wide, N central Maine. The western branch of the Penobscot River flows through the lake, which is in a noted hunting and fishing region. Baxter State Park is nearby.

Chevalier, Guillaume Sulpice. see GAVARNI.

Chevalier, Maurice (shavāl'yā, Fr. mōrēs' shavalyā'), 1888–1972, French singer and film actor. He made his debut in 1900 singing and dancing at the Casino de Tourelles, Paris. As the dancing partner of Mistinguett and as the star of several Paris music halls, he won his public by his charm and inimitable smile, by 1928 his reputation was international. Among his later films are *Love in the Afternoon* (1956), *Gigi* (1958), *Can-Can* (1959), and *Fanny* (1961). See his autobiographies *With Love* (1960) and *I Remember It Well* (1970), study by Gene Ringgold (1973).

Chevalier, Michel (mēshēl'), 1806–79, French economist. An ardent Saint-Simonian as a youth, he later favored a form of welfare capitalism. He advocated industrial development as the key to social progress. Also a proponent of free trade, he negotiated with Richard Cobden the Anglo-French trade treaty of 1860. His *Lettres sur l'Amérique du Nord* (1836) extols the United States.

Cheverus, Jean Louis Anne Madeleine Lefebvre de (zhān lwē an madēlēn' ləfēvrə də shāvrus'), 1768–1836, French churchman, first Roman Catholic bishop of Boston (1810–23). He was ordained in France and had to flee (1792) during the French Revolutionary Wars. In England he lived by teaching until 1796, when he went to Boston. He worked all over New England and was known for his work with the Indians in Maine. He was also highly esteemed as a physician. In 1810 he was consecrated bishop of Boston. At length his health began to fail, and he asked for transfer to France. Catholics and Protestants in the United States begged him to remain, but he accepted a transfer to the see of Montauban (1823). In 1826 he became archbishop of Bordeaux and in 1836 cardinal. He did much to extend the tolerance of Roman Catholicism in America. See biography by A. M. Melville (1958).

Cheves, Langdon (chī'vīs), 1776–1857, American statesman, b. Abbeville District (now Abbeville co.), S.C. Admitted to the bar in 1797, he became one of the leading lawyers of Charleston. In the U.S. House of Representatives (1810–15) he was one of the "war hawks" who agitated for hostilities with Britain. He served as chairman of the Ways and Means Committee and in 1814 succeeded Henry Clay as speaker. In this capacity Cheves cast the deciding vote against Alexander J. Dallas's bill for establishing the Second Bank of the United States, but it was chartered anyway in 1816. The bank was badly mismanaged until Cheves, elected a director and president in 1819, restored its credit. On his resignation in 1822, Nicholas Biddle took over the bank.

Cheviot (shēv'ēat, shēv'-), city (1970 pop. 11,135), Hamilton co., extreme SW Ohio, a residential sub-

urb of Cincinnati, settled early 1800s, inc. 1904. It has diverse light manufacturing industries.

Cheviot Hills (chēv'ēat, chēv'-), range, c. 35 mi (56 km) long, extending along part of the border between Scotland and England. The highest point is The Cheviot (2,676 ft/816 m). The North Tyne and branches of the River Tweed rise there. Since World War II the hills have been reforested. Northumberland National Park (398 sq mi/1,031 sq km, est. 1956) and Border National Forest Park occupy most of the hills. The Cheviots have been the scene of much border strife. They are celebrated in the ballad "Chevy Chase." A fine type of sheep, the cheviot, is bred there.

Chevreul, Michel Eugene (mēshēl' ōzhēn' shāvrol'), 1786–1889, French chemist. He studied under L. N. Vauquelin, was director of the Gobelins tapestry works, and from 1830 was professor, and from 1860 to 1879 director, at the natural history museum at Paris. Noted for his researches in the composition of animal fats (by which he contributed to the development of the soap and candle industry), he discovered and named olein and stearin and wrote *Recherches sur les corps gras d'origine animale* (1823). He also worked and wrote on color contrasts; the results of his studies influenced the neoimpressionist painters Seurat and Signac.

Chevreuse, Marie de Rohan-Montbazou, duchesse de (marē' də rōān'-mōnbazōn' dushēs' də shavroz'), 1600–1679, French beauty and politician, an intimate of the French queen, Anne of Austria. Her continuous intrigues in opposition to King Louis XIII's minister, Cardinal Richelieu, caused her to be banished repeatedly from the court and to be exiled. She proved to be even more dangerous abroad because of her intrigues with France's enemies, notably Duke Charles IV of Lorraine. In the FRONDE she at first served as a link with Spain against Cardinal Mazarin, Richelieu's successor, but subsequently she became Mazarin's ally. See biography by Michael Charol (1971).

chevrotain, name for four species of small, ruminant mammals of Africa and SE Asia. Although they are also called mouse deer, chevrotains are not closely related to true deer, and are classified in a family of their own. The smallest of the hoofed mammals, they stand 8 to 14 in. (20–66 cm) high at the shoulder, depending on the species. The body is rabbitlike, with an arched back, the legs are very slender and end in small feet, the snout is tapered and somewhat piglike. The reddish-brown coat is spotted with white in most species. Chevrotains lack antlers but have tusklike upper canine teeth, used by the males for fighting. The upper incisors are lacking. Solitary, nocturnal animals of thick forests, chevrotains browse on leaves, twigs, and fruit. They sometimes rest in the branches of low trees. The water chevrotain (*Hyemoschus aquaticus*) of Africa is always found near water and takes to the water when pursued. The other chevrotains (*Tragulus* species) are found from India to Indonesia and the Philippines. Chevrotains are classified in the phylum CHORDATA, subphylum Vertebrata, class Mammalia, order Artiodactyla, family Tragulidae.

Chevy Chase (chēv'ē), village (1970 pop. 16,424), Montgomery co., W central Md., a residential suburb of Washington, D.C., inc. 1914.

Chew, Benjamin, 1722–1810, American public official and judge, b. Anne Arundel co., Md. He read law in Philadelphia under Andrew Hamilton and was admitted (1746) to the bar. After practicing law at New Castle and Dover, Del., Chew returned to Philadelphia, where he held several public offices and was attorney general (1755–69). He was chief justice of the Pennsylvania supreme court from 1774 until the outbreak of the American Revolution, when he was suspected of Loyalist sympathies. He was arrested but was discharged soon afterward. He later served (1791–1808) as president of the high court of errors and appeals of Pennsylvania. See biography by B. A. Konkle (1932).

chewing gum, confection consisting usually of CHICLE, flavorings, and corn syrup and sugar (although there are gums with artificial sweeteners on the market). Prehistoric people are believed to have chewed resins. Spruce resin was chewed as a thirst quencher by American Indians, from whom pioneers adopted the custom. Refined paraffin was later used and then chicle, which was probably first imported into the United States through Mexico. A chicle gum was patented in 1869 by William and Sempie. In the present-day manufacture of chewing gum blocks of chicle are ground, melted, and cleared in a whirling vat, and then the flavorings (e.g., fruits, licorice, mints) and other ingredients are

added. The gum is rolled through sheeting machinery and chopped into sticks or into candy-coated pellets. Insoluble plastics may be mixed with or substituted for the chicle. Although the United States is the major producer, exporter, and consumer, the industry has also been established in Canada, Japan, Egypt, West Germany, and especially the Latin American countries.

Cheyenne (shīān', -ēn'), city (1970 pop. 40,914), alt. 6,062 ft (1,848 m), state capital and seat of Laramie co., SE Wyo., near the Colo. and Nebr. lines, inc. 1867. It is a market for sheep and cattle ranches and a shipping center with good transportation facilities. The city sprang up after the Union Pacific RR selected this site for a division point in 1867. It was made territorial capital in 1869. In the 1870s the development of the area as a cattle-ranching section and the opening of the Black Hills gold fields stimulated the city's growth. Cheyenne revives its past annually with a Frontier Days celebration, first held in 1897. Landmarks include the state capitol and the supreme court building, housing the state historical museum and library. Nearby are Francis E. Warren Air Force Base, a veterans hospital, and a U.S. horticultural station.

Cheyenne, river, 527 mi (848 km) long, rising in E Wyo. and flowing NE to the Missouri River near Pierre, S. Dak. The Cheyenne basin is part of the Missouri River basin project. The U.S. Bureau of Reclamation has established a project on the Belle Fourche River, the Cheyenne's main tributary, the Rapid Valley irrigation project in the Cheyenne valley, and the Angostura Dam, for irrigation, hydroelectric power, and flood control, on the Cheyenne itself.

Cheyenne Indians, North American Indians whose language belongs to the Algonquian branch of the Algonquian-Wakashan linguistic stock (see AMERICAN INDIAN LANGUAGES). The Cheyenne abandoned their settlements in Minnesota in the 17th cent., leaving the region to the hostile Sioux and Ojibwa. Gradually migrating W along the Cheyenne River and then south, they established earth-lodge villages and raised crops. After the introduction of the horse (c. 1760) they eventually became nomadic buffalo hunters. The tribe split (c. 1830) when a large group decided to settle on the upper Arkansas River and take advantage of the trade facilities offered by Bent's Fort. This group became known as the Southern Cheyenne. The Northern Cheyenne continued to live about the headwaters of the Platte River. For the next few years the Southern Cheyenne, allied with the Arapaho, were engaged in constant warfare against the Kiowa, Comanche, and Apache. Peace was made c. 1840, and the five tribes became allies. The Cheyenne were generally friendly toward white settlers, until the discovery of gold in Colorado (1858) brought a swarm of gold seekers into their lands. By a treaty signed in 1861 the Cheyenne agreed to live on a reservation in SE Colorado, but the U.S. government did not fulfill its obligations, and the Indians were reduced to near starvation. Cheyenne raids resulted in punitive expeditions by the U.S. army. The indiscriminate massacre (1864) of warriors, women, and children at SAND CREEK, Colo., was an unprovoked assault on a friendly group. The incident aroused the Indians to fury, and a bitter war followed. Gen. George CUSTER destroyed (1868) Black Kettle's camp on the Washita River, and fighting between the whites and the Southern Cheyenne ended, except for an outbreak in 1874–75. The Northern Cheyenne joined with the Sioux in massacring Custer and his 7th Cavalry at the Battle of the Little Bighorn in 1876. They finally surrendered in 1877 and were moved south and confined with the Southern Cheyenne in what is now Oklahoma. Plagued by disease and malnutrition, they made two desperate attempts to escape and return to the north. A separate reservation was eventually established for them in Montana. See G. B. Grinnell, *The Fighting Cheyennes* (1915, repr. 1956) and *The Cheyenne Indians* (2 vol., 1923, repr. 1972), E. A. Hoebel, *The Cheyennes* (1960), D. J. Berthrong, *The Southern Cheyennes* (1963), Joseph Millard, *The Cheyenne Wars* (1964), John Stands in Timber and Margot Liberty, *Cheyenne Memories* (1967), P. J. Powell, *Sweet Medicine* (2 vol., 1969).

Cheyne, Thomas Kelly (chā'nē), 1841–1915, English clergyman and biblical critic, educated at Oxford. While studying at Göttingen, he was influenced by Georg Ewald and gained a view of German biblical criticism little known at the time in England. From 1885 to 1908 he was Oriel professor of the interpretation of Scripture at Oxford as well as canon of Rochester. He was the author of many books of bib-

lical criticism, his most celebrated work was on the Major Prophets and on the Psalms. He also wrote *Jewish Religious Life after the Exile* (1898) and *The Reconciliation of Races and Religions* (1914). With J. S. Black, Cheyne edited the *Encyclopaedia Biblica* (4 vol., 1899-1903).

Chezib (kě'zīb), probably the same as ACHIZIB 2

Chiabrera, Gabriello (gabrē-ēl'ō kyabrē'ra), 1552-1638?, Italian poet. He adapted classical forms to Italian verse and wrote graceful lyrics in the manner of Anacreon. Wordsworth translated some of his verse.

Chia-hsing (jĕa-shĭng) or **Kashĭng** (ka'shĭng'), town, N Chekiang prov., SE China, at the junction of the Grand Canal, the Whangpoo River, and the Hangchow-Shanghai RR. An important marketing center for rice and silk, it has textile mills, food-processing establishments, and cement plants.

Chia-i or **Chiayi** (both jĕa-ē), city (1969 pop. 234,359), S Taiwan. It is an agricultural market for rice, peanuts, vegetables, sugarcane, and timber from the surrounding area. The city is also the headquarters for the Chia-i irrigation system and is a transportation center.

Chia-ling (jĕa-lĭng) or **Kialing** (kya'lĭng), river, c. 450 mi (720 km) long, rising in S Kansu prov., central China, and flowing S through Shensi and Szechwan provs. to join the Yangtze River at Chungking, it receives the Fou and Ch'u rivers. One of the Yangtze's chief tributaries, the Chia-ling is navigable up through the Szechwan basin, an important agricultural and industrial area.

Chia-mu-ssu (jĕa-mōō-sōō) or **Kiamusze** (kya'mōō-sōō, jĕa'-), city (1970 est. pop. 275,000), E Heilungkiang prov., China. It is the chief port on the lower reaches of the Sungari River; the city has coal, aluminum, lumber, paper, textile, farm machinery, and beet-sugar-processing industries. There are rail connections to Harbin, to North Korea, and to the Soviet Union. Nearby Santaokang is the site of a huge state farm that was equipped by the USSR. The city was formerly the capital of Hokiang prov.

Chi'an or **Kian** (both jĕ-an), city (1970 est. pop. 100,000), central Kiangsi prov., China. It is a major commercial port on the Kan River and an important road hub. There are coal mines in the vicinity. Chi'an is known for its pagoda. The city was formerly called Luling.

Chiang Ching (jĕang jĭng), c. 1913-, Chinese Communist political leader, wife of Mao Tse-tung. Born Li Yun-ho, she changed her name to Lan Ping when she began an acting career in the 1930s. She joined the Communist party in 1938, the same year that she adopted her present name. In 1939 she married Mao Tse-tung and thereafter remained in the background of Chinese Communist affairs until the outbreak of the Cultural Revolution (1966-69). Appointed deputy director (1966) of the Cultural Revolution, she established herself as a leading radical figure. She replaced practically all earlier works of drama, art, and music with works designed specifically to spread Maoist doctrine. She has been a member of the politburo since 1969, and is considered one of the most powerful political figures in China.

Chiang Ching-kuo (jĕang jĭng-gwō), 1909-, Chinese Nationalist leader, eldest son of CHIANG KAI-SHEK. After spending 12 years in the Soviet Union, he returned to China (1937) and served in minor government posts. Following the Nationalist retreat to Taiwan (1949), he rose to control the armed forces and intelligence agencies, and became a powerful figure within the Kuomintang party. He served as Nationalist China's defense minister from 1965 until his appointment as premier in 1972. He is considered Chiang Kai-shek's probable successor as leader of the Nationalist government on Taiwan.

Chiang Kai-shek (jĕang kī-shĕk, jĕang), 1887-, Chinese Nationalist leader. He is also called Chiang Chung-cheng. He was graduated (1909) from a military academy in Japan, and was then assigned for field training with a regiment of the Japanese army. He returned to China in 1911 and took part in the revolution against the Manchus. Chiang was active (1913-16) in attempts to overthrow the government of YUAN SHIH KAI. When SUN YAT-SEN established (1917) the Canton government, Chiang served as his military aide. In 1923 he was sent by Sun to the USSR to study military organization and to seek aid for the Canton regime. On his return he was appointed commandant of the newly established (1924) Whampoa Military Academy; he grew more prominent in the KUOMINTANG after the death (1925) of Sun Yat-sen. In 1926 he launched the NORTHERN EXPEDITION, leading the victorious Nationalist army

into Hankow, Shanghai, and Nanking. Chiang, following the original policy of Sun Yat-sen, cooperated with the Chinese Communists and accepted Russian aid, but in 1927 he dramatically reversed himself, initiating the long civil war between the Kuomintang and the Communists. By the end of 1927, Chiang controlled the Kuomintang, and in 1928 he became head of the Nationalist government at Nanking and generalissimo of all Chinese Nationalist forces. Thereafter, under various titles and offices, he exercised virtually uninterrupted power as leader of the Nationalist government. In 1936, Gen. CHANG HSUEH-LIANG seized him at Sian, supposedly to force him to terminate the civil war against the Communists and to establish a united front against the encroaching Japanese. A partial truce was concluded between Chiang and the Communists, and Chiang was released. Despite the outbreak of the Sino-Japanese War in 1937 the agreement soon broke down, and, by 1940, Chiang's best troops were being used against the Communists in the northwest. After the Japanese took Nanking and Hankow, Chiang moved his capital to Chungking. As the Sino-Japanese War merged with World War II, Chiang's international prestige increased. He attended the Cairo Conference (1943) with Franklin Delano Roosevelt and Winston Churchill. He and his wife, who had been Soong Mei-ling (see SOONG, family), were the international symbols of China at war, but Chiang was bitterly criticized by Allied officers, notably Joseph W. Stilwell, and argument raged over his internal policies and his conduct of the war. After the war ended Chiang failed to achieve a settlement with the Communists, and civil war continued. In 1948, Chiang became the first president elected under a new, liberalized constitution. He soon resigned, however, and his moderate vice president, Gen. LI TSUNG-JEN, attempted to negotiate a truce with the Communists. The talks failed, and, in 1949, Chiang resumed leadership of the Kuomintang to oppose the Communists, who were sweeping into S. China in strong military force and reducing the territories held by the Nationalists. By 1950, Chiang and the Nationalist government had been driven from the mainland to the island of TAIWAN (Formosa). On Taiwan, Chiang took firm command and established a virtual dictatorship. He reorganized his military forces with U.S. aid and then instituted limited democratic political reforms. Chiang continued to promise reconquest of the Chinese mainland and at times landed Nationalist guerrillas on the China coast, often to the embarrassment of the United States. His international position was weakened considerably in 1972 when the United Nations, reversing its former policy, expelled his regime and accepted the Communists as the sole legitimate government of China. His writings have appeared in English as *China's Destiny* (1947) and *Soviet Russia in China* (1957). See biographies by Robert Berkov (1938), H. K. Tong (rev. ed. 1953), and Richard Curtis (1969), P. P. Y. Loh, *The Early Chiang Kai-shek* (1971).

Chiangmai (jĕang'mī) or **Chiangmai** (jĕang'-), city (1970 pop. 89,272), capital of Chiangmai prov., N Thailand, on the Ping River, near the Burmese border. It is Thailand's third largest city and the economic, cultural, and religious center of the northern provinces. The terminus of a railroad from Bangkok, Chiangmai is also linked to the capital by air and highway. The city is a shipping point for the agricultural products of the surrounding region. Long the center of Thailand's teak industry, Chiangmai also produces silver and wood articles, pottery, and silk and cotton goods. Chiangmai's population is mainly Lao. The city, a center of a Lao kingdom from the 11th cent., became after the 14th cent. a target of dispute between the Burmese and the Siamese. The Burmese invasions ceased in the 19th cent., and Chiangmai was fully incorporated into Thailand. The city consists of an 18th-century walled town on the right bank of the Ping and a new town on the left bank that developed around the railroad station. The Univ. of Chiangmai (1963), a teachers college, and a technical institute are in the city.

Chianti, Monti (mōn'tē kyan'tē), small range of the Apennines, c. 15 mi (25 km) long, in Tuscany, central Italy, W of the Arno River, rises to c. 3,000 ft (915 m). The celebrated Chianti wines are produced on its slopes.

Chiapas (chē'pas), state, (1970 pop. 1,578,180), 28,732 sq mi (74,416 sq km), SE Mexico, on the Pacific Ocean between Guatemala and the Isthmus of Tehuantepec. Tuxtla is the capital. Chiapas is crossed by mountain ranges rising from the isthmus and extending SE into Guatemala. They are sepa-

rated by low, subtropical valleys. Paralleling the coastal plain is the Sierra Madre de Chiapas, a range reaching its greatest height in Tacaná volcano. The state's principal river valley is the Grijalva, northeast of which are the central highlands, populated predominantly by Indians. Farther to the northeast, in the El Desierto region, are lower ranges, lakes, and valleys, falling away toward the Usumacinta River and the jungle plains of Tabasco. This sparsely inhabited region contains valuable forests of dye-woods and hardwoods and is also the site of several Mayan cities (notably PALENQUE). The area is also the retreat of the Lacandonese, a gradually disappearing Indian group often thought to be related to the ancient Maya. The climate of Chiapas, except for the highlands, is excessively hot. Rainfall is heavy from June to November. Subsistence crops are grown, and coffee (of which Chiapas is a leading national producer), rubber, and cacao are economically important, as is livestock breeding. The state's rich mineral resources, especially silver, gold, and copper, remain mostly unexploited. In general, economic development has been hindered by remoteness and inadequate communication, but railroads, airlines, and the Inter-American Highway link Tuxtla with the highland towns and are opening up the interior. Conquered with difficulty by the Spanish, Chiapa, as it was then called, was attached to the captain generalcy of Guatemala. Never ethnologically, geographically, nor politically a part of colonial Mexico, Chiapas maintained a quasi independence during the political anarchy that followed the collapse in 1823 of the empire of Agustín de Iturbide. This status separated Chiapas from the Central American states and oriented it toward Mexico. Interesting archaeological sites have been discovered near the Indian village of Chiapa de Corzo. The state's Indians are known for their colorful dances and costumes.

chiaroscuro (kyarōskō'rō) [Ital., =light and dark], term once applied to an early method of printing woodcuts from several blocks and also to works in black and white or monotone. Today it is used loosely to refer to the distribution of light and dark in painting. The works of Caravaggio and Rembrandt exemplify the dramatic use of chiaroscuro effects.

chiasma (kĭā'z'mə) see CROSSING OVER

Chiatura (chĕātō'rā), city (1970 pop. 25,000), SE European USSR, in Georgia, on the Kvirila River. One of the world's largest manganese producers, Chiatura alone accounted for half of the world's manganese trade before World War I. The ore is shipped to the Black Sea port of Poti for export to the Ukraine and abroad.

Chiavenna (kyavān'na), town (1971 pop. 7,166), Lombardy, N Italy. It is a commercial center. Historically a strategic point, it commands both the Splügen and Maloja passes between Italy and Switzerland.

Chiba (chĕ'ba), city (1970 pop. 482,089), capital of Chiba prefecture, central Honshu, Japan, on Tokyo Bay. It is a manufacturing center noted for textiles and paper products. It was the residence of the Chiba daimyo from the 12th to the 16th cent. The city retains an 8th-century Buddhist temple. Chiba prefecture (1970 pop. 3,365,282), 1,954 sq mi (5,061 sq km), is a fertile agricultural region and a resort area. Chiba, the port of Choshi, and Funabashi are the major cities.

Chibcha (chĭb'chā), group of Indian tribes of the eastern cordillera of the Andes of Colombia. Although trade with neighboring tribes was common, the Chibcha seem to have evolved their culture in comparative isolation. They were the most highly developed of the Colombian Indians, practicing agriculture, melting and casting gold and copper ornaments, mining emeralds, weaving textiles, and making pottery. They evolved a stratified society of overlords and vassals, in which succession to office was matrilineal and inheritance of personal property was patrilineal. Among the commoners, or farmers, organization was patrilineal. The priesthood constituted a hereditary noble class. Religious ceremonies included human sacrifice. The source of the legend of *El Dorado* is attributed to them, probably because of a Chibcha ceremony, also partly legendary, in which a new ruler was covered with gold dust each year, and then washed in a sacred lake. The Chibcha were conquered by the Spanish conquistador Gonzalo JIMÉNEZ DE QUESADA between 1536 and 1541. The Chibcha languages, a separate language family, are spoken in Colombia and spread northward to other areas. Surviving Chibcha-speaking tribes, such as

the Cuna and Lenca of Central America, have experienced much cultural change since the Spanish conquest

Chicago (shīka'gō, shīkō'gō), city (1970 pop 3,369,359), seat of Cook co., NE Ill., on Lake Michigan, inc 1837. The second largest city in the country and the heart of a metropolitan area of almost 7 million people, it is the commercial, financial, industrial, and cultural center for a vast region and a great midcontinental shipping point. It is a port of entry, a major Great Lakes port, located at the junction of the St. Lawrence Seaway with the Mississippi River system, the busiest air center in the country, and an important rail and highway hub. An enormous variety of goods are manufactured there and shipped all over the world. Chicago has large grain mills and elevators, iron- and steel-works, steel-fabrication plants, stockyards, meat-packing establishments, and printing and publishing houses. Among its many other products are machinery, musical instruments, electronic equipment, furniture, chemicals, household appliances, foods, and clothing. Chicago covers over 200 sq mi (520 sq km), it extends more than 20 mi (32 km) along the lakefront, then sprawls inland to the west. Its metropolitan area stretches in the north to Evanston and other residential cities and in the south to industrial suburbs on the border of Indiana and beyond. The city's arteries are its boulevards, expressways, and a system of elevated railways (part of it a subway). The elevated lines extend into the heart of the city, making a huge rectangle for passenger convenience in transferring from one to another. This is the celebrated Loop, which gives its name to the downtown section. In or near the center of the city are the Merchandise Mart, the world's largest commercial building, the Chicago Public Library, which has neighborhood and traveling branches, the John Crerar Library of scientific books, the Chicago Board of Trade building, and the Chicago Civic Opera. La Salle St. is the financial center, State St. is known for its shops, and Randolph St. for its theaters. On the lakefront, which has many beaches, are Grant Park, with the Art Institute of Chicago, the Chicago Natural History Museum, the Adler Planetarium, the Buckingham Memorial Fountain, and the John G. Shedd Aquarium. Nearby is the huge stadium of Soldier Field, home of the Chicago Bears, the city's major-league professional football team. To the north along the lakefront is Michigan Boulevard, which, leaving the towering skyscrapers behind, proceeds past the rich hotels of the "gold coast" and enters the residential district of the north. In this section lies Lincoln Park, with the Chicago Historical Society building, the Chicago Academy of Sciences, a zoological garden, and a conservatory; sculpture in the park includes the noted standing figure of Abraham Lincoln (1887) by Augustus Saint-Gaudens and the John P. Altgeld memorial monument (1915) by Gutzon Borglum. The south side of Chicago is the seat of the Univ. of Chicago, with its imposing Gothic buildings and attractive spaciousness. Nearby is Jackson Park, with the Museum of Science and Industry. Much of the south side is, however, given over to industry and to poor residential areas, including the homes of most of Chicago's large black population. There, also, are the Union Stock Yards (founded 1865) and, at the southern edge of the city, enormous iron- and steel-works. The west side extends over a vast area and is usually spoken of as a region of nationalities because the many groups living there, though crowded next to each other physically, are more or less separate culturally. These neighborhoods grew up rapidly in the late 19th and early 20th cent. In the west, too, are large industrial areas and two well-known parks—Garfield Park, with its noted conservatory, and Humboldt Park. The west is famous for Hull House, the settlement house founded (1889) by Jane Addams. In 1961 the Hull House location, part of an urban renewal project, was selected as the site of a branch of the Univ. of Illinois in Chicago. The west stretches out in a series of suburbs, both poor and well-to-do. Other points of interest in Chicago are O'Hare International Airport, busiest in the nation, McCormick Place, the mammoth convention and exhibition center on the lakefront, the Auditorium, designed by Louis H. Sullivan, St. Patrick's Church (dedicated 1856), and the ugly but beloved water tower that survived the great fire. Notable as dividing lines in the city are the two branches of the Chicago River. In early days the river was of great value because the narrow watershed between it and the Des Plaines River (draining into the Mississippi through the Illinois River) offered an easy portage that led explorers, fur traders, and missionaries to the great central plains. Father Marquette and Louis

Jolliet arrived there in 1673, and the spot was well known for a century before Jean Baptiste Pointe du Sable (or Point du Sable) set up a trading post at the mouth of the river. John Kinzie, who succeeded him as a trader, is usually called the father of Chicago. The military post, FORT DEARBORN, was established in 1803. In the War of 1812 its garrison perished in one of the most famous tragedies of Western history. Fort Dearborn was rebuilt in 1816, and the construction of the Erie Canal in the next decade speeded the settling of the Middle West and the growth of Chicago. Harbor improvements, lake traffic, and the peopling of the prairie farmlands brought prosperity to the city. The Illinois and Michigan Canal, authorized by Congress in 1827 and completed in 1848, was soon rendered virtually obsolete by the railroads. By 1860 a number of lines connected Chicago with the rest of the nation, and the city was launched on its career as the great midcontinental shipping center. Gordon S. Hubbard had already contributed to the establishment of the meat-packing industry, with its large stockyards. In 1871 the shambling city built of wood was almost entirely destroyed by a great fire (which legend says was started when Mrs. O'Leary's cow kicked over a lantern). The fire, one of the most famous disasters of U.S. history, killed several hundred people, rendered 90,000 homeless, and destroyed some \$200 million worth of property. Chicago was rebuilt as a city of stone and steel. Industries sprang up, attracting thousands of immigrants. Many peoples have contributed to the modern city, including Germans, Scandinavians, Irish, Jews, Italians, Poles, Czechs, Lithuanians, Croats, Greeks, Chinese, and American Negroes. With industry came labor troubles, highlighted by the HAYMARKET SQUARE RIOT of 1886 and the great strikes at Pullman in 1894 (see DEBS, EUGENE V., and ALTGELD, JOHN P.). Upton Sinclair's novel of the Chicago stockyards, *The Jungle*, aroused public indignation and led to investigations and subsequent improvements. The city, although proud of its reputation for brawling lustiness, was also the center of Middle Western culture. Theodore Thomas and the Chicago Symphony Orchestra founded a great musical tradition. Chicago's literary reputation was established in the early 20th cent. by such men as Carl Sandburg, Theodore Dreiser, Eugene Field, Edgar Lee Masters, and James T. Farrell. Most notable in the development of American thought and taste in art was the WORLD'S COLUMBIAN EXPOSITION of 1893. One of the architects at the fair was Louis H. Sullivan who, together with D. H. Burnham, John W. Root, Frank Lloyd Wright, and others, made Chicago a leading architectural center, it was there that one of the distinctive U.S. contributions to architecture, the skyscraper, came into being. Chicago's continuing interest in this type of structure is seen in the John Hancock Center (1968), the Standard Oil building (1973), and the Sears Tower (1974). The city has long been an important printing center, and the circulation of the Chicago *Tribune* is now among the largest in the country. The city has many colleges and universities, including, besides the Univ. of Chicago, De Paul Univ., Northeastern Illinois Univ., Illinois Institute of Technology, Loyola Univ. of Chicago, Mundelein College, Roosevelt Univ., St. Xavier College, Chicago State Univ., Columbia College, North Park College, parts of Northwestern Univ., and several branches of the Univ. of Illinois. There are a number of theological seminaries, schools of music, art, and law, and numerous junior colleges. The noted Newberry Library and the Library of International Relations are in Chicago. The first decade of the 20th cent. saw the development of many agencies concerned with civic improvement, among them the City Club (1903), the Chicago Association of Commerce (1908), and the City Plan Commission (1909), which directs the development of the city. However, between World War I and 1933, Chicago earned unenviable renown as the home ground of gangsters—Al Capone being perhaps the most notorious—and its reputation for gangster warfare persisted long after that violent era had passed. Despite the worldwide depression of the 1930s, Chicago's world's fair, the Century of Progress Exposition (1933-34), proved how greatly the city had prospered and advanced. Perhaps the single most significant event in World War II occurred (Dec. 2, 1942) under the west stand of the Univ. of Chicago's Stagg Field, when a group of scientists working on the government's atomic bomb project achieved the world's first nuclear chain reaction. With the war came a considerable growth of the Chicago metropolitan area. In 1954 the Lyric Opera of Chicago was established, reviving the city's tradition of having its own opera company. Chicago's many cultural at-

tractions and points of interest help make it a popular convention city. Among the many political conventions held there were the Republican national conventions of 1952 and 1960, and the Democratic national conventions of 1952, 1956, and 1968. See Lloyd Lewis and H. J. Smith, *Chicago: The History of Its Reputation* (1929), M. M. Quaife, *Chicagou From Indian Wigwam to Modern City, 1673-1835* (1933), Ernest Poole, *Grants Gone: Men Who Made Chicago* (1942), Alton J. Smith, *Chicago's Left Bank* (1953), B. L. Pierce, *A History of Chicago* (3 vol., 1937-57), H. M. Mayer, *The Port of Chicago and the St. Lawrence Seaway* (1957), R. A. Cromie, *The Great Chicago Fire* (1958), H. M. Karlen, *The Governments of Chicago* (1958), T. A. Herr, *Seventy Years in the Chicago Stockyards* (1968), H. M. Mayer, *Chicago: Growth of a Metropolis* (1969).

Chicago, river, formed in Chicago by the junction of its North Branch (24 mi/39 km long) and South Branch (10 mi/16 km long), and flowing southeast via a canal into the Des Plaines River at Lockport, Ill. The river formerly flowed east, then northeast via a channel, into Lake Michigan. Its course was reversed by the Chicago Sanitary and Ship Canal, built (1892-1900) on the South Branch to prevent the pollution of Lake Michigan by Chicago's sewage, locks prevent the river from entering the lake. The use of Lake Michigan's water to flush the canal was a heated political and interstate issue in the 1920s. The controversy was settled in 1930 when the U.S. Supreme Court ordered a reduction in the amount of water being diverted from the lake, this decision forced Chicago to build sewage treatment plants. The canal, 30 mi (48 km) long, 22 ft (6.7 m) deep, and from 162 to 290 ft (49-88 m) wide, is an important part of the Illinois Waterway. The channels of the Chicago River and the North Branch have been improved to aid deep-draft vessels and barges. The old Illinois and Michigan Canal, opened in 1848, was the earlier shipping link and ran parallel to the present waterway.

Chicago, Art Institute of: see ART INSTITUTE OF CHICAGO

Chicago, University of, at Chicago, coeducational, inc 1890, opened 1892 primarily through the gifts of John D. Rockefeller. Because of the progressive programs and distinguished faculty established under its first president, William R. Harper (1891-1906), the Univ. of Chicago immediately achieved prominence in American education. Under Robert M. Hutchins (1929-51) it established a unique program of admitting students to the undergraduate division after only two years of high school and granting B.A. degrees at the age of 18 or 19. Survey courses were developed and comprehensive examinations were substituted for regular course requirements. However, under Lawrence Kimpton (1951-60), this program was largely abandoned. Significant among the university's graduate and research facilities are the Pritzker School of Medicine, the Enrico Fermi Institute for Nuclear Studies, the McDonald Observatory, at Fort Davis, Texas, the Yerkes Observatory, at Williams Bay, Wis., and the school of education.

Chicago Heights, city (1970 pop 40,900), Cook co., NE Ill., S of Chicago, settled in the 1830s, inc as a city 1901. It is an industrial community where steel, automobile bodies, castings, railroad cars, and chemicals are manufactured. Prairie State College is in Chicago Heights.

Chicago Natural History Museum. see FIELD MUSEUM OF NATURAL HISTORY

Chicago Portage Railroad National Historic Site: see NATIONAL PARKS AND MONUMENTS (table)

Chicago Sanitary and Ship Canal: see CHICAGO, river

Chicago Symphony Orchestra, founded in 1891 by Theodore Thomas, who conducted it until 1905. Orchestra Hall was built for it in 1904 with funds raised by public subscription. Frederick Stock, Thomas's assistant, succeeded him and conducted the orchestra until 1942. Rafael Kubelick, its conductor from 1950 to 1953, was followed by Fritz Reiner, who conducted until his death in 1963. In 1968, Georg Solti was named conductor. The orchestra plays a summer season at Ravinia, a suburb of Chicago.

chicha (chē'cha), term applied to various alcoholic beverages in use among the Indians of Bolivia, Colombia, and Peru. It is made by fermenting a mixture of water, sugar, and masticated grains or berries. In pre-Columbian times it was used in religious ceremonies. The ancient Incas strictly controlled its use, but later consumption was unregulated.

Chichen Itza (chē'chān' ētsā'), city of the ancient MAYA, central Yucatán, Mexico. It was founded

around two large cenotes, or natural wells. According to one system of dating, it was founded c.514, probably by the ITZ'Á and after being abandoned (692) and reoccupied (c.928) was chosen by Kulkulcan (see QUETZALCOATL) as his capital sometime between 968 and 987. After being defeated by Mayapan in 1194, the Itz'á abandoned the city for the last time. Spanning two great periods of Maya civilization, Chichén Itz'a shows both Classic and Post-Classic architectural styles. The Classic style is massive, with heavy decorative sculpture and cramped interiors. The later buildings have plainer, more austere lines, with the sculpture based on the Mexican feathered-serpent motif and columns. TOLTEC influence is strong. The Castillo, or principal temple of Kulkulcan, is representative of the period. Rare among Maya buildings is the round tower called the Caracol (snail shell), built in the Post-Classic period, it was probably an astronomical observatory. Into Chichén Itz'a's sacred well, mecca of countless pilgrimages from Central America and the Mexican plateau, were thrown jade and metal offerings. Humans were also sacrificed. Dredgings of the well in modern times have yielded a valuable collection of artifacts. See Donald Ediger, *The Well of Sacrifice* (1971).

Chicherin, Georgi Vasilyevich (gëör'gë vasë'l'ya-vich chëch'är'in), 1872-1936, Russian diplomat. Of noble origin, he entered the Russian foreign office but resigned (1904) after joining the Social Democratic party. He was in London during the October Revolution of 1917, was arrested for "enemy associations" after the Russian armistice with Germany, and was finally released by the British authorities. He returned to Russia in Jan., 1918, as Trotsky's aide and soon succeeded him as foreign commissar. An able diplomat, Chicherin successfully ended the diplomatic isolation of the USSR by gaining formal recognition for his country from W. European nations. He negotiated the Treaty of Rapallo (see RAPALLO, TREATY OF, and GENOA, CONFERENCE OF) with Germany in 1922. He ceased to conduct foreign affairs in 1928 because of illness and was succeeded by his assistant, Maxim LITVINOV, in 1930.

Chichester (ch'ich'star), municipal borough (1971 pop. 20,547), county town of West Sussex, S. England. Chichester is an agricultural and yachting center and has some light industry. The Regnum of the Romans, it was conquered by Ælla and his sons, who landed near Selsey in 477 and later (c.491) founded the kingdom of the South Saxons. In the Middle Ages Chichester was an important port, trading in wheat and wool. A portion of the medieval walls still stands. The 13th-century cathedral stands upon the site of an ancient monastery. Chichester has a teacher training college and a theological college.

Chichi, island, Japan. See BONIN ISLANDS.

Chichibu (chë'chëb'öö), city (1970 pop. 60,867), Saitama prefecture, central Japan, on the Ara River. It is a center for agricultural products and for the manufacture of silk fabrics. The city's Chichibu (Shinto) Shrine is a major tourist attraction.

Chichicastenango (chë'chëkästänäng'gö), town, SW Guatemala. In the heart of the highlands, Chichicastenango became the spiritual center of the QUICHÉ after their defeat (1524) by Pedro de Alvarado. The town, often called Santo Tomas, is quaint and charming, with a maze of winding streets surrounding the main plaza, the site of one of the most colorful town markets in Central America. In the Dominican monastery (founded 1542) was discovered the famous Popul-Vuh manuscript of Maya-Quiché mythology. There are several excellent collections of Indian relics, especially of carved jade. Chichicastenango is popular with tourists.

Ch'i-ch'i-ha-erh (chë'chë'här) or **Tsitsihar** (tsë'tsë'här), city (1970 est. pop. 1,500,000), S. central Heilungkiang prov., China, a port on the Nen River near the Great Khingan Mts. It is connected by rail with Harbin, Shen-yang (Mukden), and Ta-lien (Dairen) and is a processing center for soybeans, grain, and sugar beets. Manufactures include locomotives, machine tools, paper products, and cement. The adjacent town of Fu-la-erh-chi (Fulark) has steel works and plants that make heavy machinery. Ch'i-ch'i-ha-erh was founded in 1691 as a Chinese fortress and was formerly the capital of Hokiang and Heilungkiang provs.

Chichimec (chëchëmëk'), general term for the peoples of the Valley of Mexico between the periods of TOLTEC ascendancy and AZTEC ascendancy. Before the 11th cent. the Chichimec were nomadic peoples on the northern fringes of the valley. Although Aztec tradition has it that they were part of the Chichi-

mec, the Aztecs were actually farmers and military aids to the Toltecs. The Chichimec period (c.950-1300) was one of intertribal warfare and political confusion, but it prepared the way for the tributary empire of the Aztec.

chickadee (chik'ädë'), small North American bird of the TITMOUSE family. The black-capped chickadee (*Parus atricapillus*), lively and gregarious, is a permanent resident over most of its range in the East. Both sexes have black caps, gray backs and wings, and fluffy white to buff underparts. They often swing upside down from branch tips, searching for the insects that form more than half their diet. Their call note gives the bird its name. Other species are the Carolina, the boreal, or brown-capped (of the Northeast), and the western chestnut-backed chickadees. Chickadees are classified in the phylum CHORDATA, subphylum Vertebrata, class Aves, order Passeriformes, family Paridae.

Chickahominy (chik'höm'inä), river, c.90 mi (140 km) long, rising NW of Richmond, Va., and flowing SE to the James River. In the Civil War there was heavy fighting (1862) along its banks.

Chickahominy Indians, North American Indians whose language belongs to the Algonquian branch of the Algonquian-Wakashan linguistic stock (see AMERICAN INDIAN LANGUAGES). They were members of the Powhatan Confederacy. The Chickahominy were among the first Indian peoples with whom the English settlers in Virginia became acquainted.

chickaree: see SQUIRREL.

Chickasaw Indians (chik'äsö), North American Indians whose language belongs to the Muskogean branch of the Hoka-Siouan linguistic stock (see AMERICAN INDIAN LANGUAGES). They occupied N. Mississippi and were closely related in language and culture to the Choctaw. The Chickasaw warred constantly with the Choctaw, the Creek, the Cherokee, and the Shawnee. The decline of the Chickasaw can be traced to the conflict for control of interior North America between France and Great Britain. Probably because British traders were established in their country before the settlement of Louisiana, the Chickasaw fought on the side of Great Britain, and French attempts to make peace with them were unsuccessful. After 1834 they moved, according to treaty arrangements, to Oklahoma, where they constituted one of the Five Civilized Tribes. See A. M. Gibson, *The Chickasaws* (1971).

Chickasha (chik'ashä), city (1970 pop. 14,194), seat of Grady co., S. central Okla., on the Washita River, inc. 1898. It lies in an agricultural and oil-producing area. Chickasha has an industrial park, the city's manufactures include mobile homes, transistor and microradio components, lenses, and shock absorbers. The Oklahoma College of Liberal Arts is in Chickasha.

chicken: see POULTRY.

chickenpox or **varicella** (vär'äsë'l'ä), infectious disease usually occurring in childhood. It is believed to be caused by the same herpes virus that produces shingles. Chickenpox is highly communicable and is characterized by an easily recognizable rash consisting of blisterlike lesions that appear two to three weeks after infection. Usually there are also low fever and headache. When the lesions have crusted over, the disease is believed to be no longer communicable, however most patients simultaneously exhibit lesions at different stages of eruption. Chickenpox is usually a mild disease requiring little treatment other than medication to relieve the troublesome itching, but care must be taken that the rash does not become secondarily infected by bacteria. Pneumonia and encephalitis are rare complications.

chick-pea, annual plant (*Cicer arietinum*) of the family Leguminosae (PULSE family), cultivated since antiquity for the somewhat pea-like seeds, which are often used as food and forage, principally in India and the Spanish-speaking countries. The seeds are boiled or roasted and have been substituted for coffee. Other names are ceci, garbanzo, and gram pea. Chick-peas are classified in the division MAGNOLIOPHYTA, class Magnoliopsida, order Rosales, family Leguminosae.

chickweed: see PINK.

Chichayo (chëklä'yö), city (1969 est. pop. 135,000), capital of Lambayeque dept., NW Peru. On the coastal desert between the Andes and the Pacific, Chichayo may go years at a time with no rainfall. However, by utilizing short Andean streams for irrigation, Chichayo raises considerable sugarcane and a major part of the country's rice.

chicle (chik'al), name for the gum obtained from the latex of the sapodilla tree (*Achras zapota*), a tropical

American evergreen. The sapodilla (known also by many other common names) is widely cultivated in tropical regions, including S. Florida, for its fruit, which is plum-sized with translucent yellow-brown flesh. Large-scale cultivation of the tree for latex is impractical because it can be tapped only infrequently and varies widely in yield. Chicle is collected during the rainy season from wild trees in the rain forests. Natives, called *chicleros*, cut zigzag gashes in the tree trunk and collect the sap in bags. The collected material is boiled until it reaches the correct thickness and is then molded into blocks. These are exported, chiefly to the United States, for use in making CHEWING GUM. Unsystematic and excessive tapping of the sapodilla (especially in the Yucatan peninsula, where it was most abundant) is leading to its depletion and has necessitated increasing use of chicle substitutes from other latex-producing plants.

Chico (chë'kō), city (1970 pop. 19,580), Butte co., N. Calif., in a region noted for its almond production, inc. 1872. Principal manufactures are processed almonds, matches, and wood products. California State Univ. at Chico and a U.S. botanical experiment station are in the city, and a junior college is in nearby Durham. Lassen Volcanic National Park lies to the northeast.

Chicopee (chik'äpë), industrial city (1970 pop. 66,676), Hampden co., SW Mass., at the confluence of the Chicopee and the Connecticut rivers, settled c.1641, set off from Springfield 1848, inc. as a city 1890. It includes the villages of Willimansett, Fairview, Aldenville, Chicopee Center, and Chicopee Falls. Rubber and rubber products, sporting goods, machinery, and firearms are among the city's manufactures. The College of Our Lady of the Elms is there. The author Edward Bellamy was born and lived in Chicopee Falls.

chicory or **succory**, Mediterranean herb (*Cichorium intybus*) of the family Compositae (COMPOSITE family), naturalized in North America, where the tall stalks of usually blue flowers are common along waysides and are known as blue-sailors. It is extensively grown in Europe for its root, which, roasted and powdered, is used as a coffee substitute and adulterant. Chicory is also used as a potherb and salad plant, the common type that is blanched for salads is witloof, or French endive. True endive (*C. endivia*), a salad vegetable since antiquity, is cultivated in several broad-leaved and curly-leaved varieties. It is also called escarole. Chicory is classified in the division MAGNOLIOPHYTA, class Magnoliopsida, order Asterales, family Compositae.

Chicoutimi (shik'öö'timë'), city (1971 pop. 33,893), S. Que., Canada, at the confluence of the Chicoutimi and Saguenay rivers. The city is the cultural and economic center of the Saguenay area. It has aluminum plants and pulp and paper mills. A Jesuit mission was established there in 1676. In the city is a branch of the Université de Québec.

Chicoutimi, river, c.100 mi (160 km) long, rising in the Laurentian Mts. and flowing N into Lake Kenogami, then E into the Saguenay River at Chicoutimi. A hydroelectric facility on the falls (50 ft/15 m high) just above Chicoutimi supplies power to the region's aluminum and wood-processing industries.

Chidambaram (chidüm'baram), town (1971 pop. 48,819), Tamil Nadu state, SE India. It markets rice and produces textiles, cement, and brassware. Its temples are among the oldest examples of Dravidian art. Annamalai Univ., a leading school of S. India, is in the town.

Chidley, Cape, headland on the north coast of Labrador, E. Canada, at the entrance to Hudson Strait, named by the explorer John Davis in 1587.

Chidon (k'ï'dön) see PEREZ-UZZA.

chief or **chieftain**, political leader of a band, tribe, or confederation of tribes. At the simpler levels of social organization, the band or tribe usually lacks centralized authority and is ruled by the totality of adult males or of family or CLAN heads. Sometimes a temporary headman is chosen for a special occasion such as a hunting or war party. When authority is concentrated in one individual on a more permanent basis, the chief may have limited functions, such as the organization and supervision of work parties, religious ceremonies, or the collection and distribution of goods. A community may possess several chiefs among whom various functions are divided. Chieftainship may be achieved through inherent qualities of leadership, through the display of powers considered supernatural (see SHAMAN), through rank or wealth, or through hereditary succession. The power of chiefs is usually checked by custom and by kinship allegiances. The term *chief-*

dom is sometimes used in political anthropology to designate a particular degree of social organization, intermediate between tribe and state. See L. P. Mair, *Primitive Government* (2d ed 1964), Morton Fried, *The Evolution of Political Society* (1967), Marshall Sahlins, *Tribesmen* (1968), Elman Service, *Primitive Social Organization* (2d ed 1971).

Chiemsee (kēm'zā), lake, 31 sq mi (80 sq km), SE West Germany, SE of Munich, the largest lake entirely within West Germany. It is drained by the Alz River. Many resorts are along its shores. On the largest of three islands is a palace built by Louis II of Bavaria in imitation of Versailles.

Ch'ien-fo-tung: see TUN HUANG, China

Chiangmai: see CHIANGMAI, Thailand

Ch'ien Lung (ch'ien lōng), 1711-99, reign title of the fourth emperor (1735-96) of the Ch'ing dynasty, whose given name was Hung-li. Under his vigorous military policy, China attained its maximum territorial expanse, SINKIANG in the west was conquered, and Burma and Annam in the south were forced to recognize Chinese suzerainty. He restricted Western merchants to Canton in 1759, and he rejected British overtures for expanded trade and diplomatic ties in 1793. Ch'ien Lung was a patron of scholarship and the arts, some of China's finest porcelain and cloisonné were produced for his collections, and vast anthologies were edited, partly to censor seditious references to the Manchus. Despite the surface splendor of cultural achievement and imperial expansion, his reign in later years was characterized by growing official corruption, loss of military efficiency, and fiscal imbalance. See S. A. Hedin, *Jehol City of the Emperors* (1932), L. C. Goodrich, *The Literary Inquisition of Ch'ien Lung* (1935), E. H. Pritchard, *The Crucial Years of Early Anglo-Chinese Relations, 1750-1800* (1936).

Ch'ien-tang (ch'ien-tang) or **Tsientang**, river, 285 mi (459 km) long, Chekiang prov., SE China. An important commercial artery, it flows NE to the East China Sea at Hangchow. The tide rushing into the river from the bay causes a bore from S to 15 ft (1.5-4.6 m) high, which sweeps past Hangchow and menaces shipping in the harbor.

Chieti (kyē'tē), city (1971 pop. 50,976), capital of Chieti prov., Abruzzi region, central Italy, on the Pescara River, near the Adriatic Sea. It is a commercial and industrial center. Manufactures include textiles, iron goods, and construction materials. The city occupies the site of the Roman Teate Marrucinorum, of which ruins remain. Chieti was in the duchy of Benevento (7th cent.), fell to the Normans (1078), and thereafter was in the kingdom of Naples. It has a fine Romanesque cathedral (11th cent.), a 14th-century tower, and a university. The order of the Theatine Brothers (founded 1524) takes its name from the ancient Roman town.

Chifeng: see CH'IH-FENG, China

chiffon, plain-weave, lightweight, sheer, transparent fabric made of cotton, silk, or man-made fiber, it is made of fine, highly twisted, strong yarn. Chiffon is difficult to handle, but it drapes and wears well and is very durable despite its light weight. It is pieced or piece-printed and may be given a soft or stiff finish. Among its uses are in evening dresses, formal blouses, trimmings, and scarfs.

Chigasaki (chīga'sa'kē), city (1970 pop. 129,621), Kanagawa prefecture, central Honshu, Japan, on Sagami Bay. It is a fashionable resort with a large electronics industry.

chigger, minute, six-legged, reddish larva of the harvest MITE, one of various RED BUGS widely distributed throughout the world and common in the S United States. Attaching itself by its mouthparts to the skin of its vertebrate host, the chigger injects saliva that destroys cells and may cause an intense irritation known as red-bug dermatitis. The food of the chigger consists of the cellular contents and tissue fluid of the host. Certain Oriental species carry minute organisms (rickettsias) that cause scrub typhus, a disease of man. The chigger is sometimes confused with the CHIGOE, or jigger, a burrowing flea. Chiggers are classified in the phylum ARTHROPODA, class Arachnida, order Acarina, family Trombididae.

Chigirin (chīgīrēn'), Ukr. *Chyhyryn*, city, S central European USSR, in the Ukraine, on the Tyasmin River, a tributary of the Dnepr. It has food-processing plants and various light industries. Founded in 1589 as a fortress, Chigirin served as the residence of the hetman of Ukraine from 1649 (when it was so designated by the Treaty of Zborov between Hetman Bohdan CHMIELNICKI and the Polish king) until 1687. It was thus the capital of right-bank UKRAINE. The city passed to Russia in 1795.

Chignecto (shīgnēk'tō), isthmus connecting N S, Canada, with the Canadian mainland, between Chignecto Bay and Northumberland Strait. It is c 17 mi (27 km) across at its narrowest point near Amherst, the chief city of the isthmus.

chigoe (chīg'ō) or **jigger**, small parasitic FLEA of tropical America and the S United States. Man and his domestic animals are the main hosts. The fertilized female bores into the flesh (usually of the feet or legs) and feeds on the blood causing a painful, pustulous sore. She retains her eggs in her abdomen, which swells to the size of a pea. The eggs are expelled outside the host and hatch in the soil, undergoing complete metamorphosis. The chigoe is sometimes confused with the CHIGGER. The chigoe is classified in the phylum ARTHROPODA, class Insecta, order Siphonaptera.

Chigwell, urban district (1971 pop. 53,620), Essex, SE England. It is a residential suburb of London. Portions of Epping and Hainault forests are in the district. The Chigwell public school was founded in 1629. Part of the urban district was included in Redbridge, a borough of Greater London, in 1965.

Ch'ih-feng or **Chifeng** (both ch'ih-fung), city, W Liaoning prov., China. It is an agricultural distribution center, trading in wool, furs, hides, and grain. Coal and gold mines are nearby. It was called Ulan Hada by the Mongols, but in about 1778 it was colonized by the Chinese. Before the 1969-70 redistricting it was in the Inner Mongolian Autonomous Region.

Chihli: see HOPEH, China

Chihli, Gulf of, China: see PO HAI

Chihuahua (chēwa'wa), state (1970 pop. 1,730,012), 94,831 sq mi (245,612 sq km), N Mexico, on the border of N Mex. and Texas. The city of Chihuahua is the capital. Largest of the Mexican states, Chihuahua is divided into two regions—the mountains of the Sierra Madre Occidental to the west, and the vast, cactus-and-greasewood desert basins, broken by scattered barren ranges, to the north and east. In extreme E Chihuahua and W Coahuila is a desolate basin, the Bolson de Mapimi. Chihuahua is a leading national mineral producer, the mines of the Sierra Madre yield silver, gold, copper, lead, and manganese and constitute the state's most valuable industry. Cattle raising on the wide plains, which was practiced from the 16th cent. until it was virtually halted by the depredations of Francisco Villa, has now been revived. Long considered unsuitable for agriculture, the state has seen reclamation of some river valleys, notably that of the Conchos. The newly irrigated areas and upland mountain valleys produce grains, cotton, sugarcane, and tropical fruits. Chihuahua is now one of Mexico's chief agricultural states. Some timber is cut in the mountains. Chihuahua was first known to the Spanish through Cabeza de Vaca, and after the settlement of Durango in 1562 by Francisco de Ibarra, Chihuahua and Durango were called Nueva Vizcaya. Chihuahua became a state after the Mexican revolution against Spain. During the 19th cent. the Apache and Yaqui Indians kept the inhabitants in a recurrent state of terror, today the Tarahumara Indians inhabit some of the remote regions of Chihuahua. Of considerable importance to Chihuahua's economic and political development was the westward expansion of the United States, during the 19th and early 20th cent. foreign investment was considerable, with the border city of JUÁREZ as the commercial link. Chihuahua was occupied by American forces in the Mexican War and played a prominent part in the turbulent years following the revolution in 1910. In 1961, in an attempt to open some of the most valuable timber and mining lands in the nation, Mexico inaugurated the 560-mi (901-km) Chihuahua-Pacific RR, which borders the gigantic Barranca del Cobre (Copper Canyon). At Casas Grandes, in NW Chihuahua, is a vast archaeological site. See study by R. H. Schmidt (1973).

Chihuahua, city (1970 pop. 288,657), capital of Chihuahua state, N Mexico. It lies in a valley almost encircled by hills. Chihuahua is the only large rail and commercial center of a vast northern area. Although agriculture is important, the city's economy depends chiefly on nearby mines, smelting and other mining processes constitute the main industries. Founded in the early 18th cent., Chihuahua prospered despite Indian raids. The revolutionist Hidalgo y Costilla was executed in the city in 1811. Chihuahua was occupied briefly by U.S. forces in 1846 and served as the headquarters of Benito Juárez until French troops took it in 1865, it now has many American residents. There are several good exam-

ples of 18th-century colonial architecture, including the aqueduct.

Chihuahua (chāwa'wā), a breed of small TOY DOG probably of oriental origin and introduced into Mexico by Spanish settlers. It stands about 5 in. (12.7 cm) high at the shoulder and weighs from 1 to 6 lb (0.5-2.7 kg). There are two varieties: the smooth, with a short, close-lying, glossy coat, and the long-coated, with soft-textured, flat or slightly wavy hair that forms a fringe of longer hair on the neck, legs, and tail. The coat may be any color but is usually tan. Named after the state of Chihuahua, Mexico, this tiny dog was long believed to have been indigenously Mexican. However, there exist no archaeological remains to support this belief, the animal generally claimed to be the Chihuahua depicted in Toltec and Aztec art and described in the writings of early explorers of Mexico is most probably a variety of rodent. It is much more likely that the ancestors of the breed were brought by Spanish merchants by way of their trade route from China, where the practice of dwarfing both plants and animals has had a long history. Today the Chihuahua is widely popular as a house pet. See DOG.

Chikamatsu, Monzaemon (mōn'zāemōn' chē'-kama'tsō), 1653-1725, the first professional Japanese dramatist. Chikamatsu wrote primarily for the puppet stage in the Tokugawa shogunate. His literary work is divided into historical romances (*jidaimonō*) and domestic tragedies of love and duty (*sewamono*). Author of 110 *yoruri* [puppet plays] and 30 kabuki plays, he profoundly influenced the development of the modern Japanese theater. Among his best-known works are the *Kokusenya-kassen* [battles of Coxinga], a historical drama concerned with the conquests of a famous Chinese warlord, and the domestic tragedy *Shinju Ten no Amijima* [the love suicides at Amijima]. See *Major Plays of Chikamatsu* (tr. by Donald Keene, 1961), Donald Keene, *Bunraku, The Art of the Japanese Puppet Theatre* (1965).

Child, Francis James, 1825-96, American scholar, b. Boston, grad. Harvard, 1846. At Harvard he was professor of rhetoric (1851-76) and English literature (1876-96). He greatly influenced modern methods of Chaucer study. He is best known, however, for his *English and Scottish Popular Ballads* (5 vol., 1883-98). This is a major source on folklore in which Child defined, with examples, some 305 types of ballads, including complete textual variations.

Child, Sir John, d. 1690, English administrator in India. In 1680 he was appointed the British East India Company's agent at Surat, then the company's main factory (i.e., trading station) in W India. In 1685, Sir John moved the company's seat of government from Surat to Bombay, and in 1686 he was given authority over all the company's possessions in India. His tyrannical methods alienated many, his defeat by the Mogul emperor led to a demand that he be removed from India, but he died before the issue was settled. Sir John's activities were supported in England by Sir Josiah Child, 1630-99, who was possibly his brother. A merchant and early mercantilist, he made a fortune supplying the navy and from 1681 to 1690 virtually ruled the East India Company, of which he was deputy governor (1684-86, 1688-90) and governor (1681-83, 1686-88). His *New Discourse of Trade* (final form, 1693) was an early plea for some of the principles of free trade. See study by William Letwin (1959).

Child, Lydia Maria, 1802-80, American author and abolitionist, b. Lydia Maria Francis, Medford, Mass. She edited (1826-34) the *Juvenile Miscellany*, a children's periodical. She and her husband (David Lee Child, whom she married in 1828) were devoted to the antislavery cause, she wrote widely read pamphlets on the subject in addition to editing (1841-49) the *National Anti-Slavery Standard*, a New York City weekly newspaper. Other writings include several historical novels and a book on the history of religions. Her *Frugal Housewife* (1829) went through many editions. See her letters (with introduction by J. G. Whittier, 1883, repr. 1970), biographies by H. G. Baer (1964) and Milton Meltzer (1965).

child abuse, physical maltreatment of children by parents or guardians. Such treatment often results in physical or mental impairment and is sometimes fatal. By the 1970s in the United States there were over 60,000 reported cases per year, a rate that probably represents only a fraction of actual occurrence. Children in child abuse cases are generally less than three years of age. The most common characteristic of child abusers is a history of physical abuse in their own childhood. A number of universities have undertaken child abuse prevention programs. In 1973 the U.S. Congress authorized funds for a pro-

gram directed at prevention and treatment of child abuse

child actors. A distinction should be made between child actors who fill the ordinary subsidiary children's roles and those who emerge in periods when performing children become a dominant fad. An example of the latter is the boys' companies of the Elizabethan period. These companies dominated the English stage from c 1576 to c 1610. Many had their origins in grammar and choir schools connected with cathedrals. Particularly well-known were the Children of Paul's and the Children of the Chapel. The companies often performed plays by important authors such as John Lyly and Ben Jonson. In Shakespeare's *Hamlet*, Rosencrantz describes these troupes to Hamlet:

"but there is, sir, eyrie of children,
little eyases, that cry out on the top of question
and are most tyrannically clapped for't. These
are now the fashion."

During the first quarter of the 18th cent. children were commonly advertised as novelties on the English stage. The famous French dancer and actress Marie Salle appeared as a child at the theater in Lincoln's Inn Fields in 1716 and 1717. It became the fashion at that time to present children who had never acted before. In 1804 a great sensation on the London stage was caused by 13-year-old William Henry West Betty, known as "Young Roscius." He played roles such as Richard III and Hamlet and had a multitude of successors (e.g., Infant Hercules, Infant Billington). Many famous adult performers of the late 19th and early 20th cent. had earlier careers as child stars (e.g., Maud Adams, Helen Hayes, and Buster Keaton). However, the American movies of the 1920s and 30s created a craze for exasperatingly cute child actors who often sang and danced, among them were Jackie Cooper, Shirley Temple, Freddie Bartholomew, and Jane Withers. A sinister caricature of the Hollywood moppet is found in Nathaniel West's novel *The Day of the Locust* (1939) in the character Adore Loomis, a velvet-suited, sadistic child star who precipitates a riot in which he himself is kicked to death. The careers of many child film actors—Deanna Durbin, Margaret O'Brien, Bobby Driscoll, Claude Jarman, Jr., and Hayley Mills—ended before they reached adulthood. The most noted example of a short-lived career is undoubtedly that of Baby LeRoy, who achieved stardom at eight months and retired when three years old. Other child stars like Jackie Cooper, Judy Garland, Mickey Rooney, Roddy McDowall, and Elizabeth Taylor managed successfully to weather the transition to maturity. A superb performance by a child can be extremely affecting and appealing, e.g., Skip Homeier as a young Nazi in *Tomorrow, the World* (play, film, 1944), Patty Duke as the child Helen Keller in *The Miracle Worker* (play, film, 1962), and Tatum O'Neal as a juvenile con artist in *Paper Moon* (film, 1973). See Marc Best, *Those Endearing Young Charms* (1971).

childbirth see BIRTH

Childe, Vere Gordon, 1892–1957, British archaeologist, b. Australia. An Oxford graduate, he taught at the Univ. of Edinburgh (1927–46) and the Univ. of London (1946–56). He gained renown for his monumental synthesis of European prehistory, *The Dawn of European Civilization* (1925, 6th ed. 1957), and *The Prehistory of European Society* (1958). His studies in Asian archaeology led to *New Light on the Most Ancient East* (1929, rev. ed. 1953), and he interpreted human history in two popular works, *Man Makes Himself* (1937, rev. ed. 1951) and *What Happened in History* (1942).

Childebert I (chil'dabart), d. 558, Frankish king, son of Clovis I. On his father's death (511) he and his three brothers shared equally in the Frankish kingdom. His capital was at Paris. When his brother Clodomir died (524), he and another brother Clotaire I murdered Clodomir's sons and seized his lands. With Clotaire he shared in the reconquest and partition of Burgundy and Provence (534) and unsuccessfully campaigned in Spain (542).

Childebert II, 570–95, Frankish king of Austrasia (575–95) and Burgundy (593–95), son of Sigebert I and Brunhilda. His mother actually ruled for him. Chaos and warfare marked his reign.

Childeric I (chil'darik), c. 436–481, Merovingian king of the Salian Franks (c. 457–481), a Germanic tribe, son of Meroveus and father of Clovis I. Information on him is mostly legendary. His rule was that of a tribal chieftain. He defeated (463) the Visigoths at Orleans as an ally of the Roman general Aegidius.

Subsequently he defeated the Saxons and the Alemanni. His tomb, containing armor and ornaments, was discovered in 1653 at his capital, near Tournai, Belgium.

Childers, Robert Erskine (chil'darz), 1870–1922, Irish politician and author. Born into a Protestant family, he was a clerk in the House of Commons (1895–1910). Gradually becoming convinced of the need for Irish Home Rule, he resigned to work for it, engaging in gun-running for the Irish Volunteers in 1914. After serving in the British forces during World War I, he represented the Irish cause at Versailles and was a member of the Irish delegation that negotiated the treaty with Britain (1921). By this time he was opposed to anything other than republic status for Ireland and urged rejection of the treaty. He fought in the Irish Republican Army in the civil war that followed the creation of the Irish Free State, and was court-martialed and shot as a traitor in 1922. Childers wrote on Irish politics and on military matters, but his best-known work is *Riddle of the Sands* (1903, repr. 1971), a spy novel. His son, Erskine Hamilton Childers, 1905–74, became a naturalized Irish citizen and a member of the Dail in 1938. He held a succession of cabinet posts in the Fianna Fail governments from 1944 on and in 1973 was elected president of Ireland.

child labor, use of young workers in factories, farms, and mines. Child labor was first recognized as a social problem with the introduction of the factory system in late 18th-century Great Britain. In the Eastern and Midwestern United States, child labor became a recognized problem after the Civil War, and in the South after 1910. Children had formerly been apprenticed or had worked in the family, but in the factory their employment soon constituted virtual slavery, especially among British orphans. This was mitigated by acts of Parliament in 1802 and later. Similar legislation followed on the European Continent as countries became industrialized. Legislation concerning child labor in other than industrial pursuits, e.g., in agriculture, has lagged. Nearly all member nations of the International Labor Organization regulate the employment of children in industry, most also regulate commercial work, some, work in the street trades and a few, agricultural and household work. Despite such regulation attempts, children constitute from 2% to 10% of the labor force in parts of Africa, Asia, Latin America, and the Middle East. Although most European nations had child labor laws by 1940, the material requirements necessary during World War II brought many children back into the labor market. In the United States congressional child labor laws were declared unconstitutional by the Supreme Court in 1918 and 1922. A constitutional amendment was passed in Congress in 1924 but was not approved by enough states. International efforts also failed. The First Labor Standards Act of 1938 set a minimum age limit of 18 for occupations designated hazardous, 16 for employment during school hours for companies engaged in interstate commerce, and 14 for employment outside of school hours in nonmanufacturing companies. See Walter Trattner, *Crusade for the Children* (1970), also annual reports of the National Child Labor Committee.

children, delinquent. see JUVENILE DELINQUENCY

children, dependent. Until the end of feudalism religious institutions provided the only organized care for children orphaned, deserted, neglected by their parents (see FOUNDLING HOSPITAL), or born into such poverty that their parents could not support them. In England the poor law (1601) recognized the state's obligation to the needy. Under this law overseers of the poor could apprentice older children and provide for younger ones by farming them out, putting them in poorhouses, or giving home relief. Until about the end of the 18th cent. in both Great Britain and the English colonies in North America, the chief methods were still indenture (binding the child out to a master who expected a return in labor for expenses) or placing them in poorhouses. Children were sometimes indentured as infants and were not free until they were 21 years old or more. About 1800 an orphanage was organized in New York City, the first of many in the United States. Although only a small percentage of these institutions have ever been publicly administered, in most areas they later came under city and state regulation. In the 1850s the Children's Aid Society of New York began sending dependent children from Eastern cities to homes in the West. One criticism of this work—that it separated children permanently from their relatives—was met later by the foster home system, in such homes children can be placed

whose parents are temporarily unable to care for them, as well as children who are orphaned or deserted. The tendency in orphanages has for some time been away from regimentation and institutionalism. In current ideal circumstances, each child's situation is evaluated individually, and if he cannot remain with his own family he is placed in a foster home or child care institution, depending on which type of care is best suited to his needs and personality. Following the enactment in 1911 of a Missouri law authorizing financial assistance to the needy parents, similar laws were enacted by other states. By the time of the enactment of the Social Security Act in 1935, most states had such legislation. The Social Security Act provided for Federal grants matching those made by states to aid the parents of dependent children under approved statewide plans. These grants are now administered at the national level by the Community Services Administration of the U.S. Dept. of Health, Education, and Welfare. State and local departments of public welfare administer these programs locally. An issue was raised in the 1970s over whether or not so-called illegitimate children were qualified to receive aid. The U.S. Supreme Court ruled in 1973 that these children could not be denied such aid. On an international level the United Nations International Children's Emergency Fund (UNICEF) was established in 1946 to supply aid for the emergency needs of children in devastated countries. To date, it has helped feed children in over 50 nations, besides food aid, UNICEF also staffs projects to prevent the spread of disease among children. See SOCIAL SECURITY and CHILD WELFARE. See Winifred Bell, *Aid to Dependent Children* (1965).

children's book illustration. Among the first picture books intended for children is Comenius' *Orbis Pictus*, a primerlike text written in Latin about 1657 or 1658. Earlier works meant for adults but suitable for children include the Japanese *Scroll of Animals* (12th cent.) with animated sketches by Toba Soja and the first English edition of Aesop's *Fables*, printed by William Caxton in 1484 and illustrated with woodcuts. John Newbery included woodcuts in *The Renowned History of Little Goody Two Shoes* (1765). The earliest illustrators of children's books were usually anonymous, but with the appearance of Thomas BEWICK's art for *Pretty Book of Pictures for Little Masters and Misses*, or, *Tommy Trip's History of Beasts and Birds* (1799), well-known artists began to receive credit for their work in this field. William BLAKE printed, engraved, and hand-colored his own *Songs of Innocence* (1789). *The Butterfly's Ball* (1807), by William Roscoe, was illustrated by William MULREADY, and illustrations for the first English version of *Grimm's Fairy Tales* (1824) were created by George CRUIKSHANK. John TENNIEL's remarkable drawings for Lewis Carroll's *Alice's Adventures in Wonderland* (1865) remain unsurpassed. His art creates a visual framework through which the characters of the story come to life. Illustrations for children's books usually enhanced or explained the text, but in the latter quarter of the 19th cent. three artistic giants, Walter CRANE, Kate GREENAWAY, and Randolph CALDECOTT, gave a new dimension to illustration. They produced the picture storybook in which interdependent text and illustration are given equal emphasis. Crane's nursery-song prints in *Baby's Bouquet* (1908) combine soft colors with bold composition. Greenaway's *Under the Window* (1878) is enhanced by delicate garden colors. In the 1870s and 80s Caldecott's nursery books displayed harmonious linear composition and warm color. The exquisite watercolors in Beatrix Potter's *Peter Rabbit* books reveal her careful observation of small wild animals. The grandeur and dignity of Howard PYLE's portraits intensify the heroic adventures of *Robin Hood* (1883) and *Men of Iron* (1890). Two of Pyle's students were Jessie Wilcox, who illustrated Robert Louis Stevenson's *Child's Garden of Verses* (1905) and N. C. WYETH, whose dramatization of individuals and landscape enriched *Treasure Island* (1917), *Robinson Crusoe* (1920), and many other works. The master illustrator Arthur RACKHAM produced a host of magnificent books beginning in 1900 with *The Fairy Tales of Grimm*. His work is noted for brilliant use of color and dramatic, detailed composition. Ernest Shepard's drawings for A. A. Milne's *Winnie-the-Pooh* (1926) and for an edition of Kenneth Grahame's *Wind in the Willows* (1931) are warm and humorous. After a decline during the early 1920s, the golden age of the picture book began with the publication of Wanda Gag's *Millions of Cats* (1928). In 1938 the American Library Association instituted the Caldecott Medal for the most distinctive American picture book for chil-

dren The first recipient was Dorothy Lathrop for *Animals of the Bible* (1937). A number of major illustrators whose works are still popular emerged in the 1930s. Kurt Wiese illustrated Kipling's *Mowgli Stories* (1936). Helen Sewell employed a realistic style for *The First Bible* (1934). Maud and Miska Petersham's *The Christ Child* (1931) and Jean de Brunhoff's broadly drawn, delightful *Story of Babar, the Little Elephant* (1931) were among the outstanding books of the 30s. Robert Lawson's *Ben and Me* (1939) was the first of many witty books that he wrote and illustrated, including *Rabbit Hill* (1944) and *The Fabulous Flight* (1949). Dr. Seuss's popular, cleverly drawn books for young children began with *And to Think that I Saw It on Mulberry Street* (1937). Boris Artzybasheff illustrated *Aesop and The Seven Simeons* (both 1937) with bold woodcuts. In the next decade Robert McCloskey produced superb illustrations for *Make Way for Ducklings* (1941). Garth Williams's realistic, expressive drawings brought to life E. B. White's *Stuart Little* (1945) and *Charlotte's Web* (1952). The painter Maxfield Parrish created a series of glowing and colorful illustrations for a children's version of *The Arabian Nights* (1947). Wesley Dennis created powerful watercolors for many horse books by Marguerite Henry. The first book in the charming *Madeleine* series, written and illustrated in a broad, painterly style by Ludwig Bemelmans, appeared in 1939, his *Parsely* (1953), the story of a moose, incorporates a colorful catalog of wild flowers. Marcia Brown's *Puss in Boots* (1952) is light and whimsical. During the 1960s a number of seldom-used techniques were introduced, and color printing was much improved. Drawing was freed from the constraints of realistic representation, and fantastic imagery flourished. Photography enriched texts, as in Astrid Sucksdorff's *Chendru* (1960). Illustrations combining graphic art and collage graced Ezra Jack Keats's *The Snowy Day* (1962) and Leo Lionni's *Inch by Inch* (1960). Outstanding folk and fairy tales in a picture-book format include Adrienne Adams's *Shoemaker and the Elves* (1960) and Evaline Ness's *Tom Tit Tot* (1965). A landmark in illustrated books of the 1960s is Maurice Sendak's *Where the Wild Things Are* (1963), depicting a surreal and menacing world of make-believe creatures. Sendak's *Higglety Pigglety Pop!*, or, *There Must Be More to Life* (1967) is a fantasy reminiscent of Tenniel's work. His *In the Night Kitchen* (1970) depicts a dream world in robust detail; it was the first children's book to portray nudity. Sendak's style has had a profound influence on contemporary illustration, as in Harriet Pincus's doll figures for Carl Sandburg's *The Wedding Procession of the Rag Doll and the Broom Handle and Who Was in It* (1967) and Mercer Mayer's comic *A Boy, a Dog, a Frog, and a Friend* (1967). Mayer's book spawned a number of books in which the story is carried entirely by pictures. In the mid-1960s a new kind of picture book emerged in which the illustrations dominate the text. Ben Montresor's illustrations for *Cinderella* (1965) and for Stephen Spender's *The Magic Flute* (1966) are based on his opera stage designs and incorporate the glittering color of that medium. Brian Wildsmith made expressive use of intense, jewel-like colors for many works including La Fontaine's *The Lion and the Rat* (1963) and *Little Wood Duck* (1972). Among artists who choose to interpret a single type of book to which their styles are best suited, is Nancy Ekholm Burkert, whose specialty is fantasy and fairy tales, in *Snow-White and the Seven Dwarfs* (1972) her sweeping design and minute detail recall the works of Rackham. Margot and Harve Zemach illustrate and retell folk stories, including the rollicking *Duffy and the Devil* (1973). By the 1970s children's book illustration had developed into an artistic feast of incredible variety and richness, expressive of a particularly imaginative range of individual creativity. See Bettina Hurlimann, *Picture Book World* (1965), R. S. Freeman, *Children's Picture Books* (1967), Brian Doyle, *The Who's Who of Children's Literature* (1968), Miriam Hoffman and Eva Samuels, *Authors and Illustrators of Children's Books* (1972).

Children's Crusade: see CRUSADES

children's literature. The earliest of what came to be regarded as children's literature was first meant for adults. Among this ancient body of oral literature were myths and legends created to explain the natural phenomena of night and day and the changing seasons. Ballads, sagas, and epic tales were told by the fireside or in courts to an audience of adults and children eager to hear of the adventures of heroes. Many of these tales were later written down and are enjoyed by children today. The first litera-

ture deliberately written for children was intended to instruct them. During the Middle Ages the Venerable Bede, Aelfric, St. Aldhelm, and St. Anselm all wrote school texts in Latin, some of which were later used in schools in England and colonial America. More enjoyable and enduring fare came later when William Caxton, England's first printer, published *Aesop's Fables* (1484) and Sir Thomas Malory's *Morte d'Arthur* (1485). The HORNBOOK, invented at the end of the 15th cent., taught children the alphabet, numerals, and the Lord's Prayer. Alphabet books were popular in battle-dore and in CHAPBOOK form. *The New England Primer* (c. 1691) taught the alphabet along with prayers and religious exhortations. The first distinctly juvenile literature in England and the United States consisted of gloomy and pious tales—mostly recounting the deaths of sanctimonious children—written for the edification of Puritan boys and girls. Out of this period came one classic for both children and adults, John Bunyan's *Pilgrim's Progress* (1678). Later works written for adults but adapted for children were Daniel Defoe's *Robinson Crusoe* (1719) and Jonathan Swift's *Gulliver's Travels* (1726). In 1729 the English translation of Charles Perrault's *Tales of Mother Goose* became popular in England. A collection of MOTHER GOOSE rhymes was published in 1765 by John Newbery, an English author and bookseller. Newbery was the first publisher to devote himself seriously to publishing for children. Among his publications were *A Pretty Little Pocket Book* (1744) and *The Renowned History of Little Goody Two Shoes* (1765). Pirated editions of Newbery's works were soon published in the United States by Isaiah Thomas and others. By the end of the 18th cent., juvenile literature, partly under the influence of Locke and Rousseau, had again become didactic. This time the didacticism was of an intellectual and moralistic variety, as evidenced in the sober, uplifting books of such authors as Thomas Day, Mary Sherwood, and Maria Edgeworth in England and in the United States by Samuel Goodrich (pseud. Peter Parley) and Martha Finley (pseud. Martha Farquarson), who wrote the famous *Elsie Binsmore* series. Contrasting with this movement was 19th-century romanticism, which produced a body of literature that genuinely belonged to children. For the first time children's books contained fantasy and realism, fun and adventure, and many of the books written at that time are still popular today. Folk tales collected in Germany by the brothers Grimm were translated into English in 1823. The fairy stories of Hans Christian Andersen appeared in England in 1846. At the end of the 19th cent. Joseph Jacobs compiled English folk tales. Andrew Lang, a folklorist, began a series of fairy tales. Edward Lear's *Book of Nonsense* (1846) and Robert Louis Stevenson's *Child's Garden of Verses* (1885) set the style for much of the poetry written for children today. Lewis Carroll's twin masterpieces *Alice's Adventures in Wonderland* (1865) and *Through the Looking Glass* (1872) combine lunacy and fantasy with satire and word games. Victorian family life is realistically depicted in Louisa May Alcott's *Little Women* (1868), whereas Mark Twain's *Adventures of Tom Sawyer* (1876) and Robert Louis Stevenson's *Treasure Island* (1880) emphasize adventure, all three books present fully developed characters. At the turn of the century several children's magazines were being published, the most important being the *St. Nicholas Magazine* (1887–1943). Translations widened the world of the English-speaking child from the 19th cent. on, popular translated works include J. D. Wyss's *Swiss Family Robinson* (tr. from the German, 1814), Carlo Collodi's *Pinocchio* (tr. from the Italian, 1892), Felix Salten's *Bambi* (tr. from the German, 1928), Antoine de Saint-Exupéry's *Little Prince* (tr. from the French, 1943), Astrid Lindgren's *Pippi Longstocking* (tr. from the Swedish, 1950), and Herta von Gebhardt's *The Girl from Nowhere* (tr. from the German, 1959). The contributions and innovations of the 19th and 20th cent. have achieved a distinct place in literature for children's books and have spawned innumerable genres of children's literature. New collections of tales that reach back to the oral roots of literature have come from Europe, Asia, Africa, and the Caribbean. Fantasy for children includes L. Frank Baum's *Wonderful Wizard of Oz* (1900), A. A. Milne's *Winnie-the-Pooh* (1927), P. L. Travers's *Mary Poppins* (1934), J. R. R. Tolkien's *The Hobbit* (1937), Lloyd Alexander's *Book of Three* (1964), E. B. White's *Charlotte's Web* (1952) and *The Trumpet of the Swan* (1970), and such works of science fiction as Madeleine L'Engle's *A Wrinkle in Time* (1962) and C. S. Lewis's *Narnia* series. Popular collections of humorous verse are Laura Richards's *Tirra Lirra* (1932),

Hilaire Belloc's *Cautionary Verses* (1941), John Gardner's *Reason for the Pelican* (1959), and Arnold Spilka's *Rumbudgin of Nonsense* (1970). Adventure and mystery are found in such works as Armstrong Sperry's *Call It Courage* (1941) and E. L. Konigsburg's *From the Mixed-Up Files of Mrs. Basil E. Frankweiler* (1968). The novel for children now includes many of the literary, psychological, and social elements found in its adult counterpart. Books with sophisticated emphasis on plot, mood, characterization, or setting are Kenneth Grahame's *Wind in the Willows* (1908), Esther Forbes's *Johnny Tremain* (1944), Joseph Krumboltz's *And Now Miguel* (1953), and Scott O'Dell's *Island of the Blue Dolphins* (1961). Mature treatment of the emotions of growing up characterizes Irene Hunt's *Up a Road Slowly* (1966), whereas William Armstrong's *Sounder* (1970) realistically portrays the experiences of a black sharecropper and his family. During the 1960s and 70s "socially relevant" children's books appeared, treating subjects like death, drugs, sex, urban crisis, environment, and female liberation. Some critics consider these books as didactic as the children's books of the 17th and early 19th cent. Another trend has been books written by children, especially poetry. Richard Lewis's *Miracles* (1966) is a collection of poems written by children of many countries. Large numbers of nonfiction books are now published, completing the cycle of instruction begun in the Middle Ages. The Newbery Medal, an award for the most distinguished work of literature for children, was established by Frederic Melcher in 1922; in 1938 he established a second award, the Caldecott Medal, for the best picture book of the year. An international children's book award, the Hans Christian Andersen Award, was given in 1970 for the first time to an American, Maurice Sendak, in recognition of his contribution to children's literature. Magazines that review and discuss children's literature are *The Horn Book*, *The Bulletin of the Center for Children's Books*, and the *School Library Journal* in the United States and *The Junior Bookshelf* in Great Britain. See also CHILDREN'S BOOK ILLUSTRATION. See Anne Carol Moore, *My Roads to Childhood* (1939), Annis Duff, *Bequest of Wings* (1944), Lillian Smith, *The Unreluctant Years* (1953), Paul Hazard, *Books, Children, and Men* (4th ed. 1960), Bettina Hurlimann, *Three Centuries of Children's Books in Europe* (1967), Shela Egoff, G. T. Stubbs, and L. F. Ashley, *Only Connect* (1969), Cornelia Meigs, *A Critical History of Children's Literature* (rev. ed. 1969), Jean Karl, *From Childhood to Childhood* (1970), May Hill Arbutnot and Zena Sutherland, *Children and Books* (4th ed. 1972).

child welfare, services provided for the care of disadvantaged children. Founding institutions for orphans and abandoned children were the earliest attempts at child care, usually under religious auspices. At first the goal was to provide minimum physical subsistence, but services have been expanded to include social and psychological help. In the late 18th cent., a movement developed around the idea that children should not simply be regarded as small adults, and such educators as Rousseau, Pestalozzi, and Froebel were discussing children's special needs at the same time that the Industrial Revolution was exploiting CHILD LABOR. In the 19th cent. many institutions were organized, either under religious auspices or through private charity, to take care of children who were orphaned, destitute (see CHILDREN, DEPENDENT), or handicapped. In child-welfare legislation, the British Children's Charter Act of 1908 and the Ohio Children's Code Commission of 1911 marked a new era. The idea that it was the responsibility of the community to provide children with the advantages that their parents could not supply is a 20th-century development. In this category are free school lunches, medical, dental, and psychiatric services and child guidance clinics in schools, playgrounds, children's courts, special schools for handicapped children, and care in foster families for children of broken homes. Infant and child clinics are often provided by municipalities. Many welfare agencies finance summer camps for both healthy and handicapped children. In the United States child welfare services are administered through the Community Services Administration within the U.S. Dept. of Health, Education, and Welfare. Since 1909 decennial child-welfare conferences have been held at the White House. Under the Social Security Act (1935), the Federal government makes grants to states with approved plans of assistance to dependent children. In addition to those programs, a series of new child-welfare programs were passed by Congress in the 1960s (e.g., the Child Nutrition Act,

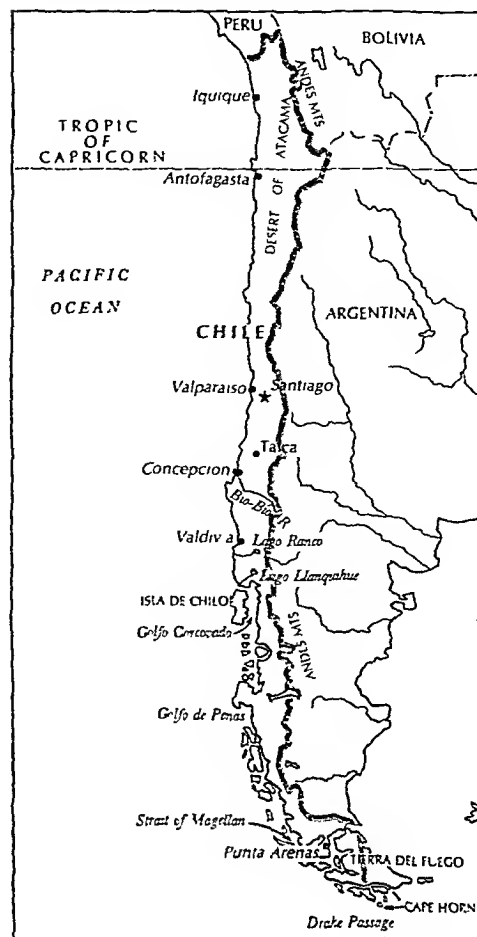
the Head Start Program, and the Foster Grandparent Program) The International Union for Child Welfare was founded in 1920 with the aim of organizing relief for child victims of major international and national disasters The United Nations International Children's Emergency Fund (UNICEF) was established in 1946 to alleviate malnutrition and to help reestablish children's services destroyed in the war See Jean Packman, *Child Care Needs and Numbers* (1968), Dorothy Zietz, *Child Welfare* (2d ed 1969), Alfred Kadushin, *Child Welfare Services* (1970), Lela Costin, *Child Welfare* (new ed 1972)

Chile (chīl'ē, Span chē'lā), republic (1972 pop 10,044,940), 292,256 sq mi (756,945 sq km), S South America, west of the continental divide of the Andes mts SANTIAGO is the capital and the largest city A long narrow strip of land (no more than c 265 mi/430 km wide) between the Andes and the Pacific Ocean, Chile stretches c 2,880 mi (4,630 km) from near lat 18°S to Cape Horn (lat 56°S), including at its southern end the Strait of Magellan and TIERRA DEL FUEGO, an island shared with Argentina Chile is bordered by Peru on the north, Bolivia on the north-east, and Argentina on the east In the Pacific Ocean, which forms the nation's western and southern borders, are Chile's several island possessions, including EASTER ISLAND, the JUAN FERNÁNDEZ islands, and the Diego Ramírez islands Chile also claims a sector of Antarctica The country is composed of three distinct and parallel natural regions—from east to west, the Andes, the central lowlands, and the Coast Ranges The Chilean Andes contain many high peaks and volcanoes, Ojos del Salado (22,539 ft/6,870 m high) is the second highest point of South America Chile is located along an active zone in the earth's crust and experiences numerous earthquakes, some of great magnitude The climate, which varies from hot desert in the north through Mediterranean-type in the central portion to the cool and humid marine west coast type in the south, is influenced by the cold Peruvian (or Humboldt) Current along the coast of N Chile and by the Andes Precipitation increases southward, the desert in the north is practically rainless, while S Chile receives abundant precipitation throughout the year However, along the coast of N Chile high humidity and dense fogs modify the desert climate The Andes are an orographic barrier, and the western slopes and the peaks receive much precipitation, permanently snow-capped mountains are found along Chile's length The rivers of Chile are generally short and swift flowing, rising in the well-watered Andean highlands and flowing generally west to the Pacific Ocean, the Loa and Baker rivers are the longest, but those in the central portion of the country are much more important because of their use for irrigation and power production In N Chile is the southern portion of the extensive desert zone of W South America It is occupied mainly by the sun-baked Desert of ATACAMA, which, toward the south, gradually becomes a semiarid steppe with limited vegetation The barren landscape of the north extends from the coast to the Andes, where snow-capped peaks tower above the desert The Loa River is N Chile's only perennial stream The region's scanty population is concentrated along the coast and in oases, the ports of IQUIQUE and ANTOFAGASTA (the chief link between Bolivia and the Pacific), the mining towns of ARICA and CHUQUICAMATA, and the industrial town of LA SERENA are the chief population centers The people of the region are almost totally dependent on supplies from the outside N Chile, the economic mainstay of the nation, is rich in a variety of minerals, including copper, nitrates, iron, manganese, molybdenum, gold, and silver Chuquicamata, the world's largest copper-mining center, produces much of Chile's output The middle portion of the country, roughly between lat 30°S and 38°S, has a Mediterranean-type climate and fertile soils, and is the nation's most populous and productive region as well as the political and cultural center It contains Chile's largest cities—Santiago, VALPARAISO, and CONCEPCIÓN Mineral deposits (in particular copper, coal, and silver) are found in central Chile, and the rivers, especially the Bío-Bío, have been harnessed to generate electricity The region, the most highly industrialized section of Chile, produces a large variety of manufactured products, especially in and around Santiago, Concepción, and Valparaíso (which is also Chile's chief port) Between the Andes and the Coast Ranges is the Vale of Chile, a long valley divided into basins by Andean spurs The valley is the heart of the republic, having the highest population density and the highest agricultural and industrial output The valley's rich alluvial soils account for nearly all of Chile's agricultural

production S Chile, extending from the Bío-Bío River to Cape Horn, is cold and humid, with dense forests, heavy rainfall, snow-covered peaks, glaciers, and islands Sections of this region, which is in the direct path of moist westerly winds, receive more than 100 in (254 cm) of precipitation annually Because of subsidence of the earth's crust, the Coast Ranges and the central lowlands have been partially submerged, forming the extensive archipelago of S Chile, an area of craggy islands (notably CHILOÉ), numerous channels, and deep fjords The Chilean lake district is a noted resort area Although all of S Chile is forested, only the drier northern part has exploitable timber resources, PUERTO MONTT and TEMUCO are major timber-handling centers The rest of the region is a virtually untouched wilderness of mid-latitude rain forest Because of the climate, agriculture is limited, oats and potatoes are the chief crops Livestock raising (cattle and pigs) is an important activity A portion of extreme S Chile lies in the rain shadow of the Andes and is covered by natural grasslands, extensive sheep grazing is carried on, with wool, mutton, and skins the chief products This area also yields petroleum More than half of S Chile's small population is found on the island of Chiloe VALDIVIA, a port on the Pacific Ocean, is the fourth largest industrial center of Chile, PUNTA ARENAS on the Strait of Magellan is the world's southernmost city The majority of Chile's population is mestizo, a result of frequent intermarriage between early Spanish settlers and native Indians Many Chileans are also of German, Italian, Irish, British, or Yugoslav ancestry Three small indigenous groups are still distinguishable—the ARAUCANIAN INDIANS of central Chile (the largest and long the strongest group), the Changos of N Chile, and the Fuegians of Tierra del Fuego By the 1970s, Chile was predominantly urban, more than a third of the total population was concentrated in and around Santiago and Valparaíso Chile is overwhelmingly Christian, with more than 85% of the people at least nominally Roman Catholic Spanish is the country's official language The country has one of the highest literacy rates (about 85%) of South America, the result of a well-established education system at all levels The economy is based on the export of minerals, which accounts for more than 85% of the total value of exports (Chile is the world's second largest producer of copper) The country has great potential for the development of hydroelectric power, which already accounts for more than half of its electrical output Although agriculture is the main occupation of about a third of the population, it only accounts for about 10% of the national wealth and produces less than half of the domestic needs, the production of an adequate food supply remains Chile's major economic problem Wheat, potatoes, corn, sugar beets, and oats are the chief crops, a variety of vegetables, fruits, and grains are grown in the Vale of Chile, the country's primary agricultural area The vineyards of the valley are the basis of Chile's growing wine industry Sheep raising is the chief pastoral occupation, providing wool and meat for domestic use and for export Fishing is an important economic activity, Chile consumes the largest amount of fish of any South American nation Since World War I, Chile has developed an industrial capacity to process its raw materials and to manufacture various consumer goods The major industrial products are processed food, fish meal, textiles, iron and steel, paper, lumber, chemicals, and leather goods Chile's economic growth has long been hindered by high inflation, which has greatly cut down the country's spending power Chile's main imports are food, machinery, and transportation equipment The chief trading partners are the United States, West Germany, Great Britain, Japan, and Argentina

History Before the arrival of the Spanish in the 16th cent, the Araucanian Indians had long been in control of the land Diego de ALMAGRO, who was sent by Francisco Pizarro from Peru to explore the southern region, led a party of men through the Andes into the central lowlands of Chile but was unsuccessful (1536) in establishing a foothold there In 1540, Pedro de VALDIVIA marched into Chile and, despite stout resistance from the Araucanians, founded Santiago (1541) and later established La Serena, Concepción, and Valdivia In spite of discouragement and incessant warfare with the Indians the Spanish persevered and succeeded The Indians were pacified, but violent outbreaks occurred, the Araucanians remained hostile until near the end of the 19th cent Although Chile was unattractive to the Spanish because of its isolation from Peru to the north and its lack of precious metals (copper was discovered much later), the Spanish developed a pastoral soci-

ety there based on large ranches and haciendas worked by Indians, the yields were shipped to Peru During the long colonial era, the mestizos became a



tenant farmer class, called *inquilinos*, although technically free, most were in practice bound to the soil During most of the colonial period Chile was a captaincy general dependent upon the viceroyalty of Peru, but in 1778 it became a separate division virtually independent of Peru Territorial limits were ill-defined and were the cause, after independence, of long-drawn-out boundary disputes with Peru, Bolivia, and Argentina The movement toward independence began in 1810 under the leadership of Juan MARTÍNEZ DE ROZAS and Bernardo O'HIGGINS The first phase (1810-14) ended in defeat at RANCAGUA, largely because of the rivalry of O'Higgins with José Miguel CARRERA and his brothers In 1817, José de SAN MARTÍN, with incredible hardship, brought an army over the Andes from Argentina to Chile The following year he won the decisive battle of MAIPÚ O'Higgins, who had been chosen supreme director, formally proclaimed Chile's independence Feb 12, 1818, at Talca and established a military autocracy that characterized the republic's politics until 1833, O'Higgins ruled Chile from 1818 until 1823, when strong opposition to his policies forced him to resign During this time the British expatriot Lord Cochrane, commanding the Chilean navy, cleared (1819-20) the coast of Spanish shipping, and in 1826 the remaining royalists were driven from Chiloe island, their last foothold on Chilean soil The colonial aristocracy and the clergy had been discredited because of royalist leanings The army, then, plus a few intellectuals, established a government devoid of democratic forms Yet with the centralistic constitution of 1833, fashioned largely by Diego PORTALES on Chile's particular needs, a foundation was laid for the gradual emergence of parliamentary government and a long period of stability During the administrations of Manuel BULNES (1841-51) and Manuel MONTT (1851-61) the country experienced governmental reform and material progress The war of 1866 between Peru and Spain involved Chile and led the republic to fortify its coast and build a navy Chileans obtained the right to work the nitrate fields in the Atacama, which then belonged to Bolivia Trouble over the concessions led in 1879 to open war (see PACIFIC WAR OF THE) Chile was the victor and added valuable territories taken from Bolivia and Peru, a long-standing quarrel also ensued, the

TACNA ARICA CONTROVERSY which was finally settled in 1929. Chile also became involved in serious border troubles with Argentina, it was as a sign and symbol of the end of this trouble that the **CHRIST OF THE ANDES** was dedicated in 1904. With the exploitation of nitrate and copper by foreign interests, chiefly the United States, prosperity continued. The Transandine Railway was completed (1910), and many more railroads were built. Industrialization, which soon raised Chile to a leading position among South American nations, was begun. Meanwhile, internal struggles between the executive and legislative branches of the government intensified and resulted (1891) in the overthrow of Jose BALMAEDA. A congressional dictatorship (with a figurehead president and cabinet ministers appointed by the congress) controlled the government until the constitution of 1925, which provided for a strong president. Former president Arturo ALESSANDRI (who had instituted a program of labor reforms during his tenure from 1920 to 1924, and who commanded widespread popular support) was recalled (1925) as a caretaker until elections were held. Although Chile enjoyed economic prosperity between 1926 and 1931, it was very hard hit by the world economic depression, largely because of its dependence on mineral exports and fluctuating world markets. Large-scale unemployment had occurred after World War I when the nitrate market collapsed. The rise of the laboring classes was marked by unionization, and there were many Marxists who advocated complete social reform. The struggle between radicals and conservatives led to a series of social experiments and to counterattempts to suppress the radicals (especially the Communists) by force. During Alessandri's second term (1932-38) a measure of economic stability was restored, however, he turned to repressive measures and alienated the working classes. A democratic-leftist coalition, the Popular Front, took power after the elections of 1938. Chile broke relations with the Axis (1943) and declared war on Japan in 1945. Economic stability, the improvement of labor conditions, and the control of Communists were the chief aims of the administration of Gabriel Gonzalez Videla, who was elected president in 1946. His efforts, as well as those of his successors, Carlos Ibañez del Campo (1952-58) and Jorge Alessandri (1958-64), were hampered by chronic inflation and repeated labor crises. In the 1964 presidential election (in which Eduardo FREI MONTALVO was elected) and in the 1965 congressional elections, the Christian Democratic party won overwhelming victories over the Socialist-Communist coalition. Frei made advances in land reform, education, housing, and labor. Under his so-called Chileanization program, the government assumed a controlling interest in U.S.-owned copper mines while cooperating with U.S. companies in their management and development. In 1970, Salvador ALLENDE GOSSENS, head of the Popular Unity party, a coalition of leftist political parties, won a plurality of votes in the presidential election and became the first Marxist to be elected president by popular vote in Latin America. Allende, in an attempt to turn Chile into a socialist state, nationalized many private companies, instituted programs of land reform, and, in foreign affairs, sought closer ties with Communist countries. His policies were resisted from the start by many factions within Chilean society. Continuing, widespread domestic problems, including spiraling inflation, lack of food and consumer goods, and stringent government controls, led to a series of violent strikes and demonstrations. As the situation worsened, the traditionally neutral Chilean military began to pressure Allende, he yielded to some of their demands and appointed military men to several high cabinet positions. In Sept., 1973, the armed forces staged a coup that resulted in Allende's death (by suicide, according to the military junta that succeeded him) and in the execution, detention, or expulsion from Chile of thousands of people. Gen. Augusto Pinochet Ugarte took control of the country, promising a more moderate economic policy and the restoration of a pro-Western foreign policy. However, in 1974, the economy continued to deteriorate, even though the government sought to return private enterprise to Chile by denationalizing many industries and by compensating businesses taken over by the Allende government. Work proceeded on the drafting of Chile's third constitution, which was to include articles preventing the election of a minority government. In June, 1974, Pinochet became the undisputed leader of Chile by assuming the position of head of state. In July, Chile's 25 existing provinces were reorganized into 12 regions and the Santiago metropolitan

area. See Luis Galdames, *A History of Chile* (tr. 1941, repr. 1964), H. R. Pocock, *The Conquest of Chile* (1967), E. H. Korth, *Spanish Policy in Colonial Chile* (1968), J. F. Petras, *Politics and Social Forces in Chilean Development* (1969), A. U. Hancock, *A History of Chile* (1893, repr. 1971), Salvatore Bizarro, *Historical Dictionary of Chile* (1972), Regis Debray, *The Chilean Revolution: Conversations with Allende* (tr. 1972), R. R. Kaufman, *The Politics of Land Reform in Chile, 1950-1970* (1972), D. J. Morris, *We Must Make Haste Slowly: The Process of Revolution in Chile* (1973), Kenneth Medhurst, ed., *Allende's Chile* (1973).

Chileab (kīl'ēāb), son of David and Abigail. 2 Sam. 33. Daniel 1 Chron. 31.

Chile saltpeper: see SODIUM NITRATE

chiliasm: see MILLENNIUM

chili con carne (chīl'ē kōn kar'nē) [Span., = hot peppers with meat], Mexican food popular in the United States and now manufactured and canned commercially. It consists mainly of beef, beans, chilies (see PEPPER), garlic, and spices, although the ingredients may be varied.

Chi-lin (jē-līn) or **Kirin** (kē'rīn'), city (1970 est. pop. 1,200,000), central Kirin prov., China, on the Sungari River. It is a shipping port, a railroad junction, and a commercial and industrial center, with large chemical plants. Oil is refined, and fertilizer, cement, lumber, and sugar are also produced. Chi-lin was the capital of Kirin prov. until 1954. It was formerly called Yung-ki.

Chilon (kīl'yōn), Ruth's brother-in-law. Ruth 1:2, 5, 49.

Chilkoot Pass, alt. c. 3,500 ft (1,070 m), in the Coast Mts., on the British Columbia-Alaska line. It was long used by the Chilkoot Indians as a link between the Pacific coast and the Yukon River valley, the first non-Indian traversed the pass in 1878. After the Klondike gold strike (1896), the pass became a much-used route to the interior. See Archie Satterfield, *Chilkoot Pass: Then and Now* (1973).

Chillán (chēyān'), city (1970 pop. 102,361), capital of Ñuble prov., S. central Chile. Located in Chile's central valley, the city is a leading agricultural and commercial center. Founded in the 16th cent., it was destroyed by earthquake and flood in 1751 but was rebuilt and played a prominent role in the revolution against Spain. Bernardo O'Higgins, the liberator of Chile, was born in Chillán. One of the world's worst earthquakes leveled Chillán in 1939, claiming 10,000 lives. The city was subsequently rebuilt.

chill hardening: see HARDENING

Chillicothe (chīl'ikōth'ē), city (1970 pop. 24,842), seat of Ross co., S. central Ohio, on the Scioto River, inc. 1802. It is the trade and distribution center of a farming area that specializes in raising cattle and hogs and growing corn. Long noted for its large paper mills, Chillicothe also manufactures aluminum cooking utensils, shoes, floor tiles, and railroad-car springs. Founded in 1796 by settlers from Virginia, Chillicothe derives its name from the Shawnee Indian word meaning "principal town." In 1800 it became the capital of the NORTHWEST TERRITORY, from 1803 to 1810 and from 1812 to 1816 it was the capital of Ohio. Chillicothe grew in the 19th cent. as an inland port on the Ohio and Erie Canal and a pork packing center. During World War I, Camp Sherman, a large Army training base, was built in Chillicothe, after the war a veterans hospital, still in use, was built on part of the site. Adena State Memorial, the home of Thomas Worthington, Ohio's first U.S. Senator and sixth governor, and Ross County Historical Society Museum, which contains exhibits of pioneer crafts and rifle making, are in Chillicothe. Just outside the city is Mound City Group National Monument, containing prehistoric Indian burial mounds. (See NATIONAL PARKS AND MONUMENTS, table.) Chillicothe also has a state prison and a branch of Ohio Univ.

Chillingworth, William, 1602-44, English theologian. He was converted to Roman Catholicism and in 1630 went to Douai to study. Under the influence of his godfather, William Laud, he abjured that faith in 1634, and took holy orders (1638) in the Church of England. In 1638 he published *The Religion of Protestants a Safe Way to Salvation*, a defense of the Protestant view that the Bible is the sole authority in matters of religion and that the right of interpretation is reserved to the individual. He served as chaplain in the king's army in the civil war, was taken prisoner (1643), and died in detention. See study by R. R. Orr (1967).

Chilliwack (chīl'iwāk), city (1971 pop. 9,135), SW British Columbia, Canada, on the Fraser River. It is

an agricultural, dairying, and logging center. The main industry is food processing.

Chilmad (kīl'mād), city or state that traded with Tyre. Ezek. 27:23.

Chiloé (chēlōā'), island (3,241 sq mi/8,394 sq km), a part of Chile prov., off S. Chile. It is separated from the mainland by the Corcovado and Ancud gulfs and the Chacao channel. It is the largest of the Chilean islands and the only one that has been successfully settled. A rainy climate favoring the growth of wet and dense evergreen forests makes it one of the world's last virgin frontiers. Nevertheless the settlers have been able to raise wheat and potatoes, and to export timber. The population is concentrated around Ancud, the capital, and Castro, the former was totally destroyed and the latter badly damaged by an earthquake in 1960. Wrested from the Indians by the Spanish in 1567, Chiloé was the last stronghold of Spanish royalists, who were not driven out until 1826.

Chilon (kī'lōn), 6th cent. B.C., one of the SEVEN WISE MEN OF GREECE. He was a Spartan and brought greater strictness to Spartan training. As an ephor (c. 556 B.C.) he strengthened the power of that position, and for the first time the ephors directed policy with the king.

Chilpancingo (chēl'pānsēng'gō), city (1970 pop. 56,904), capital of Guerrero state, S. Mexico. Nearby aboriginal ruins indicate that the city was once the center of a culture higher than the Aztec. Its full name is Chilpancingo de los Bravos, in honor of its heroes in the war against Spain—three brothers, of whom Nicolas Bravo was most prominent. During the war, the Congress of Chilpancingo, convened in 1813 by Morelos y Pavon, briefly established a constitutional republic based on the reforms of Hidalgo y Costilla.

Chilperic I (chīl'pērīk), d. 584, Frankish king of Neustria (561-84), son of Clotaire I. He feuded bitterly with his brother SIGEBERT I, who had inherited the E. Frankish kingdom that came to be known as Austrasia. Their struggle became savage after Chilperic and his mistress and future wife, FREDEGUNDE, murdered (567) Chilperic's second wife, Galswintha, she was the sister of Sigebert's wife, BRUNHILDA. In the wars between the two brothers, Sigebert overran Neustria before his death (575). Later, Chilperic was murdered, probably at the instigation of Brunhilda. The feud was inherited by Chilperic's son and successor, CLOTAIRE II.

Chiltern Hills, range of chalk hills, c. 45 mi (70 km) long and 15 to 20 mi (24-32 km) wide, S. England, NW of London, extending NE from Goring Gap. Its highest elevation is Coombe Hill (852 ft/260 m), SE of Aylesbury. Chiltern timber supports the local furniture industry. Roman works have been found in the hills.

Chiltern Hundreds, the obsolete (since the 19th cent.) administrative districts of Stoke, Burnham, and Desborough in Buckinghamshire, S. central England. The stewardship of the Chiltern Hundreds is an obsolete office with only a nominal salary. It is, however, legally an office of profit under the crown and, as such, may not be held by a member of Parliament. Since members of Parliament may not resign, "applying for the Chiltern Hundreds" or for the similarly obsolete stewardship of the Manor of Northstead is the method by which a member gives up his seat.

Chi-lung (jē-lōōng), **Kilung**, or **Keelung** (both kē'-), city (1969 pop. 317,780), N. Taiwan, on the East China Sea. Because of its excellent harbor it is the principal port and naval base of Taiwan. Shipbuilding is an important industry. Chemicals, machinery, fertilizers, and marine products are also produced. Coal and gold are mined nearby. The city has extensive rail connections and is a major commercial center. Occupied by the Spanish in 1626, it passed (1641) to the Dutch, who lost it to invading Chinese under Koxinga in 1662. It passed to the Manchus in 1683. The port was opened to Western trade in 1860. Captured by the Japanese in 1895 and renamed Kirun, Chi-lung remained under their rule until 1945.

chimaera (kīmēr'a), cartilaginous marine fish, related to the sharks. Also called ratfishes, chimaeras are found in temperate oceans throughout the world, mostly in deep water. They have large heads, long, thin, ratlike tails, and large, fanlike pectoral fins. In many species there is a poison spine in front of the first dorsal fin. Their slippery skins are black, gray, or silver, often with stripes or spots. The largest reach a length of about 6½ ft (2 m). Chimaeras resemble sharks in certain fundamental respects. They have cartilage skeletons, males have claspers for internal fertilization of females, and females lay eggs.

encased in leathery cases. However, they resemble the bony fishes in having the upper jaw fused to the skull, the gill slits opening into a single chamber, a bony covering, or operculum, over the gill slits, and separate anal and urogenital openings. A distinctive feature of chimaeras is the presence of extra claspers in the male, one in front of each pelvic fin and a prominent one on the forehead. The function of these appendages is not known, but they are thought to play a role in courtship. Chimaeras form the subclass Holocephali of the phylum CHORDATA, subphylum Vertebrata, class Chondrichthyes.

Chimay, princesse de. see TALLIEN, THÉRÈSE CABAR-RUS

Chimborazo (chëmbörä'sō), inactive volcano, 20,577 ft (6,272 m) high, central Ecuador, the highest in Ecuador. Its summit is always snow-capped. First explored by Alexander von Humboldt in 1802, it was first scaled in 1880 by Edward Whymper. It is frequently associated with nearby Cotopaxi, although the two volcanoes have different shapes.

chime, in music. see BELL

Chimera. see BELLEROPHON and TYPHON

Chimham (kî'm'hām), Barzillai's son. 2 Sam 19:37,38,40. The "habitation of Chimham" was a place near Bethlehem. Jer 41:17.

Chimkent (chîmkyënt'), city (1970 pop 247,000), capital of Chimkent oblast, Central Asian USSR, in Kazakhstan, on the Turkistan-Siberia RR. It has large zinc and lead smelters and machine, chemical, and textile industries. Founded in the 12th cent., Chimkent was a Kokand fortress before it was taken by Russia in 1864.

Chimmesyan Indians: see TSIMSHIAN INDIANS

Chimney Rock National Historic Site: see NATIONAL PARKS AND MONUMENTS (table)

chimney swallow. see SWIFT

chimpanzee, an APE, genus Pan, of the equatorial forests of central and W Africa. The common chimpanzee, Pan troglodytes, lives N of the Congo River. Full-grown animals of this species are up to 5 ft (1.5 m) tall and weigh about 150 lb (68 kg); they have an arm spread of up to 9 ft (2.7 m) and are much stronger than humans. They are covered with long, black hair over most of the body and have naked faces ranging in color from nearly white to nearly black. The pygmy chimpanzee, P. paniscus, lives south of the Congo. It is much smaller and more slenderly built, with a black face. Chimpanzees spend much time on the ground, where they walk on all fours, using the soles of the feet and the knuckles of the hands; they can also stand on two legs and sometimes walk this way for short distances, especially when carrying things. They climb trees in pursuit of food and for nesting and can swing by their hands from one branch to the next. Their diet consists largely of fruit and other plant matter, but they also hunt and eat small animals, including monkeys. They use and even make tools, for example, they collect termites using twigs that they have gathered and stripped of leaves. Chimpanzees move about the forest in bands of varying composition, usually numbering six to ten individuals. There is a social hierarchy among the males of a group, and they engage in dominance contests involving much screaming and stamping. Family groups consist of mothers and children, females mate with many males during their fertile periods. A single infant is born every two or three years, young chimpanzees ride about on their mothers' backs. Under ideal circumstances chimpanzees may live 50 years. Chimpanzees are noisy, excitable animals both in the wild and in captivity. They may develop affection for humans, but are likely to become dangerous after maturing in captivity. They are considered the most intelligent of apes; they have excellent memories and reasoning powers and enjoy performing. Although they are incapable of speech beyond their own simple system of cries, captive chimpanzees have been taught to communicate in a language using visual rather than verbal symbols. Because of their close relationship to humans they are often used for medical and behavioral experimentation. Chimpanzees are classified in the phylum CHORDATA, subphylum Vertebrata, class Mammalia, order Primates, family Pongidae. See G. H. Bourne, *The Chimpanzee* (6 vol., 1973); Jane Van Lawick-Goodall, *In the Shadow of Man* (1971); R. M. Yerkes, *Chimpanzees: A Laboratory Colony* (1943, repr 1971).

Chimu (chëmōō'), ancient Indian civilization on the desert coast of N Peru. It is believed to have begun c 1200. The MOCHICA, an earlier civilization, was previously known as early Chimu or proto-Chimu. After the decline of the Mochica (c 800), there was a long

transition period about which relatively little is known except that it was probably influenced by TIAHUANACO. The Chimu were urban dwellers and apparently had a powerful military and a complex, well-organized social system. They built many well-planned cities, the largest and most impressive was their capital, CHAN CHAN. The Chimu exerted considerable influence on the Cuismancu empire, centered at CHANCAY. The last phases of Chimu civilization were contemporaneous with the rise of the INCA empire, by which it was absorbed c 1460. See V. W. Wolfgang, *The Desert Kingdoms of Peru* (1965); E. P. Lanning, *Peru Before the Incas* (1967).

Ch'in (chîn), dynasty of China, which ruled from 221 B.C. to 207 B.C. The word *China* is derived from Ch'in, the first dynasty to unify the country. The Ch'in, a vigorous people from the northwest, moved into the rich plain of the Wei River in the 4th cent. B.C. By 221 B.C. the Ch'in army, led by Prince Cheng, had unified China by conquering the warring feudal states of the late CHOU period. The prince took the title Shih Hwang-ti [first emperor] and established his capital near modern Sian, Shensi prov. In all matters of state he was counseled by Li Ssu (d. 208 B.C.), a brilliant Chinese scholar. Until Shih Hwang-ti died in 210 B.C. he was engaged in vast projects. He had built much of the Great Wall (see CHINA, GREAT WALL OF), had extended his empire W to Kweichow, N to Kansu, and S to Tonkin in what is now North Vietnam, and had made his capital the most splendid city of China. He also built a network of roads and canals that converged on the capital. To centralize his administration he abolished feudalism and established the pyramidal governmental system that has been the model for later unifying dynasties. He attempted to unify Chinese culture by standardizing the written language and to combat traces of the feudal past by destroying all philosophical works, especially those of Confucius. Shih Hwang-ti was succeeded by a weakling son, who was quickly overthrown (207 B.C.). Soon after, the HAN dynasty came to power in China. See Derk Bodde, *China's First Unifier* (1938, repr 1967); Leonard Cottrell, *The Tiger of Ch'in* (1962).

Chin, dynasty of China (265-420). see TSIN

China, Mandarin *Chung Hua jen Min Kung Ho Kuo* [central glorious people's united country, i.e., people's republic], country (1974 est. pop. 800,000,000), 3,691,502 sq mi (9,561,000 sq km), E Asia. This article concerns mainland China, now called the People's Republic of China, the Republic of China, or Nationalist China, is on the island of TAIWAN (see separate article). The capital of mainland China is PEKING. The most populous country in the world and the second largest (after the USSR), China has a 4,000-mi (6,400-km) coast that fronts on the Yellow Sea, the East China Sea, and the South China Sea. It is elsewhere bounded on the E by the USSR and North Korea, on the N by the USSR and the Mongolian People's Republic, on the W by the USSR and Afghanistan, and on the S by Pakistan, India, Nepal, Sikkim, Bhutan, Burma, Laos, and North Vietnam. Off the coast is the large island of HAINAN. China comprises 21 provinces (ANHWEI, CHEKIANG, FUKIEN, HONAN, HOPEI, HUNAN, HUPEH, KANSU, KIANGSI, KIANGSU, KWANGTUNG, KWEICHOW, SHANSI, SHANTUNG, SHENSI, SZECHWAN, TSINGHAI, YÜNNAN, and, in MANCHURIA, HEILONGKIANG, KIRIN, and LIAONING) and five autonomous regions (TIBET, the INNER MONGOLIAN AUTONOMOUS REGION, the NINGXIA HUI AUTONOMOUS REGION, the KWANGSI CHUANG AUTONOMOUS REGION, and the Sinkiang Uigur Autonomous Region [see SINKIANG]). China may be divided into the following geographic regions: the 12,000-ft-high (3,660-m) Tibetan plateau, bounded in the N by the Kunlun mountain system, the Tarim and Dzungarian basins of Sinkiang, separated by the Tien Shan mts., the vast Inner Mongolian tableland, the eastern highlands and central plain of Manchuria, and what has been traditionally called China proper. This last region, which contains some four-fifths of the country's population, falls into three divisions. North China, which coincides with the Huang Ho (Yellow River) basin and is bounded in the S by the Tsingling mts., includes the loess plateau of the northwest, the N China plain, and the mountains of the Shantung peninsula. Central China, watered by the Yangtze River, includes the basin of Szechwan, the central Yangtze lowlands, and the Yangtze delta. South China includes the plateau of Yünnan and Kweichow and the valleys of the Si and Canton rivers. To the extent that a general statement about the climate of such a large country can be made, China may be described as wet in the summer and dry in the winter. Regional differences are found in the highlands

of Tibet, the desert and steppes of Sinkiang and Inner Mongolia, and in China proper. There the Tsingling mts. are the major dividing range not only between semiarid N China and the more humid central and S China but also between the grain-growing economy of the north and the rice economy of the south, overpopulation in the south, due to migrations from the north, has often prompted emigration to SE Asia and elsewhere. Agriculture is by far the leading occupation in China, involving about 80% of the population, although extensive rough, high terrain and large arid areas—especially in the west and north—limit cultivation to only about 11% of the land surface. Except for the oasis farming in Sinkiang and Tsinghai, some irrigated areas in Inner Mongolia and Kansu, and sheltered valleys in Tibet, agricultural production is restricted to the east. China is the world's largest producer of rice, sweet potatoes, kaoliang, millet, barley, peanuts, and tea. Those, together with wheat (in which China ranks third in world production), other grains, corn, soybeans, and potatoes, are the most important crops. Cotton is the most valuable cash crop, followed by oilseeds, silk, tea, tobacco, ramie, jute, hemp, sugarcane, and sugar beets. Livestock raising on a large scale is confined to the border regions and provinces in the north and west; it is mainly of the nomadic pastoral type. China ranks third in world production of sheep and fifth in cattle production. Horses, donkeys, and mules are work animals in the north, while oxen and water buffalo are used for plowing chiefly in the south. Hogs and poultry are widely raised in China proper, furnishing important export staples, such as hog bristles and egg products. Fish supply most of the animal protein in the diet, and both inland and marine fishing are important. China is one of the world's major mineral-producing countries; there has been extensive exploration since 1950 and significant new deposits have been found. Coal is the most abundant mineral (China ranks with the United States and the USSR in production and reserves), high-quality, easily-mined coal is found throughout the country, but especially in the north and northeast. China also has extensive iron-ore deposits, the largest mines are at AN-SHAN and PEN-CH'U, in Liaoning prov. China used to import about 90% of its petroleum, but new fields were discovered in the 1960s, and the country is approaching self-sufficiency in crude oil. Refining operations are being improved. Offshore exploration has become important, massive deposits off the coasts are believed to exceed all the world's known oil reserves. China's leading export minerals are tungsten (China has the world's largest supply), antimony, tin, molybdenum, bismuth, mercury, magnesite, and salt. China is among the world's three top producers of tin, tungsten, antimony, and magnesite, and ranks second (after the United States) in the production of salt, seventh in manganese, and eighth in lead ore. There are large deposits of uranium in the northwest, especially in Sinkiang; new mines have also opened in Kiangsi and Kwangtung provs. Aluminum is found in many parts of the country, the largest reduction plant is at FU-SHUN, in Liaoning prov. China also has deposits of gold, zinc, copper, fluorite, asbestos, phosphate rock, pyrite, and sulfur. Coal is the single most important energy source, coal-fired thermal electric generators provide close to 70% of the country's electric power. China has extensive hydroelectric energy potential, notably in Yunnan, W Szechwan, and E Tibet. Hydroelectric projects are in all the provinces served by major rivers where near-surface coal is not abundant. Perhaps the most spectacular project is the huge dam at the San-men Gorge on the Huang Ho. Important industrial products are manufactures that serve agriculture (farm machinery, fertilizers, etc.), as well as machine tools, iron and steel, textiles, processed foods, and building materials. Before 1945 heavy industry was concentrated in the northeast (Manchuria), but important centers have now been established in other parts of the country, notably in SHANGHAI and WU-HAN. Since the 1960s the emphasis has been on regional self-sufficiency, and many factories have sprung up in rural areas. The iron and steel industry is organized around eight major centers (including An-shan, one of the world's largest), but thousands of small iron and steel plants have also been established throughout the country. Brick, tile, cement, and food-processing plants are found in almost every province. Shanghai and CANTON are the traditionally great textile centers, but many new mills have been built, concentrated mostly in the cotton-growing provinces of N China and along the Yangtze River, the largest mill is now in Wu-han.

The domestic handicraft industry produces most of the consumer goods and such export products as porcelain and lacquer articles. Most of China's large cities, e.g. Shanghai, TIENTSIN, and Canton, are also the country's main ports. Other leading ports are rail termini, such as LU-TA (a conurbation of LU-SHUN, formerly Port Arthur, and TA-LIEN), on the South Manchuria RR, and CH'ING-TAO, on the line from CHI-NAN. In the northeast (Manchuria) are large cities and rail centers, notably SHEN-YANG (Mukden), HARBIN, and CH'ANG-CH'UN. Great inland cities include Peking and the river ports of NANKING, CHUNG-KING, and Wu-han. T'AI-YUAN and HSI-AN are important centers in the less populated interior, and LAN-CHOU is the key communications junction of the vast northwest. Rivers and canals (notably the Grand Canal, which connects the Huang Ho and the Yangtze rivers) remain important transportation arteries. The east and northeast are well served by railroads and highways, and there are now major rail and road links with the interior. There are railroads to North Korea, the USSR, the Mongolian People's Republic, and North Vietnam, and road connections to Pakistan, India, Nepal, and Burma. Although a British crown colony, HONG KONG has long been a major maritime outlet of S. China. The Han Chinese (so called for the Han dynasty) make up approximately 94% of the total population. They are linguistically homogeneous in the north, where they speak Mandarin dialects (the basis of the new national language of China), while in the south Cantonese, Wu, and Hakka are only a few of the many dialects spoken (some 108 dialects are spoken in Fukien prov. alone). The written language is universal, Chinese ideographs are common to all the dialects. The non-Chinese groups represent only 6% of the population, but the interior regions in which they live constitute more than half of the total area of the country. Among the main non-Chinese minorities are the Chuang, a Thai-speaking group, found principally in Kwangsi, the Uigurs, who live mainly in Sinkiang, the Hui (Muslims), found chiefly in Ninghsia, the Yi (Lolo), who live on the borders of Szechwan and Yunnan, the Tibetans, concentrated in Tibet and Tsinghai, the Miao, widely distributed throughout the mountainous areas of S. China, the Mongols, found chiefly in the Mongolian steppes, and the Koreans, who are concentrated in Manchuria. The Manchus have been sinicized and are now considered as Han. The constitution of the People's Republic of China provides for religious freedom, but religious practice is not encouraged; traditionally, Confucianism, Buddhism, Taoism, and ancestor worship were practiced in an eclectic mixture with varying appeals. Islam, the largest monotheistic sect, is found chiefly in the northwest. Christianity, which had a small number of adherents, has been repressed.

Origins and History The fossils of *Sinanthropus pekingensis* (see MAN, PREHISTORIC) found in N. China are the earliest discovered protohuman remains in NE Asia. About 20,000 years ago, after the last glacial period, modern man appeared in the Ordos desert region. The subsequent culture shows marked similarity to that of the higher civilizations of Mesopotamia, and some scholars argue a Western origin for Chinese civilization. However, since the 2d millennium B.C. a unique and fairly uniform culture has spread over almost all of China. The substantial linguistic and ethnological diversity of the south and the far west result from their having been infrequently under the control of central government. China's history is traditionally viewed as a continuous development with certain repetitive tendencies, as described in the following general pattern. The area under political control tends to expand from the E. Huang Ho and Yangtze basins, the heart of Chinese culture, and then, under outside military pressure, to shrink back. Conquering barbarians from the north and the west supplant native dynasties, take over Chinese culture, lose their vigor, and are expelled in a surge of national feeling. Following a disordered and anarchic period a new dynasty may arise. Its predecessor, by engaging in excessive warfare, tolerating corruption, and failing to keep up public works, has forfeited the right to rule—in the traditional view, he has lost "the mandate of Heaven." The administrators change, central authority is reestablished, public works constructed, taxation modified and equalized, and land redistributed. After a prosperous period disintegration reappears, inviting barbarian intervention or native revolt. Although traditionally supposed to have been preceded by the semilegendary Hsia dynasty, the SHANG dynasty (c. 1523–1027 B.C.) is the first in

documented Chinese history. During the succeeding, often turbulent, CHOU dynasty (c. 1027–256 B.C.), CONFUCIUS, LAO-TZE, and MENCIUS lived, and the literature that until recently formed the basis of Chinese education was written. The use of iron was the main material advance. The semibarbarous CH'IN dynasty (221–207 B.C.) first established the centralized imperial system that was to govern China during stable periods. The Great Wall (see CHINA, GREAT WALL OF) was begun in this period. The native HAN dynasty period (202 B.C.–A.D. 220), traditionally deemed China's imperial age, is notable for long peaceable rule, expansionist policies, and great artistic achievement. The THREE KINGDOMS period (A.D. 220–65) opened four centuries of warfare among petty states and of invasions of the north by the barbarian Hsiung-nu (Huns). In this inauspicious time China experienced rapid cultural development. Buddhism, which had earlier entered from India, and Taoism, a native cult, grew and seriously endangered Confucianism. Indian advances in medicine, mathematics, astronomy, and architecture were adopted. Art, particularly figure painting and decoration of Buddhist grottoes, flourished. Feudalism partly revived under the TSIN dynasty (265–420) with the decay of central authority. Under the SUI (581–618) and the T'ANG (618–906) a vast domain, much of which had first been assimilated to Chinese culture in the preceding period, was unified. The civil service examination system based on the Chinese classics and a renaissance of Confucianism were important developments of this brilliant era. Its fresh and vigorous poetry is especially noted. The end of the T'ang was marked by a withdrawal from conquered border regions to the center of Chinese culture. The period of the Five Dynasties and the Ten Independent States (906–60), chaotic and depraved, was followed by the SUNG dynasty (960–1279), a time of scholarly studies and artistic progress, marked by authentication of the Confucian literary canon and the improvement of printing techniques through the invention of movable type. The poetry of the Sung period was derivative, but a new popular literary form, the novel, appeared at that time. Neo-Confucianism developed systematically. Gunpowder was first used for military purposes in this period. While the Sung ruled central China, barbarians—the Khitai, the Jurchen, and the Tangut—created northern empires that were swept away by the MONGOLS under JENGHIZ KHAN. His grandson KUBLAI KHAN, founder of the YUAN dynasty (1260–1368), retained Chinese institutions. The great realm of Kublai was described in all its richness by one of the most celebrated of all travelers, Marco POLO. Improved roads and canals were the dynasty's main contributions to China. The MING dynasty (1368–1644) set out to restore Chinese culture by a study of Sung life. Its initial territorial expansion was largely lost by the early 15th cent. European trade and European infiltration began with Portuguese settlement of MACAO in 1557 but immediately ran into official Chinese antiforeign policy. Meanwhile the MANCHU peoples advanced steadily south in the 16th and the 17th cent. and ended with complete conquest of China by 1644 and with establishment of the CH'ING (Manchu) dynasty (1644–1912). Under emperors K'ang Hsi (reigned 1662–1722) and CH'EN LUNG (reigned 1735–96), China was perhaps at its greatest territorial extent.

Foreign Intervention in China The Ch'ing opposition to foreign trade, at first even more severe than that of the Ming, relaxed ultimately, and in 1834, Canton was opened to limited overseas trade. Great Britain, dissatisfied with trade arrangements, provoked the OPIUM WAR (1839–42), obtained commercial concessions, and established EXTRATERRITORIALITY. Soon France, Germany, and Russia successfully put forward similar demands. The Ch'ing regime, already weakened by internal problems, was further enfeebled by European intervention, the devastating TAI-PING REBELLION (1848–65), and Japan's military success in 1894–95 (see SINO-JAPANESE WAR, FIRST). Great Britain and the United States promoted the Open Door Policy—that all nations enjoy equal access to China's trade, this was generally ignored by the foreign powers, and China was divided into separate zones of influence. Chinese resentment of foreigners grew, and the BOXER UPRISING (1900), encouraged by Empress T'ZU HSI, was a last desperate effort to suppress foreign influence. Belated domestic reforms failed to stem a revolution long-plotted, chiefly by SUN YAT-SEN, and set off in 1911 after the explosion of a bomb at Wu-ch'ang. With relatively few casualties, the Ch'ing dynasty was overthrown and a republic was established. Sun, the first president, resigned early in 1912 in favor of YUAN SHIH-

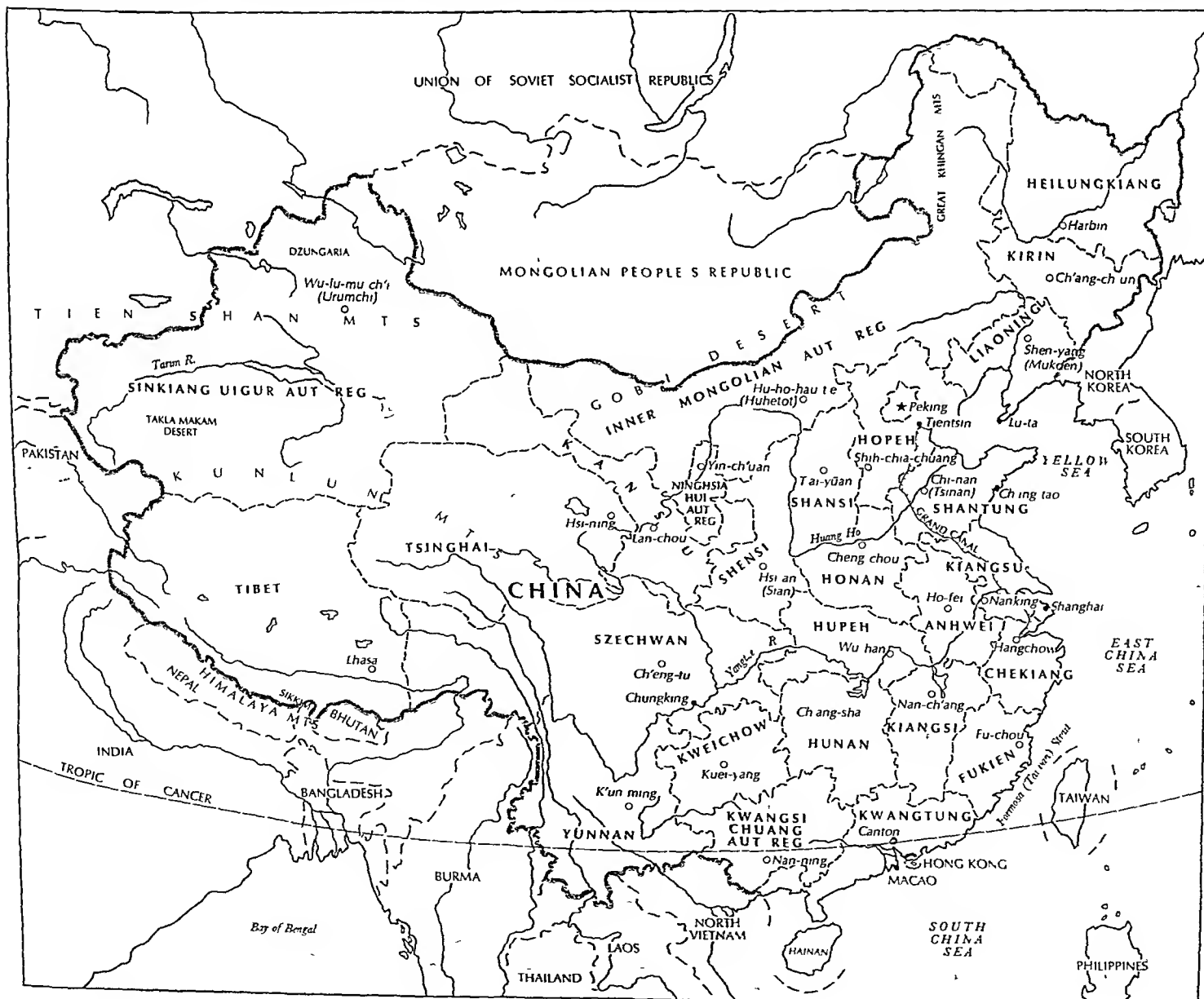
K'AI, who commanded the military power, Yuan established a repressive rule, which led Sun's followers to revolt sporadically. Early in World War I, Japan seized the German leasehold in Shantung prov. and presented China with TWENTY-ONE DEMANDS, designed to make all of China a virtual Japanese protectorate. China was forced to accept a modified version of the Demands, although the treaties were never ratified by the Chinese legislature. China entered World War I on the Allied side in 1917, but at the Versailles peace conference was unable to prevent Japan from being awarded the Shantung territory. Reaction to this provision in the Versailles treaty led to Nationalist flare-ups and the May Fourth Movement of 1919. At the Washington Conference (1921–22), Japan finally agreed to withdraw its troops from Shantung and restore full sovereignty to China. The Nine-Power Treaty, signed at the Conference, guaranteed China's territorial integrity and the Open Door Policy. Meanwhile, Yuan had died in 1916 and China was disintegrating into rival warlord states. Civil war raged between Sun's new revolutionary party, the KUOMINTANG, which established a government in Canton and received the support of the southern provinces, and the national government in Peking, supported by warlords (semi-independent military commanders) in the north. As cultural ferment seethed throughout China, intellectuals sought inspiration in Western ideals, HU SHIH, prominent in the burgeoning literary renaissance, began a movement to simplify the Chinese written language. Labor agitation, especially against foreign-owned companies, became more common, and resentment against Western religious ideas grew. In 1921, the Chinese Communist party (see COMMUNIST PARTY, in China) was founded. Failing to get assistance from the Western countries, Sun made an alliance with the Communists and sought aid from the USSR. In 1926, CHIANG KAI-SHEK led the army of the Kuomintang northward to victory. Chiang reversed Sun's policy of cooperation with the Communists and executed many of their leaders. Thus began the long civil war between the Kuomintang and the Communists. Chiang established (1928) a government in Nanking and obtained foreign recognition. A Communist government was set up in the early 1930s in Kiangsi, but Chiang's continued military campaigns forced (1934) them on the LONG MARCH to the northwest, where they settled in Shensi. Japan, taking advantage of China's dissension, occupied Manchuria in 1931 and established (1932) the puppet state of MANCHUKUO (see SINO-JAPANESE WAR, SECOND). While Japan moved southward from Manchuria, Chiang chose to campaign against the Communists. In the "Sian Incident" (Dec. 1936), Chiang was kidnapped by Nationalist troops from Manchuria and held until he agreed to accept Communist cooperation in the fight against Japan. In July, 1937, the Japanese attacked and invaded China proper. By 1940, N. China, the coastal areas, and the Yangtze valley were all under Japanese occupation, administered by the puppet regime of WANG CHING-WEI. The capital was moved inland to Chungking. After 1938, Chiang resumed his military harassment of the Communists, who were an effective fighting force against the Japanese. With Japan's attack (1941) on U.S. and British bases and the onset of World War II in Asia, China received U.S. and British aid. The country was much weakened at the war's close. The end of the Japanese threat and the abolition of extraterritoriality did not bring peace to the country. The hostility between the Chinese Nationalists and the Communists flared into full-scale war as both raced to occupy the territories evacuated by the Japanese. The United States, alarmed at the prospect of a Communist success in China, arranged through ambassadors Patrick J. Hurley and George C. Marshall for conferences between Chiang and the Communist leader MAO TSE-TUNG, but these proved unsuccessful. When the Russians withdrew from Manchuria, which they had occupied in accordance with agreements reached at the YALTA CONFERENCE, they turned the Japanese military equipment in that area over to the Chinese Communists, giving them a strong foothold in what was then the industrial core of China. Complete Communist control of Manchuria was realized with the capture of Shen-yang (Mukden) in Nov., 1948. Elsewhere in the country, Chiang's Nationalists, supplied by U.S. arms, were generally successful until 1947, when the Communists gained the upper hand. Sweeping inflation, increased police repression, and continual famine weakened public confidence in the Nationalist government, and much of the population came to at least passively support the Communists. Peking fell to the Communists without a fight in Jan., 1949, followed (April–Nov., 1949) by the major cities of Nan-

king, Han-k'ou, Shanghai, Canton, and Chungking. In Aug., 1949, when little Nationalist resistance remained, the U.S. Dept. of State announced that no further aid would be given to Chiang's government. The Communists, from their capital at Peking, proclaimed a central people's government on Oct. 1, 1949. The seat of the Nationalist government was moved to Taiwan in Dec., 1949. The new Communist government was immediately recognized by the USSR, and shortly thereafter by Great Britain, India, and other nations. Recognition was, however, refused by the United States, which maintained close ties with Taiwan. By April, 1950, the last pockets of Nationalist resistance were cleaned out, and all of mainland China was secure for the Communists.

Communism in China. The Communists brought the soaring inflation under control and effected a more equitable distribution of food. A land-reform program was launched, and police control was tightened. During the first five-year plan (1953-57), agriculture was collectivized and industry was nationalized. With USSR assistance, construction of many modern large-scale plants was begun, and railroads were built to link the new industrial complexes of the north and northwest. On the international scene, Chinese Communist troops took possession of Tibet in Oct., 1950. That same month Chinese forces intervened in the KOREAN WAR to meet a drive by United Nations forces toward the Manchurian border. Large-scale Chinese participation in the war persisted until the armistice of July, 1953, after which China emerged as a diplomatic power in Asia. CHOU EN-LAI became internationally known through his role at the Geneva Conference of 1954 and at the Bandung Conference of 1955. The Great Leap Forward, an economic program aimed at

making China a major industrial power overnight, was underway by 1958. It featured the expansion of cooperatives into communes, which disrupted family life but offered a maximum use of the labor force. The program was not successful. The worst weather conditions in a century brought three successive crop failures (1959-61), with the ensuing food shortages dramatizing the dangers of neglecting agricultural development while emphasizing industrial expansion. The industrialization program, pushed too fast, resulted in the overproduction of inferior goods and the deterioration of the industrial plant. A severe blow was the termination of Soviet aid in 1960 and the withdrawal of Soviet technicians and advisers—events that revealed a growing ideological rift between China and the USSR. The rift, which began with the institution of a destalinization policy by the Soviets in 1956, widened considerably after the USSR adopted a more conciliatory approach toward the West in the COLD WAR. There were massive military buildups along the USSR-Chinese border, and border clashes erupted in Manchuria and Sinkiang. Meanwhile, hostility continued between Communist China and the Nationalist government of Chiang Kai-shek, who pledged himself to the reconquest of the mainland. The Communist government insisted upon its right to Taiwan, but the United States made clear its intention to defend that island against direct attack, having even given (1955) a qualified promise to defend the Nationalist-held offshore islands of Quemoy and Matsu as well. China's relations with other Asian nations, at first cordial, were affected by China's encouragement of Communist activity within their borders, the suppression of a revolt in Tibet (1959-60), and an undeclared border war with India

in late 1962 over disputed territory. In the VIETNAM WAR, China provided supplies, armaments, and technical assistance as well as militant verbal support to North Vietnam. In the late 1960s and early 1970s the emphasis of China's foreign policy changed from revolutionary to diplomatic, new contacts were established, and efforts were made to improve relations with many governments. China continued to strengthen its influence with other underdeveloped nations, extending considerable economic aid to countries in South America, Africa, and Asia. Important steps in Chinese progression toward recognition as a world power were the successful explosions of China's first atomic bomb (1964) and of its first hydrogen bomb (1967), and the launching of its first satellite (1970). Internal dissension and power struggles were revealed in such domestic crises as the momentous Cultural Revolution (1966-69), the death (1971) in an airplane crash of defense minister LIN BIAO while he was allegedly fleeing to the Soviet Union after an abortive attempt to assassinate Mao and establish a military dictatorship, and a major propaganda campaign launched in 1973, which mobilized the masses against such widely ranging objects of attack as Lin Biao, the teachings of Confucius, and cultural exchanges with the West. Economically, the emphasis in the 1960s and early 1970s was on agriculture. After the Cultural Revolution, economic programs were initiated featuring the establishment of many small factories in the countryside and stressing local self-sufficiency. Both industrial and agricultural production records were set in 1970, and, despite serious droughts in some areas in 1972, output continued to increase steadily. Long-standing objections to the admission of Communist China to the United Na-



The key to pronunciation appears on page xi

tions were set aside by the United States in 1971, that October, Communist delegates were seated as the representatives of all China and, despite the opposition of the United States, which favored a "two-China" membership, the Nationalist delegation was expelled. A breakthrough in the hostile relations between the United States and Communist China came with the dramatic visit of President Richard M. Nixon to Peking in Feb. 1972. Although U.S. support of Taiwan remained a sensitive issue, the visit resulted in a joint agreement to work toward peace in Asia and to develop closer economic, cultural, and diplomatic ties. Political power in the People's Republic of China resides in the Chinese Communist party, which operates through the government structure, the party has been dominated since the 1930s by Mao Tse-tung. Although Mao resigned his position as chairman of the People's Republic during the failures of the Great Leap Forward, as chairman of the central committee of the Communist party he remains the most powerful political figure in China (Liu Shao-ch'i, who succeeded Mao as chairman of the Republic in 1959, was deposed during the Cultural Revolution.) Chou En-lai, premier and chief administrator of the country, is now second only to Mao in the power hierarchy. A new constitution, adopted in Jan. 1975, abolished the position of head of state and enhanced the power of Mao and Chou. For aspects of Chinese culture not treated in this article, see CHINESE ARCHITECTURE, CHINESE ART, CHINESE LITERATURE, CHINESE MUSIC. See Hu Chang-tu et al., *China: Its People, Its Society, Its Culture* (1960), C. K. Yang, *Religion in Chinese Society* (1961), A. D. Barnett, *China on the Eve of the Communist Takeover* (1963) and *Communist China: The Early Years, 1949-1955* (1963), K. S. Latourette, *The Chinese: Their History and Culture* (4th rev. ed. 1964), Henry McAleavy, *The Modern History of China* (1967), F. H. Schurmann and Orville Schell, *The China Reader* (3 vol., 1967), Werner Eichhorn, *Chinese Civilization* (tr. 1967), Jack Gray, *Chinese Communism in Crisis: Maoism and the Cultural Revolution* (1968), E. H. Schafer et al., *Ancient China* (1968), F. H. Schurmann, *Ideology and Organization in Communist China* (2d ed. 1968), L. C. Goodrich, *A Short History of the Chinese People* (4th ed. 1969), Hilda Hookham, *A Short History of China* (1969), Tuan-shêng Ch'ien, *The Government and Politics of China* (1950, repr. 1970), Wolfgang Franke, *China and the West* (tr. 1967), and *A Century of Chinese Revolution, 1851-1949* (tr. 1970), I. C. Y. Hsu, *The Rise of Modern China* (1970), Owen Lattimore et al., *Pivot of Asia: Sinkiang and the Inner Asian Frontiers of China and Russia* (1950, repr. 1970), Joseph Needham, *Science and Civilization in China* (4 vol., 1954-70), T. R. Tregear, *An Economic Geography of China* (1970), Lucien Bianco, *Origins of the Chinese Revolution, 1915-1949* (1971), J. K. Fairbank, *The United States and China* (3d ed. 1971), R. H. Solomon, *Mao's Revolution and Chinese Political Culture* (1971), O. E. Clubb, *Twentieth Century China* (2d ed. 1972), C. P. Fitzgerald, *The Southern Expansion of the Chinese People* (1972), Theodore Shabad, *China's Changing Map* (rev. ed. 1972), Edgar Snow, *Red China Today: The Other Side of the River* (rev. ed. 1971) and *The Long Revolution* (1972), Yuan-li Wu, *China: A Handbook* (1973), Roderick MacFarquhar, *The Origins of the Cultural Revolution* (Vol. I of a projected 3 vol. series, 1974).

China, Great Wall of, fortifications, c. 1,500 mi (2,400 km) long, winding across N China from Kansu prov. to Hopeh prov. on the Yellow Sea. The wall, running mostly along the southern edge of the Mongolian plain, was erected to protect China from northern nomads. It is an amalgamation of many walls built in ancient times, the first unified wall was built in the 3d cent. B.C. by the CH'IN dynasty. Laborers were conscripted from all over China to build it, and many of them died during the project. The wall's present form dates substantially from the Ming dynasty (1368-1644). It averages 25 ft (7.6 m) in height and is 15 to 30 ft (4.6-9.1 m) thick at the base, sloping to 12 ft (3.7 m) at the top. Guard stations and watchtowers are placed at regular intervals. The eastern part of the wall is earth and stone faced with brick, but in the west it is merely an earth mound. Successive invasions of China from the north demonstrated that the Great Wall had little military utility. Since 1949 a section N of Peking has been reconstructed and is open to visitors.

china clay, one of the purest of the clays, composed chiefly of the mineral KAOLINITE. Usage of the terms *china clay* and *kaolin* is not well defined, sometimes they are used synonymously for a group of similar clays, and sometimes kaolin refers to those obtained

in the United States and china clay to those that are imported. Some authorities term as china clays only the more plastic of the kaolins. China clays are much used in the ceramic industry, especially in fine porcelains, because they can be easily molded, have a fine texture, and are white when fired. These clays are also used as a filler in making paper. In the United States, deposits are found in Georgia, North Carolina, and Pennsylvania and in smaller quantities in some other states; in Europe they are found especially in England (in Cornwall) and in France.

China grass, see NETTLE

China Incident, see SINO-JAPANESE WAR, SECOND

china marks, potter's trademark or signature, incised in the plastic clay before firing or printed before glazing on the bottom of the piece to identify it as his product. The practice was adopted by potters and silversmiths for establishing the genuineness of their wares. Books on pottery or porcelain usually include a list of the china marks of the important factories.

Chi-nan (jê-nan) or **Tsinan** (tsin'an'), city (1970 est. pop. 1,500,000), capital of Shantung prov., E China. It lies 3 mi (4.8 km) S of the Huang Ho (Yellow River) and is a railroad junction on the network linking Shanghai and Nanking with Tientsin; it has connections to Ch'ing-tao and Yen-t'ai. Chi-nan is a light and heavy industrial center with textile mills, food-processing establishments, machine shops, paper mills, and plants making trucks, agricultural machinery, chemicals, and fertilizer. An ancient walled city, Chi-nan was a provincial center as early as the 12th cent. It fell to the Communists in Sept., 1948, with the loss of some 75,000 Nationalist troops. Chi-nan is the seat of Chi-nan Technical Univ., a medical college, and two technical institutes.

chinaware, hard, white, translucent pottery with soft GLAZE, known as PORCELAIN. It originated in China but is now produced in various countries. Its composition is of kaolin and petuntse.

Chincha, see ICA

chinch bug, small North American BUG, *Blissus leucopertus*, of the seed bug family. It feeds on small grains, corn, and other grasses, sucking the plant juices and doing much damage to crops, particularly in the Midwest. The adults, about 1/8 in. (3.5 mm) long, have black bodies with black and white wings, red legs, and red spots at the bases of the antennae. Both long- and short-winged forms occur. There are two generations a year. The adults overwinter in sheltered places, emerging in spring to feed on early maturing grains, such as wheat and oats. They lay their eggs on the bases of the grasses or in the ground, and the nymphs, or larvae (see INSECT), emerge in about a week. Red when they emerge, the nymphs mature in five stages, turning gray or brown. They feed on the same grasses as their parents. When they reach the adult stage, in about six weeks, they migrate on foot to later-maturing grains, such as corn, which are still tender, there they lay the eggs that give rise to the second generation of the season. The BEDBUG, a member of a different bug family, is sometimes called chinch in the South. Chinch bugs are classified in the phylum ARTHROPODA, class Insecta, order Hemiptera, family Lygaeidae.

chinchilla (chinchil'a), small burrowing rodent of South America. It lives in colonies at high altitudes (up to 15,000 ft/4,270 m) in the Andes of Bolivia, Chile, and Peru. One of the costliest of all furs, its soft gray pelt has been valued since the days of the Inca. The wild chinchilla was nearly exterminated before protective laws were passed. At one time over 200,000 pelts were exported from Chile. Wild chinchilla coats have cost as much as \$100,000. Chinchillas are now raised on farms in South America and the United States, and this has resulted in lower prices for the skins, which are still considered among the most valuable. Chinchillas are classified in the phylum Chordata, subphylum Vertebrata, class Mammalia, order Rodentia, family Chinchillidae.

Ch'in chiu-shao (ch'in chyô-shou), c. 1202-1261, Chinese mathematician. He pioneered in the study of indeterminate analysis in his *Mathematical Treatise in Nine Sections* of 1247. The text existed only in manuscript form for several centuries and still has not been fully translated or investigated. Like many traditional Chinese mathematical works, it reflects a Confucian administrator's concern with calendrical, mensural, and fiscal problems.

Chinchon, Luis Jerónimo Fernández de Cabrera Bobadilla Cerda y Mendoza, conde de (lôôës' hâro'nêmô fârnân'dâs dâ kâbrâ'ra bôbâthé'ya sârdâ ç mëndô'sâ kôn'dâ dâ chênchôn'), d. 1647, viceroy of Peru (1629-39). He sent Cristóbal de Acu-

ña on the Teixeira expedition down the Amazon. In 1638, Chinchon's wife, suffering from persistent fever, was treated with a native remedy made from quinaquina bark. As a result, the malaria-curing qualities of quinine became known in Europe. Linnaeus called the genus of quinine-producing trees *Cinchona* in her honor.

chinchona, see CINCHONA

Chindaswinth (chîn'daswînth), d. 653, Visigothic king of Spain (642-53). His reign began violently as factions of the nobility sought to dominate royal policy. Chindaswinth prevailed and together with his son RECCESWINTH, whom he admitted to joint rule in 649, inaugurated a program designed to reduce the differences between his Visigothic and Spanish-Roman subjects. He is therefore sometimes designated by historians a "Romanist" as opposed to a "Gothic nationalist." Unification of the diverse population was furthered by legislation. Chindaswinth seems to have been responsible for revoking the BREVIAIRY OF ALARIC, the compilation of Roman law principles for only Roman subjects, promulgated by Alaric II in 506. Instead he began the compilation of a code fusing Roman and Germanic law and binding upon all subjects. Eventually promulgated by Recceswinth c. 654, it was known as the *Liber iudiciorum* (later as the *Liber* or *Forum iudicum*).

Chinde (chîn'dâ), city (1960 pop. 25,617), E central Mozambique, on the Zambezi River delta. Founded c. 1890, it served as the chief port for Malawi and Zambia when they were British colonies. It is now an export center for sugarcane.

Chindwin (chîn'dwîn), river, c. 550 mi (890 km) long, rising in the hills of N Burma and flowing generally S into the Irrawaddy (of which it is the chief tributary) at Myingyan. It is an important commercial waterway.

Chinese, subfamily of the Sino-Tibetan family of languages (see SINO-TIBETAN LANGUAGES), which is also sometimes grouped with the Tai, or Thai, languages in a Sinitic subfamily of the Sino-Tibetan language stock. Chinese comprises a number of variants, those that are mutually unintelligible are considered separate languages by some linguists but are classed among the many dialects of Chinese by others. The most widespread form of Chinese is Mandarin, which may be regarded as modern standard Chinese. It has several dialects and is spoken by about 655 million people in central and N China, claiming more native speakers than any other language (English is second, with 265 million speakers). Almost one person in six speaks Mandarin Chinese as his mother tongue. Originally the language of the court at Peking during the imperial period, Mandarin was then called *kuan hua* [official speech]. After the Nationalists seized control in 1911, the name was changed to *kuo yu* [national tongue]. The Communists have renamed the language *p'u t'ung hua* [generally understood speech]. It is thought that at least 70% of the people of mainland China now speak *p'u t'ung hua*. Mandarin is the official language of both Communist China and Nationalist China. It is also employed as an official language, along with four others, by the United Nations. Other leading forms of Chinese include Wu, the tongue of more than 55 million people in Kiangsu and Chekiang provs., Fukienese, with some 50 million speakers distributed in Fukien prov., Taiwan, and SE Asia, Cantonese, spoken by 55 million persons residing in Kwangsi and Kwangtung provs., Hong Kong, SE Asia, and the United States, Hakka, the language of 20 million in Kwangtung and Kiangsi provs., and Amoy-Swatow, the mother tongue of 15 million in Fukien and Kwangtung provs., Taiwan, and the South Pacific. The various forms of Chinese differ least in grammar, more in vocabulary, and most in pronunciation. Like the other Sino-Tibetan languages, Chinese is tonal, i.e., different tones distinguish words otherwise pronounced alike. The number of tones varies in different forms of Chinese, but Mandarin has four tones: a high tone, a rising tone, a tone that combines a falling and a rising inflection, and a falling tone. When Chinese is transcribed into the Roman alphabet, a superscript number is often attached to each word to designate its tone. For example, *ta* pronounced with the first, or high, tone (written as *ta¹*) means "assist" or "raise"; *ta* with the second, or rising, tone (*ta²*) means "answer"; *ta* with the third, or falling and rising, tone (*ta³*) signifies "strike" or "do"; and *ta* with the fourth, or falling, tone (*ta⁴*) means "great." Again like the other Sino-Tibetan languages, Chinese is strongly monosyllabic. Chinese often uses combinations of monosyllables that result in polysyllabic compounds having different meanings from

their individual elements. For example, the word for "explanation," *shue' ming'*, combines *shue'* ("speak") with *ming'* ("bright"). These compounds can embrace three and even four monosyllables: *shuo' ch'u' lai'*, the word for "describe," is made up of *shuo'* ("speak"), *ch'u'* ("out"), and *lai'* ("come"). This practice has greatly increased the Chinese vocabulary and also makes it much easier to grasp the meaning of spoken Chinese words. Grammatically, Chinese lacks inflection to indicate person, number, gender, case, tense, voice, and so forth. Suffixes are commonly used to denote some of these features. For example, the suffix *-le* is a sign of the perfect tense of the verb. Subordination and possession can be marked by the suffix *-te*. The position and use of a word in a sentence may determine its part of speech and its meaning. The Chinese writing system developed more than 4,000 years ago; the oldest extant examples of written Chinese are from the 14th or 15th cent. B.C., when the Shang dynasty flourished. Chinese writing consists of an individual character or ideogram for every syllable; each character representing a word or idea rather than a sound, thus, problems caused by homonyms in spoken Chinese are not a difficulty in written Chinese. The written language is a unifying factor culturally, for although the spoken languages and dialects may not be mutually comprehensible in many instances, the written form is universal. The characters are written in columns that are read vertically and from right to left, although the Communists on the mainland permit horizontal lines that read from left to right. This difficult system of writing has proved to be an obstacle to mass literacy, for one needs to know at least several thousand characters to read a newspaper and even more to read literary works. In an attempt to deal with this problem, Communist China in 1956 introduced a plan to simplify a large number of commonly used characters. This was intended as a transitional phase until a workable alphabet could be devised and adopted. Also in 1956 an alphabet based on Roman letters was developed in mainland China. However, its purpose was the phonetic transcription of Chinese characters rather than the replacement of them. Since alphabetic writing requires a standardized spoken language, the local differences in the pronunciation of Chinese present a serious obstacle to the development of a satisfactory alphabet. The People's Republic of China is making a great effort to standardize the pronunciation of Mandarin, which is essentially a spoken language, and to have it adopted throughout China. The Peking dialect of Mandarin was chosen because it is already the most widely used. The literary language of Chinese differs greatly from the spoken form. Known as *wenyan*, the literary language is the same for all variants of Chinese as far as vocabulary, grammar, and the system of writing are concerned, but pronunciation differs locally according to the dialect. Under Nationalist leadership a movement began in 1917 to employ the popular, everyday speech (called *paihua*) in literature instead of *wenyan*. Since 1949, under the Communists, *paihua* has been used for all writing, including governmental, commercial, and journalistic texts as well as literary works. See Bernhard Karlgren, *The Chinese Language* (tr. 1949), J. F. De Francis, *Beginning Chinese* (rev. ed. 1963) and *Advanced Chinese* (1966), Iakov Brandt, *Introduction to Literary Chinese* (1964), F. X. Keelan, *Chinese Characters Explained* (1967), H. C. Fenn et al., *Speak Mandarin* (3 vol., 1967), Paul Kratochvil, *The Chinese Language Today* (1968), C. F. Hockett and Chaoying Fang, *Spoken Chinese* (new ed. 1973).

Chinese architecture. As a result of wars and invasions, there are few existing buildings in China predating the Ming dynasty (1368–1644). Insubstantial construction, largely of wood and rice-paper screens, also accounts for the tremendous loss. One early structure that remains is the Great Wall (see CHINA, GREAT WALL OF). The background of Chinese architecture has been clarified to some extent as a result of the increase of archaeological activity since the Communists came to power in 1949. Discoveries in 1952 near Hsi-an have brought to light a complete Neolithic village near Pan-p'o. Two kinds of mud-walled dwellings were found—of round and rectangular shapes. As in later construction, buildings were usually oriented to the south, probably as a protection against the north wind. As early as the Neolithic period, a basic principle of Chinese architecture was already established, wherein columns spaced at intervals, rather than walls, provided the support for the roof. Walls came to serve merely as enclosing screens. Although the typical Chinese roof was probably developed in the Shang (c. 1523–

1027 B.C.) or the Chou (1027–c. 256 B.C.) period, its features are unknown to us until the Han dynasty (202 B.C.–A.D. 220). Then it appeared in the form that we recognize today as a hallmark of Chinese architecture—a graceful, overhanging roof, sometimes in several tiers, with upturned eaves. The roof rests on a series of four-part brackets, which in turn are supported by other clusters of brackets set on columns. Decorative possibilities were soon realized in the colorful glazed tiling of roofs and the carving and painting of brackets, which became more and more elaborate. During the Han dynasty the characteristic ground plan was developed; it remained relatively constant through the centuries, applied to palaces and temple buildings in both China and Japan. Surrounded by an exterior wall, the building complex was arranged along a central axis and was approached by an entrance gate and then a spirit gate. Behind them in sequence came a public hall and finally the private quarters. Each residential unit was built around a central court with a garden. Based on imperial zoos and parks, the private residential garden soon became a distinctive feature of the walled complex and an art form in itself. The garden was laid out in a definite scheme, with a rest area and pavilions, ponds, and semi-planned vegetation. Evidence of early architectural development is provided by representations in Han bronze vessels, tomb models, carvings, and tiles. In the first centuries after Christ, the coming of Buddhism did not strongly affect the Chinese architectural style. Although there was considerable building activity, temples continued to be constructed in the native tradition. The only distinctly Buddhist type of building is the PAGODA, which derived from the Indian STUPA. Several masonry pagodas are extant that date from the 6th cent. In the T'ang period (618–906), pagodas were usually simple, square structures, they later became more elaborate in shape and adornment. In the 11th cent. a distinctive type of pagoda was created in the Liao territory. Built in three different stages, with a base, a shaft, and a crown, the structure was surmounted by a spire. Its plan was often octagonal, possibly as a result of the influence of Tantric Buddhism in which the cosmological scheme was arranged into eight compass points rather than four. One of the finest Liao structures is the White Pagoda at Ch'eng-te. Through the T'ang and Sung dynasties, Chinese architecture retained the basic characteristics already developed in the Han, although there was a greater technical mastery and a tendency toward rich adornment and complexity of the system of bracketing. Though little survives of the wooden structures, our knowledge of their appearance comes from detailed representations in painted scrolls, especially by the Li school of artists in the T'ang period and their followers (see CHINESE ART). Extant monuments in Japan, profoundly influenced by Chinese architecture, also reflect the progress of Chinese building techniques. Examples are the 7th-century monastery of Horyu-ji and the 8th-century monastery of Toshodai-ji. In the Ming period the complex of courtyards, parks, and palaces became labyrinthian in scope. Little remains of the imperial palaces at Nan-king, the capital of the Ming dynasty until 1421. Peking then became the capital, and its group of imperial buildings, known as the Forbidden City, remains a remarkable achievement. Around its main courtyard and many smaller courts are grouped splendid halls, galleries, terraces, and gateways. White marble, wall facings of glazed terra-cotta, roofs of glazed and colored tiles, and woodwork finished with paint, lacquer, and gilding unite to create an effect of exceptional richness. Notable among these buildings is the group constituting the Temple of Heaven, including the Hall of the Annual Prayers (added in the late 19th cent.), a circular structure on a triple platform surmounted by a roof in three tiers covered with tiles of an intense blue glaze. Since the late 19th cent. the Chinese have adopted European architectural styles. Under Communist rule they have tended to imitate modern Soviet buildings. The trend is toward the impressively massive and the clearly functional in public buildings (e.g., the Great Hall of the People, 1959, Peking). In such buildings only in the detailing around window frames and doorways can traditional features still be seen. See Johannes Prip-Møller, *Chinese Buddhist Monasteries* (1937), D. G. Mirams, *A Brief History of Chinese Architecture* (1940), A. C. H. Boyd, *Chinese Architecture and Town Planning* (1962), N. I. Wu, *Chinese and Indian Architecture* (1963), Laurence Sickman and Alexander Soper, *The Art and Architecture of China* (3d ed. 1968), Michele Pirazzoli-Serstevens, *Living Architecture* (Chinese) (1971).

Chinese art, the oldest in the world, has its origins in remote antiquity (For the history of Chinese civilization, see CHINA.) Excavations in Kansu and Honan have revealed a Neolithic culture with painted pottery that exhibits dynamic swirling or lozenge-shaped patterns. Our knowledge of ancient Chinese art is largely limited to works in pottery, bronze, bone, and jade. Excavations in the city of AN-YANG have yielded numerous ritual bronze vessels that indicate a highly advanced culture in the SHANG dynasty in the 2d millennium. The art of bronze casting of this period is of such high quality that it suggests a long period of prior experimentation. It constitutes the clearest extant record of stylistic development in the Shang, CHOU, and Early HAN dynasties. The adornment of the bronzes varies from the most meager incision to the most ornate plastic embellishment and from the most severely abstract to some naturalistic representations. The Later Han dynasty marks the end of the development of this art, although highly decorated bronze continued to be produced, often with masterly treatment of metal and stone inlays. The advent of Buddhism (1st cent. A.D.) brought a need for art of a different character. Works of sculpture, painting, and architecture of a more distinctly religious nature were created. The human figure, which had appeared rarely in ancient Chinese art, now became most important. Sculpture as an isolated art prior to Buddhism survives chiefly in tomb carvings and monumental tomb guardians in stone. With Buddhism, the representation of the Buddha and of the bodhisattvas became the great theme of sculpture. The forms of these figures came to China from India by way of central Asia, but in the 6th cent. A.D. the Chinese artists succeeded in developing a national style in sculpture. This style reached its greatest distinction early in the T'ANG dynasty. Figures, beautiful in proportion and graceful in gesture, show great precision and clarity in the rendering of form, with a predominance of linear rhythms. Gradually the restraint of the 7th cent. gave way to more dramatic work. For about 600 years Buddhist sculpture continued to flourish, then in the MING dynasty sculpture ceased to develop in style. After this time miniature sculpture in jade, ivory, and glass, of exquisite craftsmanship, but lacking vitality of inspiration, was produced in China, as in Japan. The origins of Chinese painting are lost. Although the arts thrived during the Han dynasty, little painting remains except for tomb decorations in Manchuria and N. Korea, some skillfully painted LACQUER ware, and tiles. It is only from the 5th cent. A.D. that we can trace a clear historical development. Near TUN-HUANG, more than a hundred caves (called the Caves of a Thousand Buddhas) contain Buddhist frescoes and scrolls dating mainly from the late 5th to the 8th cent. They show, first, simple hieratic forms of Buddha and of the bodhisattvas and, later, crowded scenes of paradise. The elegant decorative motifs and certain figural elements reveal a Western influence. While Chinese painting never consistently followed the rigid laws of Western PERSPECTIVE, a highly organized system of representing objects in space was evolved. Rendering of natural effects of light and shade is almost wholly absent in this art, which relies rather on its incomparable mastery of line and silhouette. One of the earliest artists about whom anything is known is the 4th-century master KU KAI CHIH, who is said to have excelled in portraiture. The art of figure painting reached a peak of excellence in the T'ang dynasty (618–906). Historical subjects and scenes of courtly life were popular, and the human figure was portrayed with a robustness and monumentality unequalled in Chinese painting. Animal subjects were also frequently represented. The 8th-century artist Han Kan is famous for his painting of horses. The T'ang dynasty also saw the rise of the great art of Chinese landscape painting. Lofty and craggy peaks were depicted, with streams, rocks, and trees carefully detailed in brilliant greens and blues. These paintings were usually executed as brush drawing and color washes. Little if anything remains of the work of such famous masters as YEN LI-PEN, Tung Yuan, Wu Tao-tzu, and Wang Wei. In the SUNG dynasty (960–1279), landscape painting reached its greatest expression. A vast yet orderly scheme of nature was conceived, reflecting contemporary Taoist and Confucian views. Sharply diminished in scale, the human figure did not intrude upon the magnitude of nature. The technique of ink monochrome was developed with great skill, with the utmost economy of pictorial means, suggestion of mood, misty atmosphere, depth, and distance were created. During the Sung dynasty the monumental detail began to emerge. A single bamboo shoot,

flower, or bird provided the subject for a painting. Among those who excelled in flower painting was the Emperor Hui-tsung, who founded the imperial academy. Hundreds of painters contributed to its glory, including LI T'ANG, HSIA KUEI, and MA YUAN. Members of the Ch'an (Zen) sect of Buddhism executed paintings often sparked by an intuitive vision. With rapid brushstrokes and ink splashes, they created works of vigor and spontaneity. With the ascendancy of the YUAN dynasty (1260-1368), painting reached a new level of achievement, and under Mongol rule many aspects cultivated in Sung art were brought to culmination. The human figure assumed greater importance, and landscape painting acquired a new vitality. Still-life compositions came into greater prominence, especially bamboo painting. During this time, much painting was produced by the literati, gentlemen scholars who painted for their own enjoyment. Under some of the emperors of the MING dynasty (1368-1644), a revival of learning and of older artistic traditions was encouraged and connoisseurship was developed. We are indebted to the Ming art collectors for the preservation of many paintings that have survived into our times. Bird and flower pictures exhibited the superb decorative qualities so familiar to the West. TUN CH'ANG, SHEN CHOU, and Tai Chin are but a few of the many great masters of this period. Under the CHING dynasty (1644-1912) a high level of technical competence was maintained, particularly in the applied arts, until the 19th cent., when the output became much more limited. The famous four Wangs imitated the great Yuan masters. Among painters of small-scale landscapes, CHU TA was outstanding as an artist of remarkable personal vision. However, there was little innovation in painting. Throughout the history of Chinese painting one characteristic has prevailed—the consummate handling of the brushstroke. Paintings were executed in a dry or wet-brush technique, with an incredible versatility, ranging from swirling patterns to staccato dots. The mastery of brushwork was directly related to calligraphy, traditionally regarded by the Chinese as an art form. Reliance on calligraphic techniques, however, produced a sterile art of overworked formulas in painting of the 19th cent. Elegant inscriptions and poems were often included within the painting, which took the form of a hand scroll, hanging scroll, or an album leaf, made of silk or paper. The fine art of Chinese pottery making followed to some degree the development of painting, reaching its highest perfection in the Sung dynasty and its extreme technical elaboration and decorative style in the Ming. In ENAMEL ware, lacquer ware, JADE, IVORY, textiles, and many other of the so-called minor arts, the world owes an incalculable debt to China. The influence of Chinese art upon other cultures has been profound, it has extended to the Muslim countries and, since the 14th cent., to Western Europe. Western influence on Chinese art has been evident since the late 17th cent., but not of major significance until comparatively recent times. The 19th cent. produced no major Chinese masters but many competent traditionalists. Early 20th-century artists copied Western styles without real comprehension, and attempts to combine them with Chinese subject matter were largely unsuccessful. After the Communists came to power in 1949, the graphic arts useful to political propaganda were encouraged, and Western influence in the arts was strictly discouraged. Within the limits of government restrictions two painters, LI K'o-jan and Ch'eng Shih-fa, have produced works of considerable individuality. Chinese artists working outside China, including Tseng Yu-ho in Hawaii and Chao Wu-chi in France, have produced abstract works based on calligraphy that reveal some Western influence. See articles on individual artists, e.g., MA YUAN. See Laurence Sickman and Alexander Soper, *The Art and Architecture of China* (1956), Osvald Siren, *Chinese Painting* (7 vol., 1956-58), P. C. Swann, *Chinese Monumental Art* (tr. 1963), William Willett, *Foundations of Chinese Art* (1965), Michael Sullivan, *The Arts of China* (rev. ed. 1973).

Chinese Communist party: see COMMUNIST PARTY, in China

Chinese examination system, civil service recruitment method and educational system employed from the Han dynasty (206 B.C.-A.D. 220) until it was abolished by the Ch'ing dowager empress Tz'u Hsi in 1905 under pressure from leading Chinese intellectuals. The concept of a state ruled by men of ability and virtue was an outgrowth of Confucian philosophy. The examination system was an attempt to recruit men on the basis of merit rather than on the basis of family or political connection. Because

success in the examination system was the basis of social status and because education was the key to success in the system, education was highly regarded in traditional China. If a person passed the provincial examination, his entire family was raised in status to that of scholar gentry, thereby receiving prestige and privilege. The texts studied for the examination were the Confucian classics. In the T'ang dynasty (618-906) the examination system was reorganized and more efficiently administered. Because some scholars criticized the emphasis on memorization without practical application and the narrow scope of the examinations, the system underwent further change in the Sung dynasty (960-1279). WANG AN-SHIH reformed the examination, stressing the understanding of underlying ideas and the ability to apply classical insights to contemporary problems. In the Ming dynasty (1368-1644) the commentaries of the Sung Neo-Confucian philosopher CHU HSI were adopted as the orthodox interpretation of the classics. Although only a small percentage of students could achieve office, students spent 20 to 30 years memorizing the orthodox commentaries in preparation for a series of up to eight examinations for the highest degree. By the 19th cent. the examination system was regarded as outdated and inadequate training for officials who faced the task of modernizing China. After it was abolished, mass education along with a Western type curriculum was promoted. See W. T. DeBary, ed., *Sources of Chinese Tradition* (1960), Wolfgang Franke, *The Reform and Abolition of the Traditional Chinese Examination System* (1960), J. M. S. Meskill, *The Chinese Civil Service* (1963), E. A. Kracke, Jr., *Civil Service in Early Sung China, 960-1067* (1968), I. C. Y. Hsu, *The Rise of Modern China* (1970).

Chinese exclusion, policy of prohibiting immigration of Chinese laborers to the United States, initiated in 1882. From the time of the U.S. acquisition of California (1848) there had been a large influx of Chinese laborers to the Pacific coast. They were encouraged to emigrate because of the need for cheap labor, and were employed largely in the building of transcontinental railroads. By 1867 there were some 50,000 Chinese in California, most of them manual laborers. Their numbers continued to increase after the conclusion in 1868 of the Burlingame Treaty with China, which guaranteed the right of Chinese immigration, it did not, however, grant the right of naturalization. In the following decades a great deal of anti-Chinese sentiment arose in California, partly because the growing American labor force had to compete with cheap Chinese labor and partly because many Americans were opposed to further immigration by what they considered to be an inferior people. In 1877 anti-Chinese riots occurred in San Francisco. Efforts were made to ban Chinese immigration, and in 1879 Congress passed a bill to that effect. It was vetoed, however, by President Hayes on the grounds that it violated the Burlingame Treaty. In 1880 a new treaty with China was concluded, it allowed the United States to regulate, limit, or suspend the entry of Chinese labor, but not to prohibit it. In 1882, however, the Chinese Exclusion Act banned immigration of Chinese laborers for 10 years. Some of the later acts (1888 and 1892) were flat violations of the 1880 treaty. A new treaty was signed in 1894 by which China agreed to exclusion of Chinese laborers for 10 years. When that period expired, Congress continued the exclusion unilaterally until the immigration law of 1924 excluded, in effect, all Asians. In 1943 the acts were repealed when a law was signed setting an annual immigration quota of 105 and extending citizenship privileges to Chinese. See R. D. McKenzie, *Oriental Exclusion* (1928), S. C. Miller, *The Unwelcome Immigrant* (1969), B. L. Sung, *The Story of the Chinese in America* (1971).

Chinese literature. It is not known when the current system of writing Chinese first developed. The oldest written records date from about 1400 B.C. in the period of the SHANG dynasty, but the elaborate system of notation used even then argues in favor of an earlier origin. From short inscriptions on bone and tortoiseshell (used for divination), characters standing for individual words have been deciphered and are traceable through many notations to modern forms. Most of the oldest surviving works of literature were not written until the later centuries of the CHOU dynasty (c. 1027-256 B.C.). At this time was written most of what scholars of the Han dynasty (202 B.C.-A.D. 220) made into the canonical literature of CONFUCIANISM (which also included their own commentaries), although the current versions of these works, traditionally classified as the *Wu Ching* [five classics], contain later interpolations.

The *Wu Ching*, traditionally attributed to CONFUCIUS either as author or compiler, consist of diverse books. The *Ch'un Ch'iu* [spring and autumn annals] is an unadorned chronology of Lu, Confucius's native state. The *I Ching* [classic of changes] explains, often in a mystifying way, a system of divination, based upon the study of 64 hexagrams of whole and broken lines. The *Li Chi* [book of rites] describes ceremonials and an ideal Confucian state. The *Shu Ching* [classic of documents or book of history] contains historical records, many of them known to be later forgeries. While some of these works contain verse, the main collection of poetry in the *Wu Ching* is the *Shih Ching* [classic of songs or book of odes], made up of 305 poems. Written in simple rhyming stanzas, they tell of the peasant's life, of love, and of the wars of the feudal states. During the SUNG dynasty (960-1279), selections from the *Li Chi* and two other works were formed into the *Shih Shu* [four books], they were thought to embody the quintessence of Confucian teachings. They are the *Ta Hsueh* [great learning] and the *Chung Yung* [doctrine of the mean] from the *Li Chi*, the *Lun Yu* [analects of Confucius], and the *Book of Mencius* (see MENCIUS). Other important early books include the *Tao Te Ching* [classic of the way and its power], traditionally ascribed to LAO TZE and the work of CHUANG-TZE. These two books, which form the chief literature of TAOISM, probably circulated in their present form from the 2d cent. B.C. The early Chinese books originally appeared in the cumbersome form of strips of bamboo. Silk was substituted as a writing material in the 2d cent. B.C., and the invention of paper in the 2d cent. A.D. was responsible for a great increase in books. The method of printing whole pages from wooden blocks was discovered under the T'ang dynasty (618-906) and was perfected and in widespread use by the 10th cent., it permitted an enormous increase in the number of copies available of any book. In time the literary and vernacular languages diverged sharply. Literary style was exceedingly concise and unmatched for its vigor, richness, and symmetry. Historical and literary allusions abounded, and finally special dictionaries were required for their elucidation. In poetry the freedom of the Chou period was followed by minutely prescribed forms. The lines, which rhymed, had to be matched syllable by syllable in both part of speech and intonation. By the T'ang period the prosodic rules no longer suited the spoken structure of the everyday language, they continued to be observed in spite of changes in pronunciation. It is generally agreed that China's greatest poetry was written in the T'ang dynasty. WANG WEI, LI PO, TU FU, PO CHU-I are masters of this period. In the succeeding Sung dynasty SU TUNG-PO was perhaps the foremost poet. Translations of T'ang and Sung poetry strongly influenced the modern imagist school in English (see IMAGISTS). Chinese lyrics are generally very short, unemphatic and quiet in manner, and limited to suggesting a mood or a scene by a few touches rather than painting a detailed picture. Intellectual themes and narratives are comparatively rare. Many varieties of learned prose have also been written in China. Notable for accuracy and objectivity are the series of dynastic histories produced since Han times, the famous *Shih Chi* [records of the historian] (c. 100 B.C.) by SSU MA CH'EN, served as their model. Chinese lexicography developed in response to the multiplication of characters. The last of a great series of dictionaries (still in standard use) was produced in the reign of K'ang Hsi (1662-1722). So-called encyclopedias, actually extracts from existing works, have been occasionally compiled, one such work of the MING dynasty (1368-1644) ran to over 11,000 short volumes and appeared in three manuscript copies. While the literati were cultivating polite literature during the T'ang and Sung periods, prose and verse of a popular nature began to appear. It was written in the spoken vernacular rather than in the classical literary language, and scholars regarded it with scorn. Springing from story cycles made familiar by professional storytellers, this vernacular literature first emerged as a full-fledged art in the drama of the Yuan dynasty (1260-1368) (see ORIENTAL DRAMA). It later developed into the great novels of the Ming period that followed. Both the drama and the novel proved immensely popular. Thus the 13th cent. witnessed the emergence of the resources of the living language of the people. The vernacular novels, although they had their roots in the Yuan epoch, took shape gradually during the Ming era until they were finally given their finished form, perhaps anonymously by some talented traditional scholar. An early and outstanding example of the novel is the *San Kuo Chih Yen I* (tr. *San Kuo*, or

Romance of the Three Kingdoms, 1925) set in the THREE KINGDOMS period (220-265), which recounts heroic deeds and chivalrous exploits. Another historical romance is the *Shui Hu Chuan* (tr. *All Men Are Brothers*, 1937), a picaresque tale of men forced by the venality of officials to become bandits. The *Hsi Yu Chi* (tr. *Monkey*, 1943) is an allegorical tale, full of the supernatural, concerning the adventures of a Buddhist pilgrim on a journey to India. The *Chin Ping Mei* (tr. *The Golden Lotus*, 1939) by contrast portrays domestic life and amorous intrigue, and is marked by realistic incident and the interplay of human relationships. The greatest Chinese novel is, however, considered to be *Hung Lou Meng* (tr. *Dream of the Red Chamber*, 1958), an 18th-century work chiefly by the hand of TS'AO MSUEH-CH'IN. With an unrivaled gift for subtle characterization and plot construction, the author recounts the declining fortunes of an aristocratic family. After the republican revolution authors turned away from the classical modes of composition, and many writers (notably HUSHIH and LUSIN) advocated writing in the pihua vernacular. The change in Chinese education from preoccupation with the classic literature to scientific and technological subjects reduced mastery of the traditional literary skills as did the abolition of the civil service examinations for official posts, which had been based on a knowledge of the Four Books of the Confucian canon. The use of characters instead of an alphabet persisted, however, this made older writings accessible and permitted the Chinese, who speak widely different dialects, amounting to different languages, to communicate with one another. The use of pihua has proved especially effective in prose. Translations of Western books frequently appeared in China, and the novelists of the republican period were greatly influenced by European writers. Among the most distinguished writers of modern China are Lusin (1881-1936), Kuo Mo-jo, Mao Tun, Lao She (1899-1966), Shen Ts'ung-wen, and Pa Chin. Under the Communist government, Chinese literature has suffered from the government-sponsored concept of SOCIALIST REALISM. A pioneering translator of the classic Confucian and Taoist texts is James Legge, whose works, still standard, appear in many volumes. More recent translations of individual classics include Arthur Waley, tr., *The Book of Songs* (1937), and *The Analects of Confucius* (1938), Richard Wilhelm and C. F. Baynes, tr., *The I Ching or Book of Changes* (1950), Bernhard Karlgren, tr., *The Book of Odes* (1950), W. I. Ch'ian, tr., *The Way of Lao Tzu* (1963), W. A. C. H. Dobson, tr., *Mencius* (1963), and Burton Watson, tr., *The Complete Works of Chuang Tzu* (1968). General anthologies of Chinese literature in translation include Lin Yutang, ed., *The Wisdom of China and India* (1942) and Cyril Birch, ed., *Anthology of Chinese Literature* (2 vol., 1961-72). Collections of short stories, new and old, include Edgar Snow, ed., *Living China. Modern Chinese Stories* (1936), and Christopher Levenson, Wolfgang Bauer, and Herbert Franks, tr., *The Golden Casket. Chinese Novellas of Two Millennia* (1964). Anthologies of Chinese poetry include Witter Bynner and K. H. Kiang, tr., *The Jade Mountain. A Chinese Anthology, Being Three Hundred Poems of the T'ang Dynasty* (1929), David Hawkes, tr., *Ch'u Tzu'u. The Songs of the South, an Ancient Chinese Anthology* (1959), A. R. Davis, ed., *The Penguin Book of Chinese Verse* (1962), S. S. Liu, tr., *One Hundred and One Chinese Poems* (1967) and Burton Watson, ed., *Chinese Rhyme-Prose* (1971). Bibliographical guides to translations and criticisms of modern Chinese literature include Martha Davidson, comp., *A List of Published Translations from Chinese into English, French, and German* (2 vol., 1952-57), and T. L. Yuan, comp., *China in Western Literature. A Continuation of Cordier's Bibliotheca Sinica* (1958). See also J. R. Hightower, *Topics in Chinese Literature. Outlines and Bibliographies* (1950), Burton Watson, *Early Chinese Literature* (1962), Lai Ming, *A History of Chinese Literature* (1964), W. C. Liu, *An Introduction to Chinese Literature* (1966), C. T. Hsia, *A History of Modern Chinese Fiction* (1961) and *The Classic Chinese Novel* (1968), and H. L. Boorman, ed., *Biographical Dictionary of Republican China* (4 vol., 1967-71).

Chinese music can be traced back as far as the third millennium B.C. Manuscripts and instruments from the early periods of its history are not extant, however, because in 212 B.C. Shih Hwang-ti of the Ch'in dynasty caused all the books and instruments to be destroyed and the practice of music to be stopped. Certain outlines of ancient Chinese music have nevertheless been ascertained. Of primary significance is the fact that the music and philosophy of China have always been inseparably bound, musical the-

ory and form have been invariably symbolic in nature and remarkably stable through the ages. The single tone is of greater significance than melody, the tone is an important attribute of the substance that produces it. Hence musical instruments are separated into eight classes according to the materials from which they are made—gourd (sheng), bamboo (panpipes), wood (*chu*, a trough-shaped percussion instrument), silk (various types of zither, with silk strings), clay (globular flute), metal (bell), stone (sonorous stone), and skin (drum). Music was believed to have cosmological and ethical connotations comparable to those of Greek music. The failure of a dynasty was ascribed to its inability to find the proper *huang chung*, or tone of absolute pitch. The *huang chung* was produced by a bamboo pipe that roughly approximated the normal pitch of a man's voice. Other pipes were cut, their length bearing a definite mathematical ratio to it. Their tones were divided into two groups—six male tones and six female. These were the *lūs*, and their relationship approximated the Pythagorean cycle of fifths. Legend ascribes their origin to birdsong, six from that of the male bird and six from that of the female, and the tones of the two sets were always kept separate. The *lūs* did not constitute a scale, however. The scale of Chinese music is pentatonic, roughly represented by the black keys on a piano. From it, by starting on different notes, several modes may be derived. The melody of vocal music is limited by the fact that melodic inflection influences the meaning of a word. Likewise, quantitative rhythms are not easily adaptable to the Chinese language. Several types of notation were used. Singers used the syllabic symbols for the five notes of the pentatonic scale, as did players of pipes. Players of the stone and bell chimes, which were tuned to the *lūs*, used symbols that represented the pitch names of the *lūs*. Players of flutes and zithers used a kind of tablature. None of this notation indicated rhythm. The ancient Chinese hymns were slow and solemn and were accompanied by very large orchestras. Chamber music was also highly developed. Chinese opera originated in the 14th cent. as a serious and refined art. Throughout the political and social turmoil following World War I, Western (classical and popular) and Japanese sources dominated Chinese music. At present, Western concepts of harmony are in active use but are generally applied to vocal genres, such as cantatas and music dramas, which have educational as well as musical value. The Peking Opera has produced numerous new works since 1949, most of them concerning political topics. It is one of the few forums of traditional performance style, although there is an ongoing effort directed by the Peking Institute of National Music to preserve the few remainders of ancient musical practice. See Curt Sachs, *The Rise of Music in the Ancient World* (1943), J. H. Lewis, *Foundations of Chinese Musical Art* (2d ed. 1964), Elizabeth Halson, *Peking Opera* (1966), bibliography by Fredric Lieberman (1970).

Chinese Nationalist party: see KUOMINTANG

Chinese Turkistan: see SINKIANG

Chinese white: see ZINC OXIDE

Ch'ing (ch'ing) or **Manchu** (mǎn'ch'ōō', mǎn'-ch'ōō'), dynasty of China that ruled from 1644 to 1912. It was established by the MANCHU, a people of Manchuria, who invaded China and captured Peking in 1644. All China was occupied and the remnants of the Ming dynasty destroyed by 1659, but disorders in S. China and Taiwan were not finally suppressed until 1683. The Manchu introduced few important changes in China. One notable political innovation, however, was the system of administration involving joint Manchu-Chinese control of military and civil affairs. Emperor K'ang Hsi (reigned 1661-1722) consolidated the Manchu regime by suppressing (1673-81) rebellions and defeating the Mongols and Tibetans. When Jesuit missionaries appeared he issued (1692) an edict of toleration. Under Emperor CHIEN LUNG (reigned 1735-96), China attained its maximum territorial expansion. China's wealth and luxury goods, notably porcelain and silk, attracted the attention of European maritime powers, but the dynasty was at first opposed to trade. In 1759 an imperial edict allowed maritime trade only at the port of Canton. By the 19th cent. Great Britain had established profitable trade relations with China, but its repeated attempts (1793, 1816, 1834) to obtain a liberal trade policy were unsuccessful. British dissatisfaction over trade restrictions, as well as the insularity of the Manchu officials, precipitated the OPIUM WAR (1839-42). China's defeat in the war resulted in the cession of Hong Kong to Great Brit-

ain and the establishment of EXTRATERRITORIALITY for other Western nations. The Manchu regime, already weakened by Western encroachments, was further enfeebled by internal rebellions. The Taiping Rebellion (1850-65) nearly brought the dynasty to an end. However, the Manchu regime suppressed the major rebellions and embarked on a policy of diplomatic, technological, and military modernization led by Tseng Kuo-fan (1811-72) and Li Hung-chang (1823-1901). These statesmen played important roles in the T'ung Chih restoration (1862-74), during which the dynasty tried to restore the traditional order by reasserting Confucian social values. China yielded to Western demands for permanent diplomatic representation in Peking (1860) and continued to suffer territorial encroachments. Russia occupied Ili, Japan incorporated the Ryukyu islands, France made Annam a protectorate, and Great Britain completed its annexation of Burma. The First Sino-Japanese War (1894-95) deprived China of its control over Korea, and the war was followed by the partition of mainland China into foreign spheres of influence. The general agreement was that Great Britain should predominate in the Yangtze valley, France in the extreme south, and Russia in Manchuria. After the Russo-Japanese War (1904-5), Japan took over Russia's sphere. Efforts to strengthen the dynasty against foreign imperialism were undertaken by K'ang Yu-wei (1858-1927) with the support of the emperor KUANG HSU. These efforts, however, were frustrated by the dowager empress TZ'U HSI, who aborted the reform movement in a coup d'état (1898). She supported the BOXER UPRISING, however, in a vain attempt to dislodge the foreign powers (1898-1900). Following foreign suppression of the Boxers, Tz'u Hsi changed course and allowed some moderate educational and administrative reforms. However, the dynasty acted slowly upon the demand of intellectuals, social leaders, and progressive provincial governors for a national assembly and a change to constitutional monarchy. From abroad Sun Yat-sen led a movement for revolutionary overthrow of the Manchus and establishment of a republic. His coalition, which included moderate leaders in S. China, revolutionary students who had returned from the West, and military officers finally overthrew the dynasty in the Revolution of 1911. With the collapse of the Ch'ing, China abandoned its 2,000-year tradition of monarchic rule in favor of a republican form of government. See S. Y. Teng and J. K. Fairbank, *China's Response to the West* (1954), Franz Michael, *The Origin of Manchu Rule in China* (1965), Albert Feuerwerker, *Approaches to Modern Chinese History* (1967), Henry McAleery, *The Modern History of China* (1968), I. C. Y. Hsu, *The Rise of Modern China* (1970).

Chingford: see WALTHAM FOREST

Chinghai: see TSINGHAI, China

Ch'ing Hai, lake, China: see KOKO NOR

Chingola (ching-gō'la), city (1972 est. pop., with suburbs, 130,000), N. central Zambia. It is a copper-mining center, located on the COPPERBELT.

Ch'ing-tao (ching-dou) or **Tsingtao** (ts'ing'tou', ching'dou'), city (1970 est. pop. 1,900,000), SE. Shantung prov., E. China, on the Yellow Sea. With an excellent ice-free harbor, it is a major port of China, connected by rail with Yen-t'ai and Chi-nan. The leading industrial city of Shantung, it has textile mills, food-processing and tobacco-processing establishments, machine shops, paper mills, and plants making diesel locomotives and railroad cars, tires, fertilizers, rubber products, chemicals, and metal items. Leased to Germany in 1898 as part of the Kiaochow territory, Ch'ing-tao became the administrative center of the leasehold and developed into a modern city. The Japanese held it from 1914 to 1922. Ch'ing-tao was a marine and naval base for the United States from 1945 to 1949, when it was abandoned and fell to the Communists. In the city are an astronomical observatory, two marine museums, Shantung Univ., Ch'ing-tao Technical Univ., a medical college, and several technical institutes.

Ching-te-chen (jing-dū-jün) or **Fowliang** (fōo'-lāng'), city (1970 est. pop. 300,000), NE. Kiangsi prov., China, on the Chang River. It is world famous for its fine porcelain, made since the Han dynasty (202 B.C.-A.D. 220) from the white clay, kaolin, found near Po-yang lake to the west. Coal is mined in the region. The city reached its greatest fame under the Northern Sung dynasty (c. 1000), when it supplied porcelain to the royal household. It declined after heavy damage in the Taiping Rebellion. **Chinhae** (chên'hǎ'), city (1970 est. pop. 92,000), SE. South Korea, on the Korea Strait. It is an important fishing port and naval base.

Chin Hills, mountain range, W Burma, along the boundary between Burma and Assam, India. It rises to 10,018 ft (3,053 m) in Mt Victoria. The range is covered with pine and teak forests. The Chin Hills Special Division (c 14,000 sq mi/36,260 sq km, 1969 est pop 354,000), a mountainous region dotted with small villages, is inhabited by Chin tribes, a Tibeto-Burman people. Falam is the capital. This district is a special division of Burma and has become largely autonomous, with representatives in the Burmese cabinet.

Chin-hua (jīn-hwa) or **Kinhwa**, town, central Chekiang prov., SE China. A transportation hub on the Chekiang-Kiangsi RR, Chin-hua has been famous for two centuries for its hams. Other products are fertilizer, machine tools, and textiles.

Ch'in-huang-tao or **Chinwangtao** (both chīn-wang-dou), city, NE Hopenh prov., China, on the Po Hai, an arm of the Yellow Sea. It is an ice-free port in an important coal area.

Chi-ning (jī-níng) or **Tsinling**, city, Inner Mongolian Autonomous Region, China. It is an important railroad center at the junction of the system connecting Peking and Lan-chow, with the line traversing the Mongolian People's Republic to the USSR. Industries include meat-packing, tanning, and the production of textiles.

Chinju (chēn'jō'), city (1970 pop 121,622), capital of South Kyongsang prov., S South Korea. It is a transportation and agricultural center, with industries producing food products and textiles.

Chinkiang. see CHEN CHIANG

Ch'in Ling, mountain range, China. see TSINLING

Chinmoy: see GHOSE, CHINMOY

Chinnampo. see NAMPO, North Korea

Chinnereth (kīn'ārēth) or **Chinneroth** (-rōth). 1 See GALILEE, SEA OF. 2 Town, near the Sea of Galilee. Deut 3:17, Joshua 11:2, 19:35. Chinneroth 1 Kings 15:20.

Chino (chē'nō), city (1970 pop 20,411), San Bernardino co., S Calif., founded 1887, inc 1910. It is the business and processing center of a diversified farming (notably dairying) area. Mobile homes, plumbing hardware, machine products, and wool items are manufactured. A state prison is located in Chino, nearby is a state game-bird farm.

chinoiserie (shēnwazrē'), decorative work produced under the influence of Chinese art, applied particularly to the more fanciful and extravagant manifestations. Intimations of Eastern art reached Europe in the Middle Ages in the porcelains brought by returning travelers. Eastern trade was maintained during the intervening centuries, and the East India trading companies of the 17th and 18th cent. imported Chinese lacquers and porcelains. Dutch ceramics quickly showed the influence of Chinese blue-and-white porcelains. In the middle of the 18th cent. the enthusiasm for Chinese objects affected practically every decorative art applied to interiors, furniture, tapestries, and *bibels* and supplied craftsmen with fanciful motifs of scenery, human figures, pagodas, intricate lattices, and exotic birds and flowers. In France the Louis XV style gave especial opportunities to chinoiserie, as it blended well with the established rococo. Whole rooms, such as those at Chantilly, were painted with compositions in chinoiserie, and Watteau and other artists brought consummate craftsmanship to the style. Thomas Chippendale, the chief exponent in England, produced a unique and decorative type of furniture. The craze early reached the American colonies. Chinese objects, particularly fine wallpapers, played an important role in the adornment of rooms, and especially in Philadelphia the style had a pronounced effect upon design. See study by Hugh Honour (1961).

Chinon (shēnōn'), town (1968 pop 5,435), Indre-et-Loire dept., W central France, in Touraine, on the Vienne River. Chinon was an important medieval town and many buildings (notably three churches) from that period are preserved. Its castle, overlooking the river, consists of three distinct fortresses built from the 11th to the 15th cent.—the Château Saint-Georges, the Château du Milieu, and the Château du Coudray. The builders of the castle included Philip II of France, Richard I of England (the Lionhearted), and Henry II of France (who died there in 1159). In the Château du Milieu in 1429 Joan of Arc presented herself to Charles VII of France and correctly identified him although he was disguised. In La Devinière, a nearby hamlet, stands the house where the poet Rabelais was born (c 1490).

chinook (shīnōōk', chī-), warm, dry air mass that descends the eastern slopes of the U.S. and Cana-

dian Rocky Mts after having lost moisture by condensation over the western slopes. Chinooks occur mainly in winter. They sometimes replace the cold continental air mass over the western plains, causing rapid melting of snow and temperature increases as great as 40°F (4°C) within a few hours. Similar winds occurring in the Alps and elsewhere are known as foehn winds. The term *chinook* was originally applied by Oregon settlers to a moist Pacific wind blowing from the direction of a Chinook Indian camp.

Chinook Indians, North American Indian tribe of the Penutian linguistic stock. Altogether twelve main tribes spoke Chinook languages, all were in the Columbia River valley. The Chinook themselves were on the lower extremity of the river and, with the Clatsop Indians, constituted the now extinct Lower Chinook branch of the linguistic stock (see AMERICAN INDIAN LANGUAGES). The village was their main social unit, and a wealthy chief might control several. The Chinook practiced head flattening, and slavery was common. Their food consisted mostly of fish, roots, and berries. They were skilled with canoes, were noted traders, and practiced the custom of POTLATCH. They lacked the totemic art and the secret societies of their neighbors. They were well known to the traders on the Pacific coast in the late 18th cent. and a corrupted form of their language known as Chinook jargon served as a trade language from the Columbia River to Alaska.

Chinook jargon, LINGUA FRANCA of early traders on the Northwest Coast of the United States and Canada. It included Chinook, Nootka, English, and French words, with various borrowings.

chinquapin (chīng'kəpīn) [Algonquian], name for certain American species of the CHESTNUT genus of the family FAGACEAE (BEECH family) and for a related species, the golden chinquapin (*Castanopsis chrysophylla*), an evergreen of the Pacific states. The common chinquapin is *Castanea pumila*, native to the E United States. Its wood and fruit are used like those of the chestnut. The bush chinquapin (*C. alnifolia*) has a more southern range. Chinquapin is classified in the division MAGNOLIOPHYTES, class Magnoliopsida, order Fagales, family Fagaceae.

chintz (chīnts) [probably Hindustani, =variegated], originally a painted or stained calico from India. Esteemed for its bright colors and designs, it was used in Europe for bedcovers and draperies. Reproductions of Indian designs and also original patterns were soon produced. Especially noted was toile de Jouy, manufactured from 1700 to 1843 at Jouy, near Paris. Both flower motifs and characteristic pictorial scenes are prized by collectors and imitated in modern prints. Modern chintz is usually made up of bright prints on a light background.

Chinwangtao. see CH'IN-HUANG-TAO, China

Chioggia (kyōd'ja), city (1971 pop 49,288), Venetia, NE Italy, on a small island at the southern end of the Lagoon of Venice (an arm of the Gulf of Venice), connected to the mainland by a bridge. It is an important fishing port and has a steel industry. In 1379-80 several naval battles were fought off Chioggia in the war between Venice and Genoa. The liberation of the town from the Genoese turned the war in favor of Venice. Old houses and churches, canals, and sailboats help make Chioggia a picturesque tourist spot.

Chios, Greece. see KRÍOS

Chipeyan Indians, North American Indians of the ATHABASCAN branch of the Nadene linguistic stock (see also AMERICAN INDIAN LANGUAGES). Scattered Chipeyan groups ranged W Canada between Great Slave Lake and the Churchill River. They were nomadic hunters in rivalry with the Woodland Cree. They are not to be confused with the Chippewa or Ojibwa Indians.

chipmunk, rodent of the family SCIRIIDAE (SQUIRREL family). The chipmunk of the E United States and SE Canada is of the genus *Tamias*. The body of the common Eastern chipmunk, *Tamias striatus*, is about 5 to 6 in (13-15 cm) long, the upper parts are reddish brown or grayish brown with a median black stripe and two black stripes separated by a whitish band along each side. The tail, 4 to 5 in (10-13 cm) long, is hairy and flattened. Food is transported in the expandable cheek pouches. Chipmunks make underground burrows, often with concealed entrances beneath stone walls or trees. Although chipmunks are usually found near the ground, they are excellent climbers. In its northern range the chipmunk goes underground about the end of October, but sleeps deeply only during the coldest period. Food for the winter is stored in the burrow. Chipmunks eat nuts, seeds, berries, and insects. Although

they are numerous, these animals are not serious threats to crops. The typical life span is 5 years. The chipmunks of W North America belong, like those of E Asia, to the genus *Eutamias*. Chipmunks are classified in the phylum CHORDATA, subphylum Vertebrata, class Mammalia, order Rodentia, family Sciuridae.

Chippawa (chīp'əwə), village (1966 pop 3,877), S Ont., Canada, just above Niagara Falls. It was first settled in 1794 and was the scene of an American victory (1814) in the War of 1812.

Chippendale, Thomas, 1718-79, celebrated English cabinetmaker. His designs were so widely followed that a whole general category of 18th-century English furniture is commonly grouped under his name. Chippendale's *Gentleman and Cabinet-Maker's Director*, an illustrated trade catalog first published in 1754, was widely influential in England and America. Among the numerous pieces stamped with his style, it is possible to assign unquestionably to his own workshop only those for which the original bills still remain, as in the case of Harewood House and Nostell Priory, whose furnishings were created by him. While he based his work upon the general Queen Anne and Georgian characteristics of sober design and thoroughly fine construction, retaining many of the early 18th-century details, Chippendale's distinction was to introduce many other forms. For these he used three outside inspirations—Chinese, Gothic, and contemporaneous French ROCOCO. The first two resulted naturally from the general mid-18th-century enthusiasms for CHINOISERIE decoration and pseudo-Gothic architecture. Chippendale's name is emphatically identified with the extensive variety of chair types that he developed—from geometrical to Chinese, lattice, or sumptuously carved and interlaced forms. Chippendale's varied output also included desks, mirror frames, hanging bookshelves, settees, with which he was especially successful, china cabinets and bookcases, frequently with fretted cornices and latticework glazed doors, and tables with delicately fretted galleries and distinctive cluster-column legs of Gothic inspiration. The last phase of his career shows the influence of the designs of Robert Adam. Chippendale's style, quickly imported to America, was imitated by a number of expert cabinetmakers. See studies by Oliver Brackett (1924) and Anthony Coleridge (1968).

Chippewa (chīp'əwə), river, c 200 mi (320 km) long, rising in several forks in the lake region of N Wis., and flowing SW to the Mississippi, which it enters at the foot of Lake Pepin. Eau Claire and Chippewa Falls are on its banks. The river was once important in the lumbering industry.

Chippewa Falls, city (1970 pop 12,351), seat of Chippewa co., W central Wis., on the Chippewa River, settled 1837, inc as a city 1869. Originally a lumbering town, Chippewa Falls once had the world's largest sawmill. Today it is a trade and transportation center in a region of beef- and dairy-cattle farms. Its industries include meat packing and the manufacture of shoes, plastics, tools, and dies. Wisconsin State Park, which includes Lake Wissota, Wisconsin's largest artificial lake, is nearby.

Chippewa Indians. see OJIBWA INDIANS

Chirchik (chīrchēk'), city (1970 pop 107,000), Central Asian USSR, in Uzbekistan. It is an industrial center with large chemical plants and machinery factories. There is a chain of hydroelectric stations on the Chirchik River. The city was founded in 1932 on the site of the village of Kirgiz-Kulak.

Chiricahua Indians. see APACHE INDIANS

Chiricahua National Monument. see NATIONAL PARKS AND MONUMENTS (table)

Chirico, Giorgio de (jōr'jō dā kē'rēkō), 1888-, Italian painter, b. Vólos, Greece. Chirico developed his enigmatic vision in Munich and Italy and from 1911 to 1915 he worked and exhibited in Paris. His powerful, disturbing paintings employ steep perspective, mannequin figures, empty space, and forms used out of context to create an atmosphere of mystery and loneliness. His work exercised a considerable influence on early surrealist painters but was never successfully imitated. In Ferrara, Chirico developed what he termed metaphysical painting, in which he consciously exploited the symbolism of his art. Chirico is represented in leading galleries throughout the world. See his memoirs (tr 1972), studies by J. T. Soby (1955, repr 1967) and Isabella Far (tr 1971).

Chiron (kī'rōn), in Greek mythology, centaur, son of Cronus. He was a renowned sage, physician, and prophet. Among his pupils were Hercules, Achilles, Jason, and Asclepius. When Hercules accidentally wounded Chiron, the pain was so great that Chiron

surrendered his immortality to Prometheus and died Zeus then set him among the stars as the constellation Sagittarius

chiroprody: see PODIATRY

chiropractic (kīrāprāk'tik) [Gr, =doing by hand], medical practice based on the theory that all disease results from a disruption of the functions of the nerves. The principal source of interference is thought to be displacement (or subluxation) of vertebrae of the spine, although other areas such as joints and muscle tissue may also be the sites of nerve interference. The method of treatment is by adjustment of displaced vertebrae. The chiropractor seeks to relieve the pressure on the nerves and thereby remove the cause of some specific ailment. Massage and manipulation by hand, exercise, and the application of heat, cold, and light are some of the healing techniques used. The early chiropractors believed that psychic energy, a force beyond human understanding, flowed from the brain, through the nerves, to all parts of the body and that it was interference with this force that caused disease. In 1953 the theory was revised to state that the health of body tissues is controlled by nerve impulses, and that interference in the nerve impulses causes disease. Chiropractic was introduced in the United States by D. D. Palmer in 1895 and carried on by his son, Bartlett Joshua Palmer. There are institutions for training students in the profession of chiropractic, which has legal recognition in the United States and in many other parts of the world. See B. J. Palmer, *Text Book on the Palmer Technique of Chiropractic* (1920); A. E. Homewood, *The Chiropractor and the Law* (1965); H. S. Schwartz, ed., *Mental Health and Chiropractic* (1971).

chiru: see ANTELOPE

Chiryu (chēryō), city (1970 pop 41,896), Aichi prefecture, S central Honshu, Japan. The city was formed in 1970 by the merger of a number of smaller towns.

Chishima: see KURIL ISLANDS

Chisholm, Shirley Anita St. Hill (chīz'am), 1924–, U.S. Congresswoman (1969–), b. Brooklyn, N.Y. An expert on early childhood education, she worked (1959–64) as a consultant to the New York City bureau of child welfare before serving (1964–68) in the state assembly. Elected (1968) to the U.S. House of Representatives as a Democrat, Chisholm became the first black woman to serve in that body. She quickly gained national attention as a vocal critic of the war in Vietnam and the House seniority system and as an outspoken advocate of the interests of the urban poor. An active member of the black Congressional caucus, Chisholm made an unsuccessful bid for the 1972 Democratic presidential nomination. She is the author of *Unbought and Unbossed* (1970) and *The Good Fight* (1973).

Chisholm Trail, route over which vast herds of cattle were driven from Texas to the railheads in Kansas after the Civil War. It took its name from Jesse Chisholm, a part-Cherokee Indian trader who, in the spring of 1866, drove his wagon, heavily loaded with buffalo hides, through the Indian territory that is now Oklahoma to his trading post near Wichita, Kansas, the wheels cutting deep ruts in the prairie. These marked a route followed for almost two decades by traders and by drovers bringing cattle to shipping points and markets in Kansas. Hundreds of thousands of Texas longhorns were driven over the trail annually, and it became celebrated in frontier lore and cowboy ballads. With the development of railroads and the introduction of wire fencing, the trail fell into disuse, although traces of it can still be seen. See studies by Wayne Gard (1954) and B. J. Fletcher (1968).

Chishtī, Muin ad-Din Hasan (mōbēn' ād-dīn hāsān' chīsh'tē), 1142–1236, Indian Muslim saint, b. Seistan, Iran. He founded a Sufi mystic order in India. After traveling extensively in the Middle East and Central Asia he went to Lahore, then later settled in Ajmer. His splendid mausoleum there is an important center of pilgrimage.

Chisinau: see KISHINEV, USSR

Chislon (kī'slōn), Benjamite Num 34:21

Chisloth-tabor (kī'slōth-tā'bar), town, N Palestine, plausibly identified with Iksal, W of Mt. Tabor, Israel. Joshua 19:12. See also CHESULOTH.

chi-square test: see STATISTICS

Chistopol (chēstō'pal), city (1970 pop 60,000), Tatar Autonomous SSR, E European USSR, on the Kama River. It is a grain-trading center and has machinery plants. Chistopol was chartered in 1781.

Chisum, John Simpson (chīz'am), 1824–84, American cattleman, b. Tennessee. In 1837 he moved with his family to Texas. He had no formal education but worked as a builder and contractor, building the first courthouse in Paris, Texas. In 1854 he entered the cattle business, beginning in 1866, in partnership with Charles Goodnight, he drove herds into New Mexico, Colorado, and Wyoming, selling them to government food contractors for Indian reservations. When, in 1883, he established his ranch near Roswell, N. Mex., he became one of the first cattlemen in that region, and his became one of the largest herds. He was a prominent figure in the Lincoln co. cattle war, and at one time Billy the Kid was employed by him, however, Chisum cooperated with the authorities to end lawlessness in the cattle business.

Chiswick Press: see WHITTINGHAM, CHARLES

Chita (chē'tā'), city (1970 pop 241,000), capital of Chita oblast, SE Siberian USSR, at the confluence of the Chita and Ingoda rivers and on the Trans-Siberian RR. Machines and food-processing equipment are manufactured. Founded in 1653, Chita was a place of exile of the 19th-century Decembrist rebels.

Ch'i-t'ai (chē-tī) or **Kitai** (kē'tī'), town and oasis, N Sinkiang Uigur Autonomous Region, China, in the Dzungarian basin. It is a road hub and a trading center (furs, skins, raisins, and tea). Gold mines are nearby.

chitin (kī'tan), main constituent of the shells of arthropods. Chitin, a POLYSACCHARIDE analogous in chemical structure to CELLULOSE, consists of units of a glucose derivative (N-acetyl-D-glucosamine) joined to form a long, unbranched chain. Like cellulose, chitin contributes strength and protection to the organism. In arthropods the chitinous shell, or exoskeleton, covers the surface of the body, does not grow, and is periodically cast off (molted). After the old shell is shed, a new, larger shell is secreted by the epidermis, providing room for future growth. The chitin is rigid except between some body segments and joints where it is thin and allows movement of adjacent parts. Chitin is also found in the cell walls of some fungi.

chiton (kī'tan), common name for rock-clinging marine mollusks of the class Amphineura. Chitons are abundant on rocky coasts throughout most of the world, from the intertidal zone to a depth of about 1,200 ft (400 m). They range in length from ½ in. to

characteristic molluscan mantle, a fleshy outfolding of the body wall. The lower edge of the mantle, called the girdle, extends below the edge of the shell and aids the foot in gripping. The girdle may be very wide and extend upward over the shell, in some species it is smooth or covered with scales, hairs, or spines that give the animal a shaggy appearance. The many gills are arranged in two rows within the mantle, one on either side of the body. The mouth, located on the ventral surface in front of the foot, contains a toothed, tongue-like scraping organ, the radula. Chitons crawl slowly by means of muscular undulations in the foot. Most are herbivorous, feeding on algae scraped from rocks and shells with the radula, some are carnivorous or omnivorous. Most feed at night and shelter under rock ledges by day. Chitons are classified in the phylum MOLLUSCA, class Amphineura, order Polyplacophora.

Chitose (chē'tō'sā), city (1970 pop 56,118), Hokkaido prefecture, central Hokkaido, Japan, on the Chitose River. It is a communications center with a major airport.

Chitré (chē'trā'), city (1970 pop 12,379), S Panama, near the Gulf of Panama. It is a district capital on the Pan-American Highway and is the commercial and processing center for an agricultural area.

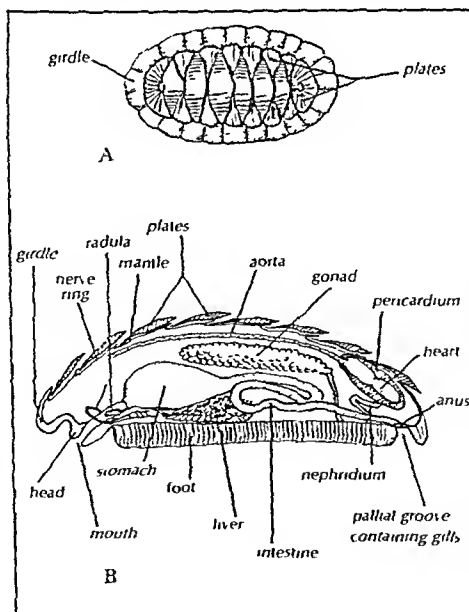
Chittagong (chī'tā'gōng), city (1969 est. pop 437,200), capital of Chittagong division, SE Bangladesh, on the Karnafuli River near the Bay of Bengal. An important rail terminus and administrative center, it is the chief port of Bangladesh, with modern facilities for oceangoing vessels. Jute, tea, and skins and hides are the major exports; imports include cotton and other piece goods, machinery, and construction materials. Offshore oil installations were set up during the 1960s. Besides an oil refinery and oil-blending plants, the city has large cotton- and jute-processing mills, tea and match factories, chemical and engineering works, an iron and steel mill, and fruit-canning, leather-processing, and shipbuilding industries. Power for Chittagong's industry is supplied by the Karnafuli hydroelectric project. The port was known to the civilized world by the early centuries A.D. and was used by Arakan, Arab, Persian, Portuguese (who called it Porto Grande), and Mogul sailors. Originally part of an ancient Hindu kingdom, Chittagong was conquered (9th cent.) by a Buddhist king of Arakan. It passed (13th cent.) to the Mogul empire, was retaken (16th cent.) by the Arakans, and again became part of the Mogul empire in the 17th cent. British control began in 1760. In the city are notable Hindu temples, Buddhist ruins, several fine examples of Mogul art, a university (founded 1966), and many arts and professional colleges. The Chittagong Hill Tracts District occupies a narrow coastal strip of parallel ranges along the Bay of Bengal and the Indian and Burmese frontiers. Valuable timber, bamboo, and cane forests, which cover the upper reaches of the hills, support a paper industry. Cotton, rice, tea, and oilseeds are raised in the valleys between the hills, and natural gas deposits lie along the shore. The cottage industries of the hill people produce woven cotton goods and bamboo nets and baskets.

Chittenden, Thomas, 1730–97, governor of Vermont, b. East Guilford, Conn. After moving to Vermont in 1774, he was active in the Windsor Convention, which declared (1777) Vermont independent. He and Ira Allen drew up the constitution, and Chittenden was elected (1778) first governor. He remained one of the Allen party, and he held office (except 1789–90) through Vermont's period of independence and early statehood until a few weeks before his death.

Chittim (kī'tim), variant of KITIM

Chittoor (chī'tōr'), city (1971 pop 63,041), Andhra Pradesh state, SE India, in the Poini River valley. Chittoor is on the Bangalore-Madras highway. It is a market for grain, sugarcane, and peanuts. The city is surrounded by mango and tamarind groves, and cattle are bred in the area. Chittoor, a district administrative center, was a British military post until 1884.

Chiu-chiang (jēō-jāng) or **Kiukiang**, city (1970 est. pop 120,000), N Kiangsi prov., China, on the Yangtze River, near P'o-yang lake. A major river port, it is connected by rail with Nan-ch'ang. In a major tea-growing area, it is a large processing, marketing, and shipping point. Other exports include rice, tobacco, cotton, ramie cloth, and tungsten ore. Machine tools are manufactured. The city was held by the Taipings from 1850 to 1854. It became a treaty port with a British concession in 1861. Chiu-chiang has notable botanical gardens and an arboretum. Just south is the wooded mountain of Lü Shan, the location of the resort of Ku-ling and of the White



A Dorsal view of a chiton, representative mollusk of the class Amphineura

B Internal anatomy of a chiton

12 in. (1.2–30 cm), according to the species, but most are 1 to 3 in. (2.5–7.5 cm) long. The body of a chiton is low and oval, it is covered dorsally by a slightly convex shell consisting of eight linearly arranged overlapping plates. The shell may be dull or brightly colored. Most of the lower surface consists of a broad, flat foot with which the chiton clings to hard surfaces, often so tightly that a sharp instrument is needed to pry it loose. When dislodged, a chiton rolls into a ball. Beneath the shell is the char-

Deer Cave, in which Chu Hsi (Chu Hi), the 13th-century Confucian philosopher, lived and taught

Chiun (kī'ən), idol worshiped by the Hebrews in the wilderness Amos 5:26 Remphan Acts 7:43

Ch'ung-shan (chēōōng-shan) or **Kiungshan** (kyōōng-shan, jeōōng-), city, on Hainan island, 5 Kwangtung prov., China It was the chief town of the island until absorbed by Hai-k'ou (which is now the largest town) Formerly a treaty port, Ch'ung-shan became part of the People's Republic of China in 1950

Chiusi (kyōō'sē), Lat. *Clusium*, Etruscan *Chamars*, town (1971 pop. 8,756), in Tuscany, central Italy, in the Apennines Chiusi was one of the 12 sovereign towns of ancient Etruria, its semilegendary king LARS PORSENA is said to have marched from there against Rome (c. 500 B.C.) The town was taken by Rome (c. 225 B.C.) Many Etruscan ruins have been found, including tombs dating from the 5th cent. B.C., and there is an excellent Etruscan museum There are also Christian catacombs

chivalry (shiv'äl're), system of ethical ideals that arose from FEUDALISM and had its highest development in the 12th and 13th cent. Chivalric ethics originated chiefly in France and Spain and spread rapidly to the rest of the Continent and to England They represented a fusion of Christian and military concepts of morality and still form the basis of gentlemanly conduct Noble youths became pages in the castles of other nobles at the age of 7, at 14 they trained as squires in the service of knights, learning horsemanship and military techniques, and were themselves knighted usually at 21 The chief chivalric virtues were piety, honor, valor, courtesy, chastity, and loyalty The knight's loyalty was due to the spiritual master, God, to the temporal master, the suzerain, and to the mistress of the heart, his sworn love Love, in the chivalrous sense, was largely platonic, as a rule, only a virgin or another man's wife could be the chosen object of chivalrous love With the cult of the Virgin Mary, the relegation of noblewomen to a pedestal reached its highest expression The ideal of militant knighthood was greatly enhanced by the Crusades The monastic orders of knighthood, the KNIGHTS TEMPLARS and the KNIGHTS HOSPITALERS, produced soldiers sworn to uphold the Christian ideal Besides the battlefield, the TOURNAMENT was the chief arena in which the virtues of chivalry could be proved The code of chivalrous conduct was worked out with great subtlety in the courts of love that flourished in France and in Flanders There the most arduous questions of love and honor were argued before the noble ladies who presided (see COURTLY LOVE) The French military hero BAYARD was said to be the last embodiment of the ideals of chivalry In practice, chivalric conduct was never free from corruption, increasingly evident in the later Middle Ages Courtly love often deteriorated into promiscuity and adultery, pious militance into barbarous warfare Moreover, the chivalric duties were not owed to those outside the bounds of feudal obligation The outward trappings of chivalry and knighthood declined in the 15th cent., by which time wars were fought for victory and individual valor was irrelevant Artificial orders of chivalry, such as the Order of the Golden Fleece (1423), were created by rulers to promote loyalty, tournaments became ritualized, costly, and comparatively bloodless, and the traditions of knighthood became obsolete Medieval secular literature was primarily concerned with knighthood and chivalry Two masterpieces of this literature are the *Chanson de Roland* (c. 1098, see ROLAND) and *Sir Gawain and the Green Knight* (see PEARL, THE) ARTHURIAN LEGEND and the CHANSONS DE GESTE furnished bases for many later romances and epics The work of CHRÉTIEN DE TROYES and the ROMAN DE LA ROSE also had tremendous influence on European literature The endless chivalrous and pastoral romances, still widely read in the 16th cent., were satirized by Cervantes in *Don Quixote* In the 19th cent., however, the romantic movement brought about a revival of chivalrous ideals and literature For the lyric poetry of the age of chivalry, see TROUBADOURS, TROUVÈRES, MINNESINGER See also ORDERS OF KNIGHTHOOD See Sidney Painter, *French Chivalry* (1940), Léon Gautier, *Chivalry* (tr. 1965), R. W. Barber, *The Knight and Chivalry* (1970), C. T. Wood, *The Age of Chivalry* (1970)

chive: see ONION

Chkalov: see ORENBURG, USSR

Chladni, Ernst Florens Friedrich (ērnst flō'rēns frē'drikh klād'nē), 1756-1827, German physicist An authority on acoustics, he made studies of the transmission of sound in various gases and of vibrating plates of glass and metal covered with sand, on which were formed the so-called Chladni figures, or

acoustic figures He invented a musical instrument that he called the euphonium Chladni also studied meteorites and proposed that they are of extraterrestrial origin

Chloe (klō'ē), Corinthian woman in whose house there were Christians 1 Cor. 1:11

chloral hydrate (klōr'al hī'drāt), central nervous system DEPRESSANT that is widely used as a hypnotic, or sleep-inducing drug Chloral hydrate is the common ingredient, along with alcohol, in what are popularly known as knockout drops or Mickey Finns, the combination can induce acute intoxication and coma

chloramine: see HYDRAZINE

chloramphenicol (klōr'ām'fēn'ākōl'), ANTIBIOTIC effective against a wide range of gram-negative and gram-positive bacteria (see GRAM'S STAIN) It was originally isolated from a species of *Streptomyces* bacteria Chloramphenicol's antibiotic activity results from its interference with protein synthesis in invading microbes However, it is a very toxic substance, its most serious and potentially lethal effect being depression of red blood cell production in bone MARROW, cases of leukemia were also attributed to early use of chloramphenicol Because of its toxicity, chloramphenicol is rarely prescribed for infections that can be treated by other antibiotics It is used to treat typhoid fever, some forms of meningitis, cholera, rickettsial infections such as Rocky Mountain spotted fever and typhus, and diseases caused by the psittacosis group of bacteria Chloramphenicol is commonly used in biological research to study protein synthesis Chloromycetin is a trade name for chloramphenicol

chlorate and **perchlorate**, SALTS of chloric acid, HClO₃, and perchloric acid, HClO₄, respectively A chlorate may be formed (together with the corresponding chloride) by heating the hypochlorite, e.g., 3Ca(ClO)₂ → Ca(ClO₃)₂ + 2CaCl₂ This reaction takes place when chlorine gas is passed into a hot aqueous solution of a metal hydroxide, the hypochlorite is formed and decomposes almost immediately Commercially, a chlorate is derived when a hot aqueous metal chloride solution is decomposed by electrolysis, forming chlorine gas at the anode and metal hydroxide at the cathode (with evolution of hydrogen), the chlorine reacts with the hydroxide to form the hypochlorite, which decomposes to form the chlorate The most industrially important chlorate is potassium chlorate, or chlorate of potash, KClO₃, sodium chlorate, or chlorate of soda, NaClO₃, is also used Potassium chlorate is a colorless crystalline substance that melts at 356°C and decomposes violently at about 400°C It is a powerful oxidizing agent and is used in making explosives and matches, a mixture of potassium chlorate with phosphorus, sulfur, or any of numerous organic compounds (e.g., charcoal or sugar) explodes upon friction or percussion When a chlorate is heated, oxygen is evolved, often explosively, and the chloride is formed, e.g., 2KClO₃ → 2KCl + 3O₂ The reaction proceeds controllably at lower temperatures if a catalyst, e.g., manganese dioxide, is used, this provides a convenient source of oxygen If the chlorate is heated carefully at a lower temperature so that no oxygen is given off, the perchlorate and chloride are formed, e.g., 4KClO₃ → 3KClO₄ + KCl Perchlorates are safer to handle than chlorates, they are more stable when exposed to heat or shock Potassium perchlorate, KClO₄, is perhaps most widely used, e.g., in matches, fireworks, and explosives It is a colorless crystalline substance that melts at about 610°C Chloric acid, HClO₃·7H₂O, is a colorless substance that occurs only in solution It is a strong acid and a strong oxidizing agent that decomposes if heated above 40°C Under certain conditions it forms oxygen, water, and the explosive gas chlorine dioxide, ClO₂, under other conditions it forms perchloric acid and hydrochloric acid Perchloric acid, HClO₄, is a volatile, unstable, colorless liquid that is a strong, corrosive acid and a powerful oxidizing agent, especially when hot It explodes if heated to about 90°C or on contact with combustible materials The monohydrate, HClO₄·H₂O, is fairly stable and forms needlelike crystals that melt at 50°C It explodes if heated to 110°C The dihydrate, HClO₄·2H₂O, is a stable liquid that boils at 200°C Perchloric anhydride, or chlorine heptoxide, Cl₂O₇, is a colorless, oily liquid that boils at 82°C without exploding but that may be detonated by shock, it can be prepared by adding phosphorus pentoxide to cold perchloric acid The perchlorate free radical (chlorine tetroxide, ClO₄) can be prepared by adding bromine to silver perchlorate, it is extremely reactive and unstable

chlordane (klōr'dān) see INSECTICIDE

chloric acid: see CHLORATE

chloride, chemical compound containing chlorine Most chlorides are salts that are formed either by direct union of chlorine with a metal or by reaction of hydrochloric acid (a water solution of HYDROGEN CHLORIDE) with a metal, a metal oxide, or an inorganic base Chloride salts include SODIUM CHLORIDE (common salt), POTASSIUM CHLORIDE, CALCIUM CHLORIDE, and AMMONIUM CHLORIDE Most chloride salts are readily soluble in water, but MERCUROUS CHLORIDE (calomel) and SILVER CHLORIDE are insoluble, and lead chloride is only slightly soluble Some chlorides, e.g., antimony chloride and bismuth chloride, decompose in water, forming oxychlorides Many metal chlorides can be melted without decomposition, two exceptions are the chlorides of gold and platinum Most metal chlorides conduct electricity when fused or dissolved in water and can be decomposed by ELECTROLYSIS to chlorine gas and the metal Chlorine forms compounds with the other halogens and with oxygen, when chlorine is the more electronegative element in the compound, the compound is called a chloride Thus, compounds with bromine and iodine are bromine chloride, BrCl, and iodine chloride, ICl, but compounds with oxygen or fluorine (which are more electronegative than chlorine) are oxides (e.g., chlorine dioxide, ClO₂) or fluorides (e.g., chlorine fluoride, ClF) respectively Many organic compounds contain chlorine, as is indicated by common names such as carbon tetrachloride, methylene chloride, and methyl chloride However, in the nomenclature system for organic chemistry adopted by the International Union of Pure and Applied Chemistry (IUPAC), the presence in a compound of chlorine bonded to a carbon atom is indicated by the prefix or infix *chloro*, thus, carbon tetrachloride is tetrachloromethane, methylene chloride is dichloromethane, and methyl chloride is chloromethane

chloride of lime: see BLEACHING POWDER

chlorinated hydrocarbon insecticide: see INSECTICIDE

chlorine (klōr'ēn, klōr'-) [Gr., =green], gaseous chemical element, symbol Cl, at no. 17, at wt. 35.453, m.p. -100.98°C, b.p. -34.6°C, density 3.2 grams per liter at STP, valence -1, +1, +3, +5, +7 Chlorine is a greenish-yellow poisonous gas with a disagreeable, suffocating odor, it is about two and one-half times as dense as air Only fluorine among the nonmetals is more chemically active Chlorine belongs to the HALOGEN family of elements, found in group VIIa of the PERIODIC TABLE The gas is composed of diatomic molecules (Cl₂) with molecular weight 70.906 Chlorine is soluble in water, its aqueous solution, called chlorine water, consists of a mixture of chlorine, hydrochloric acid, and hypochlorous acid, only a part of the chlorine introduced actually goes into solution, the major part reacting chemically with the water Chlorine water has strong oxidizing properties resulting from the oxygen set free when the unstable hypochlorous acid decomposes Chlorine reacts readily with hydrogen to form hydrogen chloride, it burns if ignited in a hydrogen atmosphere and, if unignited, can form explosive mixtures with hydrogen, it also unites with the hydrogen in compounds such as turpentine, a hydrocarbon In the presence of moisture it combines directly with certain metals, such as copper and iron, to form CHLORIDES Iron ignites when heated in a chlorine atmosphere With metals and oxygen, chlorine forms several CHLORATES, it also combines with many nonmetals and certain radicals Because of its activity chlorine does not occur uncombined in nature, but its compounds are numerous and abundant Sodium chloride (common salt) is present in seawater, salt wells, and large salt deposits, often in association with other chlorides Chlorine is produced commercially chiefly by the electrolysis of sodium chloride, either molten or in solution Other chlorides are sometimes employed Chlorine can also be prepared from hydrochloric acid by oxidation of the hydrogen chloride (Deacon's process) and from bleaching powder Chlorine is used in water purification, as a DISINFECTANT and as an antiseptic (mercuric chloride), and in the manufacture of bleaching powder (chloride of lime), dyes, and explosives Chlorinated hydrocarbons have been used extensively as pesticides, some examples are DDT (see separate article), dieldrin, aldrin, endrin, lindane, chlordane, and heptachlor These compounds resist degradation and have become very troublesome environmental pollutants Carbon tetrachloride and trichloroethylene are used as solvents The Freon refrigerants are hydrocarbons

that have been reacted with chlorine and fluorine. Chlorine is an important constituent of many poison gases. It is used in such compounds as calomel, CHLOROFORM, and CHLORAL HYDRATE, which are used in medicine. It is also employed in the extraction of bromine from seawater. It is used in preparing some synthetic rubbers, in petroleum refining, and to prepare pure hydrochloric acid (see HYDROGEN CHLORIDE). Chlorine was discovered in 1774 by K. W. SCHÉELE, who thought it was a compound of oxygen; it was named and identified as an element by Sir Humphry DAVY in 1810.

chloroform (klōr'əfōrm) or **trichloromethane** (tri'klōrēmēth'ān), CHCl_3 , volatile, colorless, non-flammable liquid that has a sweetish taste and a somewhat pungent odor; it boils at 61.2°C . It dissolves freely in ethanol and ether but does not mix with water. Chloroform is produced by reaction of chlorine with ethanol and by the reduction of carbon tetrachloride with moist iron. It was once used as a general anesthetic in surgery but has been replaced by less toxic, safer anesthetics, such as ether. Chemically, it is employed as a solvent for fats, alkaloids, iodine, and other substances. When exposed to sunlight and air it reacts to form phosgene, a poisonous gas.

Chloromycetin (klōr'ōmīsēt'ən), trade name for CHLORAMPHENICOL.

chlorophyll (klōr'əfil'), green pigment that gives most plants their color and enables them to carry on the process of PHOTOSYNTHESIS. Chemically, chlorophyll consists of two compounds, chlorophyll a and chlorophyll b, both contain carbon, hydrogen, oxygen, nitrogen, and magnesium, but in slightly differing proportions. The molecular structure of the chlorophylls is similar to that of the heme portion of hemoglobin, except that the latter contains iron in place of magnesium. Within the photosynthetic cells of plants the chlorophyll is in the chloroplasts—small, roundish, dense protoplasmic bodies that contain the grana, or disks, where the chlorophyll molecules are located. Chloroplasts have been likened to electric batteries, in which the flat chlorophyll molecules are the plates and the grana are the cells. Associated with the chlorophyll in the chloroplasts are two yellow pigments, carotene and xanthophyll. Chlorophyll is the only substance in nature that can trap and store the energy of sunlight. The light used is mainly the red and blue-violet portions of the visible spectrum; the green portion is not absorbed and, reflected, gives chlorophyll its characteristic color. Although all the details of this energy-trapping process are not yet known, it has been shown that when light (in packets called photons, or quanta) is absorbed by the complex chlorophyll molecules, certain electrons are excited, i.e., raised to a higher energy level than normal. The excited electrons are led away by so-called electron-carrier molecules (one of which has been found to contain vitamins B and K), go through a series of reactions in which energy is given up bit by bit, and finally return to the chlorophyll molecule. The energy thus made available is used to "recharge" molecules of ADENOSINE TRIPHOSPHATE, the storehouse of chemical energy used in photosynthesis. The chloroplasts also form another energy-rich phosphorus compound, called TPNH_2 , using hydrogen from naturally dissociated water. The evolutionary advantage to plants of being independent of special sources of hydrogen is enormous, and this independence can be considered responsible not only for the spread of plants to all parts of the earth but of animals as well, since they depend on plants for

food and oxygen. Recently it was discovered that the chloroplasts contain DNA (see NUCLEIC ACID), the genetic code-bearing chemical found in genes.

Chlorophyta (klōr'ōfātə), division of the plant kingdom consisting of the photosynthetic organisms commonly known as green ALGAE and the stoneworts. The organisms are largely aquatic or marine plants consisting of one to several cells, a few types are terrestrial, occurring on moist soil, on the trunks of trees, on moist rocks, and even in snowbanks. Various species are highly specialized, some living exclusively on turtles, sloths, or within the gill mantles of marine mollusks. Cells of the Chlorophyta contain organelles called CHLOROPLASTS, in which photosynthesis occurs; the photosynthetic pigments chlorophyll a and chlorophyll b, and carotenoids, are the same as those found in higher plants and are found in similar proportions. There is no differentiation into specialized tissues among members of the division, even though the plant body, or thallus, may consist of several different kinds of cells. In some groups the reproductive cells, or gametes, are found in the two forms, eggs and sperm, in others all gametes are identical in appearance (isogametes). The zygote resulting from fertilization is neither attached to the parent plant nor dependent upon it; it develops directly into a new plant.

Class Chlorophyceae (green algae). This group contains the largest number of species of the division; it is the most diversified, ranging from common pond scums to the bright green seaweeds. The green algae vary from single cells to long strings and filaments, flat plates (the common sea lettuce), and even hollow tubes. In their diversity of structure and methods of reproduction, the green algae seem to represent many different evolutionary lines, which are brought together into one class largely for reasons of convenience. The cell wall of the green algae usually consists of CELLULOSE, which forms a compact inner layer, often in combination with other carbohydrate components. There is also usually a gelatinous or slimy outer layer secreted by the cell. The nucleus is well-organized and resembles that of higher plants. The chloroplasts, which show a wide variety of shapes and structure, generally possess a body called a pyrenoid, in which starch is stored. Some groups of green algae produce oil as well as starch. The vegetative cells of many of the unicellular green algae, as well as many isogametes, sperms, and forms known as zoospores, have flagella and are motile. The flagella are whiplike structures attached to a special organ in the cytoplasm. Green algae reproduce by both asexual and sexual methods. In asexual reproduction, a normal vegetative cell becomes modified to produce up to 64 flagellated, asexual zoospores. The zoospores are released through a pore in the sporangium wall, and, after swimming around for some time, they lose their flagella and become normal vegetative cells. Similar asexual spores, but without flagella, called applanospores, are produced in many species. Sexual reproduction in green algae is extremely varied. In its simplest form, two unicellular vegetative cells fuse to form a zygote, which, after MEIOSIS, produces four spores, each of which develops directly into a new vegetative cell. In another reproductive process, one vegetative cell, or gametangium, gives rise to from 4 to 16 smaller cells, which function as gametes. Both isogamy (production of similar cells that function as gametes) and heterogamy (production of distinct eggs and sperms) are common in the group. Both types of reproduction and almost all imaginable intergradations occur in green algae species. The zy-

gote produced by fertilization may either germinate at once to produce new vegetative plants, or develop a thick and resistant wall, and become a zygospore capable of resisting unfavorable environmental conditions. There are about 7,000 species of green algae.

Class Charophyceae (stoneworts). The stoneworts are an isolated, highly modified group of Chlorophyta, of great fossil age, dating as far back as the Devonian period. They are included within the Chlorophyta largely because their physiology and pigmentation is similar to that of the green algae. The plants consist of a complex, branched thallus with an erect stemlike structure and many whorls of short branches. They occur in shallow, fresh or brackish water, and especially in water rich in calcium, where they become stiff and lime-encrusted. Sexual reproduction in stoneworts is by fusion of unlike gametes, i.e., egg and sperm. The only two genera, *Chara* and *Nitella*, have relatively few species, which are not particularly varied, a fact that may reflect their great geological age. See G. M. Smith, *Freshwater Algae of the United States* (2d ed. 1950).

chloropicrin (klōr'əpik'rīn), colorless oily liquid used as a POISON GAS. It is a powerful irritant, causing lachrymation, vomiting, bronchitis, and pulmonary edema; lung injury from chloropicrin may result in death. Trace amounts in the air cause a burning sensation in the eyes, which serves as a warning of exposure. Chloropicrin is more toxic than chlorine but less toxic than PHOSGENE. It is relatively inert and does not react with the chemicals commonly used in gas masks. It has been extensively used as a vomiting gas by the military. It is also used industrially in small amounts as a warning agent in commercial fumigants and as an insecticide and disinfectant for grain. Chloropicrin has the formula CCl_3NO_2 . It boils at 112°C with partial decomposition to phosgene and nitrosyl chloride.

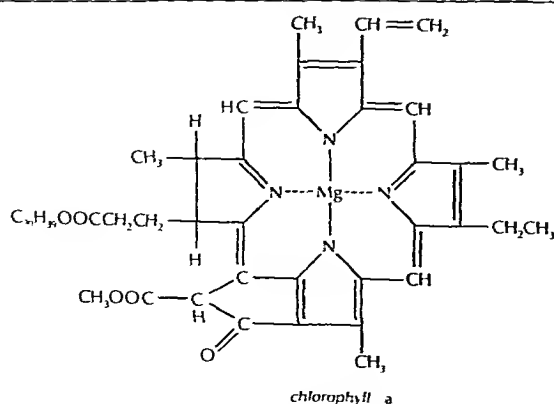
chloroplast, a complex, discrete green structure, or organelle, contained in the CYTOPLASM of plant cells. Chloroplasts are responsible for the green color of almost all plants and are lacking only in plants that do not make their own food, such as fungi and non-green parasitic or saprophytic higher plants. The chloroplast is generally flattened and lens-shaped and consists of a body, or stroma, in which are embedded from a few to as many as 50 submicroscopic bodies—the grana—made up of stacked, disklike plates. The chloroplast contains chlorophyll pigments, as well as yellow and orange carotenoid pigments. Chloroplasts are thus the central site of the photosynthetic process in plants. The chloroplasts of algae are simpler than those of higher plants, and may contain special, often conspicuous, starch-accumulating structures called pyrenoids.

chloroprene (klōr'əprēn') or **2-chloro-1,3-butadiene**, colorless liquid organic compound used in the synthesis of neoprene and certain other RUBBERS. The structure of the chloroprene molecule is very similar to that of isoprene; the molecule contains two double bonds and is readily polymerized.

chlormpromazine (klōr'prām'azēn'), one of a group of tranquilizing drugs called PHENOTHIAZINES that are useful in halting psychotic episodes. Chlormpromazine, sold under the trade name Thorazine, is often used to reduce the severe ANXIETY and agitation and the overactivity of some forms of SCHIZOPHRENIA.

Chmielnicki or **Khmelnitsky**, **Bohdan** (both bəkh'dān' khmēlnē'tskē), c. 1595–1657, hetman (leader) of Ukraine. An educated member of the Ukrainian gentry, he early joined the Ukrainian Cossacks. Elected (1648) hetman of the ZAPOROZYE Cossacks, he led their rebellion against oppressive Polish rule. At first successful, the revolt grew into a national revolution of the Ukrainian people. Two treaties (1649, 1651) with Poland—the second less satisfactory than the first—were broken by the Poles, and the war dragged on. As compromise with Poland proved to be impossible, Chmielnicki's objective came to be an independent Ukrainian state, for aid he turned to Czar Alexis of Russia. In 1654 at Pereiaslav (renamed Pereyaslav-Khmelnitski in 1944), Ukraine was proclaimed a protectorate of Moscow and recognized as autonomous. The alliance ultimately led to the destruction of Ukrainian autonomy, its immediate result was resumption of the war, ending only in 1667 with the Treaty of Andrusov, which partitioned Ukraine between Poland and Russia. See George Vernadsky, *Bohdan, Hetman of Ukraine* (1941).

Choate, Joseph Hodges, 1832–1917, American lawyer and diplomat, b. Salem, Mass., nephew of Rufus Choate. After being admitted (1855) to the bar, he moved to New York City. His legal career lasted over



50 years and included many famous cases, his brilliant presentation of cases won him an unrivaled reputation. Choate twice helped to arouse New York City to defeat Tammany Hall—in 1871, when the Tweed Ring was exposed, and again in 1894. He was president (1894) of the New York state constitutional convention and helped win public approval of the new constitution. In 1899 President William McKinley appointed him ambassador to Great Britain, and he served for six years with distinction, helping to promote Anglo-American friendship. In 1907 he headed the American delegation to the Second Hague Conference. See his autobiography, *Boyhood and Youth* (1917), biographies by T. G. Strong (1917) and E. S. Martin (2 vol., 1920).

Choate, Rufus, 1799–1859, American lawyer and Congressman, b. Essex co., Mass., uncle of Joseph Hodges Choate. Admitted to the bar in 1823, Rufus Choate gained national reputation as a lawyer and as an orator. He served (1830–34) in the U.S. House of Representatives and sat (1841–45) in the U.S. Senate, completing the unexpired term of his friend Daniel Webster. See biography by C. M. Fuess (1928, repr. 1970).

Chocano, José Santos (hōsā' san'tōs chōkā'nō), 1875–1934, Peruvian poet and revolutionary, one of the leaders of MODERNISMO. He gave an *indianista* (pro-Indian) slant to modernism, as in the poem "Quien sabe?" (1913). His most popular volume, *Alma America* [the soul of America] (1906) led Rubén Darío, the greatest of the *modernistas*, to develop native themes. Chocano was a notorious rake and a strident nationalist. Vigorous, eloquent, at times bombastic, Chocano did not restrict himself to *modernista* forms. Well-known collections of his poetry are *Fiat Lux* (1908) and *Primicias de oro de Indias* [first fruits of gold from the Indies] (1934). Having killed a political enemy, Chocano moved to Chile where he was himself murdered.

chocolate, general term for the products of the seeds of the CACAO or chocolate tree, used for making beverages or confectionery. The flavor of chocolate depends not only on the quality of the cocoa nibs (the remainder after the seeds are fermented, dried, and roasted) and the flavorings but also on a complex process of grinding, heating, and blending. The chocolate liquid formed in an intermediate stage is used in the confectionery trade as a covering for fruits, candies, or cookies, or the process may be continued and the resulting smooth mass of chocolate molded, cooled, and packaged as candy. It should be hard enough to snap when broken, have a mellow flow when melting, be free of gritty particles, and have a rich, dark color and an aromatic smell and flavor. The making of chocolate confectionery is in itself a well-developed industry of considerable commercial importance, employing highly specialized processes and machinery. A chocolate beverage was known to the Aztecs and through Spanish explorers found (c.1500) its way into Europe. In 1657 a shop was opened in London where chocolate was sold at luxury prices, sometimes as high as 15s a pound. It became a fashionable drink, many shops sprang up to become centers of political discussion and grew into famous clubs, such as the Cocoa Tree. Chocolate was first manufactured in the United States at Milton Lower Mills, near Dorchester, Mass., in 1765. About 1876, M. D. Peter of Vevey, Switzerland, perfected a process of making milk chocolate by combining the cocoa nib, sugar, fat, and condensed milk. It is a popular ingredient in custards, puddings, pastry, cakes, mousses, ice creams, and sauces as well as in confectionery. The United States has the world's largest chocolate-manufacturing industry. See P. P. Gott, *All About Candy and Chocolate* (1958), B. W. Minifie, *Chocolate, Cocoa and Confectionery* (1970).

Choctaw Indians (chōk'tō), North American Indians whose language belongs to the Muskogean branch of the Hoka-Siouan linguistic stock (see AMERICAN INDIAN LANGUAGES). They formerly occupied central and S Mississippi with some outlying groups in Alabama, Georgia, and Louisiana. Choctaw culture was similar to that of the Creek and Chickasaw Indians, who were their enemies in repeated wars. The Choctaw economy, unlike that of the Chickasaw, was based on agriculture, and the Choctaw were perhaps the most competent farmers in the Southeast. Friendly toward the French colonists, the Choctaw were their allies in wars against other tribes. After being forced to cede their lands in Alabama and Mississippi, they moved (1832) to the Indian Territory in Oklahoma, where they became one of the Five Civilized Tribes. See Angie Debo, *The Rise and Fall of the Choctaw Republic*

(3d ed. 1967), A. H. DeRosier, *The Removal of the Choctaw Indians* (1971), W. D. Baird, *Peter Pitchlynn: Chief of the Choctaws* (1972).

Choderlos de Laclos: see LACLOS, PIERRE AMBROISE FRANÇOIS CHODERLOS DE

Chodowiecki, Daniel Nikolaus (da'nēēl nē'kōlous khōdōv'yēt'skē), 1726–1801, German painter and engraver, b. Danzig. He was the most popular illustrator of his day in Prussia. *The Departure of Jean Calas* (1767) is his most famous painting. It is as an engraver, however, that Chodowiecki is best known. His book illustrations include designs for Schiller's *Räuber*, Cervantes's *Don Quixote*, Goldsmith's *Vicar of Wakefield*, and Shakespeare's works.

Chofu (chō'fō), city (1970 pop. 157,488), Tokyo Metropolis, E central Honshu, Japan, on the Tama River. It is a residential suburb of Tokyo.

choir [O Fr.] 1 A group of singers, traditionally the chorus organized to sing in a church. Usually, Roman Catholic, Anglican, and Lutheran choirs are composed of men and boys, but occasionally in these churches and customarily in other Protestant churches men and women form the choir. 2 That division of an organ usually used to accompany the singers, played from the lowest manual on the console. 3 A section of a chorus or orchestra, as the contrasted choirs of polychoral music, or brass choir, woodwind choir. 4 That part of a church reserved for the singers and the officiating clergy in a cathedral or abbey, the same area in a parish church is the chancel. See STALL.

choir stall: see STALL

Choiseul, César, comte Du Plessis-Praslin, duc de (sāzar' kōnt' du plēsē-prālān' duk dā shwazol'), 1598–1675, marshal of France, diplomat, and soldier. He served as ambassador to Turin and commanded the army in Lombardy during the Thirty Years War. In the FRONDE he sided with Cardinal Mazarin and defeated the vicomte de Turenne at Rethel (1650). Choiseul negotiated the Anglo-French alliance of 1670.

Choiseul, Étienne François, duc de (ātyēn' fra'nswā'), 1719–85, French statesman. After successful service in the army he entered the diplomatic service and gained support from Mme de Pompadour. As ambassador to Vienna (1757) he strengthened the Austrian alliance by conducting first negotiations toward the marriage of Marie Antoinette with the future Louis XVI. Later, in his capacity as minister of foreign affairs (1758–70), Choiseul negotiated the FAMILY COMPACT and the Treaty of Paris at the end of the Seven Years War, and he annexed Lorraine (1766) and Corsica (1768). As minister of war (1761–70) and of the navy (1761–66) he reorganized the fighting forces and introduced reforms. He supported the publication of the *Encyclopédie* and aided suppression of the Jesuits, which weakened his position at court. A clique surrounding King Louis XV's mistress, Mme Du Barry, caused his exile from court (1770). See his memoirs (1790), biography by R. H. Soltan (1909).

chokercherry: see CHERRY

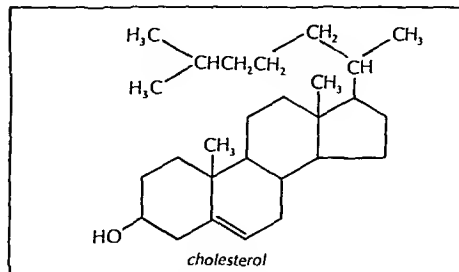
chokedamp: see DAMP

Chola (chō'lā), S Indian dynasty, whose kingdom was mainly on the Coromandel Coast. Its chief capitals were at Kanchi (Kanchipuram) and TANJORE. The Chola kingdom was one of the three of ancient Tamil tradition, but the dynasty had been virtually submerged for centuries when at the end of the 9th cent. A.D. it rose again. Under the famous rulers Rajaraja I (reigned 985–1014) and Rajendra I (reigned 1014–42) Chola power reached its zenith. The former conquered Kerala and occupied N Ceylon (now Sri Lanka), the latter completed the conquest of Ceylon, invaded Bengal, and sent out a great naval expedition that occupied parts of Burma, Malaya, and Sumatra. For 300 years the Chola kingdom supported a flourishing social and economic life, marked by a flowering of Hindu culture. Its greatest architectural monument is an 11th-century temple at Tanjore, which was dedicated to Shiva in celebration of a military victory. By the 13th cent. the kingdom was in decline, and the dynasty ended in 1279.

cholera or **Asiatic cholera**, acute infectious disease of the intestines, occurring in warm regions. It results when food and water supplies are contaminated with feces containing the bacterium *Vibrio comma*. Overwhelming dehydration brought about by severe diarrhea and vomiting is the outstanding characteristic of the disease and is the main cause of death. Cholera has a short incubation period (two or three days) and runs a quick course. In untreated cases the death rate is high, averaging 50%, and as

high as 90% in epidemics, but with effective treatment the death rate is less than 3%. The intravenous replacement of body fluids and essential electrolytes and the restoration of kidney function are more important in therapy than the administration of antibacterial drugs. In regions of Asia where public sanitation is poor the disease is still endemic or epidemic.

cholesterol (kalēs'tarōl'), fatty substance found in the body tissues of vertebrates, it is only sparingly soluble in water, but much more soluble in some organic solvents. A STEROID, large concentrations of cholesterol are found in the brain, spinal cord, and liver. The liver is the most important site of cholesterol biosynthesis, although other sites include the adrenal glands and reproductive organs. By means of several enzymatic reactions, cholesterol is synthesized from ACETIC ACID, it then serves as the major



precursor for the synthesis of vitamin D at the surface of the skin, of the various steroid HORMONES, including CORTISOL, CORTISONE, and ALDOSTERONE in the ADRENAL GLANDS, and of the sex hormones progesterone, estrogen, and testosterone. Cholesterol is secreted in the liver secretion BILE, it sometimes crystallizes in the GALL BLADDER to form gallstones. The insolubility of cholesterol in water is also a factor in the development of atherosclerosis, the pathological deposition of plaques of cholesterol and other LIPIDS on the inside of major blood vessels that is associated with heart disease (see CORONARY HEART DISEASE). Unfortunately, the relationship between cholesterol and heart disease is not completely understood, although it has been shown that decreasing the amount of saturated, or animal, fats in the diet will cause a decrease in serum lipid and cholesterol levels, it has not yet been experimentally established that a reduction of serum lipids will actually delay atherosclerosis or coronary artery disease.

Cholet (shōlā'), city (1968 pop. 41,766), Maine-et-Loire dept., W France, in Poitou, on the Maine River. Cholet, a livestock market, has textile, metallurgical, and other industries. It was totally destroyed during the VENDEE wars.

choline: see VITAMIN

Cholon (chōlōn', Fr. shōlōn'), city, since 1932 part of SAIGON, South Vietnam, on the right bank of the Saigon River, a tributary of the Dong Nai. Adjacent to Saigon, with which it is connected by rail, road, and canal waterways, Cholon is an industrial center with many rice mills and factories. Founded c. 1780 by Chinese immigrants seeking to escape the civil disorders of Annam, it became a busy trading port long before Saigon was developed by the French. It is still largely a Chinese city, containing around two thirds of South Vietnam's entire Chinese population. Heavy fighting there during the 1968 Tet offensive in the VIETNAM WAR severely damaged the city. **Cholula** (chōlōō'lā), city (1970 pop. 20,913), Puebla state, E central Mexico. The site of the famous *Teocalli de Cholula*, a pre-Columbian pyramid of great antiquity, the city was an old Toltec center and, when the Spanish came, was an Aztec sacred city devoted to the worship of Quetzalcoatl. Suspecting native insurrection, Hernán Cortés destroyed the city in 1519, from 5,000 to 10,000 Indians were killed in the massacre of Cholula. Cortés then vowed to build a church for each of the 400 Aztec shrines, 70 were in fact built, one atop the pyramid. The picturesque city remains a place of pilgrimage and attracts many tourists.

Chomo Lhari (chōmōl'hū'rē, chōmāl'hā'rē), peak, 23,997 ft (7,314 m) high, on the Bhutan-China border, in the Himalayas. It is sacred to the Tibetans.

Chomsky, Noam (nōm chōm'skē), 1928–, educator and linguist, b. Philadelphia. Chomsky has taught at Massachusetts Institute of Technology since 1955 and has developed a theory of generative grammar that has revolutionized the scientific study of lan-

guage. Instead of starting with minimal sounds, as the structural linguists had, Chomsky began his abstract analysis of language, set out in his doctoral dissertation *Syntactic Structures* (1957), with the rudimentary or primitive sentence. This formed his basis for deriving innumerable syntactic combinations by means of a complex series of transformational rules. His other principal linguistic works include *Current Issues in Linguistic Theory* (1964), *Aspects of a Theory of Syntax* (1965), *Cartesian Linguistics* (1966), *The Sound Pattern of English* (with Morris Halle, 1968), *Language and Mind* (1972), and *Studies on Semantics in Generative Grammar* (1972). Among his political writings are *American Power and the New Mandarins* (1969), *At War with Asia* (1970), and *Peace in the Middle East?* (1974).

Chomutov (khō'mōōtōf), Ger. Komotau, city (1970 pop. 40,561), NW Czechoslovakia, near the East German border. Chomutov is an industrial center in a lignite-mining region and has steelworks and industries manufacturing machine tools, chemicals, paper, and glass. Chartered in 1396, it was disputed by Roman Catholics and Protestants in the 16th cent. In the city are the 13th-century Church of St. Catherine and a 16th-century town hall with a museum.

Chonan (chūn'ān'), city (1970 est. pop. 78,000), W South Korea. It is a railroad hub and a mining and agricultural center.

chondrite see METEORITE

Chone (chō'nā), town (1962 est. pop. 12,800), W Ecuador. Cacao, ivory nuts, and panama hats are shipped through Chone.

Chongjin or Chungjin (both chūng'jēn'), Jap. Seishin, city, NE North Korea, an ice-free port on the Sea of Japan. It was developed in the 1930s by the Japanese as an iron and steel center. The city has metallurgical plants, chemical factories, sawmills, and fish canneries.

Chongju (chūng'jōō'), city (1970 pop. 143,944), capital of North Chungchong prov., W central South Korea. It is a transportation hub and a marketing and processing center for the surrounding agricultural region. Rice milling, the production of fertilizers and textiles, and the brewing of sake (rice wine) are the city's major industries.

Choniates, Michael: see ACOMINATUS, MICHAEL

Choniates, Nicetas: see ACOMINATUS, NICETAS

Chonju (chūn'jōō'), city (1970 est. pop. 263,000), capital of North Cholla prov., SW South Korea. It is a transportation and agricultural center in the heart of the country's most densely populated and richest rice-growing area. Food processing and textile manufacturing are the chief industries. The city was the capital of the Hu Paekju dynasty (892-936). The founder of the Yi dynasty, Korea's last imperial line, is buried in Chonju.

Chopin, Frederic François (frādrāk' fraNswa' shō-pān'), 1810-49, composer for the piano, b. near Warsaw, of French and Polish parentage. With his lyrical, often melancholy, compositions, he brought romantic piano music to unprecedented heights of expressiveness. A prodigy as a pianist and a composer, he began performing at aristocratic salons in Warsaw, and in 1826 he began fulltime studies at the Warsaw Conservatory. After concert appearances in Vienna and Munich, he settled in Paris, where he gave his first concert in 1831. Although he remained always devoted to Polish culture and artists, he never returned to his homeland. In Paris he became closely associated with the principal composers, artists, and literary figures of his time. He was a virtuoso interpreter of his own works, but his dislike of playing in public made him prefer teaching and composing to the concert stage. In 1836, Liszt introduced him to Mme. Dudevant, better known by her pen name GEORGE SAND, with whom he spent the winter of 1838-39 in Majorca, there, despite worsening pulmonary illness, he wrote his 24 preludes, which are counted among his finest compositions. The stormy affair with the novelist lasted until 1847, by which time Chopin's illness had developed into tuberculosis. He made a last concert tour through Great Britain in 1848. Chopin established the piano as a solo instrument free from choral or orchestral influence. Even in the piano concertos in E Minor (1833) and in F Minor (1836), the orchestra is completely dominated by the piano. Other major works include the sonatas in B Flat Minor (1840) and B Minor (1845), and two sets of études (1833, 1837). Because of their highly romantic quality, some of his works have become known by descriptive titles that he did not give them, they were published simply as nocturnes, scherzos, ballades, waltzes, impromptus, fantasies, and the like. Polish nationalism is evident in his many polonaises and mazurkas. His

last concert was a benefit performance for Polish refugees, and at his funeral in Paris, Polish soil was strewn on his grave. See his selected correspondence ed. by B. E. Sydow (1962), biographies by F. Niecks (2 vol., 1888, repr. 1973), H. Weinstock (1949), and A. Walker, ed. (1966), studies by G. Abraham (1939), André Gide (1949), and D. Branson (1972).

Chopin, Kate O'Flaherty (shō'pān'), 1851-1904, American author, b. St. Louis. Of Creole-Irish descent, she married (1870) a Louisiana businessman and lived with him in Natchitoches parish and New Orleans. In these places she acquired an intimate knowledge of Creole and Cajun life, upon which she was to draw in many of her stories. After her husband's death in 1883, she returned with their six children to St. Louis and there began to write. Two collections of tales, *Bayou Folk* (1894) and *A Night in Acadie* (1897) earned her a reputation as a local colorist, but her novel *The Awakening* (1899) caused a storm of criticism because of its treatment of feminine sexuality. In depicting objectively a woman's confused groping toward self-understanding and self-acceptance, Chopin seemed to threaten the mores of her time although she did not explicitly attack them. Largely ignored for the next 60 years, her work is now praised for its literary merit as well as for its remarkable independence of mind and feeling. See her complete works, edited by Per Seyersted (2 vol., 1969) and the biography by Per Seyersted (1969).

choragic monuments (kārāj'ik, -rāj'-, kō-) [Gr., = of the choragus, the chorus leader], small decorative structures erected in ancient Greece to commemorate the victory of the leader of a chorus in the competitive choral dances. The prize for the competition, a tripod, was placed on the monument, and the date and the name of the performer were usually inscribed. The best known is that of Lycistrates (c. 335 B.C.), still standing in Athens, a graceful circular structure showing one of the early uses of Corinthian columns.

chorale (kōrāl'), any of the traditional hymns of the German Protestant Church. The form was developed after the Reformation to replace the PLAINSONG of the earlier service and as a means of congregational participation in the liturgy. Early chorales were mainly translations of Latin hymns set to folksong melodies. The chorale is strophic, written in simple language, and has a simple melody, but its phrasing and metrical structure are less regular than those of the English hymn. J. S. Bach reworked nearly 400 existing chorales and composed 30 new ones. The major development of the form was thereby concluded although there were some 19th-century additions to the repertory.

Chor-ashan (kōr-ā'shān), one of the places to whose inhabitants David sent spoils of war 1 Sam. 30:30. See ASHAN.

Chorazin (kōrā'zīn), city NW of the Sea of Galilee, denounced by Jesus. Mat. 11:21, Luke 10:13.

chord, in geometry, straight line segment both end points of which lie on the circumference of a circle or other curve, it is a segment of a SECANT. A chord passing through the center of a circle is a diameter. In the same circle or in equal circles, equal chords subtend equal arcs and equal central angles.

chord, in music, two or more simultaneously sounding pitches. In tonal music the fundamental chord is called the triad. It consists of three pitches, two at the interval of seven semitones and a third either three or four semitones from the lower, forming respectively the major or minor triad.

Chordata (kōrdā'tā, -dā'-), phylum of animals having a notochord, or dorsal stiffening rod, as the chief internal skeletal support at some stage of their development. Most chordates are vertebrates (animals with backbones), but the phylum also includes some small marine invertebrate animals. The three features unique to chordates and found in all of them at least during early development are the notochord, composed of gelatinous tissue and bound by a tough membrane, a tubular nerve cord (or spinal cord), located above the notochord, and gill slits leading into the pharynx, or anterior part of the digestive tract (the throat, in higher vertebrates). In addition, all have blood contained in vessels, and the tunicates and vertebrates have a ventrally located heart. All have a postanal tail, that is, an extension beyond the anus of the notochord or backbone and of the body-wall musculature, containing no internal organs. In vertebrates—animals of the subphylum Vertebrata—a backbone of bone or cartilage segments called vertebrae develops around the

notochord, its upward projections partially surround the nerve cord. In many fishes and in early fossil amphibians and reptiles the notochord persists in the adult and is enclosed by the vertebrae, in higher vertebrates, however, it disappears during embryonic development. There are two invertebrate subphyla, the Orophordata, or TUNICATES, and the Cephalochordata, or lancelets. A third invertebrate group, comprising the acorn worms and their relatives, shows affinities with chordates and has sometimes been considered a chordate subphylum, but is now often classified in a phylum of its own, the HEMICHORDATA.

Subphylum Orophordata. The tunicates are marine, filter-feeding animals. The most prominent tunicates are the sea squirts (class Ascidiacea), which show affinities to other chordates only in the juvenile stage. Adult sea squirts are sessile (attached), globular or tubular animals, often with prominent incurrent and excurrent siphons, many kinds grow in colonies. Most of the body of the adult is occupied by a very large pharynx with numerous gill slits that act as a sieve for food. Water taken into the incurrent siphon enters the pharynx and passes out through the gill slits, leaving food particles trapped in the pharynx. A groove in the pharynx called the endostyle secretes mucus that traps the particles and conveys them into the digestive tract, the movement of the mucus is caused by the action of cilia. Water leaves the atrium, a sac surrounding the pharynx, by way of the excurrent siphon. Thus the gill slits in tunicates serve a feeding function, not a respiratory function. The sea squirt larva is a free-swimming animal resembling a tadpole. The head, which will become the entire body of the adult, contains a rudimentary brain and sense organs, a small pharynx and digestive tract, and a ventral heart. Incurrent and excurrent openings are located at the top of the head. The tail is a muscular appendage that functions as a swimming organ. It contains a hollow nerve tube (connected to the brain), and a notochord that extends into the head and keeps the animal from telescoping when its muscles contract. When the larva is ready to undergo metamorphosis it attaches to an object head downward. The tail, notochord, and nerve cord degenerate, the pharynx enlarges, and the other organs shift in position, the incurrent and excurrent openings develop siphons. There are two other classes of tunicates, both consisting of small planktonic animals. The salps (Thaliacea) metamorphose into barrel-shaped adults that swim by muscular contractions. The larvaceans (Larvacea) are neotenous, that is, they achieve sexual maturity and reproduce without losing the larval form. Many zoologists believe that tunicates of the sea squirt type were the first chordates and that the larval tail, with its notochord and nerve cord, was evolved as a means of dispersing their larvae. According to this theory, the later chordates, including the vertebrates, are descended from neotenous tunicates that, like the larvaceans, failed to assume the adult form.

Subphylum Cephalochordata. This class includes the several species of lancelets, or amphioxys, small, fish-like, filter-feeding animals found in shallow water. A lancelet has a long body, pointed at both ends, with a large notochord that extends almost from tip to tip and is present throughout life. At one end is a mouth surrounded by prominent bristles and leading into a pharynx. The pharynx has gill slits, an endostyle similar to that of a sea squirt, and an atrium surrounding the pharynx. Water enters the mouth and leaves through the gill slits, and food is trapped in the pharynx. The dorsal, tubular nerve cord is slightly enlarged in the anterior region, forming a rudimentary brain. Nerves extend from the nerve cord to other parts of the body. The muscles, as in fishes, are a series of cone-shaped blocks that fit into each other like stacked paper cups. This is the most primitive occurrence of the segmental body wall structure characteristic of lower vertebrates. The colorless blood moves forward through a ventral vessel and back through a dorsal vessel, in the typical chordate pattern. There is no major heart, although many small enlargements of the vessel serve the function of hearts. There are no blood cells and no respiratory pigments. The excretory system, like that of many invertebrates, consists of segmentally arranged nephridia, there is no kidney. The gonads, unlike those of any other chordate, are numerous and segmentally arranged.

Subphylum Vertebrata. Vertebrates constitute the vast majority of living chordates, and they have evolved an enormous variety of forms. The backbone of vertebrates protects the nerve cord and serves as the axis of the internal skeleton. The skel-

eton provides strength and rigidity to the body and is an attachment site for muscles. The vertebrae in the middle region of the trunk give rise to pairs of ribs, which surround and protect the internal organs. A cartilaginous or bony case encloses the brain. Bone is a substance unique to vertebrates. It was formerly thought that vertebrates with cartilage skeletons (cyclostomes and sharklike fishes) were descended from early vertebrates that had not yet developed bone. However, very primitive fishes with bone skeletons are known from the fossil record, so lack of bone is now believed to be a degenerate rather than a primitive feature. All but the most primitive vertebrates, known as jawless fishes, have jaws and paired appendages. The fishes and, to a lesser extent, the amphibians and reptiles, show a segmental arrangement of the muscles of the body wall and of the nerves leading to them. There are eight vertebrate classes. Four are aquatic, and may be grouped together as the superclass Pisces, or FISH; four are terrestrial or (in the case of amphibians) semiterrestrial, and may be grouped as the superclass Tetrapoda, or four-footed animals. Fishes breathe water by means of gills located in internal passages, although they may also have lungs as supplementary air-breathing organs. Most move through the water by weaving movements of the trunk and tail. All have fins, and most have two sets of paired fins (pelvic and pectoral). Tetrapods breathe air, usually by means of lungs, and never have gills as adults, although the amphibians go through a gilled, water-breathing stage. Except where the appendages have been lost, as in snakes, all have two pairs of limbs, generally used for locomotion; these are homologous to the pelvic and pectoral fins of fish.

Class Agnatha. The Agnatha, or jawless fishes, are the oldest known vertebrates. The only surviving members of this class are the HAGFISH and LAMPREYS, known as cyclostomes. Cyclostomes have long, slender bodies with dorsal, ventral, and caudal (tail) fins, all in the median plane. Although in their lack of jaws or paired lateral appendages they represent a very primitive stage of vertebrate development, the modern cyclostomes are highly adapted for their particular ways of life. The hagfish is a specialized scavenger, and the lamprey is a parasite on other fishes. The lamprey has a round mouth without skeletal supports, a rasping tongue, and a single, dorsally located nostril. The gill passages are enlarged to form pouches and are lined with gill filaments that serve as a surface for the exchange of respiratory gases; in vertebrates the gill passages have acquired a respiratory function. In cyclostomes, as in all fishes, water is taken in through the mouth and expelled through the gill passages, as water passes over the thin-walled gill filaments, dissolved oxygen diffuses into the blood, and carbon dioxide diffuses out. The lamprey has a notochord extending from the head to near the tip of the tail. A few cartilaginous blocks around the notochord constitute the bare rudiments of a backbone, a cartilage frame-

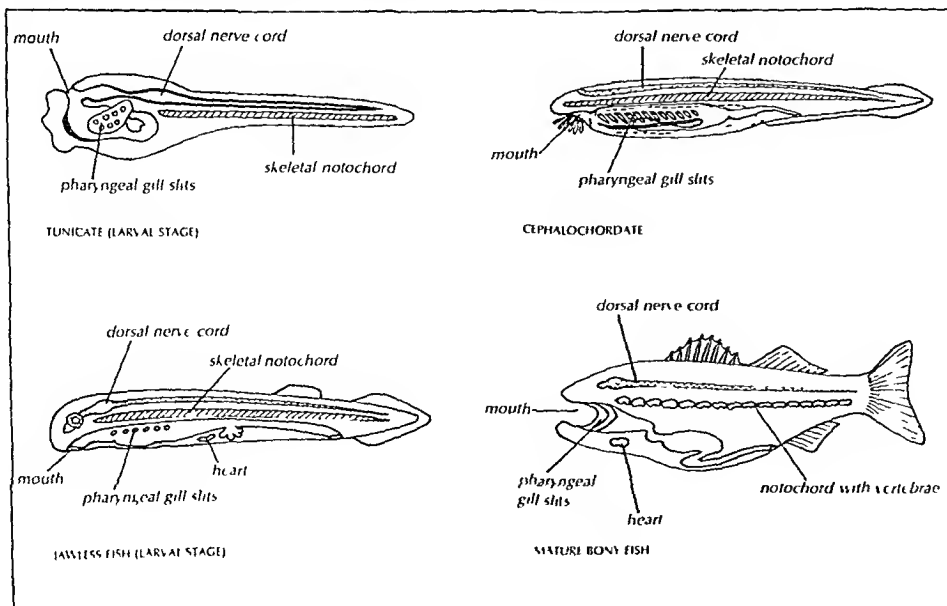
work supports the gill region, and there is a rudimentary cartilage braincase. The meagerness of the skeleton is considered a degenerate, not a primitive condition. The larva of the manne lamprey is a small animal, resembling a lancelet, that uses the pharynx and gill passages for filter-feeding. It metamorphoses into the adult form before migrating to the sea. The extinct relatives of the cyclostomes, called ostracoderms, were jawless fishes with bony armor and in some cases a well-developed bony skeleton. **Class Placodermi.** The placoderms, an entirely extinct group of armored fishes, were the first jawed vertebrates. Jaws enabled vertebrates to become predators, an important factor in the later development of active, complex forms. The placoderms were also the first vertebrates to have the two pairs of lateral appendages (supported by pelvic and pectoral girdles) that characterized all later vertebrate groups. These primitive paired fins gave rise to the pelvic and pectoral fins of modern fishes and to the limbs of four-footed animals. The ostracoderms are thought to have given rise to both the sharklike and the bony fishes.

Class Chondrichthyes. The almost exclusively marine SHARKS, RAYS, and CHIMAERAS of the class Chondrichthyes have skeletons made of cartilage. The mouth, equipped in most sharks with numerous sharp teeth, is located on the underside of the head. Passages called gill arches lead from the pharynx to the exterior and are lined with gill filaments. The gill arches are supported by gill bars. Except in chimaeras, the external gill slits are not covered and are conspicuous on the surface of the body. The jaw consists of two distinct pieces, the upper part is not fused to the braincase as in higher vertebrates. The tail is asymmetrical, curving upward in a shape found in early fossil fishes and thought to be primitive. There is no lung or swim bladder. The skin is studded with toothlike structures called denticles. Sharks have typical vertebrate kidneys that excrete a very dilute urine consisting mostly of water, presumably the earliest vertebrates (ancestral to sharks) evolved in fresh water, where this function is necessary to maintain the correct concentration of the physiologically important salts in the tissues against the tendency for them to be diluted by the inward diffusion of water. In marine species, on the other hand, it is necessary to prevent the concentration of those salts from increasing. Although the kidneys of sharks pump out water, their body fluids contain ammonia in concentrations high enough to make the osmotic pressure equal to that of sea water; this prevents the inward diffusion of salts. Sharks have internal fertilization and lay large eggs, well supplied with yolk and protected by leathery shells. In a few species the eggs are hatched within the body. **Class Osteichthyes.** The bony fish of the class Osteichthyes are the predominant class of living fishes. In this group the bony skeleton has been retained and lungs and swim bladders have evolved. Early bony fishes evolved in fresh water under conditions of periodic drought and stagnation and developed

an internal, moisture-retaining organ, the lung, for gas exchange. Those fishes gave rise to two lines of descendants. Members of one line, the fleshy-finned fish, had thick fins with supporting bones, used for crawling. The only survivors of that group are the coelacanth, or LOBEFIN, which has a vestigial lung and crawls on the sea floor, and the freshwater LUNGFISHES of drought-ridden areas, which can crawl over land in search of water and even live out of water for several years. Early fleshy-finned fish gave rise to the first land vertebrates, the amphibians. The second line, the ray-finned fish, constitutes the predominant modern group. Ray-finned fish are highly specialized for aquatic life; they have developed thin, lightweight fins supported by slender rays, and used only for balance and steering. The lung, a ventral outpocketing of the pharynx, was no longer necessary as these fish invaded fresh waters and oceans throughout the world; it shifted to a dorsal position and evolved into a hydrostatic organ called the swim bladder, or air float. The swim bladder, along with the strong, lightweight skeletal construction, makes ray-finned fishes much lighter-bodied than sharks. The gill passages of ray-finned fishes resemble those of sharks, but have a bony covering, called the operculum, over the external gill slits. Ray-fins have a typical vertebrate kidney which, in freshwater forms, maintains the proper salt concentration in the tissues by excreting excess water. In the marine forms the activity of the kidney is offset by the activity of salt-secreting glands; in addition, the kidney may be modified so as to produce a more concentrated urine. The heart, like that of sharks, has two chambers, and there is no separation of oxygenated and deoxygenated blood in the circulatory system. A few primitive ray-fins (the sturgeon, the paddle fish, and the bowfin) have asymmetrical tails and thick scales regarded as primitive in construction. The higher ray-fins, or teleosts, have more or less symmetrical tail fins extending above and below the vertebral column, and typical fish scales made of very thin layers of bone. Most marine teleosts produce enormous numbers of small eggs that are externally fertilized and float in plankton; only a few of these survive. In many species there is a larval stage that is quite dissimilar to the adult. Teleosts have evolved a tremendous variety of forms and occupy very diverse ecological niches, both freshwater and marine.

Class Amphibia. The AMPHIBIANS, the first vertebrates to have limbs, evolved during the Devonian period. They are only partially terrestrial. Their externally fertilized eggs are laid in fresh water, and they go through a gilled, aquatic larval stage (the tadpole stage) before metamorphosing into land-living adults. The skin of the adult is water-permeable, and the animal must live in a moist environment to prevent desiccation. The adult usually breathes by means of lungs, although some breathe directly through the skin. The heart is a three-chambered structure that creates a partial separation between oxygenated blood, destined for the body tissues, and depleted blood, destined for the lungs; this provides better oxygenation than a system in which the two kinds of blood mix. There are only three groups of amphibians living today. The SALAMANDERS are closest to the basic amphibian stock in form and in method of locomotion. Although supported by limbs, they move with a wriggling motion similar to that of a fish. The FROGS and TOADS are specialized for jumping, with long, muscular hind legs, while the tropical CAECILIANS are burrowing forms that have lost all but vestigial traces of their limbs.

Class Reptilia. The REPTILES, which evolved from amphibians during the Carboniferous period, were the first vertebrate group to become entirely independent of water. This was made possible by the development of a scaly, water-resistant skin and of the terrestrial, or amniote, type of egg found in all higher land vertebrates. The amniote egg has an elaborate series of internal membranes (one of which is called the amnion) surrounding a pool of liquid in which the embryo develops; the membranes prevent desiccation and allow inward diffusion of oxygen. Reptilian eggs have porous shells and large amounts of yolk. Fertilization is internal. In most cases the eggs are laid unhatched; in a few species they are retained and hatched in the body. Reptiles, including such forms as turtles and sea snakes that have returned to an aquatic life, are air-breathing at all stages, and nearly all lay their eggs on land. Gill passages appear, as in birds and mammals, only in the embryo. During the Mesozoic era, reptiles were exceedingly diverse and numerous. The reptilian DINOSAURS included the largest terrestrial animals that have ever lived, as well as many smaller forms. There were also flying and aquatic



Common features in representative groups of the phylum Chordata

reptiles With the rise of the early mammals the decline of the reptiles began The only large and successful modern group of reptiles is the order of LIZARDS and SNAKES Snakes are descended from lizards, but have lost their limbs Reptiles, like fish and amphibians, are cold-blooded, that is, they have little ability to regulate their body temperature, which approaches that of the environment The reptiles gave rise to the two warm-blooded vertebrate groups, the birds and the mammals

Class Aves The BIRDS evolved from reptiles in the Jurassic period Their front limbs are modified into wings, and the breastbone is greatly enlarged to support flight muscles They have an insulating covering of feathers, which has been an important factor in their ability to regulate body temperature The other advance that enabled birds to become warm-blooded was the evolution of a four-chambered heart, making the circulatory system a complete double circuit oxygenated blood is pumped from the lungs to the tissues, and deoxygenated blood is pumped from the tissues to the lungs The only major group besides insects to invade the air, birds are much less restricted by external temperature requirements than cold-blooded animals, and they have spread throughout every part of the world They live in many kinds of habitat and have evolved a diversity of forms Some have become flightless terrestrial animals, while others are aquatic, using their wings for swimming instead of or in addition to flying Fertilization is internal The eggs of birds are similar to those of reptiles, but parental care of the eggs and young is highly developed

Class Mammalia The MAMMALS also arose from reptiles in the Jurassic period and are now the dominant form of terrestrial vertebrate life Like the birds, they have a four-chambered heart and a double-circuit circulatory system, and are able to regulate body temperature In the case of mammals the insulating covering is provided by hair, a feature unique to the class, although in a few forms (particularly in marine species) nearly all the hair is lost, and insulation is provided by fat A second distinguishing characteristic of mammals is the production of milk by the females for the nourishment of the young All mammals have internal fertilization, and all but the most primitive (the egg-laying MONOTREMES of Australia) bear live young The mammalian egg contains little yolk In the MARSUPIALS the young are born at an extremely undeveloped stage and continue to develop in a milk-supplied pouch In the vastly more numerous placental mammals nourishment is passed from the circulatory system of the mother to that of the embryo by means of a placenta, and the young are born well-developed Most mammals have highly evolved sense organs and larger brains than other vertebrates As a group they display great adaptability to a variety of conditions and have spread to all regions of the world The earliest placental mammals were small animals of the INSECTIVORE type, but adaptive radiation has resulted in great diversity of forms and ways of life Some mammals are predators, others are herbivores with specialized digestive systems Some have taken up an aquatic existence and a few marine forms (whales and sirenians) even give birth at sea Members of one group, the bats, have developed membranous wings supported by elongated fingers and lead an aerial existence The PRIMATES, the group that includes man, are fairly close to the original mammalian type in general structure (for example, they have five fingers and toes and walk flat on the sole of the foot), but they have undergone great evolutionary advances in the development of the brain, vision, and manual dexterity See M T Jollie, *Chordate Morphology* (1962), C K Weichert, *Anatomy of the Chordates* (4th ed 1970)

chorea (karē'ə, kō-) or **St. Vitus' dance**, acute disturbance of the central nervous system characterized by involuntary muscular movements of the face and extremities The disease, known also as Sydenham's chorea (not to be confused with Huntington's chorea, a hereditary disease of adults), is usually, but not always, a complication of RHEUMATIC FEVER Sydenham's chorea, a disease of children, especially females, usually appears between the ages of 7 and 14 Facial grimacing and jerking movements persist for 6 to 10 weeks and sometimes recur after months, or even years Eventually the symptoms disappear Although there is no specific treatment, sedatives and tranquilizers are helpful in suppressing the involuntary movements

choriocarcinoma: see NEOPLASM

Chorley, municipal borough (1971 pop 31,609), Lancashire, NW England Manufactures include cotton

goods and cotton mill machinery, rayon goods, rubber products, and footwear Nearby is Leyland, one of England's chief automotive centers

Chorotega (chōrōtā'ga), aboriginal Indians and language group of Honduras, Nicaragua, and Costa Rica Little is known of the Chorotega, primarily because of the absence of extensive ruins Contemporaneous with the Maya to the northwest, they inhabited principally the ULUA River valley and the MOSQUITO COAST With other tribes to the south and the CHIBCHA of Colombia, they formed a cultural link between the peoples of the Andean area and those of Mexico The Chorotega were probably democratic, with a chief chosen by elected council Chorotega culture became extinct in the Spanish colonial period

chorus, in the drama of ancient Greece Originally the chorus seems to have arisen from the singing of the DITHYRAMB, and the dithyrambic chorus allegedly became a true dramatic chorus when THESPIUS in the 6th cent B C introduced the actor First the chorus as a participating actor tied the histrionic interludes together, later, as a narrator, it commented on the action and divided it, creating acts And as tragedy developed the chorus shrank in size and actors increased in number Aeschylus began with a chorus of 50, but the number was soon decreased to 12 Sophocles used a chorus of 15 In the 3d cent B C the comic chorus contained only seven persons and in the 2d cent B C only four, the tragic chorus having disappeared altogether The chorus had ceased to play a vital part in the drama, Euripides assigned to it lyrics not necessarily integrated with the action Ultimately it was dispensed with in comedy as well

chorus, in music, large group of singers performing in concert, a group singing religious music is a CHOIR The term *chorus* may also be used for a group singing or dancing together in a musical or in ballet By extension it is also used to mean the refrain of a song Choral music has stemmed from religious and folk music, both usually having interspersed solo and group singing The chorus as a musical form is integral to opera, and since the 19th cent it has also been integrated into compositions such as the symphony Some modern choral groups, such as the Welsh singers, groups presenting spirituals, and the Don Cossack singers, continue the folk-chorus tradition Others are intentionally formed to present all sorts of group vocal works Choral societies grew numerous in the 19th cent, especially in Great Britain, the United States, and Germany Some are created for special purposes, such as festival choruses, many oratorio societies, social and school groups (including Glee clubs), and the Bach Choir of Bethlehem, Pa In the United States, two men who did much to promote choral singing in the 19th cent were William BILLINGS and Theodore Thomas After 1940 there was a marked increase in the popularity of choral groups, usually organized for stage performance, some of these have specialized in concert versions of opera

chorus frog: see TREE FROG

Chorzów (hō'zhōōf), city (1970 pop 151,338), S Poland A rail junction and a center of the Katowice mining and industrial region, it has iron, steel, and nitrogen plants, zinc foundries, and factories producing heavy machinery Formerly known as Krolewska Huta (Ger *Königshütte*), it passed from Germany to Poland in 1921 The city has a huge sports stadium

Chosen: see KOREA

Choshi (chō'shē), city (1970 pop 90,415), Chiba prefecture, central Honshu, Japan, on the Kashimada Sea at the mouth of the Tone River It is a fishing center and the major port of Chiba prefecture Great quantities of soy are produced in Choshi

Chosroes: see KHOSRU

Chotts, Plateau of the (shōts) [Arab, = salt lake], plateau region of the Atlas Mts, alt c 3,500 ft (1,070 m), N Algeria, N Africa The plateau is c 125 mi (200 km) wide in the west, narrowing in the east to become a series of valleys Enclosed by the Tell Atlas in the north and the Saharan Atlas in the south, the region has interior drainage, a semiarid climate, and is dotted with salt lakes and salt flats Its grasslands support nomadic herding The name is also spelled Shotts

Chou (jō), dynasty of China, which ruled, according to traditional dates, from 1122 B C. to 256 B C. or, according to some modern scholars, from c 1027 B C. to 256 B C The pastoral Chou people migrated from the Wei valley NW of the Yellow River c 1027 B C and overthrew the SHANG dynasty From their capital near modern Sian they dominated the N Chi-

na plain between Manchuria and the Yangtze valley By 800 B C., however, the local lords had become strong enough to form separate states, especially in the north and at the mouth of the Yangtze In later times the state of Ch'u controlled the middle Yangtze valley, and the border state of Ch'in grew in the northwest In the 6th cent B C the states of Wu and Yueh became major powers An anarchic period (403 B C-221 B C) of warring states followed, during which the Chou gave up their power to the emerging CH'IN dynasty Despite political disorder, the Chou era was the classical age of China CONFUCIUS, Mo-ti, LAO-TZE, MENCIUS, and Chuang-tze lived then Contemporary writings, notably the *Five Classics* (see CHINESE LITERATURE) and archaeological evidence picture the Chou civilization Iron implements were introduced from W and central Asia and the ox-drawn plow was first used Chou society was sharply divided between the aristocratic warrior class and the peasant masses and domestic slaves Writers of the anarchic period that followed it pictured the early Chou as an age of well-ordered beneficent feudalism, but this may merely reflect their own desire for political unity See Arthur Waley, *Three Ways of Thought in Ancient China* (1939), H G Creel, *The Birth of China* (1954) and Confucius and the Chinese Way (1960)

Chouans (shōō'anz, Fr shwaN) [from Norman French, = owls], peasants of W France who rose against the French Revolutionary government in 1793 One of their first leaders was Jean Cottereau, traditionally nicknamed Jean Chouan, marquis de La Rouerie [John the Owl, marquis of Mischief], and the Chouans supposedly used the hoot of an owl as a signal The movement eventually merged with the contemporary rising in the VENDÉE The name Chouannerie continued to be used in reference to the fierce guerrilla warfare that lasted until put down by Napoleon The so-called Petite Chouannerie persisted until 1815, when Napoleon was forced to divert troops from Waterloo to quell it Honoré de Balzac's novel *Les Chouans* pictures these people vividly

Chou En-lai (jō ēn-lī), 1898-, Chinese Communist leader A member of a noted Mandarin family, he was educated in China at the American-supported Nankai Middle School, and later attended (1917-19) a university in Japan His youthful participation in radical movements brought him several months' imprisonment in Tientsin After his release he studied (1920-22) in France A founder of the Chinese Communist party, he established (1922) the Paris-based Chinese Communist Youth Group, an organization for expatriate Chinese students He lived for a few months in England and then studied in Germany Chou returned (1924) to China and joined Sun Yat-sen, who was then cooperating with the Communists He served (1924-26) as deputy director of the political department at the Whampoa Military Academy, of which CHIANG KAI-SHEK was commandant After the NORTHERN EXPEDITION began, he worked as a labor organizer In 1927 he directed a general strike in Shanghai that laid the city open to Chiang's Nationalist forces Soon after, Chiang broke with the Communists, executing many of his former allies, and Chou became a fugitive from the Kuomintang Chou held prominent military and political posts in the Chinese Communist party, and he participated in the LONG MARCH (1934-35) of the Communist army to NW China During the partial Communist-Kuomintang rapprochement (1936-46) he was the chief Communist liaison officer In 1949, with the establishment of the People's Republic of China at Peking, Chou became premier and foreign minister He headed the Chinese Communist delegation to the Geneva Conference of 1954 and to the Bandung Conference (1955) In 1958 he relinquished the foreign ministry but retained the premiership A practical-minded administrator, Chou has maintained his position through all of Communist China's ideological upheavals, including the Great Leap Forward (1958) and the Cultural Revolution (1966-70) He is believed to be largely responsible for China's reestablishment of contacts with the West in the early 1970s

Chou-K'ou-tien: see PEKING

Chou-shan Archipelago (jō-shān), NE Chekiang prov., China, in the East China Sea, at the entrance to Hangchow Bay It includes the main island of Chou-shan and about 100 lesser islands, Ting-hai on Chou-shan is the major population center The archipelago forms the richest fishing grounds off the China coast The island of Puto (P'u-tō) was a sacred center of Buddhism, with many ancient temples and monasteries

Chouteau (shōōtō'), family of American fur traders. **René Auguste Chouteau**, 1749-1829, b. New Orleans, accompanied (1763) his stepfather, Pierre LA-CLEDE, on a trading expedition to the Illinois country and established (1764) the post that became St. Louis. He continued as chief assistant to LaCledé until the latter's death in 1778, when he took over the management of LaCledé's trading interests. Friendly relations with the Osage Indians enabled him to extend the business considerably, from 1794 to 1802 he held a monopoly on the Osage trade. When the United States acquired Louisiana, Chouteau became a territorial judge and later served as Federal commissioner in negotiating treaties with various Indian tribes. His half-brother, **Jean Pierre Chouteau**, 1758-1849, b. New Orleans, also devoted himself to the fur trade. He worked for René Auguste for many years and extended the trade into present-day Oklahoma, where he established (1796) the first permanent white settlement at Salina. After becoming (1804) U.S. agent for the Osage, he struck out on his own and with others founded (1809) the St. Louis Missouri Fur Company. One of the wealthiest men in St. Louis, he spent the last years of his life on a large plantation outside the city. Two of his sons, Auguste Pierre and Pierre, continued in the fur trade. **Auguste Pierre Chouteau**, 1786-1838, b. St. Louis, who graduated from West Point in 1806, resigned (1807) from the army and became (1809) a member of the St. Louis Missouri Fur Company, taking part in several expeditions. He served as a captain of the territorial militia in the War of 1812. While on a trading expedition to the upper Arkansas River in 1817, he was captured by the Spanish and imprisoned at Santa Fe for several months. After his release he continued to trade with the Osage and made his home at Salina, Okla. In 1832 he led a party including Washington Irving from St. Louis to his post, the journey is described by Irving in *Tour of the Prairies* (1835). **Pierre Chouteau**, 1789-1865, b. St. Louis, early entered his father's business and accompanied him on several expeditions until 1813, when he and a partner formed their own merchandising and Indian trading firm. In 1831 he became a member of Bernard Pratte and Company, which was the Western agent of the AMERICAN FUR COMPANY. With the withdrawal of John Jacob Astor from the American Fur Company in 1834, Pratte, Chouteau and Company bought all the Missouri River interests of the old company. Reorganized (1838) as Pierre Chouteau, Jr. and Company, its business extended from the Mississippi to the Rockies and from Texas to Minnesota until its dissolution in 1864. One of the most powerful men in the West, Chouteau also invested heavily in railroads, rolling mills, and mining. He became one of the leading financiers of his time and lived his later years in New York City.

chow chow, breed of powerful NONSPORTING DOG whose origins are obscure but whose development was accomplished many centuries ago in China. It stands from 18 to 20 in. (45.7-50.8 cm) high at the shoulder and weighs from 50 to 60 lb (22.7-27.2 kg). Its abundant double coat consists of a soft, woolly underlayer and a dense, straight topcoat that stands out from the body. It may be any solid color. The ancestors of the chow chow are believed by some to have been the mastiff of Tibet and the Samoyed. However, because it is the only breed possessing a black tongue, other authorities contend that it is a basic breed and the progenitor of the Samoyed, the Keeshond, the Norwegian elkhound, and the Pomeranian. Whatever the truth of its origins, it was used as an all-purpose hunting dog in China 2,000 years ago. Its name derives from the pidgin-English term for miscellaneous cargo, of which the dog formed a part, brought from China to England in the late 18th cent. It is raised as a companion and house pet. See DOG.

chowder, stew of fish or shellfish with potatoes, onions, and pork (usually salt pork), thickened with crumbled hard bread. It has probably been known in some form to most fishing communities. The name *chowder* seems to have originated from the French word *chaudière* (a large heavy pot used by fishermen to cook soups and stews). The name probably was carried to the French Canadian coasts and traveled from there to New England (noted for its clam chowder) and then south. Each locality on the eastern coast of the United States has its favorite recipe, based on the kinds of fish and vegetables available. The name is extended to include a mixture of vegetables only.

Chozeba (közē'ba) see ACHZIB 2

Chrétien de Troyes or **Chretien de Troyes** (both krātyāN' da trvā), fl. 1170, French poet, au-

thor of the first great literary treatments of the ARTHURIAN LEGEND. His narrative romances, composed c. 1170-c. 1185 in octosyllabic rhymed couplets, include *Érec et Énide*, *Cigès*, *Lancelot, le chevalier de la charette*, *Yvain, le chevalier au lion*, and *Perceval, le conte del Graal*, unfinished (see PARSIFAL). Chretien drew on popular legend and history, and imbued his romances with the ideals of chivalry current at the 12th-century court of Marie de Champagne, to which he was attached. His other surviving works include imitations of Ovid and *Guillaume d'Angleterre*, a non-Arthurian narrative. Translations of the Arthurian romances are included in W. W. Comfort's edition (1913) and in R. S. and L. H. Loomis, *Medieval Romances* (1957). See R. S. Loomis, *Arthurian Tradition & Chretien de Troyes* (1949), P. Haidu, *Aesthetic Distance in Chretien de Troyes* (1968), U. T. Holmes, *Chretien de Troyes* (1970).

Christ: see JESUS

Christadelphians (krīs'tadēl'fēanz) [Gr., = brothers of Christ], small religious denomination founded in the United States in 1848 by John Thomas. Its members live by the Scriptures and await the second coming of Christ on earth, who, they believe, will establish a theocracy with its center in Jerusalem. There is no ordained ministry. Christadelphians do not believe in the Trinity or the existence of hell. They do not vote, hold public office, or participate in war. There are c. 16,000 members in the United States and c. 20,000 members in Canada.

Christchurch, municipal borough (1971 pop. 31,373), Hampshire, S. central England, on Christchurch Bay at the confluence of the Avon and Stour rivers. Its industries include aircraft manufacturing and salmon fishing. Christchurch is also a resort. The town's history dates back to Anglo-Saxon times. Its name derives from the church that was part of the Augustinian priory founded there before the Norman conquest of England. In 1974, Christchurch became part of the new nonmetropolitan county of Dorset.

Christchurch, city (1971 pop. 165,637, urban agglomeration 257,505), E. South Island, New Zealand, at the base of Banks Peninsula. It is the second largest city in New Zealand. Industries include tanning, meat-packing, and woolens manufacturing. Lyttelton, nearby, is the port for Christchurch. The Univ. of Canterbury was founded in the city in 1873. There are Roman Catholic and Anglican cathedrals. Hagley Park contains botanical gardens and museums.

christening: see BAPTISM

Christian I, 1426-81, king of Denmark (1448-81), Norway (1450-81), and Sweden (1457-64), count of Oldenburg, and founder of the Oldenburg dynasty of Danish kings. In 1460 he also succeeded to SCHLESWIG and HOLSTEIN, the terms of the settlement have been cited to justify both Danish and German claims to SCHLESWIG-HOLSTEIN. A weak monarch despite the vastness of his lands, he made large concessions to the nobles, particularly in his German dominions, and barely controlled Sweden (see KALMAR UNION). His attempts to assert his authority in Sweden ended in 1471 with his defeat at Brunkeberg, near Stockholm, by Sten STURE (the elder). He was succeeded by his son John.

Christian II, 1481-1559, king of Denmark and Norway (1513-23) and Sweden (1520-23), son and successor of King John. After several unsuccessful attempts, he asserted claim to Sweden by force. However, his wholesale massacre of Swedish nobles at Stockholm (1520) alienated the Swedes, who raised Gustavus Vasa to the throne as GUSTAVUS I, thus ending the KALMAR UNION. In Denmark, Christian earned the hatred of the nobles and high clergy by thorough reforms in favor of the lower and middle classes, by inviting Lutheran preachers to Copenhagen, and by placing Sigbrit, mother of his Dutch mistress, in charge of the finances of the realm. In 1523 the nobles rebelled (particularly in Jutland), deposed Christian, and chose his uncle, Frederick I, as king. Christian fled, but in 1532 he was captured while attempting to recover the throne. He was imprisoned until his death. A gifted and educated ruler despite his despotic methods, Christian II did much to advance learning in Denmark.

Christian III, 1503-59, king of Denmark and Norway (1534-59). At the death of his father, Frederick I, his election was delayed because he was a Lutheran. The German city of LÜBECK invaded Denmark to reinstate the deposed CHRISTIAN II, and the minor nobility then forced the election of Christian III in 1534 to preserve Danish autonomy. Christian III allied

with GUSTAVUS I of Sweden to defeat Lubeck in 1536. That victory broke the power of the Hanseatic League and made the Danish fleet supreme in northern waters. Christian established (1536) Lutheranism in Denmark and imposed it on Norway. Never elected king by the Norwegians, he declared Norway a dependency of Denmark. His son Frederick II succeeded him.

Christian IV, 1577-1648, king of Denmark and Norway (1588-1648), son and successor of Frederick II. After assuming (1596) personal rule from a regency, he concentrated on building the navy, industry, and commerce. He rebuilt OSLO and renamed it Christiania. Aroused when CHARLES IX of Sweden asserted authority over Lapland, he made war on Sweden (the so-called Kalmar War, 1611-13) and largely dictated the peace. In the THIRTY YEARS WAR, urged on by England, France, and the Netherlands, he invaded (1625) Germany to defend Protestantism. Defeated (1626) by TILLY at Lutter, he was driven back in 1627. Schleswig, Holstein, and Jutland were overrun and plundered, Stralsund was besieged by the imperial troops under WALLENSTEIN. Christian, with the help of Gustavus II of Sweden, raised the siege of Stralsund, but in 1629 he signed with Holy Roman Emperor Ferdinand II a separate peace that was lenient to Denmark. His anti-Swedish policy brought on a war with Sweden (1643-45) in which Christian lost the Norwegian provinces of Jamtland and Harjedalen. His son Frederick III succeeded him.

Christian V, 1646-99, king of Denmark and Norway (1670-99), son and successor of Frederick III. His minister, GRIFFENFELD, who until his fall in 1676 dominated Christian's reign, made the monarchy absolute. Christian fought (1675-79) an unsuccessful war with CHARLES XI of Sweden. He was succeeded by his son Frederick IV.

Christian VII, 1749-1808, king of Denmark and Norway (1766-1808), son and successor of Frederick V. Shortly after his accession his mental illness made him dependent on his physician, STRUENSEE, who in 1770 caused the dismissal of Johann Hartwig Ernst BERNSTORFF and in 1771 became an all-powerful minister. After Struensee's downfall (1772), Christian's marriage with Caroline Matilda, sister of George III of England, was annulled. Andreas Peter BERNSTORFF became chief minister in 1773, and after 1784 Christian's son and successor, Frederick VI, acted as regent. Widespread liberal reforms were enacted under the direction of Bernstorff and Prince Frederick, notably the abolition of serfdom.

Christian VIII, 1786-1848, king of Denmark (1839-48), nephew of Christian VII, successor of Frederick VI. As governor and king (May-Oct., 1814) of Norway he accepted a liberal Norwegian constitution that is still in use with some modifications. His reign brought prosperity to Denmark. The nature of Danish rule in the duchies of SCHLESWIG-HOLSTEIN became a prominent issue in 1846. His son Frederick VII succeeded him.

Christian IX, 1818-1906, king of Denmark (1863-1906). A member of the cadet line of Sonderburg-Glücksburg, he succeeded Frederick VII, last of the direct line of Oldenburg. The London Conference of 1852 had settled on him the contested succession to the duchies of SCHLESWIG-HOLSTEIN, but in 1863 Christian accepted parliament's annexation of Schleswig to the Danish crown. This precipitated war (1864) with Prussia and Austria, in which Christian lost Schleswig, Holstein, and Lauenburg. In 1866 the Danish constitution was revised, granting the upper chamber more power than the lower. During Christian's reign there was continual liberal agitation for a more democratic constitution. He was succeeded by his son Frederick VIII. A younger son became king of Greece as George I.

Christian X, 1870-1947, king of Denmark (1912-47) and Iceland (1912-44), son and successor of Frederick VIII and brother of King Haakon VII of Norway. He granted (1915) a new constitution that included the enfranchisement of women. During the German occupation (1940-45) of Denmark, the king defied German authority and was placed (1943) under house arrest. He became a symbol of national resistance. In 1944, Iceland severed all ties with the Danish crown. Christian's son Frederick IX succeeded him.

Christian Brothers: see JOHN BAPTIST DE LA SALLE, ST. **Christian Catholic Church**, religious denomination founded (1896) in Chicago by John Alexander DOWIE. Its members are sometimes known as Zionites. The church has its center in ZION, Ill., which Dowie founded (1901) as a religious community. In addition to religious and educational activities in

Zion, the founder started various industries on a cooperative basis, an undertaking that was built up by Wilber Glenn Voliva, who became general overseer upon the deposition of Dowie in 1905. Zion is no longer exclusively a religious community. The church extensively supports foreign missions. See Rolvix Harlan, *John Alexander Dowie and the Christian Catholic Apostolic Church in Zion* (1906).

Christian Churches: see CONGREGATIONALISM, DISCIPLES OF CHRIST

Christian Endeavor, association in evangelical Protestant Churches for strengthening spiritual life and promoting Christian activities among its members. The first Young People's Society of Christian Endeavor was started in 1881 by Dr. Francis E. CLARK in Portland, Maine. Within a few years the organization had become not only interdenominational but international, and a world union was formed in 1895, with Clark as president. Started primarily as a youth movement, the association now includes all age groups and numbers in the millions. Many denominations are represented in the association's membership.

Christiania: see OSLO, Norway

Christian iconography: see under ICONOGRAPHY

Christianity, religion founded in Palestine by the followers of JESUS CHRIST. One of the world's major religions, it predominates in Europe and the Americas, where it has been a powerful historical force and cultural influence, but it also claims adherents in virtually every country of the world. The central teachings of traditional Christianity are that Jesus is the Son of God, the second person of the TRINITY of God the Father, the Son, and the HOLY GHOST, that his life on earth, his crucifixion, RESURRECTION, and ascension into heaven are proof of God's love for man and his forgiveness of man's sins, and that by faith in Christ man may attain salvation and eternal life (see CREED). This teaching is embodied in the BIBLE, specifically in the New Testament, but Christians accept also the Old Testament as sacred and authoritative Scripture. Christian ethics derive to a large extent from the Jewish tradition as presented in the Old Testament, particularly the TEN COMMANDMENTS, but with some difference of interpretation based on the practice and teachings of Jesus. Christianity may be further generally defined in terms of its practice of corporate worship and rites that usually include the use of SACRAMENTS and that are usually conducted by a trained clergyman within an organized church. There are, however, many different forms of worship, many interpretations of the role of the organized clergy, and many variations in polity and church organization within Christianity. In the two millennia of its history Christianity has been plagued by schism, based on doctrinal and organizational differences. Today there are three broad divisions, Roman Catholic, Orthodox Eastern, and Protestant, but within the category of Protestantism, there is a particularly large number of divergent denominations. Because of the complexity of these differences this article will describe the history of Christianity only to 1054, when the schism between Eastern and Western churches became final. Separate articles detail the history and doctrines of the ROMAN CATHOLIC CHURCH and ORTHODOX EASTERN CHURCH and of the other churches of ancient origin, the ARMENIAN CHURCH, the COPTIC CHURCH (see COPT), the JACOBITE CHURCH, and the NESTORIAN CHURCH. In the 16th cent. another major schism took place in the Western Church with the Protestant REFORMATION. For the Protestant churches, see PROTESTANTISM and articles on the separate churches. For the 20th-century movement that seeks to end the divisiveness in Christianity and achieve reunion, see ECUMENICAL MOVEMENT.

Early Christianity. Christianity is in a direct sense an offshoot of JUDAISM, because Jesus and his immediate followers were Jews living in Palestine and Jesus was believed by his followers to have fulfilled the Old Testament prophecies of the MESSIAH. Following a trend of proselytization in the Judaism of that period Christianity was from its beginnings expansionist. Its early missionaries (the most notable of whom was St. PAUL, who was also responsible for the formulation of much Christian doctrine) spread its teachings through Asia Minor to Alexandria and to Greece and Rome. MISSIONS have remained a major element in Christianity to the present day. For the first three centuries of Christianity, history is dependent on apologetic and religious writings; there are no chronicles (see PATRISTIC LITERATURE). Historians differ greatly on how far back the 4th-century picture of the church (which is quite clear) can be projected, especially respecting organization by bish-

ops (each bishop a monarch in the church of his city), celebration of a UTURGY entailing a sacrament and a sacrifice, and claims by the bishop of Rome to be head of all the churches (see PAPACY). There is evidence for these features in the 2d cent. A first problem for Christians was how to resist attempts to interpret the new beliefs in old pagan terms (e.g., Gnosticism) or to incorporate them in some inclusive system (e.g., Manichaeism). The earliest sectarian deviations were those of Marcion and of Montanism (2d cent.). They were handled resolutely by the church, the teachers of novelty were expelled (excommunicated). For 250 years it was a martyrs' church, the persecutions were official, legally motivated by refusal of Christians to worship the state and the Roman emperor. The chief persecutions were under Nero, Domitian, Trajan and the other Antonines, Maximin, Decius, Valerian, and Diocletian and Galerius. In 313, Constantine I and Licinius announced toleration of Christianity in the Edict of Milan. In the East the church passed from persecution directly to imperial control (caesaropapism), inaugurated by Constantine, enshrined later in Justinian's laws, and always a problem for the Orthodox churches. In the West the church remained independent because of the weakness of the emperor and the well-established authority of the bishop of Rome. For 300 years after A.D. 275 the church in the East was occupied with doctrinal controversies—Arianism, Nestorianism, Monophysitism, and Monothelitism. These arguments concerned the relationship of Jesus Christ to God and to man. Decisions were made at a series of general councils of bishops (see COUNCIL, ECUMENICAL); at them was composed the Nicene Creed, the official orthodox summary. These centuries saw a series of Christian writers of unequalled influence (the Fathers of the Church): Origen, St. Athanasius, St. Basil the Great, St. Gregory of Nyssa, St. Gregory Nazianzen, St. John Chrysostom, and Theodoret writing in Greek; St. Ambrose, St. Jerome, and St. Augustine writing in Latin. Origen and St. Jerome had a special role in the church's work of determining and preserving the text of the Bible. From the 3d cent. an element was MONASTICISM, first well organized by St. Basil. In the West it was a central feature in the missionary work of St. Martin (Gaul, 4th cent.) and St. Patrick (Ireland, 5th cent.), and it received definitive shape from St. Benedict and St. Gregory the Great, who thereby generated an activity of continuing vitality in the Roman Catholic Church. German invasions slowed the conversion of Western Europe (e.g., that of England was recommenced in the 6th cent.). All the first invaders were Arian, but the Franks (with Clovis) adopted orthodox Christianity, a fact that probably helped to consolidate their rule. Out of this kingdom came Pepin and Charlemagne, who, by alliance with the papacy and proclamation of an empire (800), charted an ideal of the Middle Ages. In the 7th and 8th cent. the Eastern Church lost to Islam all Asia except Asia Minor. Alienation from the West was exacerbated by the bitter struggle over ICONOCLASM, ecclesiastical animosity between Rome and Constantinople came to a head in the schism of the 9th cent. and attained a sort of legal permanence in 1054 (see TO IX, SAINT). Eastern and Western Christendom were already in the 9th cent. two different cultures, their one common tie was the Christian doctrine—even worship and practices were very different. From this time it is customary to distinguish Christian history in its Eastern and Western streams as that of the Orthodox Eastern and the Roman Catholic churches. See Philip Hughes, *History of the Church* (3 vol., rev. ed. 1949), K. S. Latourette, *History of the Expansion of Christianity* (7 vol., 1937-45, repr. 1970), *History of Christianity* (1953, repr. 1962), and *Christianity through the Ages* (1965), Jules Lebreton and Jacques Zeiller, *A History of the Early Church* (4 vol., 1944-46, repr. 1962), Hans Lietzmann, *The History of the Early Church* (4 vol., tr. 1961, repr. 1967), Asher Finkel, *The Pharsees and the Teacher of Nazareth* (1964), J. G. Davies, *The Early Christian Church* (1965), R. M. Grant, *Augustus to Constantine* (1970).

Christian of Anhalt, 1568-1630, prince of ANHALT (1603-30). He was a firm Calvinist and a skilled diplomat. As adviser to Frederick IV, elector palatine, he sought to build a strong Protestant alliance against the Catholic states and achieved limited success with the formation (1608) of the PROTESTANT UNION. Christian guided Frederick's son and successor, Frederick V (FREDERICK THE WINTER KING) and arranged his election (1619) to the Bohemian throne in place of the Roman Catholic king, FERDINAND II, also Holy Roman emperor. Supported by the Catholic League under Elector MAXIMILIAN I of Bavaria, Fer-

dinand sent an army to subdue the Bohemian rebels. When military aid that Christian counted on was not forthcoming, Christian was utterly defeated at the battle of the White Mountain. He was put under the imperial ban, but was pardoned in 1624.

Christian of Brunswick or Christian of Halberstadt, 1599-1626, Protestant military leader in the THIRTY YEARS WAR, titular bishop of Halberstadt (1616-23). One of the first allies of Frederick the Winter King, elector palatine of the Rhine, he took up arms in defense of the Palatinate in 1621. Defeated (1622) by the imperial commander TILLY, he went to the Netherlands. Christian then advanced into Germany but had to retreat, and Tilly turned the retreat into a rout at Stadtlohn (1623). While serving with CHRISTIAN IV of Denmark, he was defeated a third time (1626).

Christian Reformed Church, denomination formed after the secession of a group from the REFORMED CHURCH IN AMERICA in 1857. Colonists from Holland who began settling in Michigan in 1846 generally became members of the Reformed (Dutch) church there. A number of these immigrants, dissatisfied with the doctrinal laxity and practices of that church, separated from it in 1857 and united in a new congregation at Holland, Mich. Later other congregations of this "True Holland Reformed Church" were formed in neighboring states. Missionary work in Holland led many Dutch immigrants to join this church upon their arrival in the United States. In 1882, after a new secession movement in the Reformed Church in America, caused by the General Synod's refusal to condemn Freemasonry, a considerable addition to the church was made. In 1890 it adopted the name Christian Reformed Church, in that year it was joined by the True Reformed Dutch Church (1822) of New York and New Jersey. Its constitution is an adaptation of that approved by the Synod of Dort (1619). Its doctrines are drawn mainly from those of the Reformed Church in Holland. The church is very active in mission work both in the United States and abroad. See the centennial publication *One Hundred Years in the New World* (1957), study by Henry Beets (1946).

Christians, name taken by the followers of several evangelical preachers on the American frontier, notably James O'Kelley, Abner Jones, and Barton W. STONE, all of whom were antisectionarian. Some congregations joined the DISCIPLES OF CHRIST, a body with similar emphasis founded by Thomas and Alexander CAMPBELL, and the name Christians continued to be applied often to members of the Disciples' church. Other congregations of Christians united as a separate body that ultimately took the name of the Christian Church, this was merged in 1931 with the Congregational churches and the merged group became known as the Congregational Christian churches (see CONGREGATIONALISM). See also CHRISTIANITY.

Christian Science, religion founded upon principles of divine healing and laws expressed in the acts and sayings of Jesus Christ, as discovered and formulated by Mary Baker EDDY and practiced by the Church of Christ, Scientist. Christian Scientists deny the reality of the material world, a denial that guides not only their ultimate concerns, but also their everyday life. They argue that illness and sin are illusions, to be overcome by the mind, thus, they refuse medical help in fighting sickness. The occasion of Mary Baker Eddy's discovery of divine healing was her immediate recovery of life and health when in 1866 she read an account of healing by Jesus in the New Testament. In 1875 her *Science and Health* (later published as *Science and Health, with Key to the Scriptures*), the only authorized textbook of Christian Science, was published. In 1879 she established the Church of Christ, Scientist. In Boston in 1892 was organized the First Church of Christ, Scientist—the Mother Church, of which Christian Science churches throughout the world are branches. Each individual church is self-governing and self-supporting, but all accept the tenets framed by the founder and incorporated in the *Church Manual*. Upon her death in 1910, the administrative power was assumed, as laid down in the *Manual*, by the Christian Science Board of Directors. An extremely strong organization, the board enabled Christian Science to grow steadily in numbers and scope of activity during the first third of the 20th cent. Of the numerous publications issued, the most important include the *Christian Science Monitor*, a daily newspaper, the *Christian Science Quarterly*, the *Christian Science Sentinel*, and the *Christian Science Journal*. These are published by the Christian Science Publishing Society. Other activities are conducted by a

board of education and a board of lectureship. The churches have no individual pastors. Services are conducted by two readers, one reading from the Scriptures, the other from *Science and Health*. All churches use the same lessons at the same time. The teachings are drawn from the life and words of Jesus Christ. Although most Christian Scientists are in the United States, the religion is found in most countries with large Protestant populations. A great percentage of its adherents are women. No membership figures have been published since 1936, when there were over 250,000 members in the United States. Declining membership is indicated by the decreasing number of churches and societies listed since about 1950. See Robert Peel, *Christian Science: Its Encounter with American Culture* (1958), C. S. Braden, *Christian Science Today* (1959, repr. 1969), Stephen Gottschalk, *The Emergence of Christian Science in American Religious Life* (1974).

Christianshåb (krī's'tyans-hōp), town (1969 pop. 1,588) in Christianshåb dist. (1969 pop. 1,841), W. Greenland, on Disko Bay. The town was founded in 1734. It has a shrimp-canning factory.

Christian socialism, term used in Great Britain and the United States for a kind of socialism growing out of the clash between Christian ideals and the effects of competitive business. In Europe, it usually refers to a party or trade union directed by religious leaders in contrast to socialist unions and parties. The movement was begun in England in 1848, after the failure of CHARTISM. Influenced by Carlyle, Southey, Coleridge, and the Fourierists, rather than by Marx, such men as John Ludlow, Frederick Denison MAURICE, and Charles KINGSLEY sought to encourage the laboring masses and the church to cooperate against capitalism. They published periodicals and tracts, promoted workmen's associations, founded (1854) a workmen's college, and helped achieve some general reforms. Though their experiments in producers' cooperation failed, their traditions were carried on by the Fabian Society, by adherents of guild socialism, and by several Roman Catholic groups. The movement in the United States was organized with the formation (1889) of the Society of Christian Socialists, although there had been earlier activity by Washington GLADDEN, Richard Theodore ELY, and others. Other church groups joined or aided the socialist movement, but within the churches the movement was concerned more with the application of social gospel to immediate industrial and social problems than with political socialism. See C. E. Raven, *Christian Socialism, 1848-1854* (1920, repr. 1968), James Dombrowski, *The Early Days of Christian Socialism in America* (1936, repr. 1965).

Christians of Saint John: see MANDAËANS.

Christiansted (krī's'chanstēd'), town (1970 pop. 2,966), chief city of St. Croix, one of the U.S. Virgin Islands. It is a shipping port for sugar and rum; tourism is the leading industry. Founded in 1733, Christiansted served briefly as capital of the Danish West Indies.

Christie, Dame Agatha, 1891-, English detective story writer. In 1932 she married the archaeologist Sir Max MALLOWAN and accompanied him on several excavations in the Middle East. Christie is the author of over 80 books, most of them featuring either of her two famous detectives—Hercule Poirot, the egotistical Belgian, and Jane Marple, the elderly spinster. Her works, noted for their skillful plots, include the novels *The Mysterious Affair at Styles* (1920), *The Murder of Roger Ackroyd* (1926), *Death on the Nile* (1937), *And Then There Were None* (1940), *Death Comes as the End* (1945), *Funerals Are Fatal* (1953), *The Pale Horse* (1962), *Passenger to Frankfurt* (1970), and *Elephants Can Remember* (1973), and the plays *The Mouse Trap* (1952), one of the longest running plays in theatrical history, and *Witness for the Prosecution* (1954). Christie has also published novels under the pseudonym Mary Westmacott. She was named Dame Commander, Order of the British Empire, in 1971.

Christie's, English firm of art auctioneers and appraisers, one of the largest clearinghouses in the world for art objects of all kinds. Since its founding in 1766 by James Christie, its name has been a symbol of luxury in the English-speaking world. See M. C. Marillier, *Christie's, 1766-1925* (1926), Denys Sutton, *Christie's since the War, 1945-1958* (1959).

Christina, 1626-89, queen of Sweden (1632-54), daughter and successor of Gustavus II. From her father's death (1632) until 1644 she was under a regency headed by Chancellor Axel OXENSTIERNA. Her early devotion to state affairs soon gave place to

other interests, especially a zeal for learning. She attracted many foreign artists and scholars—including Descartes—to her court. Music and literature, especially the poetry of Jorge Stiernhielm (1598-1672), were encouraged. On her favorites she lavished titles, lands, and money, and by the end of her reign half of the crown lands had been given away. Her distaste for marriage caused her to designate her cousin Charles (later Charles X) as her successor. Weary of her duties and the growing antagonism of the nobles, and attracted to Catholicism, Christina abdicated in 1654. She left Sweden attired as a man, was received into the Catholic Church at Innsbruck in 1655, and settled at Rome. Her eccentricity and financial incompetence kept her affairs in continual disorder. On the death (1660) of Charles X, Christina returned to Sweden, she hoped to regain her throne but failed. She again went to Sweden in 1667 but was refused entrance into Stockholm because of her religion. She died in Rome and was buried at St. Peter's. See biographies by M. L. Goldsmith (1933), Alfred Neumann (tr. 1935), Sven Stolpe (1960, tr. 1966), C. H. J. Weibull (1960, tr. 1966), and Georgina Masson (1968).

Christine de Pisan: see PISAN, CHRISTINE DE.

Christmas [Christ's Mass], in the Christian calendar, feast of the nativity of Jesus Christ (Dec. 25). In liturgical importance it ranks after Easter, Pentecost, and EPIPHANY (Jan. 6). The observance probably does not date earlier than A.D. 200 and did not become widespread until the 4th cent. The date was undoubtedly chosen for its nearness to Epiphany, which, in the East, originally included a commemoration of the nativity. The date of Christmas coincides closely with the winter solstice, a time of rejoicing among many ancient cultures. Christmas, as the great popular festival of Western Europe, dates from the Middle Ages. In England after the Reformation the observance became a crux between Anglicans and other Protestants, and the celebration of Christmas was suppressed in Scotland and in much of New England until the 19th cent. The Yule Log [Yule, from O.E. = Christmas], the boar's head, the goose (in America the turkey), decoration with holly, hawthorn, wreaths, mistletoe, and the singing of carols (especially by waits) are all typically English (see CAROL). Gifts at Christmas are also English, elsewhere they are given at other times, as at Epiphany in Spain. Christmas cards first appeared c. 1846. The current concept of a jolly Santa Claus was first made popular in New York in the 19th cent. (see NICHOLAS, SAINT). The Christmas tree was a tradition from the Middle Ages in Germany. The crib (creche) with the scene at Bethlehem was popularized by the Franciscans. A familiar religious observance is the midnight service in Roman Catholic and some Protestant churches. See ADVENT and TWELFTH NIGHT. For an account of medieval and modern Yuletide customs, see Miles Hadfield and John Hadfield, *The Twelve Days of Christmas* (1961).

Christmasberry or **toyon** (tō'yān), evergreen tree or shrub (*Photinia arbutifolia*) of the family Rosaceae (ROSE family), found on the Pacific coast of North America. Its white flowers are followed by bright red berries, with its handsome leaves, it is used on the Pacific coast as a Christmas green. It is also called California holly. Most other species of *Photinia*, sometimes cultivated, are native to the Far East. Christmasberry is classified in the division MAGNOLIOPHYTES, class Magnoliopsida, order Rosales, family Rosaceae.

Christmas fern: see FERN.

Christmas Island (1969 pop. 3,500), 60 sq. mi. (155 sq. km), in the Indian Ocean, c. 200 mi. (320 km) S of Java. The majority of the inhabitants are Chinese and Malays who work the extensive deposits of phosphate of lime. The island was annexed by Great Britain in 1888 and became part of the former STRAITS SETTLEMENTS in 1889. In 1958 it passed under Australian administration.

Christmas Island, largest atoll in the Pacific (1968 pop. 367), 222 sq. mi. (575 sq. km), in the LINE ISLANDS, a part of the British colony of the GILBERT AND ELLICE ISLANDS. The island is worked as a copra plantation by the British government, and most of the inhabitants work in the industry. The atoll was discovered by Capt. James COOK in 1777, annexed by Great Britain in 1888, and included in the Gilbert and Ellice Islands colony in 1919. British nuclear tests were conducted on the atoll in 1957 and 1958 and U.S. tests in 1962. The United States claims sovereignty over Christmas Island.

Christmas rose: see HELLEBORE.

Christ of the Andes, statue of Christ commemorating a series of peace and boundary treaties between

Argentina and Chile. Dedicated March 13, 1904, it stands in USALLATA PASS, high in the Andes, on the Argentine-Chilean boundary. A tablet (added in 1937) bears in Spanish the inscription "Sooner shall these mountains crumble into dust than Argentines and Chileans break the peace sworn at the feet of Christ the Redeemer."

Christophe, Henri (aNRē' krēstōf'), 1767-1820, Haitian revolutionary leader. A freed Negro slave, he aided TOUSSAINT L'OUVREUR in the liberation of Haiti and was army chief under DESSALINES. When the latter declared himself emperor, Christophe took part (1806) in a successful plot against his life and was elected president of the republic. Christophe, a pure-blooded Negro, then waged a savage and inconclusive struggle with Alexandre PÉTION, the champion of mulatto supremacy, who retained control of S. Haiti. In 1811, entrenching himself in N. Haiti, Christophe declared himself king as Henri I and entered upon an energetic but tyrannical reign. He created an autocracy patterned after the absolute monarchies of Europe. Compulsory labor enriched his fiefdom. Christophe surrounded himself with lavish, and sometimes ludicrous, magnificence, the pomp and splendor of his reign are still shown by the ruins of the citadel of La Ferrière, a formidable fortress on top of a mountain, surrounded by precipitous cliffs, and of the fabulous palace of Sans Souci, at Cap-Haïtien, his capital. In 1820, when he was suffering from partial paralysis, revolts broke out. In despair, Christophe committed suicide. See his correspondence with Thomas Clarkson, ed. by E. L. Griggs and C. H. Prator (1952, repr. 1968), biography by Hubert Cole (1967), J. W. Vandercock, *Black Majesty* (1928), Charles Moran, *Black Trumvirate: A Study of L'Ouvverture, Dessalines, Christophe* (1957).

Christopher, Saint [Gr. = Christ bearer], 3d cent., martyr of Asia Minor. His characteristic legend is that one day when he was carrying a little child over a river, he felt the child's weight almost too great to bear. The child was Jesus, carrying the world in his hands. Hence St. Christopher is usually represented as a giant, with the Holy Child on his shoulder, he leans on a staff. He is the patron of travelers, hence the practice of wearing his medal on journeys. His name was dropped from the liturgical calendar in 1969. Feast July 25.

Christ's-thorn, name for several Old World plants popularly said to have composed the crown of thorns. It is applied most often to two members of the family Rhamnaceae (BUCKTHORN family): (1) the Jerusalem thorn (*Paliurus spina-christi*), which is a spiny shrub or small tree with curious fruit resembling a miniature head under a wide-brimmed hat, and (2) a variety of jujube. Christ's-thorn is classified in the division MAGNOLIOPHYTES, class Magnoliopsida, order Rhamnales, family Rhamnaceae.

Christus or **Cristus**, **Petrus** (both pē'tras krī's'tas), fl. 1444-c. 1473, Flemish painter, a follower and probably a pupil of the Van Eycks. In 1444 he became a free citizen of Bruges, where he remained until his death. Christus was successful in the rendering of geometric perspective and became noted for his fine, introspective treatment of figures, particularly in portraiture. Many of his works show a simplification of the compositions of Jan van Eyck, and there are traces of the influence of Roger van der Weyden. Among the paintings ascribed to Christus are the portraits of Edward Grymestone (Earl of Verulam, Coll., England), *Lamentation*, and a portrait of an unknown Carthusian monk (both Metropolitan Mus.), *Lamentation* (Brussels), and *Nativity* (National Gall. of Art, Washington, D.C.).

Christy, Edwin P., 1815-62, American showman, b. Philadelphia. He established c. 1846 in Buffalo, N.Y., a company of minstrels that came to be known as Christy's Minstrels. The company, although not the first of its kind, crystallized the pattern of the MINSTREL SHOW—the interlocutor, the semicircular arrangement of white performers in blackface, the end man, and the variety act. For over 10 years Christy had great success all over the United States and in England. He retired in 1854, and the group continued under the direction of George N. Harrington, who assumed the name Christy. Some of the songs of Stephen FOSTER were published bearing Christy's name as author and composer.

chromatic aberration: see ABBERRATION, in optics.

chromatic scale, in music: see SCALE.

chromatid (krō'matəd) see CHROMOSOME, CROSSING OVER.

chromatin: see CHROMOSOME.

chromatography (krō'matōg'rafē), resolution of a chemical mixture into its component compounds.

by passing it through a system that retards each compound to a varying degree, a system capable of accomplishing this is called a chromatograph. The retarding system can be a surface adsorbent, such as silica, alumina, cellulose, or charcoal, capable of reversibly adsorbing the compounds (see ADSORPTION). In column chromatography the adsorbent is packed into a column and a solution of the mixture is added at the top. An appropriate solvent is passed through the column, washing, or eluting, the compounds down the column. A polar substance that is adsorbed very tightly to the surface will be efficiently retarded by the column, while a nonpolar substance will elute very rapidly. By varying the nature of the solid adsorbent and the eluting solvent, a wide variety of resolutions, even of very similar substances, can be carried out. The earliest compounds separated by column chromatography were highly colored, hence the name chromatography [Gr. = color recording]. For analytical purposes a layer of the adsorbent can be spread on a glass plate. The plate is spotted with a solution of the mixture or, means of a thin capillary tube, and the solvent is allowed to evaporate. An eluting solvent is then allowed to move up the plate by capillary action, drawing the components of the mixture along by varying degrees. The plate is developed by spraying it with an oxidizing agent, so that each component becomes colored and appears as a dark spot on the plate. The location and size of the spots serve to identify and measure the relative quantities of the components. As in column chromatography, polar substances will not elute as well and will remain nearer the bottom of the plate, while nonpolar substances will elute to the top. This process is called thin-layer chromatography (TLC). In paper chromatography a procedure similar to TLC is used except that the cellulose in the paper acts as the adsorbent. The gas chromatograph (GC) is a system consisting of a liquid with a high boiling point impregnated on an inert solid support as the stationary phase and helium gas as the mobile phase. The stationary phase is packed into a thin metal column and helium gas is allowed to flow through it. The column is attached to an injection port, and the entire system is heated in an oven. A solution of the mixture is injected into the column through the injection port by means of a syringe and is immediately volatilized. The helium gas then sweeps the components out of the column and past a detector. The polarity of the compounds and their volatility determines how long they are retained by the column. When each component passes the detector, a peak is registered on a recorder. From the relative areas under the peaks, the relative quantities of the components can be obtained. By varying the polarity of the column and its temperature, many different resolutions can be carried out. Since the capacity of GC columns is very low, the gas chromatograph is used chiefly as an analytical tool, although it can be used for preparative purposes as well. For compounds that cannot be volatilized readily, the liquid chromatograph (LC) can be used instead of the GC. The stationary phase consists of a finely powdered solid adsorbent packed into a thin metal column and the mobile phase consists of an eluting solvent forced through the column by a high-pressure pump. The mixture to be analyzed is injected into the column and monitored by a detector. Many different LC packings and eluting solvents are available to achieve the desired resolution. In gel-permeation chromatography, compounds are separated on the basis of their molecular size. Porous beads of the gel are packed into a column and the mixture is added at the top in an appropriate solvent. Large molecules are forced straight down the column, while small molecules suck in the pores and are retarded. For compounds that can exist as ions, ion-exchange chromatography can be used to separate them from neutral or oppositely charged compounds. The mixture is added to a column packed with a porous, insoluble resin which has a negatively charged (anionic) group attached to it and an unattached, positively charged (cationic) counterion. A cation from the mixture will exchange with the positive counterion of the resin and will be retarded while neutral and anionic substances are not affected. Ion-exchange resins with exchangeable anions work in a similar manner. Electrophoresis can also be used as an effective tool for analyzing mixtures of ions. A strip of paper or a column of polymeric gel, saturated with an electrolyte, is set up so that it spans two solutions containing electrodes. The mixture to be analyzed is spotted onto the paper or gel and the two electrodes are connected to a high-energy power source (about 5,000 volts). Positive

ions will migrate in one direction and negative ions in the other. The greater the charge on the ion, the farther it will migrate. This method is especially useful for the resolution of mixtures of proteins.

chromite (krō'mīt), dark brown to black mineral. It is an iron-chromium oxide, FeCr_2O_4 , with traces of magnesium and aluminum. It crystallizes in the isometric system, but crystals are rare, and it usually occurs as irregular masses and small grains. The only commercial source of chromium and its compounds, chromite is also used in the manufacture of refractories. The principal countries producing chromite are the USSR, South Africa, Rhodesia, the Philippines, and Turkey.

chromium (krō'mēam) [Gr. = color], metallic chemical element; symbol Cr; at. no. 24, at. wt. 51.995, m.p. about 1850°C; b.p. 2482°C; sp. gr. about 7.2 at 20°C; valence -2, -3, -6. Chromium is a silver-gray, lustrous, brittle, hard metal that can be highly polished. It is found in group VI of the periodic table. It does not tarnish in air, but burns when heated, forming the green chromic oxide. When combined with oxygen, besides yielding chromic oxide, which is used as a pigment, it forms chromic anhydride (the red trioxide and anhydride of chromic acid). With other metallic elements, e.g., lead and potassium, together with oxygen, it forms the chromates and dichromates. These compounds are salts of chromic acid and are used as pigments in paints, in dyeing, and in the tanning of leather. Chrome yellow, a pigment, consists largely of lead chromate. Other chrome colors are black, red, orange, and green. In the chrome process for tanning leather, a dichromate is used, and chromium hydroxide, a basic compound of chromium, hydrogen, and oxygen, is precipitated and held in the leather. The hydroxide is used also as a mordant in dyeing cloth. A mixture of potassium dichromate and sulfuric acid is used as a powerful agent for cleaning laboratory glassware. Chromium is a comparatively rare element, never occurring by itself in nature but always in compounds. Its chief source is the mineral chromite, which is composed of iron, chromium, and oxygen and is found principally in the USSR, South Africa, Rhodesia, Turkey, and the Philippines. The element, in the form of chromic oxide, gives the greenish tint to the emerald and the aquamarine. Metallic chromium is prepared by reduction of the oxide by aluminum or by carbon. It is used in plating other metals because of its hardness and non-tarnishing properties. In alloys with other metals it contributes hardness, strength, and heat resistance. Its most important use is in the steel industry, where it is a constituent of several alloy steels, e.g., chromium steel or chrome steel. Stainless steel contains from 11% to 18% chromium. An alloy of nickel and chromium, often called Nichrome, is widely used as a heating element in electric toasters, coffee pots, and other appliances. Stellite is an extremely hard alloy of cobalt, chromium, and tungsten, with small amounts of iron, silicon, and carbon; it is used in metal cutting tools and for wear-resistant surfaces. A similar alloy, with molybdenum instead of tungsten, is used in surgical tools since it does not react with body fluids. Chromium was discovered in 1797 by L. N. Vauquelin.

chromoprotein: see PROTEIN.

chromosome (krō'masōm'), structural carrier of hereditary characteristics, found in the nucleus of every cell and so named for its readiness to absorb dyes. The term *chromosome* is usually reserved for the structure when it is condensed and readily visible during cell division (see MITOSIS). At other times the chromosome appears as a fibrous structure, called the chromonema, consisting of accumulations (called chromomeres) of chromatin, the dye-absorbing material. During nuclear division, when each chromosome splits, each of the duplicate chromosomes is called a chromatid. A certain number of chromosomes is characteristic of each species of plant and animal; e.g., the human has 46 chromosomes, the potato has 48, and the fruit fly *Drosophila* has 8. Each of these chromosome numbers is the so-called diploid number, i.e., the number found in the somatic (body) cells and in the germ cells that give rise to the gametes, or reproductive cells. When the germ cells divide in the two-step process of MEIOSIS, the chromosomes are separated in such a way that each daughter cell receives a haploid (half the diploid) number of chromosomes. Fusion of the male and female gametes in fertilization restores the diploid number in the fertilized egg, or zygote, which thus contains two sets of homologous chromosomes, one from each parent. The principal constituents of the chromosomes are nu-

cleoproteins containing deoxyribonucleic acid, or DNA (see NUCLEIC ACID). Chromosomes appear microscopically as a linear arrangement of genes, the factors that determine the inherited characteristics of all living organisms. The very large chromosomes in the salivary gland cells of *Drosophila* and other insects have furnished valuable material for the study of GENETICS.

chromosphere (krō'masfēr') [Gr. = color sphere], layer of rarefied gases in the solar atmosphere, it measures 6,000 mi (9,700 km) in thickness and lies between the photosphere (the sun's visible surface) and the corona (its outer atmosphere). The flash spectrum has been a valuable tool in the study of the chromosphere. This spectrum is obtained just before a solar eclipse reaches totality and is formed from the thin arc of the sun disappearing behind the moon's disk. An analysis of the emission lines gives information about the height of the chromosphere and the heights at which various elements exist in it. Using the flash spectrum, scientists find that the chromosphere is composed primarily of hydrogen, causing its visible reddish tint, and of helium, oxygen, calcium, iron, and titanium in lesser amounts. In itself, it consists of three distinct layers which decrease in density and increase abruptly in temperature. The lower chromosphere is about 10,800°F (6,000°C), the middle rises to 99,000°F (50,000°C), and the upper part, merging into the lower corona, reaches 1,800,000°F (1,000,000°C). At 600 mi (1,000 km) above the photosphere, the chromosphere separates into cool, high-density columns, called spicules, and hot, low-density material. The spicules, each about 500 mi (800 km) in diameter, shoot out at 20 mi per sec (32 km per sec) and rise as high as 10,000 mi (16,000 km) before falling back. Any point on the sun will erupt a spicule at the rate of about once every 24 hr. Other types of solar activity are found to occur in the chromosphere. The elements of each layer are sometimes distributed in bright, cloudlike patches called plages, or faculae, and in general are located along the same zones as sunspots and fluctuate with the same 11-yr cycle; the relationship between the two is not yet understood. Most spectacular of the solar features are the streams of hot gas, called prominences, which shoot out thousands or even hundreds of thousands of miles from the sun's surface at velocities as great as 250 mi per sec (40 km per sec). Two major classifications are the quiescent and the eruptive prominences. Quiescent prominences bulge out from the surface about 20,000 mi (32,000 km) and can last days or weeks. Eruptive prominences are thin flames of gas often reaching heights of 250,000 mi (400,000 km), they occur most frequently in the zones containing sunspots. Dark strandlike objects called filaments were discovered on the disk and were originally thought to be a special kind of feature. These are now known to be prominences seen against the bright background of the photosphere. Until the middle of the 19th cent. prominences could be viewed extending from the edge of the sun's disk only during a solar eclipse. However, in 1868 a method of observing them with a spectroscopic at any clear time of day was developed, and in 1930 the invention of the CORONAGRAPH allowed them to be continuously photographed. Another phenomenon occurring in the chromosphere is the solar flare, a sudden and intense brightening of a plage which lasts an average of 15 minutes. This feature is also associated with sunspots, although its nature is not well understood. Flares are found to disrupt magnetic compasses and radio signals on the earth.

chronicle, official record of events, set down in order of occurrence, important to the people of a nation, state, or city. Almanacs, *The Congressional Record* in the United States, and the *Annual Register* in England are chronicles. From ancient times rulers have made certain that written records of their achievements proclaimed their glory to posterity. King Alfred of England was perhaps the first to encourage objectively. The Anglo-Saxon Chronicle, in lively English prose, notes the inauspicious beginnings of the British navy in A.D. 897: while pursuing the Danes, Alfred's long boats ran aground at low tide. Other chronicles of literary as well as historical interest are Tacitus' *Annals* (1st cent. A.D.); Bece's *Historia Ecclesiastica Gentis Anglorum* (7th cent.); Geoffrey of Monmouth's *Historia Regum Britanniae* (c.1135); and Polish-Saxon *Chronicles of England, Scotland, and Ireland* (1577). Modern developments of the form include the daily metropolitan newspaper, which provides exhaustive coverage of a panorama of events, from space exploration to kitchen range experimentation, and such codifications of

journalistic sources as *The New York Times Index* and the *New York Times Idea Bank*—the latter a computerized *Index*, which makes any name or fact instantly available

chronicle plays, dramas based upon 16th-century chronicles of English, particularly those of Edward HALL and Raphael HOLINSHED. These plays became very popular late in the reign of Elizabeth I, when, in a burst of patriotism, the public became interested in the history of their country. Starting as loosely structured depictions of events featuring large casts, battle scenes, and much pageantry, the chronicles evolved into narratives of the events of the reign of a single king. Christopher Marlowe depicted the reign of Edward II whereas Shakespeare treated the histories of kings from Richard II to Henry VIII. His *Henry IV*, Parts I and II, and *Henry V* are marked by complex characterizations and comic subplots.

Chronicles or Paralipomenon (pār'ālīpōm'ōn) [Gr, =things left out], two books of the Old Testament, originally a single work in the Hebrew canon, called First and Second Chronicles in the Authorized Version, where they occupy the 13th and 14th places, and called First and Second Paralipomenon in Greek versions and in the Roman Catholic Bible. The books are a history of the Jewish kingdom under David (1 Chron. 10-29) and Solomon (2 Chron. 1-9) and, after the division of the kingdom, of the southern kingdom of Judah, including the Babylonian captivity (2 Chron. 10-36). The work commences with a collection of genealogies from Adam until the time of Saul (1 Chron. 1-9) and ends with the decree (538 B.C.) of the Persian king Cyrus restoring the Jews (2 Chron. 36:22-23). Thus the historical material parallels (and supplements) part of the narrative of First and Second Samuel and First and Second Kings, but from the point of view of one who adheres strictly to the house of David and to the worship in the Temple. Like Kings, these books quote their sources constantly. Originally Chronicles formed one book with Ezra and Nehemiah. For views of the higher criticism, see OLD TESTAMENT. See J. C. Whitcomb, *Solomon to the Exile: Studies in Kings and Chronicles* (1971).

chronometer, instrument for keeping highly accurate time, used especially in navigation. Before the advent of radio time signals it was the only device that provided the time accurately enough for a ship at sea to determine its longitude. A mechanical chronometer is a spring-driven escapement time-keeper, like a watch, but its parts are more massively built. Changes in the tension of the spring caused by variations in temperature are compensated for by devices included in it. Some modern chronometers are electronic, using the vibrations of a quartz crystal to regulate the rate at which a time-indicating display moves.

chrysalis (krī'sālīs) see PUPA

chrysanthemum (krī'sānthēməm), name for a large number of annual or perennial herbs of the genus *Chrysanthemum* of the family Compositae (COMPOSITE family), some cultivated in the Orient for at least 2,000 years. A chrysanthemum is the floral emblem of the imperial family of Japan, and, sharing the honor with the cherry blossom, it is the national flower, the highest officials are honored by orders of the chrysanthemum. The flower heads are mostly late blooming and of various shades of red, yellow, and white, they range from single daisylike to large rounded or shaggy heads. Chrysanthemums were introduced to England in the late 18th cent., and today innumerable named horticultural types exist. Most are varieties of *C. morifolium*, a species of indeterminate origin and no longer known in the wild form. Chrysanthemums rank with roses in commercial importance as cut flowers and pot and garden plants. The pyrethrum, feverfew, marguerite, and daisy belong to the same genus. Chrysanthemum is classified in the division MAGNOLIOPHYTA, class Magnoliopsida, order Asterales, family Compositae.

Chryseis (krī'sē'is), in the *Iliad*, girl captured by Agamemnon. When ransom efforts failed, her father, the priest Chryses, appealed to Apollo, who promptly sent a plague to terrorize the Greek army, it continued until Chryseis was given up. Agamemnon took Briseis from Achilles to replace Chryseis.

chryselephantine (krī's'ēlafān'tīn, -tīn), Greek sculptural technique developed in the 6th cent. B.C. Sculptures, especially temple colossi, were made with an inner core of wood overlaid with ivory, to simulate flesh, and gold, to represent drapery. The great Parthenon Athena, now lost, was chryselephantine.

Chrysippus (krī's'īpəs), c.280-c.207 B.C. Greek Stoic philosopher, b. Soli, Cilicia. He was a disciple of

Cleanthes and succeeded him as head of the Academy in Athens. After Zeno, the founder of STOICISM, Chrysippus is considered the most eminent of the school. He systematized Stoicism and reconciled the factions that threatened to split the school. Chrysippus wrote with exquisite logic but also gave great weight to prophecy and the irrational. Only fragments of his work survive. See J. B. Gould, *The Philosophy of Chrysippus* (1970).

Chrysler, Walter Percy, 1875-1940, American industrialist, founder of the Chrysler Corp., b. Wamego, Kansas. He began as a machinist's apprentice and rose within the industry to become vice president in charge of operations of the General Motors Corp. in 1919. In 1920 he undertook the reorganization of the Willys Overland and Maxwell companies and in 1924 brought out the first Chrysler car. Within a short time he had made his company one of the largest of the automobile industry.

chrysoberyl (krī's'abēr'īl) [Gr, =golden beryl], a beryllium aluminate used as a gem. It has a vitreous luster and is transparent to translucent. The more valuable CAT'S-EYE is a variety of chrysoberyl. Another variety, alexandrite, was first discovered in the Ural Mts. of Russia, on the birthday of Czar Alexander II, for whom it was named. It is remarkable in that it is green by daylight and raspberry red under artificial light. It was popular in imperial Russia, both because of its association with the czar and because red and green were the colors of the empire. It is now found chiefly in Sri Lanka (formerly Ceylon) and Brazil.

chrysolite: see OLIVINE

Chrysoloras, Manuel (krī'səlōr'əs), c.1355-1415, Greek teacher and writer, b. Constantinople. Traveling to Italy on a diplomatic mission, he became celebrated for his teaching and introduced Greek literature into Florence and other Italian cities. Among his works were a Greek grammar and translations of Plato and Homer. His pupils included a number of the finest early Renaissance scholars. Through Chrysoloras's teaching, the culture of classical Greece became the foundation of humanist studies in the West.

Chrysophyta (krāsōf'āta), division of the plant kingdom consisting of four rather diverse classes of algae, of which the class containing the DIATOMS is the largest and best known. All four classes are placed together in this division because of their similar physiological behavior and structural composition. In the Chrysophyta, the cell walls, in the form of two overlapping shells, are rarely composed of cellulose, but instead usually contain large quantities of silica. The two flagella, when they occur, are usually dissimilar. The plants, which are photosynthetic, are yellowish green to golden brown because of the presence of large amounts of carotenoid pigments (xanthophylls) relative to the amount of chlorophyll. The chlorophyll pigment differs in type and amount from that of the green algae (division CHLOROPHYTA). The photosynthetic pigments are found in cell structures known as CHLOROPLASTS. The food storage products of chrysophytes consist of oils and complex polysaccharides, such products are unique to this group and are most closely related to those of the brown algae (division Phaeophyta). With the exception of diatoms, the four classes of chrysophytes are of little value in the plant-to-fish food chain. Class Chloromonadophyceae (chloromonads), class Xanthophyceae (yellow-green algae), and class Chrysophyceae (golden algae) comprise relatively small groups of marine and freshwater algae, largely single-celled plankton but occasionally colonial or filamentous. Class Bacillariophyceae contains the diatoms, single-celled or occasionally colonial, golden brown algae found commonly and abundantly in both fresh and salt water. Asexual reproduction of diatoms occurs by mitotic cell division, after which each daughter cell keeps one of the two overlapping shells, producing a new shell to fit within the old one (see MITOSIS). The manner of sexual reproduction varies according to the group of diatoms. With over 10,000 known species, the diatoms form the largest single and natural group of algae, they constitute most of the marine plankton that occurs in the colder seas and are thereby the prime food source for marine animals higher on the food chain. Moreover, since the silicon shells of diatoms are totally nonbiodegradable, they accumulate indefinitely in bottom deposits, through the geological ages they have formed layers of diatomaceous earth several hundreds of feet thick that are of considerable importance for many industrial purposes.

chrysoprase (krī's'āprās) [Gr, =golden leek], apple green variety of CHALCEDONY, used as a gem. The color is caused by the presence of nickel compounds. Silesia was long the chief source of chrysoprase. More recently it has been obtained in California and Oregon and in Australia.

Chrysorrhoeas. see JOHN OF DAMASCUS, SAINT

Chrysostom. see JOHN CHRYSOSTOM, SAINT

chrysotile. see SERPENTINE

Ch'uan-chou (chuan-jō) or **Tsinkiang**, town (197 est. pop. 130,000), SE Fukien prov., China, on an inlet of Formosa Strait. Local handicrafts, machine tools, and fertilizer are produced. Ch'uan-chou has been identified with Zaiton (Zaitun or Zayton) which was the departure point for Marco Polo's return journey. The Overseas Chinese Univ. is in the town.

Chuang-tze or **Chuang-tzu** (jwang-dzū, -dzō) (c.369-c.286 B.C.) Chinese Taoist writer. Little is known about his life. He was a native of the state of Meng, on the border of present-day Shantung and Honan provinces, and is said to have lived as a hermit. The collection of essays attributed to him called the *Chuang-tze*, is distinguished by its brilliant and original style, with abundant use of satire, paradox, and seemingly nonsensical stories. Chuang-tze emphasizes the relativity of all ideas and conventions that are the basis of judgments and distinctions, he puts forward as the solution to the problems of the human condition, freedom in identification with the universal Tao, or principle of Nature. He is less political in his orientation than the earlier Taoist LAO-TZE. He is also called Chuang Chou. See his complete works, tr. by Burton Watson (1968).

Chub (küb), an African people. Ezek. 30:5. This may be a textual error for Lub (i.e., LUBIM).

chub. see MINNOW

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Chudskoye, Lake (chōōtskü'yā), or **Lake Peipus** (pī'pəs), Estonian *Peipsi Jarv*, c.1,390 sq mi (3,600 sq km), dividing the Estonian Republic from W Pskov oblast, NW European USSR. Its southern section is known as Lake Pskov. Lake Chudskoye, which is navigable, empties through the Narva River into the Gulf of Finland. The Russian coastal population engages in fishing. On the frozen strait between Lake Chudskoye and Lake Pskov, Alexander Nevsky defeated the Livonian Knights in 1242.

Chufut-Kale (chōōfōōt'-kal'yē') [Turk, =Jews' city], ruined fortress and town, S European USSR, in the Ukraine, in the Crimea. While under Turkish rule (1475-1783), it was the center of the Jewish sect of Karaites. Jewish inscriptions date back to 1203, and the region was probably the last refuge of the Crimean Khazars.

Chugach Mountains (chōōg'äch), one of the Pacific coastal ranges, S Alaska, extending from the St. Elias Mts. on the Alaska-Yukon border, NW to the Manuskas River. Mt. Marcus Baker, 13,176 ft (4,016 m), is the highest peak. Rugged, with forested lower slopes (the southern slope is a national forest) and glacier-covered summits, the Chugach are a barrier for movement inland from the coast. The Richardson Highway, a north-south road running from the coast to Fairbanks, Alaska, and the Copper River are the only corridors through the range.

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Chulalongkorn (chōō'lāōng'kōrn) or **Rama V** (rā'mā), 1853-1910, king of Siam (1868-1910). Educated in part by a British governess, Anna Leonovens, and an English tutor, he greatly advanced the Westernization of Siam (present-day Thailand) begun by his father, King Mongkut. He departed from tradition by traveling abroad—to Singapore, Java, and India in 1871 and to Europe in 1897. He abolished slavery, simplified court etiquette, initiated the practice of sending young Siamese abroad for training, set up schools, reorganized the administration of justice, laid the foundations of a sound financial policy, and built public works. He also was responsible for the centralization of Siamese administration that checked the independence of the hereditary provincial chieftains (1892). The total effect of Chulalongkorn's reforms and of the foreign policy he directed was to preserve Siam as an independent state at a time when the rest of SE Asia was falling subject to France and Great Britain.

Chula Vista (chōō'la), city (1970 pop 67,901), San Diego co, S Calif, on San Diego Bay, inc 1911. Citrus fruits and vegetables are grown in the area, and aircraft engines and men's slacks are manufactured in the city. A junior college is there.

Chulym (chōōlīm'), river, c 1,075 mi (1,730 km) long, Krasnoyarsk Krai, S central Siberian USSR. It rises in the eastern slopes of the Kuznetsk Ala-Tau and flows N and W through Krasnoyarsk Krai and Tomsk oblast into the Ob. Its lower course is navigable. Another Chulym River, 140 mi (225 km) long, in SW Siberia, feeds Lake Chany.

Chumashan Indians (chōō'māshān), North American Indian group, formerly on the Pacific coast in the vicinity of Santa Barbara, Calif., and on three islands of the Santa Barbara archipelago. Their canoes were quite large, and their culture was more maritime than other California Indians. Spanish missions were established among them in the late 18th cent. Their practice of abortion, in addition to their being forced out by Spanish settlers, led to their extinction. They were sometimes called the Santa Barbara Indians.

Chun (kūn), in the Bible: see BEROthAI

Chunchon (chōōn'chūn'), city (1970 pop 122,672), capital of Kangwon prov., N South Korea. It is an important market town and rice-processing center. Textiles, silk yarn, and raw silk are also produced. Tungsten, mica, and fluorspar are mined nearby. Chunchon was the capital of the kingdom of Maek (250 B C-A D 660) and was later absorbed by Silla (see KOREA).

Ch'ung-ch'ing, see CHUNGKING, China

Chungin: see CHONGJIN, North Korea

Chungju (chōōng'jōō'), city (1970 pop 87,227), central South Korea. Chungju is an important agricultural center.

Chungking (chōōng'king') or **Ch'ung-ch'ing** (chōōng-ch'ing), city (1970 est pop 3,500,000), SE Szechwan prov., China, at the junction of the Yangtze and Chia-ling rivers. The commercial center of W China, it commands a large river trade. Surrounded on three sides by water, it is situated on a rock promontory, all supplies from the river front must be carried by stairway or inclined railway. A flourishing industrial city, it has railroad shops, shipyards, a large-scale integrated steel complex, cotton and silk mills, chemical and cement plants, food-processing establishments, machine shops, paper mills, and a developing motor vehicle industry. Large coal and iron mines are nearby. Chungking was opened as a treaty port in 1891. In Nov, 1937, just before the Japanese capture of Nanking in the

Second Sino-Japanese War, the capital of China was transferred to Chungking, where it remained until the end of hostilities. During that time administrative agencies, educational institutions, and industrial plants from all over the country were relocated in Chungking, and the population more than tripled. The city was taken by the Communists on Nov 30, 1949. Its many institutions of higher learning include Chungking Univ., Chungking Technical Univ., and a medical college.

Chung-shan (jōōng-shān) or **Shekki** (shē'kē'), town, S Kwangtung prov., SE China, near Macao. It is situated on Chung-shan island (sometimes called Macao island), and has sugar refineries. Sun Yat-sen was born there.

Chuquet, Nicolas (nēkōlā' shūkā'), c 1450-1500, French mathematician, probably b Paris. Little is known of Chuquet's life. At Lyons in 1484 he composed a manuscript on the science of numbers, which was finally published in two parts in 1880 and 1881. The first part, called the "Triparty," was a treatise on algebra and contained the first use of the RADICAL sign with an index (as in $\sqrt[n]{x}$), the second part contained the statement of, and the replies to, a set of 156 mathematical problems.

Chuquicamata (chōō'kēkāmā'tā), town, N Chile, on the western slopes of the Andes. At an elevation of 10,435 ft (3,181 m), Chuquicamata has one of the world's largest copper mines. The extensive open-pit mining of the region dates to 1915.

Chur (kōōr), Fr Coire, Romansh Cuera, city (1971 pop 31,193), capital of Grisons canton, E Switzerland, on the Plessur River. Chur is an important transportation junction. Manufactures include foodstuffs (especially chocolate), textiles, and metal products. Chur was capital of the Roman province of Rhaetia. In the 5th cent, it became an episcopal see, the bishops were later made princes of the Holy Roman Empire. The temporal power of the prince-bishops was limited (c 1465) by the townspeople and later, when the Reformation was accepted (1524-26), ended altogether. Outstanding buildings are a restored 8th-century church, the Renaissance episcopal palace, the cathedral (begun 12th cent.), and the Rhaetian Museum (of folklore). Most of the inhabitants speak Romansh. The Swiss painter Angelica Kauffmann was born in Chur.

Church, Benjamin, 1639-1718, New England colonial soldier in KING PHILIP'S WAR, b Plymouth, Mass. He took a leading part in the Great Swamp Fight (Dec., 1675), W of Kingston, R I., and finally hunted down and killed Philip in Aug., 1676.

Church, Frederick Edwin, 1826-1900, American landscape painter of the HUDSON RIVER SCHOOL, b Hartford, Conn., studied with Thomas Cole at Catskill, N Y. He traveled and painted in North and South America and in Europe and excelled in panoramic scenes. He preferred to paint exotic and foreign landscapes instead of the native scenery favored by other members of the school. His large canvases are noted for the accuracy and clarity of the scenery portrayed, and for a crystalline rendering of light. Church is represented in the Metropolitan Museum, the New York Public Library, the National Academy of Design, New York City, and the Corcoran Gallery.

Church, Sir Richard, 1784-1873, British army officer. After varied service, he organized a Greek regiment to defend (1812-15) the Ionian Islands, and in 1827 he was made generalissimo of the Greek insurgents in the Greek War of Independence. Residing in Greece, he subsequently engaged in politics there and was made (1854) a general in the Greek army.

Church, Richard William, 1815-90, English Anglican clergyman. He was educated at Oxford, where he became a follower of John Henry Newman. As dean of St Paul's (1871-90) he did much to disseminate High Church doctrine. His book *The Oxford Movement* (1891) was long the authoritative work on the subject. In 1846 he helped found the *Guardian*, an Anglican newspaper. See his life and letters (ed. by his daughter, 1894).

church [probably Gr. =divine], aggregation of Christian believers. The traditional belief has the church the community of believers, living and dead, headed by Jesus Christ, who founded it in the apostles. This is the doctrine of the mystical body of Christ (Eph 1:22-23). Some divisions speak of the church militant (the living), the church suffering (the dead in purgatory), and the church triumphant (the saints of heaven). The church is said to be recognizable by four marks (as in the Nicene Creed): it is one (united), holy (producing holy lives), catholic (universal, supranational), and apostolic (having continuity with the apostles). In the Orthodox East-

ern Church, the Roman Catholic Church, and the Church of England, crucial importance is attached to the unbroken tradition, as handed down through the Holy Ghost (see APOSTOLIC SUCCESSION), with this doctrine goes the apostolic power to administer grace through the SACRAMENTS. Certain men of the Reformation rejected the doctrine of apostolic succession and substituted for the authority of the church the authority of Scripture alone. Protestants generally interpret the oneness of the church in a mystical sense, the true church is held to be invisibly present in all Christian denominations. The ecumenical movement in recent years has stimulated fresh study on the doctrine of the church.

church [Gr. *kuraikon* = belonging to the Lord], in architecture, a building for Christian worship. The earliest churches date from the late 3d cent., before then Christians, because of persecutions, worshiped secretly, especially in private houses. In Rome and some other cities Christians worshiped at the martyrs' tombs in the underground cemeteries, or CATACOMBS. The catacomb chapel influenced the furnishing of churches, particularly the CRYPT. The BASILICA form came to be standard in Western Europe, while in the East the norm became the square church of BYZANTINE ARCHITECTURE, derived from the shape of the Greek cross. The interior of the Eastern church is characterized by an image screen (iconostasis) rendering the sanctuary invisible to the lay worshippers, except that the ALTAR may be seen through the doors of the screen. In the West, modifications of the basilica were developed in ROMANESQUE ARCHITECTURE and in GOTHIC ARCHITECTURE. BAROQUE architecture produced innovations in ecclesiastical design in the 17th cent. Western churches in general have an east-west ORIENTATION with the altar at the eastern end. In America, Colonial architects developed an austere beautiful type of spired church, patterned after the works of Christopher Wren and James Gibbs. Churches differ in importance according to their constitution and the position in the hierarchy of their clergy, the CATHEDRAL being the bishop's church. See CHAPEL, ABBEY, HAGIA SOPHIA, SAINT PETER'S CHURCH, articles on other important churches.

church and state. There have been several phases in the relationship between the Christian church and the state. The uncompromising refusal of the early Christians to accord divine honors to the Roman emperor was the chief cause of the imperial persecutions of the church. After CONSTANTINE gave it official status, the church at first remained fairly autonomous, but during the 4th cent. the emperor began to figure increasingly in religious affairs. In the East in the 6th cent., Justinian was ruler of church and state equally, and thereafter the ORTHODOX EASTERN CHURCH in the Byzantine Empire was in confirmed subservience to the state. This domination of state over church is called Erastianism, after the theologian ERASTUS. When the empire began to disintegrate, the power of the state over the church declined, and under the Ottoman sultans the situation was reversed to the extent that the patriarchs of Constantinople were given political power over the laymen of their churches. In Russia the Orthodox Church was quite dominated by the state. In the West different factors were in play. After 400 there was no central power in the West, but there was a central ecclesiastical power, the see of Rome, which had claimed primacy from the earliest times. The barbarian invasions and the ensuing anarchy resulted in a tremendous growth in the power of the PAPACY. With the appearance of strong political powers in Europe, particularly the HOLY ROMAN EMPIRE and the kingdom of France, a struggle began between the papacy and the temporal rulers. The principal contention was over INVESTITURE, but underlying it was violent disagreement as to the proper distribution of power, theories ranged from the belief that emperor or king, as ruler by divine right, should control church as well as state (a theory known also as caesaropapism) to the belief that the pope, as vicar of God on earth, should have the right of supervision over the state. The centuries-long struggle was highlighted by such bitter clashes as those between Pope Gregory VII and Holy Roman Emperor Henry IV, between Pope Innocent III and Emperor Frederick II and King Philip II of France, and between Pope Boniface VIII and King Philip IV of France. The conflict of GUELFIS AND GIBELINES began as part of the imperial-papal struggle. The nearest the papacy ever came to Erastianism was in the period during which the popes resided at Avignon, where they were virtually at the beck and call of the French kings. After the return of the papacy

journalistic sources as *The New York Times Index* and the *New York Times Idea Bank*—the latter a computerized *Index*, which makes any name or fact instantly available

chronicle plays, dramas based upon 16th-century chronicles of English, particularly those of Edward HALL and Raphael HOLINSHED. These plays became very popular late in the reign of Elizabeth I, when, in a burst of patriotism, the public became interested in the history of their country. Starting as loosely structured depictions of events featuring large casts, battle scenes, and much pageantry, the chronicles evolved into narratives of the events of the reign of a single king. Christopher Marlowe depicted the reign of Edward II whereas Shakespeare treated the histories of kings from Richard II to Henry VIII. His *Henry IV*, Parts I and II, and *Henry V* are marked by complex characterizations and comic subplots.

Chronicles or Paralipomenon (pär'älipöm'ñōn) [Gr., =things left out], two books of the Old Testament, originally a single work in the Hebrew canon, called First and Second Chronicles in the Authorized Version, where they occupy the 13th and 14th places, and called First and Second Paralipomenon in Greek versions and in the Roman Catholic Bible. The books are a history of the Jewish kingdom under David (1 Chron. 10-29) and Solomon (2 Chron. 1-9) and, after the division of the kingdom, of the southern kingdom of Judah, including the Babylonian captivity (2 Chron. 10-36). The work commences with a collection of genealogies from Adam until the time of Saul (1 Chron. 1-9) and ends with the decree (538 B.C.) of the Persian king Cyrus restoring the Jews (2 Chron. 36:22-23). Thus the historical material parallels (and supplements) part of the narrative of First and Second Samuel and First and Second Kings, but from the point of view of one who adheres strictly to the house of David and to the worship in the Temple. Like Kings, these books quote their sources constantly. Originally Chronicles formed one book with Ezra and Nehemiah. For views of the higher criticism, see OLD TESTAMENT. See J. C. Whitcomb, *Solomon to the Exile: Studies in Kings and Chronicles* (1971).

chronometer, instrument for keeping highly accurate time, used especially in navigation. Before the advent of radio time signals it was the only device that provided the time accurately enough for a ship at sea to determine its longitude. A mechanical chronometer is a spring-driven escapement timekeeper, like a watch, but its parts are more massively built. Changes in the tension of the spring caused by variations in temperature are compensated for by devices included in it. Some modern chronometers are electronic, using the vibrations of a quartz crystal to regulate the rate at which a time-indicating display moves.

chrysalis (krī'sälīs) see PUPA

chrysanthemum (krī'sānthēməm), name for a large number of annual or perennial herbs of the genus *Chrysanthemum* of the family Compositae (COMPOSITE family), some cultivated in the Orient for at least 2,000 years. A chrysanthemum is the floral emblem of the imperial family of Japan, and, sharing the honor with the cherry blossom, it is the national flower, the highest officials are honored by orders of the chrysanthemum. The flower heads are mostly late blooming and of various shades of red, yellow, and white, they range from single daisylike to large rounded or shaggy heads. Chrysanthemums were introduced to England in the late 18th cent., and today innumerable named horticultural types exist. Most are varieties of *C. morifolium*, a species of indeterminate origin and no longer known in the wild form. Chrysanthemums rank with roses in commercial importance as cut flowers and pot and garden plants. The pyrethrum, feverfew, marguerite, and daisy belong to the same genus. Chrysanthemum is classified in the division MAGNOLIOPHYTES, class Magnoliopsida, order Asterales, family Compositae.

Chryseis (krī'sē'īs), in the *Iliad*, girl captured by Agamemnon. When ransom efforts failed, her father, the priest Chryses, appealed to Apollo, who promptly sent a plague to terrorize the Greek army, it continued until Chryseis was given up. Agamemnon took Briseis from Achilles to replace Chryseis.

chryselephantine (krī's'ēlafān'tīn, -tīn), Greek sculptural technique developed in the 6th cent. B.C. Sculptures, especially temple colossi, were made with an inner core of wood overlaid with ivory, to simulate flesh, and gold, to represent drapery. The great Parthenon Athena, now lost, was chryselephantine.

Chrysippus (krī'sīpəs), c. 280-c. 207 B.C., Greek Stoic philosopher, b. Soli, Cilicia. He was a disciple of

Cleanthes and succeeded him as head of the Academy in Athens. After Zeno, the founder of STOICISM, Chrysippus is considered the most eminent of the school. He systematized Stoicism and reconciled the factions that threatened to split the school. Chrysippus wrote with exquisite logic but also gave great weight to prophecy and the irrational. Only fragments of his work survive. See J. B. Gould, *The Philosophy of Chrysippus* (1970).

Chrysler, Walter Percy, 1875-1940, American industrialist, founder of the Chrysler Corp., b. Wamego, Kansas. He began as a machinist's apprentice and rose within the industry to become vice president in charge of operations of the General Motors Corp. in 1919. In 1920 he undertook the reorganization of the Willys Overland and Maxwell companies and in 1924 brought out the first Chrysler car. Within a short time he had made his company one of the largest of the automobile industry.

chrysoberyl (krī's'abēr'il) [Gr., =golden beryl], a beryllium aluminate used as a gem. It has a vitreous luster and is transparent to translucent. The more valuable CAT'S-EYE is a variety of chrysoberyl. Another variety, *alexandrite*, was first discovered in the Ural Mts. of Russia, on the birthday of Czar Alexander II, for whom it was named. It is remarkable in that it is green by daylight and raspberry red under artificial light. It was popular in imperial Russia, both because of its association with the czar and because red and green were the colors of the empire. It is now found chiefly in Sri Lanka (formerly Ceylon) and Brazil.

chrysolite: see OLIVINE

Chrysoloras, Manuel (krī'solór'as), c. 1355-1415, Greek teacher and writer, b. Constantinople. Traveling to Italy on a diplomatic mission, he became celebrated for his teaching and introduced Greek literature into Florence and other Italian cities. Among his works were a Greek grammar and translations of Plato and Homer. His pupils included a number of the finest early Renaissance scholars. Through Chrysoloras's teaching, the culture of classical Greece became the foundation of humanist studies in the West.

Chrysophyta (krāsōf'atə), division of the plant kingdom consisting of four rather diverse classes of algae, of which the class containing the DIATOMS is the largest and best known. All four classes are placed together in this division because of their similar physiological behavior and structural composition. In the Chrysophyta, the cell walls, in the form of two overlapping shells, are rarely composed of cellulose, but instead usually contain large quantities of silica. The two flagella, when they occur, are usually dissimilar. The plants, which are photosynthetic, are yellowish green to golden brown because of the presence of large amounts of carotenoid pigments (xanthophylls) relative to the amount of chlorophyll. The chlorophyll pigment differs in type and amount from that of the green algae (division CHLOROPHYTES). The photosynthetic pigments are found in cell structures known as CHLOROPLASTS. The food storage products of chrysophytes consist of oils and complex polysaccharides, such products are unique to this group and are most closely related to those of the brown algae (division Phaeophyta). With the exception of diatoms, the four classes of chrysophytes are of little value in the plant-to-fish food chain. Class Chloromonadophyceae (chloromonads), class Xanthophyceae (yellow-green algae), and class Chrysophyceae (golden algae) comprise relatively small groups of marine and freshwater algae, largely single-celled plankton but occasionally colonial or filamentous. Class Bacillariophyceae contains the diatoms, single-celled or occasionally colonial, golden brown algae found commonly and abundantly in both fresh and salt water. Asexual reproduction of diatoms occurs by mitotic cell division, after which each daughter cell keeps one of the two overlapping shells, producing a new shell to fit within the old one (see MITOSIS). The manner of sexual reproduction varies according to the group of diatoms. With over 10,000 known species, the diatoms form the largest single and natural group of algae, they constitute most of the marine plankton that occurs in the colder seas and are thereby the prime food source for marine animals higher on the food chain. Moreover, since the silicon shells of diatoms are totally nonbiodegradable, they accumulate indefinitely in bottom deposits, through the geological ages they have formed layers of diatomaceous earth several hundreds of feet thick that are of considerable importance for many industrial purposes.

chrysoprase (krī's'apraz) [Gr., =golden leek], apple-green variety of CHALCEDONY, used as a gem. The color is caused by the presence of nickel compounds. Silesia was long the chief source of chrysoprase. More recently it has been obtained in California and Oregon and in Australia.

Chrysorroas: see JOHN OF DAMASCUS, SAINT

Chrysostom: see JOHN CHRYSOSTOM, SAINT

chrysotile: see SERPENTINE

Ch'uan-chou (chuan-jō) or **Tsinkiang**, town (1970 est. pop. 130,000), SE Fukien prov., China, on an inlet of Formosa Strait. Local handicrafts, machine tools, and fertilizer are produced. Ch'uan-chou has been identified with Zaiton (Zaitun or Zayton), which was the departure point for Marco Polo's return journey. The Overseas Chinese Univ. is in the town.

Chuang-tze or **Chuang-tzu** (jwang-dzū, -dzōō), (c. 369-c. 286 B.C.) Chinese Taoist writer. Little is known about his life. He was a native of the state of Meng, on the border of present-day Shantung and Honan provinces, and is said to have lived as a hermit. The collection of essays attributed to him, called the *Chuang-tze*, is distinguished by its brilliant and original style, with abundant use of satire, paradox, and seemingly nonsensical stories. Chuang-tze emphasizes the relativity of all ideas and conventions that are the basis of judgments and distinctions, he puts forward as the solution to the problems of the human condition, freedom in identification with the universal Tao, or principle of Nature. He is less political in his orientation than the earlier Taoist LAO-TZE. He is also called Chuang Chou. See his complete works, tr. by Burton Watson (1968).

Chub (kūb), an African people. Ezek. 30:5. This may be a textual error for Lub (i.e., LUBIM).

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Chuguchak: see TA CHENG, China

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Chukotsk see CHUKCHI PENINSULA, USSR

Chulalongkorn (chōō'lālong'kōrn) or **Rama V** (ra'-ma), 1853-1910, king of Siam (1868-1910) Educated in part by a British governess, Anna Leonowens, and an English tutor, he greatly advanced the Westernization of Siam (present-day Thailand) begun by his father, King Mongkut He departed from tradition by traveling abroad—to Singapore, Java, and India in 1871 and to Europe in 1897 He abolished slavery, simplified court etiquette, initiated the practice of sending young Siamese abroad for training, set up schools, reorganized the administration of justice, laid the foundations of a sound financial policy, and built public works He also was responsible for the centralization of Siamese administration that checked the independence of the hereditary provincial chieftains (1892) The total effect of Chulalongkorn's reforms and of the foreign policy he directed was to preserve Siam as an independent state at a time when the rest of SE Asia was falling subject to France and Great Britain

Chula Vista (chōō'la), city (1970 pop 67,901), San Diego co, S Calif, on San Diego Bay, inc 1911 Citrus fruits and vegetables are grown in the area, and aircraft engines and men's slacks are manufactured in the city A junior college is there

Chulym (chōōlīm'), river, c 1,075 mi (1,730 km) long, Krasnoyarsk Krai, S central Siberian USSR It rises in the eastern slopes of the Kuznetsk Ala-Tau and flows N and W through Krasnoyarsk Krai and Tomsk oblast into the Ob Its lower course is navigable Another Chulym River, 140 mi (225 km) long, in SW Siberia, feeds Lake Chany

Chumashan Indians (chōō'māshān), North American Indian group, formerly on the Pacific coast in the vicinity of Santa Barbara, Calif, and on three islands of the Santa Barbara archipelago Their canoes were quite large, and their culture was more maritime than other California Indians Spanish missions were established among them in the late 18th cent Their practice of abortion, in addition to their being forced out by Spanish settlers, led to their extinction They were sometimes called the Santa Barbara Indians

Chun (kūn), in the Bible see BEROETHAI

Chunchon (chōōn'chūn'), city (1970 pop 122,672), capital of Kangwon prov, N South Korea It is an important market town and rice-processing center Textiles, silk yarn, and raw silk are also produced Tungsten, mica, and fluorspar are mined nearby Chunchon was the capital of the kingdom of Maek (250 B C-A D 660) and was later absorbed by Silla (see KOREA)

Ch'ung-ch'ing see CHUNGKING, China

Chungjin see CHONGJIN, North Korea

Chungju (chōōng'jōō'), city (1970 pop 87,227), central South Korea Chungju is an important agricultural center

Chungking (chōōng'kīng') or **Ch'ung-ch'ing** (chōōng-chīng), city (1970 est pop 3,500,000), SE Szechwan prov, China, at the junction of the Yangtze and Chia-ling rivers The commercial center of W China, it commands a large river trade Surrounded on three sides by water, it is situated on a rock promontory, all supplies from the river front must be carried by stairway or inclined railway A flourishing industrial city, it has railroad shops, shipyards, a large-scale integrated steel complex, cotton and silk mills, chemical and cement plants, food-processing establishments, machine shops, paper mills, and a developing motor vehicle industry Large coal and iron mines are nearby Chungking was opened as a treaty port in 1891 In Nov, 1937, just before the Japanese capture of Nanking in the

Second Sino-Japanese War, the capital of China was transferred to Chungking, where it remained until the end of hostilities During that time administrative agencies, educational institutions, and industrial plants from all over the country were relocated in Chungking, and the population more than tripled The city was taken by the Communists on Nov 30, 1949 Its many institutions of higher learning include Chungking Univ, Chungking Technical Univ, and a medical college

Chung-shan (jōōng-shan) or **Shekki** (shē'kē'), town, S Kwangtung prov, SE China, near Macao It is situated on Chung-shan island (sometimes called Macao island), and has sugar refineries Sun Yat-sen was born there

Chuquet, Nicolas (nēkōla' shukā'), c 1450-1500, French mathematician, probably b Paris Little is known of Chuquet's life At Lyons in 1484 he composed a manuscript on the science of numbers, which was finally published in two parts in 1880 and 1881 The first part, called the "Tripartite," was a treatise on algebra and contained the first use of the RADICAL sign with an index (as in $\sqrt[n]{x}$), the second part contained the statement of, and the replies to, a set of 156 mathematical problems

Chuquicamata (chōō'kēkama'ta), town, N Chile, on the western slopes of the Andes At an elevation of 10,435 ft (3,181 m), Chuquicamata has one of the world's largest copper mines The extensive open-pit mining of the region dates to 1915

Chur (kōōr), Fr Coire, Romansh Cuera, city (1971 pop 31,193), capital of Grisons canton, E Switzerland, on the Plessur River Chur is an important transportation junction Manufactures include foodstuffs (especially chocolate), textiles, and metal products Chur was capital of the Roman province of Rhaetia In the 5th cent it became an episcopal see, the bishops were later made princes of the Holy Roman Empire The temporal power of the prince-bishops was limited (c 1465) by the townspeople and later, when the Reformation was accepted (1524-26), ended altogether Outstanding buildings are a restored 8th-century church, the Renaissance episcopal palace, the cathedral (begun 12th cent), and the Rhaetian Museum (of folklore) Most of the inhabitants speak Romansh The Swiss painter Angelica Kauffmann was born in Chur

Church, Benjamin, 1639-1718, New England colonial soldier in KING PHILIP WAR, b Plymouth, Mass He took a leading part in the Great Swamp Fight (Dec, 1675), W of Kingston, RI, and finally hunted down and killed Philip in Aug, 1676

Church, Frederick Edwin, 1826-1900, American landscape painter of the HUDSON RIVER SCHOOL, b Hartford, Conn, studied with Thomas Cole at Catskill, NY He traveled and painted in North and South America and in Europe and excelled in panoramic scenes He preferred to paint exotic and foreign landscapes instead of the native scenery favored by other members of the school His large canvases are noted for the accuracy and clarity of the scenery portrayed, and for a crystalline rendering of light Church is represented in the Metropolitan Museum, the New York Public Library, the National Academy of Design, New York City, and the Corcoran Gallery

Church, Sir Richard, 1784-1873, British army officer After varied service, he organized a Greek regiment to defend (1812-15) the Ionian Islands, and in 1827 he was made generalissimo of the Greek insurgents in the Greek War of Independence Residing in Greece, he subsequently engaged in politics there and was made (1854) a general in the Greek army

Church, Richard William, 1815-90, English Anglican clergyman He was educated at Oxford, where he became a follower of John Henry Newman As dean of St Paul's (1871-90) he did much to disseminate High Church doctrine His book *The Oxford Movement* (1891) was long the authoritative work on the subject In 1846 he helped found the *Guardian*, an Anglican newspaper See his life and letters (ed by his daughter, 1894)

church [probably Gr, =divine], aggregation of Christian believers The traditional belief has the church the community of believers, living and dead, headed by Jesus Christ, who founded it in the apostles This is the doctrine of the mystical body of Christ (Eph 1:22-23) Some divisions speak of the church militant (the living), the church suffering (the dead in purgatory), and the church triumphant (the saints of heaven) The church is said to be recognizable by four marks (as in the Nicene Creed) it is one (united), holy (producing holy lives), catholic (universal, supranational), and apostolic (having continuity with the apostles) In the Orthodox East-

ern Church, the Roman Catholic Church, and the Church of England, crucial importance is attached to the unbroken tradition, as handed down through the Holy Ghost (see APOSTOLIC SUCCESSION), with this doctrine goes the apostolic power to administer grace through the SACRAMENTS Certain men of the Reformation rejected the doctrine of apostolic succession and substituted for the authority of the church the authority of Scripture alone Protestants generally interpret the oneness of the church in a mystical sense, the true church is held to be invisibly present in all Christian denominations The ecumenical movement in recent years has stimulated fresh study on the doctrine of the church

church [Gr *kuraikon*=belonging to the Lord], in architecture, a building for Christian worship The earliest churches date from the late 3d cent, before then Christians, because of persecutions, worshiped secretly, especially in private houses In Rome and some other cities Christians worshiped at the martyrs' tombs in the underground cemeteries, or CATACOMBS The catacomb chapel influenced the furnishing of churches, particularly the CRYPT The BASILICA form came to be standard in Western Europe, while in the East the norm became the square church of BYZANTINE ARCHITECTURE, derived from the shape of the Greek cross The interior of the Eastern church is characterized by an image screen (iconostasis) rendering the sanctuary invisible to the lay worshippers, except that the ALTAR may be seen through the doors of the screen In the West, modifications of the basilica were developed in ROMANESQUE ARCHITECTURE and in GOTHIC ARCHITECTURE BAROQUE architecture produced innovations in ecclesiastical design in the 17th cent Western churches in general have an east-west ORIENTATION with the altar at the eastern end In America, Colonial architects developed an austere beautiful type of spired church, patterned after the works of Christopher WREN and James Gibbs Churches differ in importance according to their constitution and the position in the hierarchy of their clergy, the CATHEDRAL being the bishop's church See CHAPEL ABBEY, HAGIA SOPHIA, SAINT PETER'S CHURCH, articles on other important churches

church and state. There have been several phases in the relationship between the Christian church and the state The uncompromising refusal of the early Christians to accord divine honors to the Roman emperor was the chief cause of the imperial persecutions of the church After CONSTANTINE I gave it official status, the church at first remained fairly autonomous, but during the 4th cent the emperor began to figure increasingly in religious affairs In the East in the 6th cent, Justinian was ruler of church and state equally, and thereafter the ORTHODOX EASTERN CHURCH in the Byzantine Empire was in confirmed subservience to the state This domination of state over church is called Erastianism, after the theologian ERASTUS When the empire began to disintegrate, the power of the state over the church declined, and under the Ottoman sultans the situation was reversed to the extent that the patriarchs of Constantinople were given political power over the laymen of their churches In Russia the Orthodox Church was quite dominated by the state In the West different factors were in play After 400 there was no central power in the West, but there was a central ecclesiastical power, the see of Rome, which had claimed primacy from the earliest times The barbarian invasions and the ensuing anarchy resulted in a tremendous growth in the power of the PAPACY With the appearance of strong political powers in Europe, particularly the HOLY ROMAN EMPIRE and the kingdom of France, a struggle began between the papacy and the temporal rulers The principal contention was over INVESTITURE, but underlying it was violent disagreement as to the proper distribution of power, theories ranged from the belief that emperor or king, as ruler by divine right, should control church as well as state (a theory known also as caesaropapism) to the belief that the pope, as vicar of God on earth, should have the right of supervision over the state The centuries-long struggle was highlighted by such bitter clashes as those between Pope Gregory VII and Holy Roman Emperor Henry IV, between Pope Innocent III and Emperor Frederick II and King Philip II of France, and between Pope Boniface VIII and King Philip IV of France The conflict of GUELPHS AND GIBELLINES began as part of the imperial-papal struggle The nearest the papacy ever came to Erastianism was in the period during which the popes resided at Avignon, where they were virtually at the beck and call of the French kings After the return of the papacy

to Rome the popes generally maintained independence of temporal powers but on occasion were either influenced or coerced by king or emperor. The contest in England was perhaps no less bitter than on the Continent, but it was more sporadic. LANFRANC and ANSELM contended against King WILLIAM II, ST THOMAS À BECKET against Henry II. The REFORMATION introduced a great number of complicated factors into the relations of church and state. Different solutions have been found, ranging from the establishment of one particular church (as in England and the Scandinavian countries) to the total separation of church and state (as in the United States). The patterns of relation between church and state remain a living issue in today's society. See B D Hill, ed., *Church and State in the Middle Ages* (1970), Walter Ullmann, *The Growth of Papal Government in the Middle Ages* (3d ed 1970).

In the British Isles The most extreme form of Erastianism is seen in the Church of England (see ENGLAND, CHURCH OF), of which the monarch is supreme head. This situation derives from the strongly political character of the Protestant Reformation in England. It is notable that in the early history of religious dissent, the Puritans (see PURITANISM) did not wish to end the Established Church, their aim was rather to capture and control it. The church was not disestablished after the ENGLISH CIVIL WAR, Anglicanism, or Episcopalianism, was merely replaced by a Presbyterian establishment (although the latter was a dead letter from the beginning). After the Restoration (1660) of the monarchy, measures were taken against the Puritans that for the first time actually excluded them from the Church of England as NONCONFORMISTS. They and the Roman Catholics were the victims of religious and civil disabilities (gradually reduced) into the 19th cent. Although the state has taken less and less interest in supervising the Church of England, the connection is still very real, e.g., revisions of the BOOK OF COMMON PRAYER must be approved by Parliament, and appointments to all bishoprics are made by the monarch, acting on the advice of the prime minister. John CALVIN tended to a view directly opposed to that of the reforming English monarchs, in Geneva he set up a virtual theocracy with the state subordinate to the church. The Presbyterian churches have, therefore, maintained a stand for freedom of the church, and the Church of Scotland (see SCOTLAND, CHURCH OF) is much less under state control than is the Church of England. See T G Sanders, *Protestant Concepts of Church and State* (1964).

In the United States The Presbyterians in the British North American colonies helped in the struggle against the institution of an established church, particularly in Virginia. More important, however, was the broad principle of religious toleration forwarded by Roger WILLIAMS and others. This principle, befitting the heterogeneity of the colonies, ultimately triumphed against both the virtual theocracy of the New England Puritans and the conservative Established Church of the Southern colonists. The American idea of separation of church and state—complete noninterference on both sides—emerged. In the United States today there is a minimum of friction between church and state. The practical line of demarcation, however, continues to create problems, and any seeming transgression by either institution causes a tremendous outcry. Education has been a fertile field of controversy, debates have arisen over such questions as religious education in tax-supported schools and public aid to parochial schools. See study by A P Stokes and Leo Pfeffer (3 vol., 1950, rev ed., 1 vol., 1964), J F Wilson, ed., *Church and State in American History* (1965), Leo Pfeffer, *Church, State, and Freedom* (rev ed 1967). *On the Continent* In Europe, as in Latin America, the concept of separation of church and state is different from that in the United States, particularly in predominantly Roman Catholic countries. The wars of the Reformation produced, in the Peace of Augsburg (1555), a formula of *cuius regio, eius religio* [whose the region, his the religion], by which the ruling prince determined the religion of his territory. The compromise, curiously contrary to the idea of a universal Christian church, even more curiously corresponded to the principle practiced in Asia (e.g., the Buddhism of Asoka). It more or less prevailed in Europe after the Thirty Years War and the Peace of Westphalia (1648). Religion thus in a certain sense became a national affair, particularly in Protestant countries. The internationalism of the Roman Catholic Church, however, prevented nationalization in Catholic countries, despite such movements as GALICANISM in France. The church, when recognized as the state church, exercised consider-

able influence on the government of the state. More important, perhaps, was the fact that the church and its religious orders owned much property and exerted considerable economic influence. The CONCORDAT was used as a means of regulating the relation of church and state and delimiting the spheres of respective influence. Of the modern concordats perhaps the most famous was Napoleon I's Concordat of 1801. The opponents of clerical influence in the state, the anticlericals, in the 19th cent. agitated for the removal of clerical influence. To them the separation of church and state meant the ending of the establishment of the church and complete noninterference of the church in affairs of state but not noninterference of the state in such matters as church property and religious education. The clerical parties, on the other hand, fought to maintain establishment and property and (to some extent) the enforcement of ecclesiastical law by the civil arm. One of the most bitter of these contests took place in France, where ultimately the anticlericals triumphed, notably in the *Lois des associations* (1905), which in effect placed the church under subjection to the state. The contests were also bitter in Latin America, particularly in Mexico, where the church wielded an enormous influence. This struggle led under Plutarco E. Calles to the practical abolition of the church in Mexico and the harrying of priests in the 1920s, adjustments since that time have tended to an approximation of the complete noninterference rule prevalent in the United States. In Germany the relations of church and state reached a crucial point in the KULTURKAMPF of Otto von BISMARCK. Adolf Hitler, although he signed a concordat, undertook to reduce both Roman Catholic and Protestant churches to instruments of the National Socialist government. In Italy, the LATERAN TREATY, agreed to by Pius XI in 1929, ended the so-called Roman Question and secured recognition of the pope as a sovereign apart from the Italian government. In the Soviet Union, especially in its early period, the Communist party fostered much antireligious propaganda. A large percentage of the churches were closed. The Constitution of 1936, however, guaranteed freedom of religious worship, and the Russian Orthodox Church was subsequently revived. In 1944 two state-controlled councils were established to supervise religion, one regulates the affairs of the Russian Church, the other those of the other Christian denominations and of the Muslim, Jewish, and Buddhist groups. Similar systems of state control exist in many other Communist countries. See A H Dalton, *Church and State in France 1300-1907* (1907, repr 1972), E C Helmreich, *A Free Church in a Free State? The Catholic Church in Italy, Germany, France 1864-1914* (1964), J L Mechem, *Church and State in Latin America* (rev ed 1966), H H Stroup, *Church and State in Confrontation* (1967).

Churches of Christ, conservative body of Protestant Christians. Its founders were originally members of the DISCIPLES OF CHRIST who gradually withdrew from that body beginning c 1840. They objected to the use of musical instruments in the church and to the introduction of new titles and more power for the pastors. Each church is entirely self-governing. The Bible, especially the New Testament, is considered its complete and sufficient authority. The Churches of Christ, highly evangelistic, have emerged as one of the largest Christian denominations in the United States, especially strong in the South and the West. They were first listed as a separate group in the U.S. census of religious bodies of 1906. They claim a membership of c 2,400,000.

Churches of God in North America, evangelical and orthodox Christian bodies, Arminian in faith (see ARMINIANISM), with certain Baptist doctrines. Each local church has a council consisting of the pastor and of elders elected by the congregation. Baptism by immersion and the Lord's Supper, with the attendant ceremony of foot washing, are the principal ordinances. The Bible is the sole rule of faith and practice. The movement originated during revivals held by John Winebrenner, of Harrisburg, Pa. Opposition to his evangelistic methods led to his eventual exclusion in 1825 from the German Reformed Church. In 1830 the General Eldership of the Church of God was organized by the independent congregations of Winebrenner's founding. Later this became the General Eldership of the Churches of God in North America. Originally in Maryland and Pennsylvania, the churches are now found elsewhere in the United States.

Churchill, Charles, 1731-64, English poet and satirist. Upon his family's insistence he took religious

orders in 1756, but life as a London dandy suited him more, and he resigned his curacy. His first poem and perhaps his best work, *The Rosciad* (1761), a satire on the leading actresses and actors of the day, was an immediate success. His other works include *The Prophecy of Famine* (1763), a highly topical political satire, and *An Epistle to William Hogarth* (1763), attacking Hogarth for his heartless portrait of John Wilkes. See his works (ed. by Douglas Grant, 1956), study by W C Brown (1953).

Churchill, John: see MARLBOROUGH, JOHN CHURCHILL, 1ST DUKE OF.

Churchill, Lord Randolph Henry Spencer, 1849-95, English statesman, son of the 7th duke of Marlborough. A sincere Tory and a founder (1883) of the Primrose League, dedicated to upholding national institutions, he was nonetheless opposed to the traditional structure of Conservative rule. On entering (1874) the House of Commons, he began to attack the Conservative ministry with the incisive rhetoric for which he became famous. During William Gladstone's Liberal ministry (1880-85) he allied with other Tory independents to form the so-called "Fourth Party," which advocated a new conservatism, more democratic and more receptive to the need for social and political reforms. Acquainted with some of the problems of Ireland, having accompanied his father, the viceroy, there (1876-80), he was committed to continued union but recognized the extent of maladministration and was opposed to coercive measures. Churchill's appointment (1884) as chairman of the National Union of Conservative Associations and his advocacy of increased popular participation in the party organization, provoked a breach with the aristocratic leadership of Lord Salisbury, but Churchill's popularity necessitated Salisbury's acceptance of him into the new Tory government in 1885. He was secretary of state for India (1885-86) and chancellor of the exchequer and leader of the House of Commons (1886). His first budget implicitly criticized the entire foreign policy by its proposed drastic cuts in funds for the armed services. It was rejected by the cabinet and Churchill resigned. There was no effort at reconciliation and, unexpectedly, no popular outcry. Churchill continued as a member of Parliament but had no further active political role. In his last years he was crippled by illness. His American wife, Jennie Jerome, whom he married in 1874, was a leader in London society. She was the author of *Reminiscences* (1908) and two plays, *Borrowed Plumes* (1909) and *The Bill* (1912). She died in 1921. See biographies of Lord Randolph Churchill by their son, Winston S. Churchill (1906, repr 1952) and R R James (1959), Brian Roberts, *Churchills in Africa* (1970), biographies of Jennie Jerome by Anita Leslie (1969) and R G Martin (2 vol., 1969-71).

Churchill, Sarah: see MARLBOROUGH, SARAH CHURCHILL, DUCHESS OF.

Churchill, Winston, 1871-1947, American novelist, b. St. Louis, grad. Annapolis, 1894. He wrote several popular historical novels including *Richard Carvel* (1899), *The Crisis* (1901), and *The Crossing* (1904). His later books, such as *Coniston* (1906), *The Inside of the Cup* (1913), and *The Dwelling-Place of Light* (1917), reflected his interest in social, religious, and political problems.

Churchill, Sir Winston Leonard Spencer, 1874-1965, British statesman, soldier, and author, son of Lord Randolph Churchill. Educated at Harrow and Sandhurst, he became (1894) an officer in the 4th hussars. On leave in 1895 he saw his first military action in Cuba as a reporter for London's *Daily Graphic*. He served in India and in 1898 fought at Omdurman in the Sudan under Kitchener. Having resigned his commission, he was sent (1899) to cover the South African War by the *Morning Post*, and his accounts of his capture and imprisonment by the Boers and his escape raised him to the forefront of English journalists. He was elected to Parliament as a Conservative in 1900, but he subsequently switched to the Liberal party and was appointed undersecretary for the colonies in the cabinet of Sir Henry Campbell-Bannerman. He was (1908-10) president of the Board of Trade, and as home secretary (1910-11) originated important labor exchange and old age pension acts. Becoming first lord of the admiralty (1911), he presided over the naval expansion that preceded World War I. Discredited by the failure of the Dardanelles expedition, which he had championed, Churchill lost (1915) his admiralty post and served for a time on the front lines in France. Returning to office under Lloyd George, he served as minister of munitions (1917), secretary of state for war and for air (1918-21), and colonial secretary

(1921–22) In the last capacity he helped negotiate the treaty that set up the Irish Free State. After two defeats at the polls he returned to the House of Commons, once more as a Conservative, and held office (1924–29) as chancellor of the exchequer. His revaluation of the pound (1925) undoubtedly worsened the economic situation (as John Maynard Keynes pointed out) and thus was a factor leading to the general strike of 1926. He advocated aggressive action to end the strike and thus earned the lasting distrust of the labor movement. Out of office from 1929 to 1939, Churchill wrote and remained in the public eye with his support for Edward VIII in the abdication crisis of 1936 and with his vehement opposition to the Indian nationalist movement. He also issued unheeded warnings of the threat from Nazi Germany. When World War II broke out (Sept., 1939), Neville Chamberlain appointed him first lord of the admiralty. The following May, when Chamberlain was forced to resign, Churchill became prime minister. His stirring oratory, his energy, and his stubborn refusal to make peace until Adolf Hitler was crushed were crucial in rallying and maintaining British resistance to Germany during the grim years from 1940 to 1942. He met President Franklin Roosevelt at sea (see ATLANTIC CHARTER) before the entry of the United States into the war, twice addressed the U.S. Congress (Dec., 1941, May, 1942), twice went to Moscow (Aug., 1942, May, 1944), visited various battle fronts, and attended a long series of international conferences (see CASABLANCA CONFERENCE, QUEBEC CONFERENCE, CAIRO CONFERENCE, TEHRAN CONFERENCE, YALTA CONFERENCE, POTSDAM CONFERENCE). The British nation supported the vigorous program of his coalition cabinet until after the surrender of Germany. Then in July, 1945, Britain's desire for rapid social reform led to a Labour electoral victory, and Churchill became leader of the opposition. In 1946, on a visit to the United States, he made a controversial speech at Fulton, Mo., in which he warned of the expansive tendencies of the USSR (he had distrusted the Soviet government since its inception, when he was a leading advocate of Western intervention to overthrow it) and coined the expression "Iron Curtain." Churchill returned to power in 1951, and his government ended nationalization of the steel and auto industries but maintained most other socialist measures instituted by the Labour government. In 1953 he was honored with a knighthood and in the same year was awarded the Nobel Prize in Literature, not only for his writing but also for his oratory. After another Conservative electoral victory (1955), the aging prime minister retired from the leadership of his party, although he retained a seat in Parliament until 1964. Churchill was undoubtedly one of the greatest public figures of the 20th cent. Extraordinary vitality, imagination, and boldness characterized his whole career. His weaknesses, such as his opposition (except in the case of Ireland) to the expansion of colonial self-government, and his strengths, evidenced by his brilliant war leadership, sprang from the same source—the will to maintain Britain as a great power and a great democracy. His biographical and autobiographical works include *Lord Randolph Churchill* (1906), *My Early Life: A Roving Commission* (1930), and the study of his ancestor *Marlborough* (4 vol., 1933–38). *Blood, Sweat, and Tears* (1941) is one of a number of volumes of collected speeches. *World Crisis* (4 vol., 1923–29) is his account of World War I. *The Second World War* (6 vol., 1948–53) was followed by *A History of the English-speaking Peoples* (4 vol., 1956–58). See his complete speeches edited by R. R. James (8 vol., 1974), the multivolume study by his son Randolph Churchill and Martin Gilbert (1966–), biographies by Reginald Thompson (1963), Violet Bonham-Carter (1965), and Lord Moran (1966), A. J. P. Taylor and others, *Churchill Revised: A Critical Assessment* (1968), R. R. James, *Churchill: A Study in Failure, 1900–1939* (1970), Henry Pelling, *Churchill* (1974), R. W. Thompson, *Generalissimo Churchill* (1974).

Churchill. 1 River, c 600 mi (970 km) long, issuing as the Ashuanipi River from Ashuanipi Lake, SW Labrador, Canada, and flowing in an arc north, then southeast through a series of lakes to Churchill Falls and McLean Canyon. It then runs NE past Goose Bay and through Melville Lake and Hamilton Inlet to the Atlantic Ocean near Rigolet. The river has the greatest hydroelectric power potential of any river in North America, and Churchill Falls is the site of one of the world's largest hydroelectric power plants. Formerly known as the Hamilton River, it was renamed (1965) in honor of Sir Winston Churchill. 2 River, c 1,000 mi (1,610 km) long, issuing from Methy Lake, NW Sask., Canada, and flowing south-

east, east, and northeast across the lowlands of N Saskatchewan and N Manitoba to Hudson Bay at Churchill. It meets the Beaver River, its chief tributary, at Lac Île-à-la-Croix. Once a famous fur-trade route, it was discovered (1619) by Jens Munck, a Scandinavian sent by Christian IV, king of Denmark and Norway, to search for the Northwest Passage. In 1717 the Hudson's Bay Company established a trading post, later called Fort Prince of Wales, near the mouth of the river. A massive stone fort replaced the post in 1732 and served for many years as the British stronghold in the region. Captured (1782) by the French under Jean La Prouse, the fort was regained by the British and renamed Fort Churchill; its ruins are preserved in Fort Prince of Wales National Historic Park. Exploration of the upper reaches of the river was carried on by the Frobishers, Peter Pond, and Alexander Henry, all of the North West Company. A hydroelectric power station on the upper river supplies power for mining operations in Manitoba. The modern port of Churchill (1966 pop. 1,878), at the mouth of the river, is the western terminus (est. 1929) of the Hudson Bay Railway. There, in the short summer navigation season, grain from the Prairie Provinces is shipped abroad. See James Knight's journal, *The Founding of Churchill*, ed. by J. F. Kenney (1932), S. F. Olson, *The Lonely Land* (1961).

Churchill Downs, Ky. see LOUISVILLE

Churchill Falls, once spectacular waterfalls of the upper Churchill River, 245 ft (75 m) high, SW Labrador, Canada, known as Grand Falls until renamed (1965) in honor of Sir Winston Churchill. The falls were discovered (1839) by John McLean, a trader of the Hudson Bay Company, and were rediscovered in 1891, after having been generally forgotten because of their remote location. Four miles (6.4 km) above the falls, the Churchill River narrows to 200 ft (61 m) and negotiates a series of rapids before dropping into McLean Canyon, from which sheer cliffs rise several hundred feet on either side. The river flows 12 mi (19 km) through the canyon over a series of rapids. The total drop from the rapids above the main falls to the end of McLean Canyon is 1,038 ft (316 m). Because of their isolated location and harsh surroundings, the falls never became a tourist attraction. Churchill Falls is the site of the world's largest underground power plant, which has one of the largest hydroelectricity-generating capacities (5,225,000 kw) in the world. It was put into operation in June, 1972, and most of the power is sent to the Montreal vicinity. The falls are expected to dry up as the power plant approaches full operation, since greater amounts of water will be diverted to drive the nearby underground turbines.

church music. 1 Music intended for performance as part of services of worship. With few exceptions, music is essential to the ritual of every religion; the singing of prayers and portions of Scripture is part of Judaeo-Christian tradition, and a large number of melodies for specific parts of the liturgy were embodied in the medieval collection of church music called Gregorian chant. Additional musical settings of liturgy from later times to the present have added to the liturgical repertory. Such customary interpolations in the service as the motet, chorale, and hymn have achieved an integral place in many church services. This is also true of the Anglican anthem and was at one time true of the Lutheran cantata. See ANTHEM, ANTIPHON, CANTATA, CHANT, CHORALE, HYMN, MASS, MOTET, PLAINSONG. 2 Music intended for performance in a church outside of the regular worship service. This may include works taken from the repertory above as well as music of religious content, e.g., oratorios or sacred cantatas and instrumental music which is not specifically secular in nature. See CANTATA, CAROL, ORATORIO. See Erik Routley, *Twentieth-Century Church Music* (1964), E. H. Fellowes, *English Cathedral Music* (5th ed. 1969), Edward Dickinson, *Music in the History of the Western Church* (1902, repr. 1970).

Church of Christ, Scientist. see CHRISTIAN SCIENCE

Church of England. see ENGLAND, CHURCH OF

Church of God. see ADVENTISTS

Church of the Brethren. see BRETHREN

Church of the Nazarene, U.S. Protestant denomination established in 1908 through the union of the Church of the Nazarene, based in California, the Association of Pentecostal Churches, a New England group, and the Holiness Church of Christ whose origin was mainly in the Southwest. An evangelical group, the Nazarenes believe in entire sanctification, that is, that God "extirpates man's sinful nature" and removes the ability to sin after conver-

sion. Local churches are autonomous in matters of worship and evangelism, but a representative body maintains Sunday schools, Bible colleges, publishing enterprises, and other activities. See C. T. Corbeth, *Our Pioneer Nazarenes* (1958), and T. C. Smith, *Called unto Holiness* (1962).

Church Slavonic, language belonging to the South Slavic group of the Slavic subfamily of the Indo-European family of languages (see SLAVIC LANGUAGES). Although it is still the liturgical language of most branches of the Orthodox Eastern Church, Church Slavonic is extinct today as a spoken tongue. In its earliest period, from the 9th to the 11th cent. A.D., this language is variously termed Old Church Slavonic, Old Church Slavic, or Old Bulgarian. The year 1100 is the conventional dividing line between the ancestor, Old Church Slavonic, and its descendant, the later Church Slavonic, which flourished as the literary language of a number of Slavic peoples before the 18th cent. Old Church Slavonic was created in the 9th cent. by St. Cyril and St. Methodius for their translation of the Gospels and other religious texts. Scholars disagree as to which spoken Slavic dialect was chosen by the two saints as the basis for the language of their translations. In any case, because this dialect was inadequate for their purpose, they had to enrich and transform it, drawing on the vocabulary and syntax of Greek. Old Church Slavonic is the first Slavic language known to have been recorded in writing. Two alphabets were devised for it, the Glagolitic and the Cyrillic. Tradition makes St. Cyril the inventor of both, although this view has been questioned, and both alphabets are said to have been derived in part from the Greek. The earliest surviving documents in Old Church Slavonic date from the 10th and 11th cent. In time, as the South and East Slavic tongues influenced this literary language in their respective regions, three major forms of the later Church Slavonic arose: Bulgarian, Serbian, and Russian. For various historical reasons, Russian Church Slavonic eventually became the dominant form. The Western Slavs were not caught up in this development, since they came under the domination of the Roman Catholic Church after the 11th cent. At first employed for religious writings, Church Slavonic later came to be used in secular compositions as well. Today it is written in the Cyrillic alphabet. See Grigore Nandris, *Handbook of Old Church Slavonic* (1959), H. G. Lunt, *Old Church Slavonic Grammar* (4th ed. 1966).

Churchyard, Thomas, 1520?–1604, English author. In his youth he was page to Henry Howard, earl of Surrey. He spent most of his life as a professional soldier, serving in Scotland, Flanders, and France. His best-known work, the poem *Shore's Wife*, was contributed to the 1563 edition of the *Mirror for Magistrates*. Much of his work reflects his war experiences, most notably the narrative poems, *Wofull Warres in Flaunders* (1578) and *General Rehearsall of Warres* (1579).

churn: see BUTTER

Churriguera, José Benito (hōsā' bānē'tō chōōr-rēgā'ra), 1665–1725, Spanish architect and sculptor. A native of Madrid, he won fame for his design (1689) of the great catafalque for Queen Maria Luisa and for his ornate retables, characterized by twisted columns and elaborate leafwork. After 1690 he served as architect of the Cathedral of Salamanca, although he returned to Madrid after 1699. There he built a private palace (now the Academia de San Fernando) for the banker Don Juan de Goyeneche and also designed for him the urban complex Nuevo Baztan, including the glassworks, palace, and church. Associated with him were his brothers Joaquín and Alberto. Much of the architectural work of the Churriguera family has been subsequently altered. The term Churrigueraesque (chūr'ēgārēsk') describes the architecture of the late 17th and early 18th cent. in Spain, marked by extravagance of design and capricious use of Renaissance motives, the architects of the period used architectural forms to produce free and theatrical contrasts of line and surface with extreme richness and exuberance. The facade of the cathedral at Murcia illustrates the style's full expression. The Churrigueraesque manner was an important influence on the Spanish colonial work in the United States and in Mexico, where the mission buildings are frequently naive examples of that style, much modified by lack of trained workmen.

Churubusco, battle see CONTRERAS

Chusan Archipelago: see CHOU-SHAN ARCHIPELAGO, China

Chushan-rishathaim (kyōō'shān-rīshāthā'im), Mesopotamian king, conqueror and oppressor of Israel. Judges 3:8–10.

Chu Shih-chieh (jōō shū-jē), fl 1280-1303, Chinese mathematician. He contributed to the study of arithmetic and geometric SERIES and to that of finite differences. His two mathematical works, *Introduction to Mathematical Studies* and *Precious Mirror of the Four Elements*, were lost for a time in China and were recovered only in the 19th cent.

Chusovaya (chōōsavi'ə), river, c 460 mi (740 km) long, E European USSR. It rises in the central Urals and flows northwest through a major industrial region to join the Kama River at Perm, site of the Kama hydroelectric station. The Chusovaya is navigable c 250 mi (400 km).

Chu Ta (jōō tā), c 1626-c 1705, Chinese painter, also known as Pa-ta Shan-jen. He is said to have been a descendant of the imperial Ming family. Becoming a monk after the fall of the dynasty, he suffered from dumbness for a number of years and was known for his fits of madness and eccentric behavior. Despite his afflictions he became a founder of the school of painting known as Ch'ing. Most of his works are small-scale spontaneous studies of nature. His brush strokes, which seem free and careless at first glance, are filled with vitality and descriptive power. His works may be seen at the British Museum, Freer Gallery, Washington, D.C., and Museum of Fine Arts, Boston.

Chu Teh (jōō tū), 1886-, Chinese Communist soldier and leader. He was graduated (1911) from the Yunnan military academy and served in various positions with armies loyal to Sun Yat-sen. Stationed in Szechwan prov., he took up the life of a warlord from 1916 to 1920. In 1922 he went to Europe, where he met Chou En-lai and joined the Chinese Communist party. He studied political science at the Univ. of Göttingen but was expelled (1925) from Germany for radical activities. He returned to China by way of the USSR, and in 1927, when Chiang Kai-shek purged the Communists from the Kuomintang, Chu led an uprising in Nanchang and fled with troops to S Kiangsi prov. He joined forces there with Mao Tse-tung. When the Communist position became untenable, Chu led (1934-35) his section of the Red Army on the LONG MARCH to the northwest. In the Second Sino-Japanese War he was commander in chief of all Communist forces, a position he retained after the establishment (Sept., 1949) of the People's Republic of China in Peking. In 1954, Chu left his military position to serve (1954-59) as deputy chairman of the People's Republic of China. He later (1959-) became chairman of the National People's Congress, Communist China's major legislative body.

Chuvash Autonomous Soviet Socialist Republic (chōōvash'), autonomous republic (1970 pop 1,224,000, 7,066 sq mi (18,301 sq km), E central European USSR, in the middle Volga valley. CHEBOKSARY is the capital. The region, consisting largely of the Chuvash plateau, is wooded steppe. There are peat bogs and deposits of limestone, dolomite, clays, sands, and phosphorites. Grain, potatoes, flax, hemp, fruit, and sugar beets are grown, and livestock is raised. With about one third of the area in forests, both lumbering and woodworking are important occupations. Among the republic's other industries are oil and natural gas refining, metalworking, and food and flax processing. Chuvash make up some 70% of the population and Russians (who are mostly urban) around 25%; there are Mordvinian, Tatar, and Ukrainian minorities. The Chuvash, descendants of the medieval Bulgars, represent a mixture of Finnish and Mongolian peoples. They speak a Turkic language and adhere to Orthodox Christianity. Their wood carving is notable. Conquered by the Mongols in the 13th and 14th cent., the Chuvash came under Russian rule in 1552. The Chuvash Autonomous Oblast was established in 1920, it became an autonomous republic in 1925.

Chuzza (kyōō'zā), steward of Herod Antipas. Luke 8:3.

Chuzenji (chōōzān'jē), mountain lake, c 5 sq mi (13 sq km), Tochigi prefecture, central Honshu, Japan, in Nikko National Park. The lake is famed for its beauty. The Kegon waterfall (350 ft/107 m high) spills from the lake's outlet. On the shore stands the ancient Buddhist temple of Chuzenji. The lake is also called Satsu-no-umi [Sea of Happiness].

chyme (kīm), semiliquid substance found in the stomach and resulting from the partial digestion of food by the salivary enzyme amylase, the gastric enzyme pepsin, and hydrochloric acid. Secretion of hydrochloric acid by the stomach makes the chyme strongly acidic. The rhythmic muscular action of the stomach wall (peristalsis) moves the chyme into the duodenum, the first section of the small intestine,

where it stimulates the release of secretin, a hormone that increases the flow of pancreatic juice as well as bile and intestinal juices. Chyme also stimulates the release of cholecystokinin, a hormone that primarily increases the flow of bile but also increases the proportion of digestive enzymes in the pancreatic juice.

chymotrypsin (kī'mōtrīp'sīn), proteolytic, or protein-digesting, ENZYME active in the mammalian intestinal tract. It catalyzes the HYDROLYSIS of PROTEINS, degrading them into smaller molecules called PEPTIDES. Peptides are further split into free AMINO ACIDS. Chymotrypsin is produced in the pancreas as the inactive, or zymogen, form chymotrypsinogen. Along with other digestive enzymes of the pancreas, chymotrypsinogen is carried in the PANCREATIC JUICE through the pancreatic duct into the duodenum. There chymotrypsinogen is activated by another enzyme, trypsin, and by molecules of active chymotrypsin. Partly because it was one of the first enzymes available commercially in crystalline form, chymotrypsin has been studied extensively.

Cialdini, Enrico (ānrē'kō chaldē'nē), 1811-92, Italian general and diplomat. During the wars leading to Italian unification he fought in Sardinian service in the campaigns of 1848-49 and 1859 against Austria and, invading the Papal States in 1860, won at Castelfidardo. He led the siege of Gaeta and, after the surrender of Francis II of Naples in 1861, was made duke of Gaeta. Cialdini was (1861-62) civil and military commissioner of the former kingdom of Naples and became (1864) a senator. He succeeded (1866) La Marmora as commander in the Austro-Prussian War. He was (1876-81) ambassador to France until his retirement.

C.I.A.M. (Congres internationaux d'architecture moderne) Founded in 1928 by Helene de Mandrot, Sigfried GIEDION, and LE CORBUSIER, C.I.A.M. sought to divert architecture from academic preoccupations. The organization was the major instrument for propagating avant-garde ideas in architecture and town planning during the periods from 1930 to 1934 and between 1950 and 1955. The early congresses stressed rigid functional zoning and a single type of urban housing, at subsequent meetings members reacted against inflexible and mechanical concepts of orderly planning. Internal conflict led to the group's eventual collapse after the Dubrovnik congress of 1956.

Ciano, Galeazzo (galāat'sō chā'nō), 1903-44, Italian foreign minister and Fascist leader, son of Admiral Costanzo Ciano, conte di Cortellazzo. He entered on a diplomatic career, married (1930) Mussolini's daughter Edda, and became foreign minister in 1936. He helped to create the Rome-Berlin Axis and the military pact with Germany and was in part responsible for the attack on Greece in 1940. In 1943 he was dismissed as foreign minister and made ambassador to the Vatican. At the meeting of the Fascist grand council that preceded Mussolini's dismissal (1943) by the king, Ciano voted against the Duce. He was later arrested by the Germans, transferred to the Fascist authorities in N Italy, and executed for high treason. See his diaries (1946).

Ciardi, John (chēard'ē), 1916-, American poet, b Boston, grad Tufts College (B.A., 1938), Univ. of Michigan (M.A., 1939). His poetry, noted for its wit and perception, includes *Homeward to America* (1940), *Live Another Day* (1949), *I Marry You* (1958), *In the Stoneworks* (1961), and *Lives of X* (1971). He has also written *How Does A Poem Mean?* (1960), verse translations of Dante's *Inferno* (1954) and *Purgatorio* (1970), and *Dialogue With an Audience* (1963), reprints of his pieces for *The Saturday Review*, with readers' replies.

Cibber, Colley, 1671-1757, English dramatist and actor-manager. Joining the company at the Theatre Royal in 1690, Cibber became successful as a comedian, playing the fops of Restoration comedy. His first play, *Love's Last Shift* (1696), is a landmark in the history of the theater and is regarded as the first sentimental comedy. Of his 30 dramas, *She Wou'd and She Wou'd Not* (1702), *The Careless Husband* (1704), and *The Nonjuror* (1717) are the most notable. From 1710 to 1740 he was the manager of Drury Lane. He was appointed poet laureate in 1730. An extremely unpopular, social-climbing, and insolent man, he was ridiculed by the critics and bitterly attacked by Pope, who made him the hero of the final version of *The Dunciad*. Cibber's *Apology* (1740) is a mine of information about the theater of this period. See R. H. Barker, *Mr Cibber of Drury Lane* (1939), Leonard Ashley, *Colley Cibber* (1965). Both his son, Theophilus Cibber, 1703-58, and his daughter, Charlotte (Cibber) Clarke, d 1760?, went on the

stage with some success, earning wild and eccentric reputations in the tradition of the family. The wife of Theophilus, Susannah Maria (Arne) Cibber, 1714-66, sister of the composer Thomas Augustine Arne, sang in opera and appeared with great success in tragic roles.

Cibber or Cibert, Caius Gabriel (both sīb'ər), 1630-1700, Danish-English sculptor. Cibber was appointed carver to the king's closet for his services to William III of England. He worked for a time for Sir Christopher Wren. Cibber is best known for his statues *Melancholy* and *Raving Madness*, both in London. He also executed sculptures (destroyed) for the Royal Exchange and other works now at Chatsworth.

Cibola see MARCOS DE NIZA, CORONADO, FRANCISCO VÁSQUEZ DE

cicada (sīkā'dā), large, noise-producing INSECT of the order Homoptera, with a stout body, a wide, blunt head, protruding eyes, and two pairs of membranous wings. The front wings, which are longer than the rear pair, extend beyond the insect's abdomen. Male cicadas have platelike membranes on the thorax, which they vibrate like drum heads, producing a loud, shrill sound. Females of most species are mute. Characteristic songs are produced by members of different species, each also produces a noise indicating irritation, and some have special courtship songs. There are about 2,000 cicada species distributed throughout the tropical and temperate regions of the world, they are most numerous in the Orient and the Australian region. There are about 180 species in North America, adults of these species range from approximately 1 to 2 in (2.5-5 cm) in length. The periodical cicadas (*Megacicada* species), found in the eastern half of the continent, have the longest known life cycles of any insect. Because of their periodic appearance they are often called locusts, although they are not related to true locusts. Their life cycle takes 17 years in northern species (the so-called 17-year locusts) and 13 years in southern species, the two types overlap in parts of the United States. The female deposits her eggs in slits that she cuts in young twigs. In about six weeks the wingless, scaly larvae, or nymphs, drop from the tree and burrow into the ground, where they remain for 13 or 17 years, feeding on juices sucked from roots. The nymphs molt periodically as they grow, finally the full-grown nymphs emerge at night, climb tree trunks and fences, and shed their last larval skin. The winged adults, which generally emerge together in large numbers, live for about one week. Different broods mature at regular intervals, so that at least one colony is conspicuous in some part of the United States each year, and even in a given locality a brood may appear every few years. Other North American cicadas (*Tibicen* species and others) are known as dog-day cicadas, or harvest flies, because the adults appear in late summer. Their life cycle is thought to be similar to that of the periodical cicadas, but in most species it is completed in two years. Cicada larvae do little damage, but when adults appear in large numbers their egg-laying may damage young trees. Cicadas are sometimes kept for their song in the Orient, as they were in ancient Greece. They are classified in the phylum ARTHROPODA, class Insecta, order Homoptera, family Cicadidae.

cicely: see SWEET CICELY

Cicero (Marcus Tullius Cicero) (sīs'ərō) or **Tully**, 106 B.C.-43 B.C., greatest Roman orator, famous also as a politician and a philosopher. He studied law and philosophy at Rome, Athens, and Rhodes. His political posts included those of curule aedile (69 B.C.), praetor (66 B.C.), and consul (63 B.C.). He was always a member of the senatorial party, and as party leader he successfully prosecuted CATILINE. Later he was unable to prove that he had legal sanction to execute five members of Catiline's group, and on the charge of illegality he was exiled (58 B.C.) by his personal enemy, CLODIUS. He was recalled by Pompey the following year and was hailed as a hero. Strongly opposed to Julius CAESAR, Cicero was a leader of the party that caused him to convene (56 B.C.) the triumvirate at Lucca. In 51 B.C. he was governor of Cilicia, and on his return he joined Pompey against Caesar. After the civil war Caesar forgave Cicero, and he lived in honor at Rome under the dictatorship. He did not take part in the assassination of Caesar, but he applauded it. He and Marc ANTONY were bitter enemies, and Antony attacked Cicero in the senate. Cicero replied in the *First Philippic* and the *Second Philippic*, in which he sought to defend the republic. When Octavian (later AUGUSTUS) took Rome, he allowed Antony to put Cicero's name among those condemned, and Cicero

was put to death on Dec 7, 43 B.C. To the modern reader probably the most interesting of Cicero's voluminous writings are his letters to Atticus, his best friend, to Quintus, his brother, to Brutus, the conspirator, to Caelius, another close friend, and to miscellaneous persons. They reveal more of Roman life and political manners than does any other source. His philosophical works, which are generally stoical, include *De amicitia* [on friendship], *De officiis* [on duty], *De senectute* [on old age] or *Cato Major*, *De finibus* [on ends], a dialogue on the good, *The Tusculan Disputations*, and *De natura deorum* [on the nature of the gods], an attack on various philosophies, especially Epicureanism. His rhetorical works are of less general interest. *De oratore*, addressed to his brother, is a kind of handbook for the young orator. *Brutus* is an account of Roman oratory, and *Orator* is a discussion of the ideal orator. The most widely read of Cicero's works are his orations, which have become the standard of Latin. The most famous of these are the *Orationes against Catiline*, on the occasion of the conspiracy, and the *Philippics* against Antony. Other famous speeches are *Against Verres*, *On the Manilian Law*, *On Behalf of Archias*, *On Behalf of Balbus*, and *On Behalf of Roscius*. Cicero's literary and oratorical style is of the greatest purity, and his reputation as the unsurpassed master of Latin prose has never waned. See Loeb ed. of his works (2B vol., 1912-58), his letters (tr 1969), studies by T. A. Dorey (1965), David Stockton (1971), and D. R. S. Bailey (1972).

Cicero, Quintus Tullius, c 102 B.C.-43 B.C., Roman general, brother of Cicero the orator. After service in Asia he accompanied Julius Caesar to Britain (55 B.C.), wintered in Gaul (54 B.C.), where he fought off the attacks of Ambiorix, and went to Cilicia (51 B.C.) as legate with his brother. He fought for Pompey in the battle of Pharsala. He was proscribed and killed with his brother.

Cicero, town (1970 pop 67,058), Cook co., NE Ill., an industrial and residential suburb adjoining Chicago, inc 1867.

cichlid (sīk'lid), common name for members of the family Cichlidae, several hundred species of spiny-finned freshwater fishes of moderate or small size, native to Africa, S Asia, Mexico, and Central and South America. Cichlids are found in tropical waters, where they occupy the same ecological niche as their colder water relatives, the SUNFISHES. The larger species are food fish of some importance, and small species are popular as aquarium fish. Cichlids are noted for the care they give their young; the eggs are laid in a basin hollowed in the sand and, until they hatch, are stored in the mouth of either the male or the female, depending on the species. Cichlids are classified in the phylum CHORDATA, subphylum Vertebrata, class Osteichthyes, order Perciformes, family Cichlidae.

Cid or **Cid Campeador** (sīd, Span thēth kāmpā-āthōr') [Span, =lord conqueror], d 1099, Spanish soldier and national hero, whose real name was Rodrigo (or Ruy) Díaz de Vivar. Under Ferdinand I and Sancho II of Castile he distinguished himself while fighting against the Moors, but Alfonso VI distrusted him and banished (1081) him from Castile. Entering the service of the Moorish ruler of Saragossa (a course not unusual among Castilian nobles of his time, in accord with the rights of a free lord in feudal society), he fought against Moors and Christians alike. In 1094 he conquered the kingdom of Valencia, which he ruled until his death. His widow Jimena surrendered the kingdom to the Almoravids in 1102. The Cid's exploits have been much romanticized. *The Song of the Cid*, an anonymous Old Spanish work of the 12th cent., has served as basis for numerous treatments, notably the plays by Guillen de Castro y Bellvis and Pierre Corneille. See Ramon Menendez Pidal, *The Cid and His Spain* (2 vol., 1929, tr 1934, repr 1971), Stephen Clissold, *In Search of the Cid* (1965).

cider, in Europe, fermented juice of apples, in the United States, unfermented apple juice, unless allowed to ferment, in which case it is known as hard cider. Selected apples are grated in a mill, and the juice is expressed and, for hard cider, fermented and filtered. The commercial product is usually pasteurized or treated with preservatives and is frequently blended to balance the chief constituents, sugar, malic acid, and tannin. In France cider is made principally in Normandy and Brittany. It is at its best after a year or two in cask. English cider from the southern and western counties is noted and rivals beer as a popular alcoholic beverage. Cider is popular also in Germany, Spain, and Switzerland. Perry is a similar beverage made from pears.

Ciego de Ávila (syā'gō dā ā'vēla), city (1970 pop 60,910), Camagüey prov., central Cuba. An important processing center in a sugarcane region, it is also Cuba's leading producer of pineapples and oranges. Cattle raising is another major industry. The city has excellent road and rail communications. Ciego de Ávila was founded in the late 16th cent.

Cienfuegos (syānfwā'gōs), city (1970 pop 85,248), Las Villas prov., central Cuba, a port on the Caribbean Sea. It is the marketing and processing center of a region producing sugarcane, tobacco, coffee, and rice, and it has rum distilleries. Sugar is the chief export. Established in 1819 by French emigrants from Louisiana and named for one of the original founders, Cienfuegos was destroyed by a tropical storm in 1825 and later rebuilt. In 1957 members of its naval academy staged an unsuccessful revolt against Cuban dictator Fulgencio Batista. Reported Soviet efforts to build a submarine base at the Cienfuegos harbor in 1970 ceased after the U.S. government expressed strong opposition.

Cierva, Juan de la (hwan dā la thyā'vā), 1895-1936, Spanish aeronautical engineer, inventor of a rotary-wing aircraft called an autogiro. He flew his first autogiro in 1923 and crossed the English Channel in an improved model in 1928. See his *Wings of Tomorrow* (1931).

Cieszyn: see TESCHEN

Cieza de León, Pedro (pā'thōr dā thēā'tha dā lāōn'), 1518?-1560, Spanish soldier and explorer in South America. His *Chronicle of Peru* is one of the most richly detailed accounts of the Spanish conquest. See *El Inca*, abr Eng tr (1959) by Harriet de Onís.

cigar and cigarette, tubular rolls of TOBACCO designed for smoking. Cigars consist of filler leaves held together by binder leaves and covered with a wrapper leaf, which is rolled spirally around the binder. Cigarettes consist of finely shredded tobacco enclosed in a paper wrapper, and they often have a filter tip at the end; they are usually shorter and narrower than cigars. In pre-Columbian times, Indians of the West Indies and in parts of Central and South America smoked tobacco and other plant products in the form of rolls similar to the modern cigar or cigarette. Spanish travelers to the Americas introduced the cigar to Spain by the late 1500s, whence it spread to other European countries. Spanish words such as *claro*, *colorado*, *maduro*, *panetela*, and *perfecto* are used to describe the color, shape, and quality of cigars. Havana cigars made of fine Cuban leaf are highly esteemed. The United States and most European countries have large cigar industries. The stogie, a slender roll usually made without binder, is named for Conestoga, Pa., where a cigar factory was established in the early 1800s. The cheroot, originally made in India and Manila, is of uniform thickness with both ends clipped. Cigars, except for very fine grades, have been made by machine since about 1902, cigarettes, since the last quarter of the 19th cent. The cigarette industry has increased phenomenally in the 20th cent., especially since World War I. The composition of cigarettes in the United States has changed, at first, imported Turkish tobacco was favored, then, the tobacco of Virginia. Since World War I, the most important U.S. commercial blends have consisted of the following types of tobacco: the flue-cured type (the most widely used), grown in Virginia, the Carolinas, Georgia, and Florida; Burley and Maryland, both air-cured types, and Turkish tobacco, added for its desired aroma and low nicotine content. Tobacco smoke contains nicotine, carbon dioxide, carbon monoxide, ammonia, aldehydes, and a number of organic tarry compounds. The use of filter-tipped cigarettes increased in the United States after medical reports in the early 1950s suggested a link between lung cancer and cigarette smoking. In 1964 the U.S. Surgeon General issued a report that condemned cigarettes as causing cancer and several respiratory diseases. Despite this report and other deterrents such as antismoking campaigns, a ban on television advertising, and warning labels on packages, cigarette consumption has continued to increase. By the early 1970s, Americans consumed about 550 billion cigarettes a year. See Zino Davidoff and Gilles Lambert, *The Connoisseur's Book of the Cigar* (tr 1969), Susan Wagner, *Cigarette Country* (1971).

Gignani, Carlo, Conte (kar'lō kōn'tā chēnya'nē), 1628-1719, Italian historical painter of the Bolognese school. He was a pupil of Francesco Albani. The influence of Guido Reni, Carracci, and particularly of Correggio is apparent in much of his fresco work. His notable paintings include *The Entry of Paul III*

into Bologna (painted for the public palace at Bologna), *Pera and Simon* (Vienna), *The Power of Love* (dual palace, Parma), and his masterpiece, the colossal *Assumption of the Virgin*, in the dome of the cathedral at Forlì, on which he worked for 20 years.

Cilicia (sīlīsh'ā), ancient region of SE Asia Minor, in present S Turkey, between the Mediterranean and the Taurus range. It included a high and barren plateau, Cilicia Trachia or Cilicia Tracheia, and a fertile plain, Cilicia Pedias. The area was under the domination of the Assyrian Empire before it became part of the Persian Empire. Greeks early settled on the coast, and Cilicia was hellenized to a great extent. In the Hellenistic period the region was disputed by the Seleucid kings of Syria and the Ptolemaic kings of Egypt. Tarsus and Seleucia (not to be confused with the port of Antioch) were the principal cities. They flourished after the region became part of the Roman Empire (a portion in 102 B.C., but most of it only after Pompey's campaign against the pirates there in 67 B.C.). Later Cilicia was included in the Byzantine Empire and in the 8th cent. was invaded by the Arabs. In 1080, Prince Reuben set up an Armenian state there, which became a kingdom in 1098 and is generally called Little Armenia. The Armenians cooperated with the rulers of the neighboring Latin Kingdom of Jerusalem. They maintained their independence against the Turks until 1375, when the Mamelukes conquered them. (For the later history of the region, see ARMENIA.) Cilicia is mentioned in the Bible (Acts 6, 9, 21, 39, 22, 3, Gal 1, 21). See Mary Gough, *Travel into Yesterday* (1954).

Cilician Gates (sīlīsh'ān), Turk *Kölek Boğazi*, mountain pass, S Turkey, leading across the Taurus range. Known to the ancients as the Pylae Ciliciae, it follows the gorge of the Gökoluk River. The gates have served for centuries as a natural highway linking Anatolia with the Mediterranean coast.

Cima, Giovanni Battista (jōvan'nē bat-tē'stā chē'mā), c 1459-c 1517, Venetian painter, called Cima da Conegliano. Influenced by Giovanni Bellini and Antonello da Messina, he created many fine altarpieces in the best tradition of Venetian coloring and landscape. Many of his paintings have remained in Venice. There are notable altarpieces of the *Madonna and Saints* in Vicenza and in Conegliano and one of *St. Peter, Martyr* in Milan. In the United States he is represented by numerous works, including a *Madonna and Saints* and *St. Jerome* (National Gall. of Art, Washington, D.C.), two paintings of the *Madonna* (Walters Art Gall., Baltimore), and two Bacchic scenes (Philadelphia Mus.).

Cimabue, Giovanni (jōvan'nē chēmabōō'ā), d c 1302, Florentine painter, whose real name was Cenni di Pepo or Peppi. The works with which his name is associated constitute a transition in painting from the strictly formalized Byzantine style, hitherto prevalent in Italy, to the freer expression of the 14th cent. Cimabue retained most of the old conventions but introduced greater naturalism in his treatment of figures. He was master of mosaics at the cathedral in Pisa, where a *St. John* is attributed to him. Other attributions include a fresco, *Madonna with Saints and Angels* (lower church of St. Francis in Assisi), frescoes representing the four evangelists, scenes from the lives of the Virgin and St. Peter, scenes from the Apocalypse, and the Crucifixion (all in the upper church of St. Francis in Assisi), and *Madonna Enthroned* (Uffizi). A major work credited to him, a *Crucifixion* (Santa Croce), was badly damaged in the flood that ravaged Florence in 1966. Cimabue is said to have been the teacher of Giotto. See studies by Eugenio Battisti (1966) and Alfred Nicholson (1932, repr 1972).

Cimarosa, Domenico (dōmē'nēkō chēmārō'za), 1749-1801, Italian operatic composer. He wrote almost 80 operas, which were successfully produced in Rome, Naples, Vienna, and St. Petersburg. His works, of which *Il matrimonio segreto* (1792) is the best known, are good examples of pure opera buffa. He also wrote serious operas and church and instrumental music notable for its clear and Mozartean effect.

Cimarron, river, 698 mi (1,123 km) long, rising in NE N Mex., and flowing generally E to the Arkansas River, W of Tulsa, Okla. The river winds through a thinly populated area where cattle and wheat are raised. Sections of its bed are dry during most of the year.

Cimarron, Territory of, now the Panhandle of Okla. It was settled in the early 1800s by cattle ranchers, many of them squatters. To protect their claims they attempted, in 1887, to create a separate territorial government at Beaver, Okla. After subse-

quent efforts toward this end failed in the U S Congress, Cimarron became part of the Oklahoma Territory in 1890

Cimber (Lucius Tilius Cimber), d after 44 B C, one of the assassins of Julius Caesar. He presented the petition that was used as a pretext to approach Caesar and held his hands or his toga as CASCA stabbed

Cimbri: see GERMAN

Cimmerians (sīm'ērēanz), ancient people of S Russia of whom little is actually known. They are mentioned in Homer, but they emerge into history only in the 8th cent B C when they were driven by the Scythians from their former home in Crimea and came to the region around Lake Van (in present-day E Turkey). Defeated (634 B C) by the Scythians, the Cimmerians swept across Asia Minor, plundering Lydia and breaking the power of Phrygia. The biblical GOMER may be the eponym of the Cimmerians, and they are mentioned in the inscriptions of the Assyrians, with whom they warred.

Cimon (sīm'ōn), d 449 B C, Athenian general and statesman, son of Miltiades. He fought at Salamis and shared command (with Aristides) of the fleet sent to rescue the Asiatic Greek cities from Persian domination. From 478 to 477 he helped Aristides form the Delian League. He conquered Skiros, subdued Asia Minor, and in 468 defeated the Persian sea and land forces on the Eurymedon River. On the death of Aristides he led the Athenian aristocratic and pro-Spartan party and was its chief statesman in succession to Themistocles. He was later sent into exile, from which he was recalled in 451 to conclude a peace with Sparta. He died while besieging Cytium, in Cyprus.

Cimpina (kūm'pēna), town (1970 est pop 25,000), S central Rumania, in Walachia. It is a major petroleum center, chemicals and oil-drilling equipment are also produced. The city is connected by oil pipeline with Ploiesti and with the port of Constanta on the Black Sea.

Cimpulung (kəmp'oolōng'), town (1970 est pop 27,000), S central Rumania, in Walachia, on the southern slope of the Transylvanian Alps. A commercial center, it has industries producing textiles and paper. It is also a summer resort. Founded in the 12th cent by German colonists, Cimpulung became the capital of Walachia in the 13th cent. The town has a 13th-century monastery with a tower and a 14th-century church (restored 17th-18th cent).

cinchona (sīngk'ōnə) or **chinchona** (chīngk'ōnə), name for species of the genus *Cinchona*, evergreen trees of the Madder family native to the Andean highlands from Bolivia to Colombia and also to some mountainous regions of Panama and Costa Rica. The trees are now cultivated elsewhere for the commercially valuable "Peruvian bark," the source of QUININE. Several species yield quinine and several other antimalarial alkaloids. The trees were named in honor of the countess of Chinchon who, legend says, was cured of a fever in 1638 by a preparation of the bark. At her instigation the bark was collected for malaria sufferers and later exported to Spain. Indians, however, had long used it for medicinal purposes. It is sometimes called Jesuits' bark because of the part the Jesuits played in its dispersal. So successful were the Dutch and English in transplanting cinchona to Java and India that until World War II these countries, especially Java, grew practically the entire commercial supply. The bark of the uprooted tree is beaten loose, peeled by hand, and dried quickly to prevent the loss of alkaloids. Final extraction is conducted in factories, chiefly in the United States or Europe. Cinchona is classified in the division PINOPHYTA, class Pinopsida. See M. L. Duran-Reynals, *The Fever Bark Tree* (1946), P. E. Thompson and L. M. Werbel, *Antimalarial Agents* (1972).

Cincinnati (sīnsanāt'ē, -nāt'ē), city (1970 pop 452,524), seat of Hamilton co, extreme SW Ohio, on the Ohio River opposite Covington, Ky, inc as a city 1819. The third largest city in the state, Cincinnati is the industrial, commercial, and cultural center for an extensive area including numerous suburbs in Ohio and Kentucky. It is also a port of entry with a large river front and good transportation facilities. Machine tools, transportation equipment (automobiles and parts, truck bodies, aircraft engines), radar equipment, electrical machinery, metal goods, and cosmetics are the chief manufactures. Cincinnati was founded in 1788 as Losantville, in 1790 Arthur St. Clair, the first governor of the Northwest Territory, renamed it Cincinnati for the Society of Cincinnati, a group of Revolutionary War officers. It was the first seat of the legislature of the Northwest Territory and a busy transshipping center for early settlers. After the opening of the Ohio and Erie

Canal (c 1832), the city developed as a shipping point for farm products and meat. A crime wave, the result of corrupt politics and lax law enforcement, provoked the Cincinnati riot in March, 1884, and G. B. Cox, a political boss, gained firm control of the city. A reform movement culminated in the establishment (1924) of the city-manager type of government (notable managers were Clarence A. Dykstra and Clarence O. Sherrill). The Univ. of Cincinnati, Edgecliff College, Xavier Univ., and several other educational institutions are in the city. William Howard Taft and his son Robert A. Taft were born in Cincinnati, where the Taft family has long been prominent. Cincinnati's landmarks are the Taft Museum, Eden Park, with the Cincinnati Art Museum, a museum of natural history, and zoological gardens. The city also has a symphony orchestra, a music conservatory, an art academy, and a large public library. Cincinnati suffered disastrous floods in 1884 and 1937, but Federal and state flood-control projects have now greatly reduced the danger.

Cincinnati, Society of the [Lat pl. of CININNATUS], organization formed (1783) by officers of the Continental Army just before their disbanding after the American Revolution. The organization, with a constitution drafted by Gen. Henry Knox, was founded for fraternal, patriotic, and allegedly nonpolitical purposes. George Washington was made president of the national society, and auxiliary state societies were organized. Membership was limited to officers of the Continental Army, certain officers of the French army that assisted the Continentals, and the eldest male descendants of both. The society provoked much opposition among the zealous Republicans of the time, who attacked it as the beginning of an aristocratic military nobility. The Tammany societies of New York, Philadelphia, and other cities were founded partly in opposition to it. Beginning in 1893 a successful revival of many of the defunct state organizations was made, and the society is still active as a patriotic service organization. It has about 2,500 members in one French and 13 U S branches. See W. S. Thomas, *The Society of the Cincinnati, 1783-1935* (1935), E. E. Hume, ed., *General Washington's Correspondence concerning the Society of the Cincinnati* (1941).

Cincinnati, University of, at Cincinnati, coeducational, founded 1819 as Cincinnati College, incorporated 1870 as a municipal university, opened 1873, affiliated with the state university system 1968. The College-Conservatory of Music merged with the university in 1962 and includes the former College of Music (est 1878) and Conservatory of Music (est 1867). The Art Academy of Cincinnati and Hebrew Union College-Jewish Institute of Religion are affiliated schools.

Cincinnati Art Museum, Cincinnati, Ohio. Founded in 1877 by the Women's Art Museum Association, the museum opened in 1886. Its collections contain examples spanning 3,000 years of artistic production. Works from Mesopotamia and medieval Europe are featured. The museum's European paintings include works by El Greco, Murillo, Mantegna, Tiepolo, and Titian. The museum also houses outstanding collections of oriental art and musical instruments.

Cininnatus (Lucius or Titus Quinctius Cincinnatus) (sīnsināt'as, -nāt'as), fl 5th cent B C, Roman patriot. He was consul in 460 B C and dictator twice (458 and 439). According to tradition, in his first dictatorship he came from his farm to defeat the Aequi and Volscians, who were threatening the city from the east and southeast. He returned from battle, resigned his dictatorship, and went home to his farm. In 439 he came out of retirement to put down the plebeians. The separation of legend from history in Cincinnatus' story is impossible.

Cinderella, heroine of one of the most famous folktales in the world. She is rescued from a life of drudgery by her fairy godmother and eventually marries a handsome prince. The story (dating back to 9th-century China) exists in 500 versions in Europe alone; it was included by both Charles Perrault and the Grimm brothers in their collections of tales.

cinema: see MOTION PICTURES

cinematography: see MOTION PICTURE PHOTOGRAPHY

cineraria (sīn'arār'ēa) see GROUNDSEL

Cinna (Lucius Cornelius Cinna) (sīn'a), d 84 B C, Roman politician, consul (87 B C-84 B C), and leader of the popular party. Shortly after Cinna's first election, SULLA left Rome to fight against Mithradates VI of Pontus, having received from Cinna and Cinna's colleague Gnaeus Octavius a promise to maintain Sulla's reforms. When Sulla was safely out

of Italy, Cinna revived certain anti-Sullan proposals, the conservatives opposed Cinna and expelled him from the city. Cinna promptly collected Roman soldiers and Italians in S Italy, called MARIUS from Africa, and returned to Rome. Cinna and Marius declared themselves consuls, and a great slaughter of Sulla's followers took place. After Marius' death Cinna remained consul. When Sulla defeated Mithradates and set out for Rome, Cinna and Cneius Papius CARBO raised an army to oppose him, but before the civil war began, Cinna was murdered in a mutiny at Brundisium. His daughter Cornelia was the first wife of Julius Caesar. See Harold Bennett, *Cinna and His Times* (1923). Cinna's son Lucius Cornelius Cinna, fl 44 B C, was a praetor who expressed approval of Caesar's assassination.

Cinna (Caius Helvius Cinna), d 44 B C, Roman tribune. At the funeral of Julius Caesar the mob mistook him for Lucius Cornelius Cinna and killed him. He was probably the minor poet Cinna, a friend of Catullus and author of the epic *Smyrna* (of which fragments survive).

cinnabar (sīn'ābar), mineral, the sulfide of mercury, HgS. Deep red in color, it is used as a pigment (see VERMILION), but principally it is a source of the metal mercury. It is mined in Spain, Italy, and in the United States in California. The mercury is obtained from it by roasting, the sulfur combining with oxygen and passing off as sulfur dioxide.

cinnamon, name for trees and shrubs of the genus *Cinnamomum* of the family Lauraceae (LAUREL family). Cinnamon spice comes chiefly from the Ceylon cinnamon (*C. zeylanicum*), now cultivated in several tropical regions. It is obtained by drying the central part of the bark and is marketed as stick cinnamon or in powdered form. The waste and other parts are used for oil of cinnamon, a medicine and flavoring. Cassia, cassia bark, or Chinese cinnamon (*C. cassia*) was used in China long before true cinnamon but is now considered an inferior substitute. Cinnamon and cassia (often confused) have been favorite spices since biblical times, used also as perfume and incense. Cinnamon trade successively passed (with political control of Ceylon, now Sri Lanka) to the Portuguese, Dutch, and British. *C. camphora* is the source of CAMPHOR. Cinnamon is classified in the division MAGNOLIOPHYTA, class Magnoliopsida, order Magnoliales, family Lauraceae.

cinnamon vine: see YAM

Cinneroth (sīn'ārōth) see CHINNERETH 2

Cino da Pistoia (chē'nō da pēstō'ya), 1270-1337?, Italian jurist and poet, whose full name was Guittorino dei Sinibaldi, or Sighibuldi. A friend of Dante and Petrarch, he wrote treatises on jurisprudence as well as numerous lyrics and sonnets dealing with the psychology of love. His verse, musical and tender, foreshadows the work of Petrarch. For translations, see D. G. Rossetti, *The Early Italian Poets* (1904 ed.).

Cinq Mars, Henri Coeffier Ruzé d'Effiat, marquis de (āNré' kōēfyā' ruzā' dēfyā' mār'kē' dā sāN-mar'), 1620-42, French conspirator. Introduced at court by Cardinal Richelieu at an early age, Cinq Mars rapidly rose in King Louis XIII's favor and was made master of the horse. He joined in a conspiracy with Frederic Maurice de BOUTILLON and Gaston d'ORLÉANS against the cardinal. The discovery of a secret treaty they had signed with Spain led to their arrest, and Cinq Mars and his friend, François de Thou, were executed. The conspiracy formed the basis of Alfred de Vigny's novel *Cinq-Mars* and Gounod's opera of the same name. See Philippe Erlanger, *Richelieu and the Affair of Cinq-Mars* (tr 1971).

cinquefoil (sīngk'fōil) [O Fr, = five leaves], name for any plant of the widely distributed genus *Potentilla* of the family Rosaceae (ROSE family), chiefly herbs of north temperate and subarctic regions. Most cinquefoils are perennial, many but not all of them have leaves of five leaflets, for which they are also called five-finger. The flowers are most often yellow. Most North American species are native to cooler regions of the U S and Canada. The shrubby cinquefoil (*P. fruticosa*) and the silverweed (*P. anserina*) are common wildflowers in the West and the Northeast, they are thought to be naturalized from the Old World. These and other species are sometimes cultivated in rock gardens. Silverweed is one of the species reputed to have medicinal powers, hence the Latin name of the genus [*potens*=powerful]. Cinquefoil is classified in the division MAGNOLIOPHYTA, class Magnoliopsida, order Rosales, family Rosaceae.

Cinque Ports (sīngk'), [O Fr, = five ports], name applied to an association of maritime towns in Sussex

and Kent, SE England. They originally numbered five: Hastings, Romney (now New Romney), Hythe, Dover, and Sandwich. The association was informally organized in the 11th cent., and a formal charter was drawn up in the 13th cent. In the 12th cent., Winchelsea and Rye were added with privileges and duties similar to those of the founding members. Later, neighboring places were added as "limbs" or "members." The Cinque Ports reached the peak of their significance during the Anglo-French struggle in the 14th cent. The main duty of the ports was the provision of ships and men for protection against invasion at a time when England had no permanent navy. (The ports form an arc along the coast most likely to receive an invasion from the European continent.) In return the crown allowed the members various privileges, such as exemption from taxation and from certain laws governing municipalities. The highest officer of the chartered organization was the lord warden of the Cinque Ports, who had extensive civil, military, and naval duties. His official residence was at Walmer Castle, near Deal. After Henry VII (1485-1509) founded the royal navy, the association declined. It contributed only five ships to defeat the Spanish Armada in 1588. Today the Cinque Ports court of admiralty still has some maritime jurisdiction. The office of lord warden still exists but has no real power.

Cinthio. see GIRALDI, GIOVANNI BATTISTA.

Cinto, Monte (môn'tā chēn'tō), peak, 8,891 ft (2,710 m) high, NW Corsica, France, NW of Corte. It is the highest point on Corsica.

Cintra, Port Sintra (sēn'tra), town (1960 pop. 20,321), Lisboa dist., W Portugal, in Estremadura. The region has orange groves and vineyards as well as marble quarries, but Cintra is known primarily for its beautiful mountain location. The view is superb, and Cintra has been rapturously described not only by Portuguese writers but also by Byron and other foreigners. It flourished as a Moorish city, and there are still ruins of a Moorish castle. With Lisbon it was permanently retaken from the Moors by Alfonso I in 1147 and thereafter was a favorite residence of the Portuguese monarchs. Cintra has a royal palace (15th-16th cent.) and an old convent surrounded by a lovely park. Near the town, in the Peninsular War, the Convention of Cintra was agreed upon (1808) by the French, British, and Portuguese.

Cinzio. see GIRALDI, GIOVANNI BATTISTA.

CIO. see AMERICAN FEDERATION OF LABOR AND CONGRESS OF INDUSTRIAL ORGANIZATIONS.

Cione, Andrea di. see ORCAGNA.

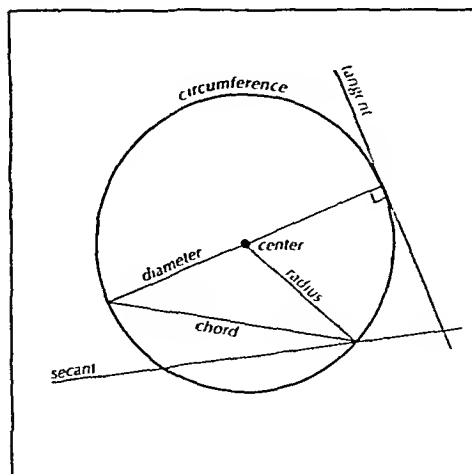
cipher. see CRYPTOGRAPHY.

circadian rhythm. see RHYTHM, BIOLOGICAL.

Circassia (sər'kash'ēa), historic region, encompassing roughly the area between the Black Sea, the Kuban River, and the Caucasus, now largely the KRASNODAR KRAY of SE European USSR. The Circassians are a Muslim people, whose Russian name is Cherkess and whose native name is Adyghe. They are now officially classified as three peoples: the Kabarda, in the Kabardino-Balkar ASSR, the Circassians or Cherkess, in the Karachay-Cherkess Autonomous Oblast, and the Adyghe, in the Adyghe Autonomous Oblast. The term Circassian has sometimes been incorrectly applied to all the mountain peoples of the N Caucasus. Known in antiquity, they inhabited the western side of the Caucasus and the Crimea and were known to the Greeks as the Zyukhoy. They were Christianized in the 6th cent. A.D. but adopted Islam in the 17th cent. after coming under the rule of the Ottoman Empire. In 1829 the Ottoman Turks were forced to cede Circassia to Russia. At this time the Circassians occupied almost the entire area between the main Caucasian range, the Kuban River, and the Black Sea. In the many Russo-Turkish wars in the first half of the 19th cent., the Circassians bitterly fought the Russians. After the Russian conquest of the area, many Circassians migrated to Turkey (1861-64). The men were warlike, proud, and handsome, the women were famous for their beauty, and many were sold into slavery in Turkey. There are today large Circassian groups in Turkey, Syria, and Jordan.

Circe (sūr'sē), in Greek mythology, enchantress, daughter of Helios. She lived on an island, where she decoyed sailors and treacherously changed them into beasts. According to the *Odyssey*, she changed the companions of Odysseus into swine, but with the aid of Hermes, Odysseus forced her to break the spell. In post-Homeric legend she bore Odysseus a son, Telegonus, who unwillingly killed his father.

circle, closed plane curve consisting of all points at a given distance from some fixed point, called the center. A circle is a CONIC SECTION cut by a plane perpendicular to the axis of the cone. The term circle is also used to refer to the region enclosed by the curve, more properly called a circular region. The radius of a circle is any line segment connecting the center and a point on the curve; the term is also used for the length r of this segment, i.e., the common distance of all points on the curve from the



Circle

center. Similarly, the circumference of a circle is either the curve itself or its length or ARC. A line segment whose two ends lie on the circumference is a chord, a chord through the center is the diameter. A secant is a line of indefinite length intersecting the circle at two points, the segment of it within the circle being a chord. A tangent to a circle is a straight line touching the circle at only one point, the point of contact, or tangency, and is always perpendicular to the radius drawn to this point. A circle is inscribed in a polygon if each side of the polygon is tangent to the circle, a circle is circumscribed about a polygon if all the vertices of the polygon lie on the circumference. The length of the circumference C of a circle is equal to π (see π) times twice the radius distance r , or $C = 2\pi r$. The area A bounded by a circle is given by $A = \pi r^2$. Greek geometry left many unsolved problems about circles, including the problem of squaring the circle, i.e., constructing a square with an area equal to that of a given circle, using only a straight edge and compass; it was finally proved impossible in the late 19th cent. (see GEOMETRIC PROBLEMS OF ANTIQUITY). In modern mathematics the circle is the basis for such theories as inversive geometry and certain non-Euclidean geometries. The circle figures significantly in many cultures. In religion and art it frequently symbolizes heaven, eternity, or the universe.

Circleville, city (1970 pop. 11,687), seat of Pickaway co., S central Ohio, on the Scioto River, in a farm area, inc. 1853. Corn, hogs, and poultry are processed in the city. Circleville was laid out in 1810 within the remains of a circular fort allegedly erected by mound builders. Its growth was spurred by the building of the Ohio and Erie Canal.

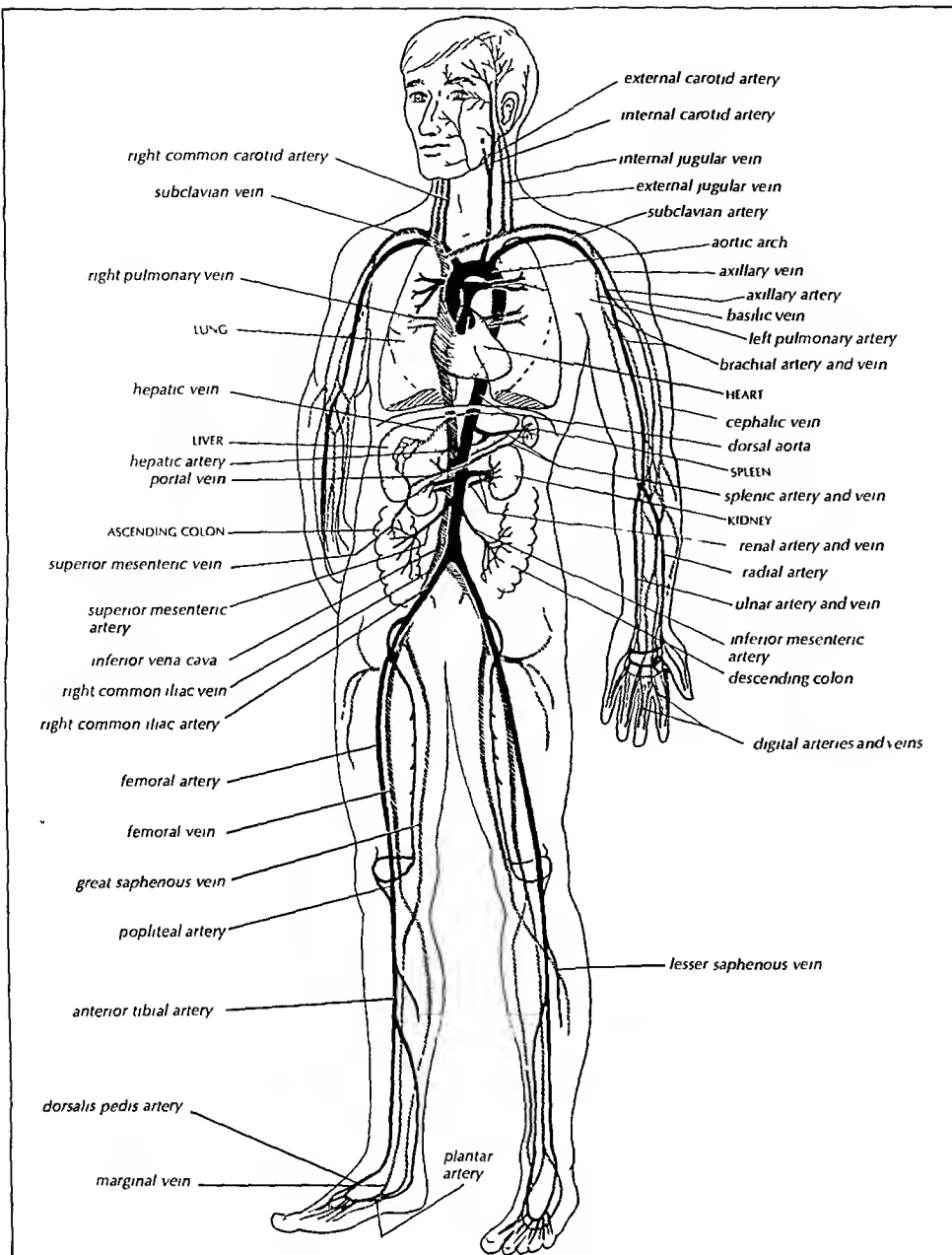
circuit, electric. see ELECTRIC CIRCUIT.

circuit breaker, electric device that, like a fuse, interrupts an electric current in a circuit when the current becomes too high. The advantage of a circuit breaker is that it can be reset after it has been tripped; a fuse must be replaced after it has been used once. When a current supplies enough energy to operate a trigger device in a breaker, a pair of contacts conducting the current are separated by preloaded springs or some similar mechanism. Generally, a circuit breaker registers the current either by the current's heating effect or by the magnetism it creates in passing through a small coil. Because it is usual for an electric arc to form between the contacts when a breaker opens, some means must be provided for preventing rapid erosion of the contacts. Normally this is done by opening the contacts fast enough to make the arc of short duration. The U.S. National Electric Code now requires that circuit breakers be used in all new home installations. Breakers for this service are usually of the thermally actuated type.

circuit rider, itinerant preacher of the Methodist denomination who served a "circuit" consisting usually of 20 to 40 "appointments." The circuit sys-

tem, devised by John Wesley for his English societies in their formative period and developed in America by Francis Asbury, proved especially adapted to the conditions of the American frontier and came into its own in the trans-Allegheny region. Its success was a factor in establishing Methodism in America. The circuit rider, traveling usually on horseback because it was economical and suited to the forest pathways, preached nearly every day and twice on Sundays, thus covering his circuit every four or five weeks. His appointments were usually in pioneer cabins, schoolhouses, or tavern barrooms. The circuit rider often had a limited education, but he was usually an effective preacher and lived a very self-sacrificing life. See E. K. Nottingham, *Methodism and the Frontier* (1941, repr. 1966); W. W. Sweet, *The Methodists, 1783-1840* (1946, repr. 1964).

circulatory system, group of organs that transport blood and the substances it carries to and from all parts of the body. The circulatory system consists of vessels that carry the blood, and a muscular pump, the HEART, that drives the blood. Of the vessels, the ARTERIES carry blood away from the heart, the main arterial vessel, the aorta, branches into smaller arteries, which in turn branch repeatedly into still smaller vessels and reach all parts of the body. Within the body tissues, the vessels are microscopic CAPILLARIES through which gas and nutrient exchange occurs (see RESPIRATION). Blood leaving the tissue capillaries enters converging large vessels, the VEINS, to return to the heart and lungs. The human heart is a four-chambered organ with a dividing wall, or septum, that separates it into a right heart for pumping blood from the returning veins into the lungs, and a left heart for pumping blood from the lungs to the body via the aorta. The circulatory system can be considered as composed of two components, the systemic circulation, which serves the body as a whole except for the lungs, and the pulmonary circulation, which carries the blood to and from the lungs. In the systemic circulation, purified oxygenated blood from the lungs returns to the heart from two pairs of pulmonary veins, a pair from each lung. It enters the left atrium, which contracts when filled, sending blood into the left ventricle. The bicuspid, or mitral, valve controls blood flow into the ventricle. Contraction of the powerful ventricle forces the blood under great pressure into the aortic arch and on into the aorta. The aorta branches into the coronary arteries, which nourish the heart muscle itself, and three major arteries from the aortic arch that supply the head, neck, and arms. The other major arteries branching off from the aorta are the renal arteries, which supply the kidneys, the celiac axis and superior and inferior mesenteric arteries, which supply the intestines, spleen, and liver, and the iliac arteries, which supply the lower trunk and become the femoral and popliteal arteries of the thighs and legs, respectively. The arteries contain fibrous tissue to regulate BLOOD PRESSURE and flow. Blood pressure, the lateral pressure on the walls of the arteries, is controlled by several factors including force of contraction of the heart, elasticity of the arterial walls, blood volume and thickness, and the resistance of the arterioles and capillaries. Within the tissues the small arterioles shade into capillaries, vessels about the diameter of a red blood cell, which form a network facilitating exchange of gases and nutrients. In addition, a system of shunts allows blood to bypass the capillary beds and helps to regulate body temperature. At the far end of the network, the capillaries converge to form venules, which in turn form veins. The inferior vena cava returns blood to the heart from the legs and trunk; it is supplied by the iliac veins from the legs, the hepatic veins from the liver, and the renal veins from the kidneys. The subclavian veins, draining the arms, and the jugular veins, draining the head and neck, join to form the superior vena cava. The two vena cavae, together with the coronary veins, return blood low in oxygen and high in carbon dioxide to the right atrium of the heart. Veins lack muscle tissue but many, especially in the limbs, contain one-way valves that prevent backward flow of blood. In the heart, the blood is pumped from the right atrium into the right ventricle, the tricuspid valve controls flow into the right ventricle. The contraction is simultaneous with that of the left atrium. The right ventricle contracts to force blood into the lungs through the pulmonary arteries. In the lungs oxygen is picked up and carbon dioxide eliminated, and the oxygenated blood returns to the heart via the pulmonary veins, thus completing the circuit. In pulmonary circulation the arteries carry oxygen-poor blood and the veins oxygen-rich blood, the



Circulatory system

terms *vein* and *artery* refer to vessels carrying blood to or away from the heart and not to the gas content of the blood carried. The organs most intimately related to the substances carried by the blood are the kidneys, which filter out nitrogenous wastes and regulate concentration of salts, the **SPLEEN**, which removes worn red blood cells and produces white blood cells, or lymphocytes, and the **LIVER**, which contributes clotting factors to the blood, helps to control blood sugar levels, also removes old red blood cells and, receiving all the veins from the intestines and stomach, detoxifies the blood before it returns to the vena cava (see **URINARY SYSTEM**). An auxiliary system, the **LYMPHATIC SYSTEM**, is composed of vessels that collect lymph from body tissues. Carried to converging vessels of increasing size, the lymph enters the thoracic duct and is emptied into a large vein near the heart. Disorders of the circulatory system result in diminished flow of blood and diminished oxygen exchange to the tissues. Acute impairment of blood flow to the heart muscle itself (heart attack) or to the brain (stroke) are most dangerous. Blood supply is also impeded in such conditions as **ARTERIOSCLEROSIS** and high blood pressure, low blood pressure resulting from injury (**SHOCK**) is manifested by inadequate blood flow. Structural defects of the heart affecting blood distribution may be congenital or caused by many diseases, e.g., **RHEUMATIC FEVER**. See also **HEART DISEASE**, **HYPERTENSIVE HEART DISEASE**.

circumcision (sûr'kamsîzh'ân), operation to remove the foreskin covering the glans of the penis. It dates back to prehistoric times and was widespread

throughout the Middle East as a religious rite before it was introduced among the Hebrews presumably by Abraham. It is performed by Jews on the eighth day after the birth of the male child, unless postponed for reasons of health. It is also practiced among Muslims and by peoples in many parts of the world. Explanations of the origin of circumcision are entirely conjectural. It is related to rites of initiation. Among Jews it is considered to involve membership in the community and to be a sign of the covenant between God and man. The decision that Christians need not practice circumcision is recorded in Acts 15; there was never, however, a prohibition of circumcision, and it is practiced by Coptic Christians. It is widely practiced in modern times as a sanitary measure. Female circumcision, in the form of excision of the labia minora and clitoris (clitoridectomy), is known in Islam and in certain tribes of Africa, South America, and elsewhere.

circumpolar star, star whose **DIURNAL CIRCLE** lies completely above or completely below an observer's horizon. A star whose diurnal circle lies above the horizon never sets, even though it cannot be seen during the day. Designation of a star as circumpolar depends on the observer's latitude. At the equator no star is circumpolar. At the North or South Pole all stars are circumpolar, since only one half of the celestial sphere can ever be seen. For an observer at any other latitude a star whose declination is greater than 90° minus the observer's latitude will be circumpolar, appearing to circle the celestial pole and remaining always above the horizon. A constellation made up entirely of circumpolar stars

is also called **circumpolar**. From most of the northern United States (above lat. 40°N) the Big Dipper is circumpolar.

circus [Lat. = ring, circle], associated historically with the horse and chariot races and athletic contests known in ancient Rome as the **Circensian games**. The Roman circus was a round or oval structure with tiers of seats for spectators, enclosing a space in which the races, games, and gladiatorial combats took place. Underneath were dressing rooms, dens for wild beasts, and rooms where properties were stored. The **Circus Maximus**, presumably built in the reign of Tarquin I (c. 616–c. 578 B.C.), and rebuilt by Julius Caesar, is said to have had a seating capacity of 350,000. Other famous *circi* of Rome were the **Circus Flaminius** (221 B.C.), the **Circus Nervae**, of Caligula and Nero, at which many Christians perished, and the **Circus Maxentius**. The circus of Septimius Severus at Constantinople and many others were often scenes of riot and bloodshed between factions of charioteers. The games, aside from races, were brutal and bloody, and for this reason the Greeks, even under Roman domination, never really accepted the circus. The modern circus, which originated in performances of equestrian feats in a horse ring strewn with sawdust, dates from the closing years of the 18th cent. The circus is a nomadic tent show, with trained animals, acrobats, and clowns. The main tent, known as the big top, is usually surrounded by various concessions and sideshows with freaks and wild animals. Even before 1830, traveling circuses were common in the United States and in England. After 1869 two rings were used in the main tent and the three-ring circus, as we know it today, was initiated by James A. Bailey. The most celebrated circus in America was "The Greatest Show on Earth" of P. T. Barnum, which, in merging with Bailey's, became Barnum and Bailey's. On Bailey's death in 1907 the circus was purchased by Ringling Brothers, and in 1919 the two circuses were combined. In its heyday from 1880 to 1920, the traveling circus has declined in recent years. See studies by H. R. North and Alden Hatch (1960), E. C. May (1932, repr. 1963), C. P. Fox and Tom Parkinson (1970), Marian Murray (1956, repr. 1973).

cire perdue (sêr pèrdu'), [Fr. = lost wax], sculptural process of hollow casting in metal. A model is made in plaster or clay, coated with wax in which the finer details are executed, and covered with a mold of perforated plaster or clay. It is then heated until the wax melts and runs out the holes, and molten metal (usually bronze) is poured in the mold at the top until the metal fills the space formerly occupied by the wax. When cool, the mold is broken, the core removed, and the metal is sometimes filed and polished (chased). The chief advantage of this process is that it takes far less metal than the method of solid casting, and the danger of cracking during the cooling process is lessened. The method, probably of Egyptian origin, was introduced into Greece in the 6th cent. B.C. by Rhœceus and Theodorus of Samos and was used extensively from the 5th cent. The **Zeus of Artemisium** (National Mus., Athens) and the **Charioteer of Delphi** (Delphi Mus.), both hollow casts, are the finest of the few Greek bronzes that have survived. In use throughout the world, *cire perdue* was introduced in China c. 200 B.C. and was employed later in casting the Benin bronzes of Africa. The great bronze masterpieces of the Renaissance were produced by this process (see the autobiography of Benvenuto Cellini for a detailed account). The method has enjoyed a recent revival, primarily for jewelry making, although it has been supplemented by other processes. See H. Jackson, *Lost Wax Bronze Casting* (1972), G. Pack, *Jewelry Making by the Lost Wax Process* (1968).

cirrhosis (sə-rō'sas), degeneration of tissue in an organ resulting in fibrosis, with nodule and scar formation. The term is most often used in relation to the liver, since that organ is most often involved in cirrhosis. The most prevalent form of cirrhosis of the liver, **portal cirrhosis**, appears in middle-aged males with a history of chronic alcoholism and is caused by protein deficiency (specifically choline), a type of malnutrition common in alcoholics. Protein deprivation is also responsible for **KWASHIORKOR**, a nutritional deficiency with symptoms resembling those of cirrhosis of the liver. **Biliary cirrhosis** is a type caused by disruption of bile flow and is more common in women. Failure of liver function results in gastrointestinal disturbances, emaciation, enlargement of the liver and spleen, jaundice, accumulation of fluid in the abdomen and other tissues of the body, and obstruction of the venous circulation with distention of the veins. It is not uncommon for

greatly distended veins in the esophagus to rupture and cause massive hemorrhage. Treatment is supportive—a diet with adequate protein (except where ammonia poisoning is a factor), vitamin supplements, transfusions to replace any blood loss, and removal of accumulated fluid.

circocumulus: see CLOUD

cirrostratus: see CLOUD

cirrus: see CLOUD

Cirta: see CONSTANTINE, Algeria

Cis (sīs), same as KISH 1.

Cisalpine Republic (sīsāl'pīn), Italian state created by Napoleon Bonaparte in 1797 by uniting the Transpadane and Cispadane republics, which he had established (1796) N and S of the Po River. The new republic included the former duchies of Milan, Parma, and Modena, the legations of Bologna and Ferrara, and the Romagna. By the Treaty of Campo Formio (1797), Austria recognized the republic, to which were added the Venetian territories W of the Adige (including Bergamo and Brescia), the duchy of Mantua, and the formerly Swiss Valtellina. The republic was in fact subject to France, and its constitution was based on the French model. In 1799 the Austro-Russian armies occupied it, but Bonaparte recovered it in 1800. By the Treaty of Lunéville (1801) its nominal autonomy was restored. In 1802 it became the Italian Republic and in 1805, with the addition of Venetia, the Napoleonic kingdom of Italy. It was broken up by the Congress of Vienna (see VIENNA, CONGRESS OF) in 1815.

cis-butenedioic acid (sīs-byōō'tēndī'ōīk), IUPAC name for maleic acid, see FUMARIC ACID

Cislethania: see AUSTRO HUNGARIAN MONARCHY

Cisneros, Francisco Jiménez de: see JIMÉNEZ DE CISNEROS FRANCISCO

Cispadane Republic: see CISALPINE REPUBLIC

Cistercians (sistūr'shanz), monks of a Roman Catholic religious order founded (1098) by St. Robert, abbot of Molesme, in Cîteaux [*Cistercium*], Côte-d'Or dept., France. They reacted against the laxity in the Cluniac order. The particular stamp of the Cistercians stems from the abbacy (c. 1109–1134) of St. STEPHEN HARDING. The black habit of the Benedictines was changed to an unbleached white, and the Cistercians became known as White Monks. St. BERNARD OF CLAIRVAUX is often regarded as their "second founder." Through a return to strict asceticism and a life of poverty, the Cistercians sought to recover the ideals of the original Benedictines. They expanded greatly, especially during St. Bernard's lifetime, and at the close of the 12th cent. there were 530 Cistercian abbeys. The life and writings of St. Bernard were their guiding influence. They considered farming the chief occupation for monks and led Europe in the development of new agricultural techniques (In England the Cistercians were important in the growth of English wool culture.) The Cistercians were the first to make large use of lay brothers, conversi, who lived in the abbey under a separate discipline and aided the monks in their farm system. In the 13th cent. relaxation of fervor blunted Cistercian importance, and by 1400 they had ceased to be prominent, their place being taken by the Dominican and Franciscan friars. Of later reform attempts, the most important was the movement begun at La Trappe, France (17th cent.), those accepting the greater austerities were known popularly as TRAPPISTS, officially titled (after 1892) Cistercians of the Stricter Observance [Lat. abbr., *OCSO*], as distinct from Cistercians of the Common Observance [Lat. abbr., *SO Cist*]. Today the difference is not great. The unit of Cistercian life is the abbey. Its members compose a permanent communal entity, with the abbey joined in loose federation. Cistercian nuns (founded in the 12th cent.) have rules and customs paralleling those of the monks, they lead contemplative lives in complete seclusion from the world. A 17th-century reform of Cistercian nuns produced the remarkable development of PORT-ROYAL. Famous Cistercian abbeys include Cîteaux, Clairvaux, Fountains, Rievaulx, and Alcobaca. See A. J. Luddy, *The Order of Cîteaux* (1932), Louis Bouyer, *The Cistercian Heritage* (tr. 1958), M. B. Pennington, ed., *The Cistercian Spirit* (1970).

Citadel, The—The Military College of South Carolina, at Charleston, state supported, primarily for men, chartered 1842 as The Citadel, opened 1843. From 1882 to 1910 it was named the South Carolina Military Academy. The cadets are subject to military regulations.

Cîteaux see CISTERCIANS

Cithaeron (sithē'ran), Gr. *Kithairón*, mountain range, c. 10 mi (16 km) long, central Greece, between

Boeotia in the north and Attica in the south. It rises to 4,623 ft (1,409 m). The range was the scene of many events in Greek mythology and was especially sacred to Dionysius.

cithara: see KITHARA

cithern: see CITTERN

Citium (sish'ēam), ancient city of Cyprus, on the southeast coast, the modern Larnaca. Of Mycenaean origins, it was a major port with valuable saltworks and was an important center under Phoenician and Assyrian rulers. It is identical with the biblical KITHIM. Zeno was born there. It is also known as Citon.

citizen, member of a state, native or naturalized, who owes ALLEGIANCE to the government of the state and is entitled to certain rights. The citizen may be said to enjoy the most privileged form of NATIONALITY, he is at the furthest extreme from nonnational residents of a state (see ALIEN), but he may also be distinguished from nationals with a subject or servile status (e.g., slaves or serfs). (It should be noted, however, that in Great Britain and some other constitutional monarchies a citizen is called a subject.) The term *citizen* originally designated the inhabitant of a town. In ancient Greece property owners in the CITY-STATES were citizens and, as such, might vote and were subject to taxation and military service. Citizenship in the Roman Empire was at first limited to the residents of the city of Rome and was then extended in A.D. 212 to all free inhabitants of the empire. Under feudalism in Europe the concept of national citizenship disappeared. In time, however, city dwellers purchased the immunity of their cities from feudal dues, thereby achieving a privileged position and a power in local government, these rights were akin to those of citizenship and supplied much of the content of later legislation respecting citizenship. Modern concepts of national citizenship were first developed during the American and French revolutions. Today each country determines what class of persons are its citizens. In some countries citizenship is determined according to the *jus sanguinis* [Lat., =law of blood], whereby a legitimate child takes its citizenship from its father and an illegitimate child from its mother. In some countries the *jus soli* [Lat., =law of the soil] governs, and citizenship is determined by place of birth. These divergent systems may lead to conflicts that often result in dual nationality or loss of citizenship (statelessness). Although the Constitution of the United States, as written in 1787, uses the word *citizen* and empowers Congress to enact uniform NATURALIZATION laws, the term was not defined until the adoption (1868) of the FOURTEENTH AMENDMENT, which gave citizenship to former Negro slaves. As this amendment indicates, the United States generally follows the *jus soli*. However, Congress has also recognized, subject to strict rules, the principle of *jus sanguinis* so that children born of American parents abroad are citizens during their minority and can retain this citizenship at majority if they meet certain conditions. Until the 1940s the United States recognized several classes of nationals who were not citizens, e.g., Filipinos and Puerto Ricans. Today, however, all U.S. nationals are citizens. The United States recognizes the right of voluntary EXTRADITION, and in 1967 the Supreme Court ruled that citizenship can be lost only if freely and expressly renounced, Congress does not have the power to take it away.

citrange (sī'trānj) see ORANGE

citric acid or **2-hydroxy-1,2,3-propanetricarboxylic acid**, $\text{HO}_2\text{CCH}_2\text{C}(\text{OH})(\text{CO}_2\text{H})\text{CH}_2\text{CO}_2\text{H}$, an organic carboxylic acid containing three CARBOXYL GROUPS; it is a solid at room temperature, melts at 153°C, and decomposes at higher temperatures. It is responsible for the tart taste of various fruits in which it occurs, e.g., lemons, limes, oranges, pineapples, and gooseberries. It can be extracted from the juice of citrus fruits by adding calcium oxide (lime) to form calcium citrate, an insoluble precipitate that can be collected by filtration; the citric acid can be recovered from its calcium salt by adding sulfuric acid. It is obtained also by fermentation of glucose with the aid of the mold *Aspergillus niger* and can be obtained synthetically from acetone or glycerol. Citric acid is used in soft drinks and in laxatives and cathartics. Its salts, the citrates, have many uses, e.g., ferric ammonium citrate is used in making BLUEPRINT paper. Sour salt, used in cooking, is citric acid.

citric acid cycle, series of chemical reactions carried out in the living cell, in most higher animals, including man, it is essential for the oxidative METABOLISM of GLUCOSE and other simple sugars. The breakdown of glucose to carbon dioxide and water

is a complex set of chemical interconversions called CARBOHYDRATE CATABOLISM, and the citric acid cycle is the second of three major stages in the process, occurring between GLYCOLYSIS and oxidative PHOSPHORYLATION. This cycle is also known as the Krebs cycle, in recognition of the German chemist Hans Krebs, whose research into the cellular utilization of glucose contributed greatly to the modern understanding of this aspect of metabolism. The common designation for this series of reactions, citric acid cycle, is derived from the first product generated by the sequence of conversions, i.e., CITRIC ACID. The reactions are seen to comprise a cycle inasmuch as citric acid is both the first product and the final reactant, being regenerated at the conclusion of one complete set of chemical rearrangements. Citric acid is a so-called tricarboxylic acid, containing three carboxyl groups (COOH). Hence the citric acid cycle is sometimes referred to as the tricarboxylic acid (TCA) cycle. The citric acid cycle begins with the condensation of one molecule of a compound called oxaloacetic acid and one molecule of acetyl CoA (a derivative of coenzyme A, see COENZYME). The acetyl portion of acetyl CoA is derived from pyruvic acid, which is produced by the degradation of glucose in glycolysis. After condensation, the oxaloacetic acid and acetyl CoA react to produce citric acid, which serves as a substrate for seven distinct enzyme-catalyzed reactions that occur in sequence and proceed with the formation of seven intermediate compounds, including succinic acid, fumaric acid, and malic acid. Malic acid is converted to oxaloacetic acid, which, in turn, reacts with yet another molecule of acetyl CoA, thus producing citric acid, and the cycle begins again. Each turn of the citric acid cycle produces, simultaneously, two molecules of carbon dioxide and eight atoms of hydrogen as by-products. The carbon dioxide generated is an ultimate end product of glucose breakdown and is removed from the cell by the blood. The hydrogen atoms are donated as hydride ions to the system of electron transport molecules, which allow for oxidative phosphorylation. In most higher plants, in certain microorganisms, such as the bacterium *Escherichia coli*, and in the algae, the citric acid cycle is modified to a form called the glyoxylate cycle, so named because of the prominent intermediate, glyoxylic acid.

Citrine, Walter McLennan Citrine, Baron (sī'rēn'), 1887–, English trade union leader. An electrician, he became district secretary of the electrical trade union in 1914 and rose to be general secretary of the Trades Union Congress in 1926, president of the International Federation of Trades Unions in 1928, and president of the World Trade Union Conference in 1945. A skillful organizer, he led the conservative wing in labor and became powerful in the Labour government of Clement Attlee. He was created baron in 1946 and was chairman of the Central Electricity Authority (1947–57). His writings include *My Finnish Diary* (1940), *In Russia Now* (1942), and *British Trade Unions* (1942). See his autobiography, *Two Careers* (1967).

citron (sī'trān), name for a tree (*Citrus medica*) of the family Rutaceae (ORANGE family), and for its fruit, the earliest of the CITRUS FRUITS to be introduced to Europe from the Orient. The small evergreen tree is now cultivated commercially in the Mediterranean region and, to a lesser extent, in the West Indies, Florida, and California. The large fruit has a rough and furrowed surface and a thin outer rind of yellowish-green color. The inner rind is thick, white, and tender, and the pulp is small and acid. The juice is sometimes used as a beverage or syrup. The rind, candied and preserved, is used in confectionery and cookery. The name is also applied to a small variety of watermelon with a thick rind, used to make preserves. Citron is classified in the division MAGNOLIOPHYTES, class Magnoliopsida, order Sapindales, family Rutaceae.

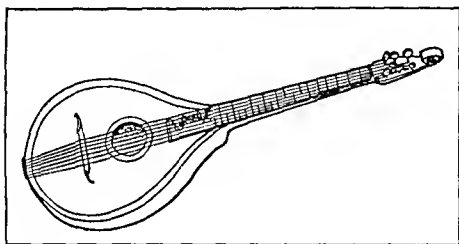
citronella, common name for a grass, *Cymbopogon nardus*, the source of oil of citronella, used in perfumes and soaps and as an insect repellent. The plant, with bluish green, lemon-scented leaves, is cultivated in Java and Sri Lanka. Citronella is classified in the division MAGNOLIOPHYTES, class Liliatae, order Cyperales, family Gramineae.

citrus fruits, widely used edible fruits of plants belonging to *Citrus* and related genera of the family Rutaceae (ORANGE family). Included are the tangerine, citrange, tangelo, orange, pomelo, GRAPEFRUIT, LEMON, LIME, CITRON, and KUMQUAT. Almost all the species bearing edible fruits are small trees native to SE Asia and the East Indies. The citron was introduced to the Mediterranean area from the Orient before Christian times, the others were spread

chiefly by the Arabs during the Middle Ages. Introduced throughout Europe during the Crusades, they were brought by Portuguese and Spanish explorers to the West Indies, whence they were introduced into North and South America. Commercially they are now the most important group of tropical and subtropical fruits in the world. The fruits are rich in vitamin C (ascorbic acid), various fruit acids (especially CITRIC ACID), and fruit sugar. The rind, which contains numerous oil glands, and the fragrant blossoms of some species are also a source of essential oils used for perfumes and similar products. See H J Webber and L D Batchelor, ed., *The Citrus Industry* (2 vol., 1943-48), H H Hume, *Citrus Fruits* (rev ed 1957), J T Hopkins, *Fifty Years of Citrus* (1960).

Città Vecchia (chêt-ta' vĕk'kya) [Ital., =old city], **Città Notabile**, or **Notabile** (nōta'bĕlā), Maltese **Mdina** (amdē'na), town, central Malta. It was the capital of Malta until supplanted by VALLETTA (1570). The town has a large 17th-century cathedral, the old palace of the grand masters of the Knights of Malta (Knights Hospitalers), and catacombs, some of which are pre-Christian.

cittern (sīt'arn), stringed musical instrument of the guitar family having an oval body, a flat back, and a fretted neck (see FRETTED INSTRUMENT). Its strings, made of wire and varying in number, were plucked



Cittern

It was first made in the Middle Ages and at that time was usually called citole or sitole. The name *cittern* was given to it in the 16th cent in England, where, as in all western Europe, it was very popular until the early part of the 18th cent. It has also been called cister, cistre, cithern, cithren, citharen, cetera, cither, cithara, gittern, and sitron.

city, densely populated urban center, larger than a village or a town, whose inhabitants are engaged primarily in commerce and industry. In the legal sense, in the United States a city is an incorporated municipality. Cities have appeared in diverse cultures, e.g., among the Aztecs, Maya, and Inca, in China and India, and in Mesopotamia and Egypt. In all these civilizations the cities were the centers of internal change and development. The history of ancient Europe is that of the Greek cities and of Rome (see CITY-STATE). From the decline of Rome the cities were in eclipse, and in Western Europe their role as centers of learning and the arts passed to the monasteries. The 11th cent saw the resurgence of vigorous cities, first in Italy and then in northern Europe, due mainly to a revival of trade, by the 13th cent, with the decline of feudalism, the dynamic life of the Middle Ages was centered in the cities. From that time dates the importance of the great modern cities, e.g., Milan, London, Paris, and the Hanseatic cities. The giant modern city is a product of the Industrial Revolution, which introduced large-scale manufacturing. Sheer size made old problems of urban life acute, some of them, such as sanitation, utilities, and distribution, have been better solved than others, such as HOUSING and transport. As urban life came to furnish more remunerative and varied employment opportunities, rural populations increasingly were attracted, and by the 20th cent some nations were faced with shortages of agricultural workers. Among movements to reform urban life some aim at abolishing cities as known today, this is the tradition exemplified by William Blake, Henry Thoreau, William Morris, Eric Gill, and Lewis Mumford. There are also less radical designs, like rational city planning and the development of rapid transit to distant suburbs. There have been many reforms aimed at restoring community life for the rootless strangers so frequent in modern cities, such as a common function of settlement houses, community centers, and other philanthropic and cooperative enterprises. Statistical study of cities is difficult, because figures are usually given by political units and rarely is an entire urban area a single, exclusive political unit. Cities are often complex, with suburbs within them, e.g., the Newark

area falls inside the New York metropolis. The word *megapolis* is sometimes used to describe the great swath of communities stretching N and S of New York City from Boston to Washington, D C. In Great Britain the term *conurbation* refers to a cluster of urban areas such as the one centered in London. There are similar complexes of cities in Asia, notably that of WU-HAN in China. See CITY GOVERNMENT, LOCAL GOVERNMENT. See Henry Pirenne, *Medieval Cities* (tr 1925, repr 1956), Gustave Glotz, *The Greek City and Its Institutions* (tr 1929, repr 1965), Max Weber, *The City* (tr 1958), Otis Duncan et al., *Metropolis and Region* (1960), Lewis Mumford, *The City in History* (1961), P M Hauser, ed., *The Study of Urbanization* (1965), Jane Jacobs, *The Economy of Cities* (1969), Stephan Thernstrom and Richard Sennett, ed., *Nineteenth-Century Cities* (1969), W A Robson and D E Regan, ed., *Great Cities of the World* (3d ed., 2 vol., 1972), D R Gordon, *City Limits* (1973).

City College of the City University of New York, coeducational, est 1847 as the Free Academy, called the College of the City of New York (CCNY) 1866-1929 (see NEW YORK, CITY UNIVERSITY OF). It includes schools of education, liberal arts, and technology. Its former school of business administration became BARUCH COLLEGE in 1968. Residents of New York City are admitted free to the baccalaureate program.

city government, political administration of urban areas. The English tradition of incorporating urban units (cities, boroughs, villages, towns) and allowing them freedom in most local matters is general in the United States (see CITY, LOCAL GOVERNMENT). The traditional U S city government had a mayor and council, whose members (aldermen) represented districts (wards). As the complexity of urban life increased in the 19th cent, the old system became less efficient. Problems included overlapping of old offices with new, poor methods of accounting and taxation, and much blatant graft. Hence there arose movements for municipal reform, which have become a recurrent feature of American political life. They have familiarized Americans with a gallery of such political figures as William M TWEED of New York City, Frank HAGUE of Jersey City, and William Hale THOMPSON of Chicago (see BOSSISM). Although the urban political machine has, in most cities, lost its former power, the traditional type of city government, also known as the independent executive type, remains the most common urban governmental form. It is often subdivided into the strong mayor type (e.g., New York City) and the weak mayor-strong council type (e.g., Los Angeles). Reform efforts, however, have resulted in the development of two fairly widespread alternative governmental types. The commission form has a board, both legislative and administrative, usually elected nonpartisan and at large. First adopted by Galveston, Texas, (1901), this system achieved great popularity in the early 1900s, but many cities (e.g., Buffalo and New Orleans) later abandoned it. The city manager plan gives the administration to one professional nonpolitical director. The system has gained in popularity, notable examples are in Staunton, Va., the first (1908), and Cincinnati, Ohio. A perennial problem of U S urban government is the division of urban areas among several independent city governments, survivals of old separate communities. The Eastern metropolises all provide examples, aggravated in some (e.g., New York City and Philadelphia), where state lines run through the heart of the metropolitan area. Attempts at efficiency have produced such organizations as the Port Authority of New York and New Jersey, a corporation set up by joint action of New York state and New Jersey, and assigned specific powers formerly held by local governments. Another problem besetting city government is the migration of middle-class families to the suburban areas, thus shrinking the tax base and financial resources of the cities. In the rest of the English-speaking world and wherever else there is much local self-government, American forms and problems are paralleled. Elsewhere, as typically in France, the local officers, albeit elected mayor and councillors, are largely figureheads, serving mainly to carry out the regulations of the central bureaucracy. See C M Kneier, *City Governments in the United States* (3d ed 1957), L I Ruchelman, *Big City Mayors* (1969), C R Adrian, *Governing Urban America* (4th ed 1972), W A Robson and D E Regan, eds, *Great Cities of the World* (2 vol., 1972).

city manager: see CITY GOVERNMENT

City of David, epithet of BETHLEHEM, the birthplace of David, and of JERUSALEM, its capital.

city of refuge: see SANCTUARY

City of Refuge National Historical Park: see NATIONAL PARKS AND MONUMENTS (table)

city planning, process of planning for the improvement of urban centers in order to provide healthy and safe living conditions, efficient transport and communication, adequate public facilities, and aesthetic surroundings. Planning that also includes outlying communities and highways is termed regional planning. Many ancient cities were built from definite plans. The fundamental feature of the plans of Babylon, Nineveh, and the cities of ancient Greece and of China was a geographical pattern of main streets running north and south and east and west, with a public square or forum in the center. This gridiron plan was also followed by the Romans, as in Lincoln and Chester in England, in all their towns. The Romans emphasized drainage and water supply and practiced zoning. In medieval cities, built with military security in mind, the only relief from the extremely narrow streets was the space formed by municipal and church squares. The living conditions of the poorer citizens were given little attention. With the Renaissance came the truly monumental views—wide avenues and long approaches creating vistas of handsome buildings. The new aim is seen first in special sections of a city, such as Michelangelo's grouping on the Capitoline at Rome and Bernini's piazza of St Peter's. In most European cities through the 17th and 18th cent there was fragmentary replanning of medieval streets. After the fire of 1666 in London, Sir Christopher WREN devised a superb plan for a complete rebuilding of the city, but the plan unfortunately was not carried out. In the 18th cent, Mannheim and Karlsruhe, Germany, were laid out geometrically, Emmanuel Herre planned Nancy, France, John Wood produced grand architectural streets and squares at Bath, and the new part of Edinburgh was laid out. In the early 19th cent John Nash planned certain sections of London, central Vienna was improved, and Baron HAUSSMAN remodeled Paris to produce the celebrated boulevard system with its spokes-and-hub design. Legislation that enabled cities to make and carry out planning designs was enacted earlier in Europe than in the United States. Such laws were passed in Italy in 1865, in Sweden in 1874, and in Prussia and Great Britain in 1875. Planning in Great Britain was especially concerned with slum elimination, its greatest exponent was Sir Patrick GEDDES. At the turn of the century Sir Ebenezer HOWARD was the founder of the modern garden city movement. The first English GARDEN CITY, Letchworth, was begun in 1903. In the United States, early New England towns, formally disposed along wide elm-lined central roadways or commons, exhibit a conscious planning. Annapolis, Md., Philadelphia, and Paterson, N J, were built after plans, but the most celebrated example is the city of Washington D C, laid out according to the plan devised (1791) by Pierre Charles L'ENFANT, under the supervision of George Washington and Thomas Jefferson—a rectangular plan with diagonal main thoroughfares superimposed and the Capital as the central feature. In the 19th cent Frederick LAW OLIMSTED was a pioneer in city planning, especially in developing parks. State legislation enabling cities to appoint planning commissions and in some cases giving them authority to carry out the plans began in Pennsylvania in 1891. The work of Daniel Hudson Burnham for the World's Columbian Exposition in Chicago, 1893, was a stimulus to city planning, and Burnham, with Edward Bennett, drew up a plan for Chicago, much of which was put into execution. In 1901 a commission composed of Burnham, Charles Follen McKim, and Frederick Law Olmsted, Jr., devised a scheme for the modern development and beautification of Washington, D C, adhering to L'Enfant's original plan as a basis for all new operations. A wide influence on planning in U S cities was exerted by the ZONING laws adopted in New York City in 1916, which controlled the uses of each district in the city and regulated the areas and heights of buildings in relation to street width. The important Regional Survey of New York and Environs, completed in 1929, took into consideration legal and social factors as well as internal transit problems and various modes of approach to the metropolitan area. Governmental efforts to provide employment during the depression of the 1930s led to the building (under the Federal Resettlement Administration) of three experimental model communities—Greenbelt, Md., Greendale, Wis., and Greenhills, Ohio. Among the many subsequent planned communities, built by private developers are Columbia, Md., and Reston, Va. The increase of traffic and crowding together of tall buildings have crippled the street plans of many cities—especially U S cities that have been handicapped by their rectangular or checkerboard layouts. Contemporary exam-

ples of planned cities include BRASÍLIA, the federal capital of Brazil, ROTTERDAM, main seaport of the Netherlands, and CHANDIGARH, the joint capital of the Indian states of Haryana and Punjab. In the larger U.S. cities, physical deterioration, crowding, and complex socioeconomic factors have produced vast slums. Most urban renewal programs of the mid-20th cent. were aimed at clearing these slums through the demolition of decayed buildings and the construction of low-income and middle-income housing projects. It was found, however, that the mere replacement of old buildings with new structures did not eliminate slum conditions. In contrast to traditional planning, which concentrated on improving the physical aspects of buildings and streets, modern city planning is increasingly concerned with the social and economic aspects of city living. The process of city planning is a highly complex, step-by-step procedure, usually involving a series of surveys and studies, development of a land-use plan and transportation plan, preparation of a budget, and approval of a unified master plan by various agencies or legislative bodies. City planners are usually part of an urban planning board or governmental agency that must take into account the characteristics and long-range welfare of the people of a particular urban community—their employment opportunities, income levels, need for transportation, schools, shopping areas, hospitals, parks and recreational facilities. The city planner is faced with the problems of traffic, congestion, and pollution, he must also consider the availability of police, fire, and sanitation services, the limitations posed by zoning and other regulations, and the problems of funding. In recent years, residents of many communities have demanded greater participation in the planning of their own neighborhoods, and some planners have worked closely together with community groups during various stages of the planning process. See Jane Jacobs, *The Death and Life of Great American Cities* (1961, repr. 1969), Lewis Mumford, *The City in History* (1961, repr. 1966), J. W. Reps, *The Making of Urban America* (1965), E. N. Bacon, *Design of Cities* (1966), Frederick Gibberd, *Town Design* (5th ed. 1967), W. H. Whyte, *The Last Landscape* (1968), Françoise Choay, *The Modern City Planning in the Nineteenth Century* (1969), Hila Colman, *City Planning* (1971).

city-state, in ancient Greece, autonomous political unit consisting of a city and surrounding countryside. The Greek word *polis* meant both city and city-state. From the beginning of Greek history to its climax in the 5th and 4th cent. B.C., the Greeks were organized into city-states, of which there were several hundred. Since the city-state was autonomous, different states—and the same state at different times—had a variety of governments, ranging from absolute monarchy to pure democracy. Only citizens participated in the government, or in the religious, social, and economic life of the city-state, and citizenship was limited to those born of citizen parents. A large proportion of the population of the city-state consisted of slaves. The degree of participation by the citizens in government was often limited by class distinctions. The government usually consisted of an assembly and council, the former predominated in democracies, the latter in oligarchies. Although the various city-states combined into religious or military federations under the hegemony of one city-state, these never endured for long, and Greece was left open to foreign attack by large centralized states to which it eventually became subject. See A. E. Zimmern, *The Greek Commonwealth* (5th rev. ed., 1931, repr. 1973), Gustave Glotz, *The Greek City and Its Institutions* (ed. by N. Mallinson, 1930, repr. 1969), Victor Ehrenberg, *The Greek State* (2d rev. ed., 1969, repr. 1972).

Ciudad [Span., =city]. For cities whose names begin thus but are not so listed, see under the following name, e.g., for Ciudad Juárez, see JUÁREZ.

Ciudad Bolívar (syōōthāth' bōlē'vār), city (1970 est. pop. 110,000), capital of Bolívar state, E Venezuela, an inland port on the Orinoco River. It is the commercial center of the eastern llanos, the Orinoco basin, and the GUAYANA HIGHLANDS. Wood products and leather are produced, and hides, cattle, and gold are exported. The city was founded in 1764 and called Angostura. The congress of Angostura (1819) made Simon BOLÍVAR president of Venezuela and later in the same year decreed the formation of the republic of Greater Colombia, with Bolívar as president. The city's Angostura suspension bridge (2,336 ft/712 m long, completed 1967) is the longest in South America.

Ciudad Guzman: see GUZMÁN, Mexico

Ciudad Juárez: see JUÁREZ, Mexico

Ciudad Real (thyōōthāth' rāal'), city (1970 pop. 41,708), capital of Ciudad Real prov., central Spain, in New Castile, on a fertile plain between the Jabalón and Guadiana rivers. It is an agricultural market place, with farm-related industries. Ciudad Real was founded by Alfonso X of Castile in the 13th cent., during the Peninsular War, the French defeated (1809) the Spanish in a battle nearby. The city preserves some of its medieval flavor, it has several notable Gothic churches.

Ciudad Rodrigo (rōthré'gō), town (1970 pop. 13,320), Salamanca prov., central Spain, in Leon, on the Agueda River near the Portuguese border. It is a trade center for a cattle-raising area. Originally a Roman settlement, the town was abandoned and reestablished in the 12th cent. as a fortress. It has preserved its medieval flavor and has been declared a historic monument.

civet (siv'ət) or **civet cat**, any of a large group of mostly nocturnal mammals of the Old World family Viverridae (civet family), which also includes the MONGOOSE. Civets are not true cats, but the civet family is related to the cat family (Felidae). Most civets have catlike bodies, long tails, and weasel-like faces. Their fur may be gray or brown, and may be marked in various patterns. All civets have scent-producing glands, located in a double pouch near the genitals. The fatty yellow secretion of these glands has a distinctive musky odor used for territorial marking. Commercially, this substance is known as civet and is used as a perfume fixative. Civet can be removed from captive animals every 14 to 20 days. Some civet species are hunted for their fur. The ground-living, or true, civets form a distinctive group within the family; these animals have a highly carnivorous diet. Most have dark spots and ringed tails. They include several Asian species (genus *Viverra*) and one African species (*Civettictis civetta*). Best known is the Indian civet, *V. zibetha*, of S Asia, from which most of the civet for perfume is derived. It has tawny fur with black spots and black bands on the tail. It is about 30 in. (76 cm) long, excluding the 20-in. (42-cm) tail, and about 15 in. (38 cm) high at the shoulder, it weighs up to 25 lb (11 kg). Its musk glands are greatly enlarged. Some of the ground-living civets are called linsangs and genets. The palm civets form another distinct group within the civet family. These are arboreal, largely fruit-eating animals of Africa and Asia, they are classified in several genera. The North American spotted skunk is sometimes popularly called civet but is not closely related to civets. Civets are classified in the phylum CHORDATA, subphylum Vertebrata, class Mammalia, order Carnivora, family Viverridae.

civics, branch of learning that treats of the relationship between the citizen and his society and state, originally called civil government. In an educational sense it involves passing the tradition of the community to new generations with a view to establishing civic allegiance. With the large immigration into the United States in the latter half of the 19th cent., civics became a subject in the secondary schools and colleges through the influence of the National Education Association and other organizations.

Civil Aeronautics Board (CAB), independent agency of the executive branch of the U.S. Federal government. It was established by Congress in 1938 as the Civil Aeronautics Administration and charged with the encouragement and development of civil aviation and the formulation of economic and safety rules in air traffic. The Federal Aviation Act of 1958 transferred the safety-rulemaking function to the Federal Aviation Administration. The CAB authorizes all carriers and air routes, must approve all rates, and passes on any agreement between airlines. Its five members are appointed by the President with the consent of the Senate.

civil defense, nonmilitary activities designed to protect civilians and their property from enemy actions in time of war. A civil defense program usually includes measures taken during peace (e.g., building home shelters or air raid warning practice), measures to warn civilians of an impending attack, to protect them during attack, and to save their lives and property after attack. Civil defense grew in proportion to the use of aircraft in modern warfare, thus, warning and protection systems were primitive in World War I and greatly improved in World War II, when both sides engaged in the strategic bombing of civilian populations. After World War II the existence of nuclear weapons, the development of long-range bombers and missiles, and the ever-present possibility of war encouraged the establishment

of comprehensive civil defense systems. The principal U.S. civil defense agency was established by executive order in 1950, and in 1961 civil defense functions were transferred to the Defense Dept. The civil defense program in the United States has included the formulation of rescue and survival plans, the stockpiling of food and equipment, and the encouragement of home shelter construction. Early warning of attack is provided by chains of radar stations built across Canada. Opinion in the United States has been divided over the value of civil defense programs. Opponents of civil defense have maintained that, given the destructiveness of modern weapons, warning and shelter systems are useless and merely encourage war hysteria. Proponents of civil defense have asserted that, since a major danger from a nuclear attack is radioactive fallout, an adequate shelter program can save the lives of a large portion of the population. With the beginnings of a detente with the Soviet Union and the People's Republic of China in the 1970s, interest in civil defense in the United States, which peaked at the height of the cold war, had begun to decline. However, most industrialized countries still maintain some form of civil defense.

civil engineering: see ENGINEERING

Civilian Conservation Corps (CCC), established in 1933 by the U.S. Congress as a measure of the New Deal program. The CCC provided work and vocational training for unemployed single young men through conserving and developing the country's natural resources. At its peak in 1935, the organization had more than 500,000 members in over 2,600 camps. These were usually operated by the War Dept., but the men were not subject to military control. In 1939 the CCC was made part of the Federal Security Agency. Beginning in 1940, greater emphasis was placed on projects aiding national defense. Against President Franklin D. Roosevelt's request, Congress abolished the CCC in 1942.

Civilis (Julius Civilis) (siv'īlīs), fl. A.D. 70, Batavian chief who chose the unsettled period at the fall of NERO to raise a revolt in Germany, which quickly spread to Gaul (A.D. 69–A.D. 70). Its chief effect was to remove from VITELLIUS, who was struggling with VESPASIAN, any real support from Gaul. After Vespasian became emperor, he sent the Roman general Cerialis to put down the revolt. The rebels were treated with great consideration, and many entered the Roman service. Civilis' fate, however, is unknown.

civilization, culture with a relatively high degree of elaboration and technical development. The term *civilization* also designates that complex of cultural elements that first appeared in human history between 8,000 and 6,000 years ago. At that time, on a basis of agriculture, stock-raising, and metallurgy intensive occupational specialization began to appear in the river valleys of SW Asia. Writing appeared, as well as relatively dense urban aggregations that accommodated administrators, traders and other specialists. The specific characteristics of civilization are food production (plant and animal domestication), metallurgy, a high degree of occupational specialization, writing, and the growth of cities. Such characteristics have emerged in several parts of the prehistoric world: Mesopotamia, Egypt, China, Greece, Rome, India, Highland Peru and Bolivia, the valley of Mexico, and Guatemala. They were never fully realized in America north of the Rio Grande prior to European colonization.

civil law. As used in this article, the term *civil* signifies a modern legal system based upon ROMAN LAW, as distinguished from COMMON LAW. In common usage, however, it also means the rules that govern private legal affairs, in this sense civil law contrasts with public law and criminal law. With a few exceptions, the countries on the continent of Europe, the countries that were former colonies of such continental powers (e.g., the Latin American countries), and other countries that have recently adopted Western legal systems (e.g., Japan) use civil law. It is also the foundation for the law of Quebec prov. and of Louisiana. Modern countries that do not adhere to the civil law (this includes all states of the United States except Louisiana) for the most part were founded by England and apply the system of common law prevailing there. The law that had been in force throughout the Roman Empire when it controlled most of Europe and the Middle East was to some extent supplanted by GERMANIC LAWS when Germanic tribes carried out their great conquests. The principle of personal (as opposed to territorial) law was observed by the invaders, however, and thus the former Roman subjects

and their descendants were permitted to follow the Roman law (*leges romanorum*) in their affairs with one another. The great *CORPUS JURIS CIVILIS* of Justinian, compiled in the 6th cent and in use in the Byzantine Empire, served also to keep the old law alive. The medieval church, too, was an important guardian of Roman law, for much of the law used by the church was based upon Roman principles and concepts. Germanic law, although at first adequate, did not have legal concepts that suited the commercial requirements of the late Middle Ages, and there was then heavy borrowing of Roman ideas. As part of a concurrent revival of interest in classical culture, the late 11th and the 12th cent saw the resumption of systematic study of Roman law, chiefly in N Italy (notably at Bologna, where IRNE-RIUS gave the first lectures in Roman law), in S France, and in Spain. Extensive glosses and commentaries on the *Corpus Juris Civilis* and on other classical texts were produced. Through the agency of scholars and of judges trained in Roman law principles, these principles (though strongly modified) came to be observed in national courts in all classes of legal disputes, although for a long time courts of local jurisdiction continued to enforce customary law. Scholars of Roman law enjoyed increasing prestige, by 1500 the *Corpus Juris Civilis* had become the basis of legal science throughout Western Europe. The next step, emulating the systematizing of Justinian, was to state these principles in exact, ordered form, i.e., as a CODE. The CODE NAPOLEON (1804), the most famous of such works, had many successors. In England there was some interest in Roman law during the Renaissance, there, however, the early centralization of the legal system and the existence of an independent class of lawyers with an interest in the law as administered in the courts ensured the triumph of the common law. Nevertheless, civil law influenced the common law in the fields of admiralty law, testamentary law, and domestic relations, and civil law became the basis for the whole system of EQUITY. The tendency of civil law is to create unified legal systems by working out with maximum precision the conclusions to be drawn from basic principles. The civil law judge is bound by the provisions of the written law, and not by previous judicial interpretations. The traditional civil law decision states the applicable provision from the code or from a relevant STATUTE and the judgment is based upon that provision. See A. T. Von Mehren, *The Civil Law System* (1957); A. N. Yiannopoulos, ed., *Civil Law in the Modern World* (1965).

civil liberty: see LIBERTY

civil rights, rights that a nation's inhabitants enjoy by law. A distinction is usually recognized between civil liberties and civil rights. The former refers to negative restraints upon government, civil rights pertain to positive acts of government designed to protect persons against arbitrary or discriminatory treatment by government or individuals. The charter of the United Nations states as a central goal the expansion of both civil liberties and civil rights. In the United States civil rights are usually thought of in terms of the specific rights guaranteed in the Constitution: freedom of religion, of speech, and of the press, and the rights to due process of law and to equal protection under the law. Since the Civil War, much of the concern over civil rights in the United States has focused on efforts to extend these rights more fully to blacks. The first legislative attempts to grant blacks a political and legal status equal to that of whites were the Civil Rights Acts of 1866, 1870, 1871, and 1875. Those acts bestowed upon blacks such freedoms as the right to sue and be sued, to give evidence, and to hold real and personal property. The 1866 act was of dubious constitutionality and was reenacted in 1870 only after the passage of the FOURTEENTH AMENDMENT. The third Civil Rights Act (1871) attempted to guarantee to the blacks those social rights that were still withheld. It penalized innkeepers, proprietors of public establishments, and owners of public conveyances for discriminating against blacks in accommodations, but was invalidated by a decision of the Supreme Court in 1883 on the ground that these were not properly civil rights and hence not a field for Federal legislation. After the Civil Rights Act of 1875 there was no more Federal legislation in this field until the Civil Rights Acts of 1957 and 1960, although several states passed their own civil rights laws. The struggle to expand civil rights for blacks has been led by the National Association for the Advancement of Colored People, the Congress of Racial Equality, the Urban League, the Southern Christian Leadership Conference, and others. The civil rights movement, led especially by Martin Luther King, Jr., in the late 1950s

and 1960s and the executive leadership provided by President Lyndon Baines Johnson, encouraged the passage of the most comprehensive civil rights legislation to date, the Civil Rights Act of 1964, it prohibited discrimination for reason of color, race, religion, or national origin in places of public accommodation covered by interstate commerce, i.e., restaurants, hotels, motels, and theaters. Besides dealing with the desegregation of public schools, the act, in Title VII, forbade discrimination in employment (Title VII also prohibited discrimination on the basis of sex). In 1965 the Voting Rights Act was passed, which placed Federal observers at polls to ensure equal voting rights, and the Civil Rights Act of 1968 dealt with housing and real estate discrimination. In addition to congressional action on civil rights, there has been action by other branches of the government. The most notable of these were the Supreme Court decisions in 1954 and 1955 declaring racial segregation in public schools unconstitutional, and the court's rulings in 1955 banning segregation in publicly financed parks, playgrounds, and golf courses. In the 1960s women began to organize around the issue of their civil rights. By the early 1970s over 40 states had passed equal pay laws, and in 1972 the Senate adopted an equal rights amendment, if ratified by 38 states it would prohibit all discrimination based on sex. See A. J. M. Milne, *Freedom and Rights* (1968), Chester Anteau, *Federal Civil Rights Acts* (1971), A. L. Del Russo, *International Protection of Human Rights* (1971), H. J. Abraham, *Freedom and the Courts* (1972), T. R. Brooks, *The Walls Come Tumbling Down* (1974).

civil service, entire body of those employed in the civil administration as distinct from the military and excluding elected officials. The term was used in designating the British administration of India, and its first application elsewhere was in 1854 in England. Modern civil service personnel are usually chosen by examination and promoted on the basis of merit ratings. In democratic nations recruitment and advancement procedures are designed to divorce the civil service from political patronage. The use of competitive examinations to select civil officials was begun in China during the Han dynasty (206 B.C.-A.D. 220), and expanded to include all important positions during the Sung dynasty (960-1279, see CHINESE EXAMINATION SYSTEM). In the West, however, selection of civil administrators and staff on the basis of merit examinations is a late development. Despite important contributions to administrative structure and procedure, the Roman Empire seems to have recruited and promoted officials largely on the basis of custom and the judgement of superiors. The establishment of the modern civil service is closely associated with the decline of feudalism and the growth of national autocratic states. In Prussia, as early as the mid-17th cent., Frederick William, elector of Brandenburg, created an efficient civil administration staffed by civil servants chosen on a competitive basis. In France similar reforms preceded the Revolution, and they were the basis for the Napoleonic reforms that transformed the royal service into the civil service. Development of a professional civil service came several decades later in Great Britain and the United States. Owing doubtless in part to the spoils system so strongly established in the Jacksonian era, the United States lagged far behind other nations in standards of civil service competence and probity. Agitation for reform began shortly after the Civil War. In 1871, Congress authorized the President to prescribe regulations for admission to public service and to appoint the Civil Service Commission, which lasted only a few years. The scandals of President Grant's administration lent weight to the arguments of reformers. George W. Curtis, Dorman B. Eaton, and Carl Schurz. President Hayes favored reform and began to use competitive examinations as a basis for appointment to office. The assassination of President Garfield in 1881 by a disappointed office seeker precipitated the passage of the Pendleton Act in 1883, reestablishing the Civil Service Commission after a nine-year lapse. The commission draws up the rules governing examinations for those positions that Congress places in the classified civil service. All Presidents since Cleveland have expanded the classified list, and the great majority of Federal employees during peacetime are now classified. In 1939 the merit system was extended to sections of state administration receiving Federal grants. The Hatch Act of 1940 forbade campaign contributions by officeholders with the intention of divorcing the civil service from politics. Appointive power is shared by the President, who appoints the heads of all government departments and may remove his appointees

at will, by Congress, which controls its own employees, and by the Civil Service Commission and departmental appointing officers, in whose charge are vacancies in the classified service. Important changes were made in the structure of the U.S. civil service as a result of the reports issued (1949, 1955) by the two commissions known as the Hoover Commission. The organization of the government bureaucracy was streamlined by the creation of the General Services Administration, combining the operations and activities of some 60 government agencies. Of the world's civil services, the most outstanding on several counts is still the British, extremely powerful because of its permanency, its extensive grants of power from Parliament, and its reputation for absolute honesty, although it is criticized for a lack of flexibility and for class exclusiveness in its upper ranges. A Civil Service Commission and the beginnings of a system of competitive examinations were established in Great Britain in 1855, and the influential Whitley Councils, representing both government employees and administrators in questions dealing with service conditions, were set up after World War II. British civil servants are strictly excluded from politics. In Communist nations, on the other hand, the official party and the civil service tend to interpenetrate. The secretariat of the League of Nations and of the United Nations are possible precursors of an international civil service. See W. A. Robson, *The Civil Service in Britain and France* (1956), Paul Van Riper, *History of the United States Civil Service* (1958), E. A. Kracke, *The Civil Service in Britain and France* (1968), F. C. Mosher, *Democracy and the Public Service* (1968), Alan Gartner et al., ed., *Public Service Employment* (1973).

civil time, local TIME based on Greenwich mean time. Civil time may be formally defined as mean SOLAR TIME plus 12 hr, the civil day begins at midnight, while the mean solar day begins at noon. Civil time is usually not used, since it depends on the observer's longitude, instead, STANDARD TIME, which is the same throughout a given time zone, is generally adopted.

civil war, English: see ENGLISH CIVIL WAR

civil war, in Roman history see MARIUS and SULLA, POMPEY and JULIUS CAESAR

Civil War, in U.S. history, conflict (1861-65) between the Northern states (the Union) and the Southern states that seceded from the Union and formed the CONFEDERACY. It is generally known in the South as the War between the States and is also called the War of the Rebellion (the official Union designation), the War of Secession, and the War for Southern Independence. The name Civil War, although much criticized as inexact, is most widely accepted. It is, in fact, somewhat misleading, since the war was not a class struggle, but a sectional combat having its roots in such complex political, economic, social, and psychological elements that historians still do not agree on its basic causes. It has been characterized, in the words of William H. Seward, as the "irrepressible conflict." In another judgment the Civil War was viewed as criminally stupid, an unnecessary bloodletting brought on by arrogant extremists and blundering politicians. Both views accept the fact that in 1861 there existed a situation that, rightly or wrongly, had come to be regarded as insoluble by peaceful means. Earlier, in the days of the American Revolution and of the adoption of the Constitution, differences between North and South were dwarfed by their common interest in establishing a new nation. But sectionalism steadily grew stronger. In the 19th cent the South remained almost completely agricultural, with an economy and a social order largely founded on Negro slavery and the plantation. These mutually dependent institutions produced the staples, especially cotton, from which the South derived its wealth. The North had its own great agricultural resources, was always more advanced commercially, and was also expanding industrially. Hostility between the two sections grew perceptibly after 1820, the year of the MISSOURI COMPROMISE, which was intended as a permanent solution to the issue in which that hostility was most clearly expressed—the question of the extension or prohibition of slavery in the Federal territories of the West. Difficulties over the tariff (which led John C. CALHOUN and South Carolina to NULLIFICATION and to an extreme STATES' RIGHTS stand) and troubles over internal improvements were also involved, but the territorial issue nearly always loomed largest. In the North moral indignation increased with the rise of the ABOLITIONISTS in the 1830s. Since Negro slavery was unadaptable to much

of the territorial lands, which eventually would be admitted as free states, the South became more anxious about maintaining its position as an equal in the Union. Southerners thus strongly supported the annexation of Texas (certain to be a slave state) and the Mexican War and even agitated for the annexation of Cuba. The COMPROMISE OF 1850 marked the end of the period that might be called the era of compromise. The deaths in 1852 of Henry CLAY and Daniel WEBSTER left no leader of national stature, but only sectional spokesmen, such as W. H. SEWARD, Charles SUMNER, and Salmon P. CHASE in the North and Jefferson DAVIS and Robert TOOMBS in the South. With the KANSAS-NEBRASKA ACT (1854) and the consequent struggle over "bleeding" Kansas the factions first resorted to shooting. The South was ever alert to protect its "peculiar institution," even though many Southerners recognized slavery as an anachronism in a supposedly enlightened age. Passions aroused by arguments over the FUGITIVE SLAVE LAWS (which culminated in the DRED SCOTT CASE) and over slavery in general were further excited by the activities of the Northern abolitionist John BROWN and by the vigorous proslavery utterances of William L. YANCEY, one of the leading Southern FIRE-EATERS. The "wedges of separation" caused by slavery split large Protestant sects into Northern and Southern branches and dissolved the WHIG PARTY. Most Southern Whigs joined the DEMOCRATIC PARTY, one of the few remaining, if shaky, nationwide institutions. The new REPUBLICAN PARTY, heir to the FREE-SOIL PARTY and to the LIBERTY PARTY, was a strictly Northern phenomenon. The crucial point was reached in the presidential election of 1860, in which the Republican candidate, Abraham LINCOLN, defeated three opponents—Stephen A. DOUGLAS (Northern Democrat), John C. BRECKINRIDGE (Southern Democrat), and John BELL of the CONSTITUTIONAL UNION PARTY. Lincoln's victory was the signal for the SECESSION of South Carolina (Dec. 20, 1860), and that state was followed out of the Union by six other states—Mississippi, Florida, Alabama, Georgia, Louisiana, and Texas. Immediately the question of federal property in these states became important, especially the forts in the harbor of Charleston, S.C. (see FORT SUMTER). The outgoing President, James BUCHANAN, a Northern Democrat who was either truckling to the Southern, proslavery wing of his party or sincerely attempting to avert war, pursued a vacillating course. At any rate the question of the forts was still unsettled when Lincoln was inaugurated, and meanwhile there had been several futile efforts to reunite the sections, notably the CRITTENDEN COMPROMISE offered by Sen. J. J. Crittenden. Lincoln resolved to hold Sumter. The new Confederate government under President Jefferson Davis and South Carolina were equally determined to oust the Federals.

Sumter to Gettysburg When, on April 12, 1861, the Confederate commander P. G. T. BEAUREGARD, acting on instructions, ordered the firing on Fort Sumter, hostilities officially began. Lincoln immediately called for troops to be used against the seven seceding states, which were soon joined by Arkansas, North Carolina, Virginia, and Tennessee, completing the 11-state Confederacy. In the first important military campaign of the war untrained Union troops under Irvin McDOWELL, advancing on Richmond, now the Confederate capital, were routed by equally inexperienced Confederate soldiers led by Beauregard and Joseph E. JOHNSTON in the first battle of BULL RUN (July 21, 1861). This fiasco led Lincoln to bring up George B. MCCLELLAN (1826-85), fresh from his successes in West Virginia (admitted as the new state of WEST VIRGINIA in 1863). After the retirement of Winfield SCOTT in Nov., 1861, McClellan was for a few months the chief Northern commander. The able organizer of the Army of the Potomac, he nevertheless failed in the PENINSULAR CAMPAIGN (April-July, 1862), in which Robert E. LEE succeeded the wounded Johnston as commander of the Confederate Army of Northern Virginia. Lee planned the diversion in the Shenandoah Valley, which, brilliantly executed by Thomas J. (Stonewall) JACKSON, worked perfectly. Next to Lee himself Jackson, with his famous "foot cavalry," was the South's greatest general. Lee then went on to save Richmond in the SEVEN DAYS BATTLES (June 26-July 2) and was victorious in the second battle of Bull Run (Aug. 29-30), thoroughly trouncing John POPE. However, he also failed in his first invasion of enemy territory. In September, McClellan, whom Lincoln had restored to command of the defenses of Washington, checked Lee in Maryland (see ANTIETAM CAMPAIGN). When McClellan failed to attack the Confederates as they retreated, Lincoln removed him again, permanently

Two subsequent Union advances on Richmond, the first led by Ambrose E. BURNSIDE (see FREDERICKSBURG, BATTLE OF) and the second by Joseph HOOKER (see CHANCELLORSVILLE, BATTLE OF), ended in resounding defeats (Dec. 13, 1862, and May 2-4, 1863). Although Lee lost Jackson at Chancellorsville, the victory prompted him to try another invasion of the North. With his lieutenants Richard S. Ewell, James LONGSTREET, Ambrose P. HILL, and J. E. B. (Jeb) STUART, he moved via the Shenandoah Valley into S. Pennsylvania. There the Army of the Potomac, under still another new chief, George G. MEADE, rallied to stop him again in the greatest battle (July 1-3, 1863) of the war (see GETTYSBURG CAMPAIGN). In the meantime, with the vastly superior sea power built up by Secretary of the Navy Gideon WELLES, the Union had established a blockade of the Southern coast, which, though by no means completely effective, nevertheless limited the South's foreign trade to the uncertain prospects of blockade-running. In cooperation with the army the Union navy also attacked along the coasts. The forts guarding New Orleans, the largest Confederate port, fell (April 28, 1862) to a fleet under David G. FARRAGUT, and the city was occupied by troops commanded by Benjamin F. BUTLER (1818-93). The introduction of the ironclad warship (see ERICSSON, JOHN, MONITOR AND MERRIMACK) had revolutionized naval warfare, to the ultimate advantage of the industrial North. On the other hand, CONFEDERATE CRUISERS, built or bought in England (see ALABAMA CLAIMS) and captained by men such as Raphael SEMMES, destroyed or chased from the seas much of the U.S. merchant marine. Britain never formally recognized the Confederacy (neither did France) and maintained peaceful relations with the Union despite the provocation late in 1861 of the TRENT AFFAIR, which was adroitly handled by Secretary of State Seward. Charles Francis ADAMS (1807-86) at London and John BIGELOW at Paris were able diplomats, but probably more important in winning popular support for the Union in England and France was the EMANCIPATION PROCLAMATION, which Lincoln issued after Antietam. This act appealed for a time the anti-Lincoln radical Republicans in Congress, among them Benjamin F. WADE, Zachariah CHANDLER, Thaddeus STEVENS, and Henry W. DAVIS, with whom Secretary of the Treasury Salmon P. Chase and Secretary of War Edwin M. STANTON were allied. Not all Unionists were abolitionists, however, and the Emancipation Proclamation was not applied to the border slave states Delaware, Maryland, Kentucky, and Missouri (all remained loyal for Lincoln and kindred moderates, such as Postmaster General Montgomery BLAIR, the restoration of the Union, not the abolition of slavery, remained the principal objective of the war. The Union victories at Gettysburg and Vicksburg in July, 1863, marked a definite turning point in the war. Both sides now had seasoned, equally valiant soldiers, and in Lee and Ulysses S. GRANT each had a superior general. But the North, with its larger population and comparatively enormous industry, enjoyed a tremendous material advantage. Both sides also resorted to conscription, even though it met some resistance (see DRAFT RIOTS). Again, under Stanton, successor to Simon CAMERON, the overall administration of the Union army was more efficient. Problems of organization still remained, however, and Henry W. HALLECK continued in the difficult role of military adviser, with the title of general in chief. The Joint Congressional Committee on the Conduct of the War, organized in Dec., 1861, attempted to influence the actions as well as the appointment of Union generals (its efforts were particularly strong on behalf of Hooker). The chairman, Benjamin F. Wade, was frequently at odds with Lincoln, and the committee's investigations and high-handed actions lowered morale among the Union forces.

Grant and Sherman Lead to Victory That the "war was won in the West" has become axiomatic. There the rivers, conveniently flowing either north (the Cumberland and the Tennessee) or south (the Mississippi), invited Union penetration, as they did not in Virginia. In Feb., 1862, the Union gunboats of Andrew H. FOOTE forced the Confederates to retire from their post FORT HENRY on the Tennessee to their stronghold on the Cumberland, FORT DONELSON. There, on Feb. 16, 1862, Grant, commanding the Army of the Tennessee, won the first great Union victory of the war, and Nashville promptly fell without a struggle. Farther down the Tennessee, Grant was lucky to escape defeat in a bloody contest (April 6-7) with Albert S. JOHNSTON and Beauregard (see SHILOH, BATTLE OF). Minor Union successes at luka (Sept. 19) and CORINTH (Oct. 3-4) followed, while the counterinvasion by the Confederate Army

of Tennessee under Braxton BRAGG was stopped by Don Carlos BUELL at Perryville, Ky. (Oct. 8, 1862). William S. ROSECRANS, Buell's successor, then stalked Bragg through Tennessee, fought him to a standoff at MURFREESBORO (Dec. 21, 1862-Jan. 2, 1863), and finally, by outmaneuvering him, forced the Confederate general to withdraw S. of Chattanooga. Union gunboats had cleared the upper Mississippi (see ISLAND NO. 10, FORT PILLLOW), leading to the fall of Memphis on June 6, 1862. Grant's VICKSBURG CAMPAIGN, at first stalled by the raids of Confederate cavalrymen Nathan B. FORREST and Earl Van Dorn, was pressed to a victorious end in a brilliant movement in which the navy, represented by David D. PORTER, also had a hand. The Union now controlled the whole Mississippi, and the trans-Mississippi West was severed from the rest of the Confederacy. The fighting in that area (see WILSON'S CREEK, PEA RIDGE, PRAIRIE GROVE, ARKANSAS POST) had held Missouri for the Union and led to the partial conquest of Arkansas, but after the fall of Vicksburg, the war there, with the exception of the unsuccessful Union Red River expedition of Nathaniel P. BANKS and a last desperate Confederate raid into Missouri by Sterling PRICE (both in 1864), was largely confined to guerrilla activity. Back on the Georgia-Tennessee line in Sept., 1863, Bragg, having temporarily halted his retreat, severely jolted the Federals, who were saved from a complete rout by the magnificent stand of George H. THOMAS, the Rock of Chickamauga (see CHATTANOOGA CAMPAIGN). Grant, newly appointed supreme commander in the West, hurried to the scene and, with William T. SHERMAN, Hooker, and Thomas's fearless troops, drove Bragg back to Georgia (Nov. 25). Since Knoxville, occupied in September, withstood Longstreet's siege (Nov.-Dec.), all Tennessee, hotbed of Unionism, was now safely restored to the Union. In March, 1864, Lincoln, for many years an admirer of Grant, made him commander in chief. Leaving the West in Sherman's capable hands, Grant came east, took personal charge of Meade's Army of the Potomac, and engaged Lee in the WILDERNESS CAMPAIGN (May-June, 1864). Outnumbered but still spirited, the Army of Northern Virginia was slowly and painfully forced back toward Richmond, and in July the tenacious Grant began the long siege of PETERSBURG. Although Jubal A. EARLY won at MONOCACY (July 9), threatening the city of Washington, the Confederates were unable to repeat Jackson's successful diversion of 1862, and Philip H. SHERIDAN, victorious in the grand manner at CEDAR CREEK (Oct. 19), virtually ended Early's activities in the Shenandoah Valley. For his part, Sherman, opposed first by the wily Joe Johnston and then by John B. HOOD, won the ATLANTA CAMPAIGN (May-Sept., 1864). On the political front, a movement within the Republican party to shelve Lincoln had collapsed, and, with Andrew JOHNSON, his own choice for Vice President over the incumbent Hannibal HAMLIN, the President was renominated in June, 1864. The Democrats nominated McClellan, who still had a strong popular following, on an ambiguous peace platform (largely dictated by Clement L. VALLANDIGHAM, leader of the COPPERHEADS), which the ex-general repudiated. Even so Lincoln was easily reelected. After the fall of Atlanta, which had contributed to Lincoln's victory, Sherman's troops made their destructive march through Georgia. Hood had failed to draw Sherman back by invading Union-held Tennessee, and after the battle of Franklin (Nov. 30) Hood's army was almost completely annihilated by Thomas at Nashville (Dec. 15-16, 1864). Sherman presented Lincoln with the Christmas gift of Savannah, Ga., and then moved north through the Carolinas. Farragut's victory at Mobile Bay (Aug. 5, 1864) had effectively closed that port, and on Jan. 15, 1865, Wilmington, N.C., was also cut off (see FORT FISHER). After Sheridan's victory at FIVE FORKS (April 1), the Petersburg lines were breached and the Confederates evacuated Richmond (April 3). With his retreat blocked by Sheridan, Lee, wisely giving up the futile contest, surrendered to Grant at APPOMATTOX COURTHOUSE on April 9, 1865. The surviving Confederate armies also yielded when they heard of Lee's capitulation.

The New Nation The long war was over, but for the victors the peace was marred by the assassination of Abraham Lincoln, the greatest figure of the war. The ex-Confederate states, after enduring the further unpleasantness of RECONSTRUCTION with its corruption and vindictiveness, were readmitted to the Union, which had been saved and in which slavery was now abolished. The Civil War brought death to more Americans than did any other war, including World War II. Photographs by Mathew B. BRADY and others reveal some of the horror behind the statis-

tics The war cost untold billions and nourished rather than canceled the hatreds and intolerance that persisted for decades It established many of the patterns, especially a strong central government, which are now taken for granted in our national life Virtually every battlefield, with its graves, is either a national or a state park Monuments commemorating Civil War figures and events are conspicuous in almost all sizable Northern towns and are even more numerous in the Upper South Notable fictional treatments of the war are Stephen Crane's *Red Badge of Courage* (1896) and Margaret Mitchell's *Gone with the Wind* (1936), and there is one outstanding work in verse—Stephen Vincent Benet's *John Brown's Body* (1928) The quantity of historical literature on the Civil War is enormous, and there is no single, adequate bibliographical guide For bibliographies, see Allan Nevins et al, ed, *Civil War Books A Critical Bibliography* (2 vol, 1967-69) On the causes of, and events leading up to, the war, see A C Cole, *The Irrepressible Conflict, 1850-1865* ("History of American Life" series, Vol VII, 1934, rev ed 1938, repr 1971), G F Milton, *The Eve of Conflict* (1934), A O Craven, *The Coming of the Civil War* (1942, new ed 1957) and *Civil War in the Making* (1959, repr 1968) Standard, older works on the military phase are C C Buel and R U Johnson, ed, *Battles and Leaders of the Civil War* (4 vol, 1877, new ed 1956), J C Ropes, *The Story of the Civil War* (2 vol, 1898-99, completed by W R Livermore, 1913), Sir Frederick Maurice, *Statesmen and Soldiers of the Civil War* (1926) R E Lee A Biography (4 vol, 1934-35) and Lee's Lieutenants (3 vol, 1942-44), both by Douglas Southall Freeman, and *Lincoln Finds a General* (5 vol, 1949-59), by K P Williams, are definitive in their respective fields See also T L Livermore, *Numbers and Losses in the Civil War in America, 1861-1865* (1901, new ed 1957, repr 1969), J F Rhodes, *History of the Civil War, 1861-1865* (1917, new ed 1961), J B McMaster, *A History of the People of the United States during Lincoln's Administration* (1927), E C Smith, *The Borderland in the Civil War* (1927, repr 1970), R S Henry, *The Story of the Confederacy* (1931, rev ed 1957), C R Fish, *The American Civil War An Interpretation* (1937), Margaret Leech, *Reveille in Washington* (1941), Allan Nevins, *Ordeal of the Union* (8 vol, 1947-71), Bruce Catton, *A Stillness at Appomattox* (1953) and other studies, Benjamin Quarles, *The Negro in the Civil War* (1953, repr 1968), L M Starr, *Bohemian Brigade* (1954), J B Mitchell, *Decisive Battles of the Civil War* (1955), R S West, Jr, *Mr Lincoln's Navy* (1957), Shelby Foote, *The Civil War* (2 vol, 1958-63), M M Boatner, *The Civil War Dictionary* (1959), *American Heritage Picture History of the Civil War* (ed by R M Ketchum et al, 1960), R F Nichols, *The Stakes of Power* (1961), Virgil Jones, *The Civil War at Sea* (3 vol, 1960-62), J M McPherson, *The Negro's Civil War* (1965), J C Randall, *The Civil War and Reconstruction* (2d ed, with David Donald, 1969) See also the bibliographies in separate articles on the major events of the war

ivitali, Matteo (mat-tē'ō chēvētā'īē), 1436-1501, Italian sculptor and architect, born and worked in Lucca, where his work is best represented Trained in Florence, he executed elaborate tomb sculptures of biblical figures in the Chapel of San Giovanni Battista in Genoa Cathedral

ivitavecchia (chēvētā-vēk'kēā), city (1971 pop 43,434), in Latium, W central Italy, on the Tyrrhenian Sea The harbor, favored by Trajan (early 2d cent AD), is still the chief port of Rome It also handles traffic for the Terni industrial area and is the main maritime link with Sardinia Industries of the city include fishing and petroleum refining The arsenal in Civitavecchia was built by Bernini, and Michelangelo directed the final stages of the construction of the powerful citadel (begun 1508, nearly destroyed in World War II)

Cl, chemical symbol of the element CHLORINE

Clackmannanshire (klākmān'ānshīr), county (1971 pop 45,553), 55 sq mi (142 sq km), central Scotland, at the head of the Firth of Forth ALLOA is the administrative center Clackmannanshire is the smallest county in area in Scotland Part of the Ochil Hills are in the north The county has an important coal industry, as well as dairy and grain farming and sheep raising In 1975 Clackmannanshire became part of the Central region

Clacton, urban district (1971 pop 37,942), Essex, E central England It is a seaside resort situated on high cliffs The Norman Church of St John was restored there in 1865

Claffin, Tennessee: see WOODHULL VICTORIA (CLAF LIN)

Claiborne, William (klā'bōrn), c 1587-c 1677, Virginia colonist, b Westmorland co, England He emigrated to Virginia in 1621 as official surveyor and then served as secretary of state (1626-37, 1652-60) of that colony He traded with the Indians, explored near the head of Chesapeake Bay, and established a fort and settlement on Kent Island in the Chesapeake He opposed the grant of Maryland to Lord Baltimore, and after Baltimore's order (1634) for his arrest, Claiborne undertook armed resistance from his stronghold Claiborne went (1637) to England to justify his conduct, but the issue was decided in favor of Lord Baltimore In 1642, Claiborne was made treasurer of Virginia, and several years later, claiming the authority of Parliament, he invaded Maryland and drove out the governor, Leonard Calvert He controlled Maryland for several years and was a member (1652-57) of its governing commission

Claiborne, William Charles Coles, 1775-1817, governor of Louisiana, b Sussex co, Va He began law practice in Sullivan co, Tenn, and was appointed a judge of the state supreme court in 1796 As a Congressman (1797-1801) he supported Jefferson, and in 1801 the President made him governor of Mississippi Territory In 1803, Claiborne was one of the commissioners appointed to receive Louisiana from France after the Louisiana Purchase, and he was governor (1804-12) of the newly organized Territory of Orleans American government was not well received by the Creoles, and Claiborne had many quarrels with legislators and others He was also criticized for his apparent approval of the questionable activities of Gen James Wilkinson However, when the Territory of Orleans was admitted to the Union in 1812 as the state of Louisiana, Claiborne was elected governor and served until 1816 In 1817 he was elected to the US Senate but died before he could take his seat See Dunbar Rowland, ed, *Official Letterbooks of W C C Claiborne, 1801-1816* (6 vol, 1917)

Clair, René (rənā' klār), 1898-, French film director, writer, and producer Clair's films, notable for fantasy and satire, first received international attention in 1930 His *Sous les toits de Paris* (1929), one of the first artistic "talkies," was followed by *Le Million* (1931) and *À nous la liberté* (1932) *The Ghost Goes West*, made in England in 1936, *Les Belles de Nuit* (1952), and *Les Fêtes Galantes* (1965) are among his notable films In 1962 he was elected to the French Academy, the first film director to be so honored See his *Reflections on the Cinema* (tr 1953) and *Cinema Yesterday and Today*, ed by R C Dale (1972)

Clairaut, Alexis Claude (alēksēs' klōd klērō'), 1713-65, French mathematician He assisted P L M de Maupertuis in measuring (1736) a degree of an arc of a meridian in Lapland He is noted for his work on differential equations and on curves and for formulating Clairaut's theorem dealing with geodesic lines on the surface of an ellipsoid

Claire, Ina, 1892?- , American actress, b Washington, D C, originally named Ina Fagan Claire began her stage career in 1909, impersonating Sir Harry LAUDER Noted for her gay and elegant style, she performed in vaudeville and in many successful shows on Broadway and in London, including *The Quaker Girl*, *Ziegfeld Follies*, and *The Confidential Clerk* Among her few films were *The Awful Truth* (1929), *Ninotchka* (1939), and *Claudia* (1942)

Clairton, city (1970 pop 15,051), Allegheny co, SW Pa, an industrial suburb of Pittsburgh, on the Monongahela River, settled 1770, inc 1903 Its extensive steelworks turn out a great variety of products Coal mines and oil wells are also found in the area, and coke, coke by-products, and chemicals are important manufactures

clairvoyance (klār'vō'āns), power to perceive, as though visually, objects or persons not discernible through the ordinary sense channels Clairvoyance may occur in a supposedly normal state (second sight) or more generally in a trance induced by various agencies, such as drugs, fasting, illness, or crystal gazing See SPIRITISM and PARAPSYCHOLOGY

Clallam Indians (klāl'ām), North American Indians whose language belongs to the Salishan branch of the Algonquian-Wakashan linguistic stock (see AMERICAN INDIAN LANGUAGES) They formerly occupied the south shore of Puget Sound, in the present state of Washington

clam, common name for certain BIVALVE mollusks, especially for marine species that live buried in mud or sand and have valves (the two pieces of the shell) of equal size The oval valves, which cover the right and left sides of the animal, are hinged together at

the top by an elastic ligament Clams burrow by means of a muscular foot, located at the front end, which can be extruded between the valves The head, located within the shell, is rudimentary, without eyes or antennae Water containing oxygen and food particles enters through an incurrent siphon, waste-containing water is expelled through an excurrent siphon The two tubes project from the end opposite the foot and may be united in a single structure called the neck The sexes are usually separate Eggs and sperm are deposited in the water, the fertilized egg develops into a free-swimming larva without a shell, which may not attain the adult form for several months Clams are highly valued as food The soft-shell clam, or steamer (*Mya arenaria*), of both coasts of North America, is one of the most popular eating clams The hard-shell clam (*Mercentaria mercenaria*), abundant from the Gulf of St Lawrence to Texas, was called quahog by some Indians, who used the violet portion of the shell for wampum Small hard-shell clams are called little-necks, or cherrystones The razor clam (*Ensis*), shaped like an old-fashioned straight razor, burrows rapidly and swims by means of its foot The Atlantic razor clam, found from Labrador to W Florida and prized for its flavor, may attain lengths of 10 in (25 cm) The Eastern surf clam (*Spisula solidissima*) frequents sandy bottoms in shallow water from Labrador to North Carolina and is much used for bait There are also several Pacific surf clams Other Pacific clams include the succulent Pismo clam (*Tridacna stultorum*), found from mid-California southward and protected by law from overdigging, and the GEODUCK of the Pacific Northwest, which may weigh as much as 12 lb (5.4 kg) The valves of many small clams are familiar seashells, such as those of the pea-sized amethyst gem clam The GIANT CLAM of the Pacific Ocean may reach a weight of 500 lb (227 kg) and a length of 5 ft (150 cm) There are two families of freshwater bivalves called clams The small freshwater clams (family Sphaeriidae) are hermaphroditic, they retain the fertilized eggs in a brood pouch and bear young with shells The large freshwater clams (family Unionidae) are also called freshwater MUSSELS, the nacreous inner layer of their shells is a source of mother-of-pearl The larvae of these clams are parasitic on the gills of fish The term clam is sometimes used synonymously with bivalve, in this sense it includes the OYSTERS, SCALLOPS, and marine mussels Clams are classified in the phylum MOLLUSCA, class Pelecypoda

Clamart (klamar'), suburb SW of Paris (1968 pop 55,299), Hauts-de-Seine dept, N central France There are pharmaceutical laboratories, a tobacco factory, and nurseries in the town Fruits and vegetables are grown, and tourism is important On the outskirts of Clamart are an airplane factory and a military airfield

clam shrimp: see SHRIMP

clamworm: see ANNELIDA, WORM

clan, social group based on actual or alleged unilateral descent from a common ancestor Such groups have been known in all parts of the world and include some that claim the parentage or special protection of an animal, plant, or other object (see TO TEM) They also include such familiar groups as the Highland clans of Scotland (the English word clan comes from Gaelic) Most clans stress mutual obligations and duties Clan descent is traced in one line only, male or female The word clan has by some been restricted to those descended through the mother (matrilineal) in contrast to the GENS, descended through the father (patrilineal) The word sib has been much used to cover both types A clan includes several family groups Most clans are exogamous and regard marriages among their members as incest A clan is distinguished from a lineage in that a clan merely claims common ancestry, a lineage can be traced to a common progenitor A clan may have several lineages Several clans may be combined into a larger social group called a phratry If a tribe includes two clans or phratries, each clan or phratry is called a moiety See Sir Iain Moncreiffe, *The Highland Clans* (1967)

Clanricarde, Ulick de Burgh, 5th earl and marquess of (yōō'lik də būrg, klānrīk'ārd), 1604-57, Irish Catholic nobleman He assisted James Butler, 12th earl of ORMONDE, in his attempt, during the English civil war, to unite Catholic and Protestant royalists and hold Ireland loyal to Charles I When Ormonde left Ireland (1650), he named Clanricarde his deputy Clanricarde made peace (1652) with Oliver Cromwell at the request of Charles II

clapboard (klāp'bōrd), board used for the exterior finish of a wood-framed building and attached horizontally to the wood studs The word, in its original

and strict use, refers to a product of New England, boards of similar type made elsewhere are termed siding. Clapboards are particularly characteristic of the United States, having been steadily used since the earliest years of the colonial settlements. Each clapboard overlaps the one below it, leaving a few inches exposed to the weather. White pine is considered the best wood for clapboards, cedar, cypress, and spruce are also used.

Clapham, Sir John Harold, 1873–1946, English economic historian. He was lecturer, professor and administrator at Cambridge from 1908 to 1943. Outstanding among his many authoritative, classic works on British economic history are *An Economic History of Modern Britain* (2d ed., 3 vol., 1931–38) and *The Bank of England* (1944). Other books include *The Economic Development of France and Germany, 1815–1914* (4th ed., 1936), a comparative study, and *A Concise Economic History of Britain, from the Earliest Times to 1750* (1949), a useful standard survey.

Clapham Sect, group of English social reformers, active c 1790–1830, so named because their activities centered on the home in Clapham, London, of Henry Thornton and William Wilberforce. Most of the members were evangelical Anglicans and members of Parliament. They included Zachary Macaulay, Thomas Babington, John Venn, James Stephen, and Hannah More. Known as the “Saints,” they worked for the abolition of the slave trade and slavery, improvement of prison conditions, and other humane legislation. They published a journal, the *Christian Observer*, and helped to found several missionary and tract societies, including the British and Foreign Bible Society and the Church Missionary Society. See E. M. Howse, *Saints in Politics* (1952, repr. 1971).

Clapp, Verner, 1901–72, American librarian, b. Johannesburg, South Africa. After studying philosophy at Harvard, Clapp worked for the Library of Congress (1922–1956), becoming chief assistant librarian in 1947. He also did much work for the United Nations and served as chairman of the U.S. Library Mission to Japan (1947–48). From 1956 to 1967 he was president of the Council on Library Resources. He has written *The Future of the Research Library* (1963) and *Copyright: A Librarian's View* (1968).

Clapperton, Hugh, 1788–1827, British explorer, b. Annan, Scotland. After serving with the British navy in East India and Canada he made two journeys to W. Africa. On the initial journey (1822–25) he was one of the first Europeans to reach Lake Chad (Feb. 4, 1823). He traveled through the Hausa states and collected much information about Kano and Sokoto. Clapperton's second expedition sought to discover the mouth of the Niger River. Before he could accomplish this task he died near Sokoto on April 13, 1827. His servant, R. L. Lander, returned to England with his records, which were published (1829) as the *Journal of a Second Expedition into the Interior of Africa*. See Henry Williams, *Quest beyond the Sahara* (1965).

Clare or Clara, Saint, 1193?–1253, Italian nun of Assisi, devoted from her youth to St. FRANCIS, to whom she took a vow of poverty. She led a life of great austerity. She organized her companions into the Franciscan nuns, or Poor Clares, and struggled a long time for the preservation of the primitive poverty of her order. Feast Aug. 12.

Clare, John, 1793–1864, English nature poet. He is numbered among the romantic poets. His *Poems Descriptive of Rural Life and Scenery* (1820) brought him a brief period of fame. Subsequent volumes included *The Village Minstrel* (1821) and *Rural Muse* (1835). Throughout his life he suffered fits of melancholy, which were intensified by financial difficulties and bad health. In 1837 he was declared insane and committed to an asylum. See biographies by J. W. Tibble and A. Northgrave (2d ed. 1972) and Frederick Martin (1865, repr. 1973), studies by Mark Storey, ed. (1973) and J. M. Todd (1973).

Clare, John Fitzgibbon, 1st earl of, 1749–1802, Irish statesman. He was (1783–89) attorney general of Ireland and in 1789 became lord chancellor. A resolute upholder of the Protestant ascendancy in Ireland, he denounced the Catholic Relief Act of 1793 and helped to thwart Lord Fitzwilliam in his move toward Catholic Emancipation. He was instrumental in effecting the Act of Union (1800) between England and Ireland. Clare, who was created earl in 1795, was so unpopular in Ireland that his funeral was broken up by a mob.

Clare, Richard de. see PEMBROKE, RICHARD DE CLARE 2D EARL OF

Clare, county (1971 pop. 74,844), 1,231 sq mi (3,188 sq km), W. Republic of Ireland, between Galway Bay

and the Shannon River. The county town is Ennis. The terrain is broken and hilly, with many bogs and lakes, and the coastline is especially rugged, much of the land is completely barren. Fishing is carried on, and sheep, cattle, pigs, and poultry are raised. Chief crops are oats and potatoes. Woolens are produced, and there are flour mills and slate quarries. The population has declined steadily for more than 100 years. The region came under the control of the Anglo-Norman Clare family in the 13th cent.

Clare Island, c 6 sq mi (15 sq km), Co. Mayo, W. Republic of Ireland, at the entrance to Clew Bay. There are ruins of a 13th-century Carmelite abbey and of the 16th-century castle of Grania or Grace O'Malley, queen of the island.

Claremont, 1. City (1970 pop. 23,464), Los Angeles co., S. Calif., in a citrus farm area at the foot of the San Gabriel Mts., inc. 1907. It is mainly residential. The Claremont Colleges, a theological school, and a large botanical garden are there. 2. City (1970 pop. 14,221), Sullivan co., SW N.H., in a farm and dairy area, on the Sugar River near its junction with the Connecticut, inc. 1764. It is a summer resort and has plants manufacturing shoes, textiles, machinery, and paper. The oldest Roman Catholic church in the state (begun 1823) is there, and in nearby West Claremont is Union Church, the state's oldest Episcopal church (begun 1773). A replica of a pre-Revolutionary fort complex is nearby.

Claremont Colleges, at Claremont, Calif., including five liberal arts and sciences colleges and a graduate school, founded 1925, known until 1961 as the Associated Colleges at Claremont. Their history began with Pomona College (inc. 1887, opened 1888, coeducational), which centers its curriculum in the social sciences and humanities. Scripps College (chartered 1926, opened 1927, for women) has a noted humanities program. Claremont Men's College (chartered and opened 1946) concentrates on preparing students for careers in business and government. Harvey Mudd College (inc. 1955, opened 1957, coeducational) stresses science and engineering. Pitzer College (founded 1963, for women) emphasizes the liberal arts. The Claremont Univ. Center (1925) is the central coordinating institution and the graduate school.

Clarence, George, duke of, 1449–78, son of Richard, duke of York, and brother of EDWARD IV. In defiance of Edward, Clarence married Isabel Neville and joined her father, Richard Neville, earl of WARWICK, in rebellion against the king in 1469–70. He deserted that party in 1471, however, and was reconciled with Edward. In 1478, exasperated by Clarence's continued factiousness, Edward had him attainted for treason by Parliament. He was sent to the Tower of London, where he was secretly executed. It was rumored that he was drowned in a butt of malmsey wine.

Clarence, Lionel, duke of, 1338–68, third son of Edward III of England. His marriage (1352) to Elizabeth de Burgh gained him the title and lands of the earl of Ulster. Governor of Ireland from 1361 to 1367, he presided (1366) at the assembly where the notorious Statute of Kilkenny was adopted, forbidding marriage between the English settlers and the Irish. Clarence died soon after his later marriage to Violante Visconti. His daughter, Philippa, married Edmund Mortimer, 3d earl of March. Their granddaughter, Anne Mortimer, married Richard, earl of Cambridge, and their son, Richard, duke of YORK, derived his claim to the throne through his descent from Lionel.

Clarendon, Edward Hyde, 1st earl of (klâr'əndan), 1609–74, English statesman and historian. Elected (1640) to the Short and Long parliaments, he was at first associated with the opposition to CHARLES I and helped prepare the impeachment of the earl of Strafford. The increasing radicalism of the opposition, however, led him to offer his services to the king, whom he aided by drafting a reply to the Grand Remonstrance. After the outbreak of the civil war, Hyde was appointed (1643) chancellor of the exchequer, and he represented (1645) Charles in the unsuccessful Uxbridge negotiations to end the war. Hyde followed Prince Charles (later CHARLES II) into exile in 1646 and became one of his chief advisers. Pursuing Hyde's policy, Charles awaited the appearance of a strong, friendly faction in England and successfully negotiated his own restoration (1660) without foreign aid. After Charles's return to England, Hyde became (1660) lord chancellor and was created earl of Clarendon (1661). Clarendon hoped to achieve a lenient religious settlement that would conciliate the Puritans, but his wishes were over-

borne by the militantly Anglican Cavalier Parliament, which passed the ironically named CLARENDON CODE. He was unjustly blamed by the public for the sale (1662) of Dunkirk to the French and for the second DUTCH WAR (which he opposed), and he was unpopular with the licentious Restoration court. In 1667, Charles dismissed him from office, using him as a scapegoat for military failures and financial breakdown in the Dutch War. Impeachment proceedings were begun, and Clarendon fled England to live the remainder of his life in exile. As a statesman he was consistent and moderate, never wavering from his early views on constitutional monarchy but blind to new political forces created by the English civil war. Through the marriage (1660) of his daughter Anne to the duke of York (later James II), Clarendon was the grandfather of two queens, Mary II and Anne. His renowned *History of the Rebellion* (standard ed., 6 vol., 1888), written partly from memory and partly from documents, is an indispensable account of the civil war. See his autobiography (1857), study by B. H. G. Wormald (1951, repr. 1964).

Clarendon, George William Frederick Villiers, 4th earl of, 1800–1870, British statesman. He was ambassador (1833–39) to Spain during the difficult period of the Carlist war and then lord privy seal (1839–41). As lord lieutenant of Ireland (1847–52), he made efforts to ease disorder and distress during the famine. He was foreign secretary (1853–58) during the Crimean War, held together the French alliance with England, and was one of the negotiators of the Peace of Paris (1856). He was twice again foreign secretary (1865–66, 1868–70), and during the latter period he laid the foundation for the settlement of the ALABAMA CLAIMS of the United States. See biography by H. E. Maxwell (1913), George Villiers, *Vanished Victorian* (1938).

Clarendon, Constitutions of, 1164, articles issued by King HENRY II of England at the Council of Clarendon defining the customs governing relations between church and state. In the anarchic conditions of the previous reign, the church had extended its jurisdiction in various ways, and it was the king's object to curb the growth of ecclesiastical power by securing the assent of the English prelates to this codification, which he claimed represented the practices followed during the reign of his grandfather, Henry I. The majority of the 16 articles dealt with church authority and the competence of ecclesiastical courts, while others defined the extent of papal authority in England, and they were in fact a fair statement of earlier customs. However, several articles were contrary to canon law, and controversy centered on two clauses in particular that which provided for the secular punishment of clerics convicted of crime in the ecclesiastical courts (already a major point at issue between the king and the archbishop of Canterbury, THOMAS A. BECKET) and that which forbade appeals to Rome without royal consent. After much debate, the English prelates assented to the Constitutions at Clarendon, but after the pope had condemned the codification, Becket repudiated his agreement. When the bitter quarrel between the king and his archbishop ended (1170) in Becket's murder, Henry felt compelled to amend the Constitutions, explicitly revoking the two controversial clauses. However, for the most part the Constitutions of Clarendon remained in effect as part of the law of the land. See A. L. Poole, *From Domesday Book to Magna Carta, 1087–1216* (2d ed. 1955).

Clarendon Code, 1661–65, group of English statutes passed after the Restoration of Charles II to strengthen the position of the Church of England. The Corporation Act (1661) required all officers of incorporated municipalities to take communion according to the rites of the Church of England and to abjure the Presbyterian covenant. The Act of Uniformity (1662) required all ministers in England and Wales to use and subscribe to the Book of Common Prayer, nearly 2,000 ministers resigned rather than submit to this act. The Conventicle Act (1664) forbade the assembling of five or more persons for religious worship other than Anglican. The Five-Mile Act (1665) forbade any nonconforming preacher or teacher to come within 5 mi (8.1 km) of a city or corporate town where he had served as minister. These laws, named after Edward Hyde, earl of CLARENDON, chief minister of Charles II at the time of their passage, decreased the following of numerous dissenting sects, especially the Presbyterians. Clarendon himself opposed their enactment, but after their passage he worked for their enforcement. Charles II, to court popularity with dissenters and to ease the position of Roman Catholics (with whom

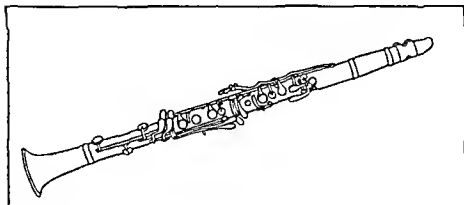
he was in sympathy), attempted to interfere with the operation of these laws by his unsuccessful declarations of indulgence in 1662 and 1672. As a political device to weaken the Whigs, the Clarendon Code was largely superseded by the TEST ACT of 1673, although some of the statutes, in modified form, remained in force for some time.

Clarens (klaraN'), village, Vaud canton, W Switzerland, on the Lake of Geneva. A resort near Montreux, Clarens was once the residence of Lord Byron. The Clarens region is immortalized in Rousseau's *Nouvelle Héloïse*.

claret: see WINE

Clarín: see ALAS, LEOPOLDO

clarinet, musical wind instrument of cylindrical bore employing a single reed. The clarinet family comprises all single-reed instruments, including the saxophone. The predecessor of the modern clarinet was the simpler chalumeau, which J. C. Denner of Nuremberg improved (c 1700) into the clarinet. It was accepted into the orchestra during the 18th



Clarinet

cent, and Mozart used it extensively. Major improvements of the key system during the 19th cent. employed the principles of Theobald Boehm. The clarinets in B flat and A are the standard orchestral instruments. The higher, shriller E flat clarinet is also a band instrument and is used occasionally in the orchestra. Of the larger clarinets, the B flat bass clarinet is the most important. The E flat alto and the E flat contrabass clarinets are mainly band instruments. Clarinets were once made in other keys, but all of these instruments are now obsolete. The basset-horn, a type of alto clarinet, was much used by Mozart and was revived by Richard Strauss. The clarinet is a TRANSPOSING INSTRUMENT. See F. G. Rendall, *The Clarinet* (3d rev. ed. 1971).

Clark, Abraham, 1726-94, political leader in the American Revolution, signer of the Declaration of Independence, b. Elizabethtown (now Elizabeth), N.J. After holding several local offices, Clark became, at the beginning of the American Revolution, a member and later secretary of the New Jersey committee of safety. He was a member (1775) of the New Jersey provincial congress, which appointed him (1776) delegate to the Continental Congress. Clark served three terms in Congress (1776-78, 1779-83, 1787-89), and in the interim periods he served in the New Jersey legislature.

Clark, Alvan, 1804-87, American astronomer and maker of astronomical lenses, b. Ashfield, Mass. In 1846 the firm of Alvan Clark & Sons was established at Cambridgeport, Mass.; it became famous as the manufacturer of the largest and finest telescope lenses. The first achromatic lenses made in the United States were produced there. Clark's son, Alvan Graham Clark, 1832-97, b. Fall River, Mass., became a partner in the business. Among lenses made under his direction are the 26-in. lens at the U.S. Naval Observatory, Washington, D.C., the 36-in. lens at Lick Observatory, California, and the 40-in. lens at Yerkes Observatory, Wisconsin, which is the largest refracting telescope in the world. The younger Clark discovered a number of double stars as well as the companion star of Sirius.

Clark, Champ, 1850-1921, American legislator, b. near Lawrenceburg, Ky. His full name was James Beauchamp Clark. After a career as lawyer, newspaper editor, and politician in Missouri, he was (1893-95, 1897-1921) a member of the U.S. House of Representatives, becoming (1907) Democratic leader. He organized (1910) the successful fight against Speaker Joseph Cannon and his arbitrary control of legislative procedure. Clark served as speaker from 1911 to 1919. At the Democratic convention in 1912 he was the leading candidate for the Democratic nomination for President until William Jennings Bryan shifted his support to Woodrow Wilson. See his autobiographical *My Quarter Century of American Politics* (1920, repr. 1969).

Clark, Francis Edward, 1851-1927, American Congregational clergyman, founder of CHRISTIAN EN

DEAVOR. He was born of American parents in Aylmer, Que., and was graduated from Dartmouth College in 1873. While serving as pastor of the Williston Congregational Church in Portland, Maine, he organized (1881) the first Young People's Society of Christian Endeavor. He was a lifelong leader in this movement.

Clark, George Rogers, 1752-1818, American Revolutionary general, conqueror of the Old Northwest, b. near Charlottesville, Va., brother of William Clark. A surveyor, he was interested in Western lands, served (1774) in Lord Dunmore's War, and later went to what is now Kentucky for the OHIO COMPANY. In 1776 he secured the Virginia legislature's assertion of sovereignty over the Kentucky region, thereby obtaining military and financial support. He returned in time to repel British and Indian attacks on Harrodsburg, Ky., and other posts. In 1778 he made plans for aggressive action against the British in the Old Northwest and, going to Virginia, persuaded Gov. Patrick Henry and his council to send an expedition. At its head, he swept into the Illinois country and took the British-held settlements of KASKASKIA, CAHOKIA, and VINCENNES. The British under Gen. Henry Hamilton advanced from Detroit and retook Vincennes after Clark had left. Winter and Ohio floods halted Hamilton there, but Clark and his men, defying cruel conditions of cold and hardship, braved the flooded bottom lands to return to Vincennes. With the heroic aid of Francis Vigo, François Bosseron, and Father Gibault, he struck at the British fort and surprised and captured Hamilton and the garrison in Feb. 1779. After this, the greatest of his exploits, Clark hoped to capture Detroit, but adequate supplies never came from Virginia to the fort he had built (Fort Nelson, where Louisville now stands), and he remained inactive. In 1782 the British and the Indians disastrously defeated the Kentuckians in the battle of Blue Licks. The ensuing unrest led Clark, who had not taken part in the battle, to lead another expedition northward against the Indians and again establish control of the region. His services had been rewarded by the rank of brigadier general in the Virginia militia, and he was made an Indian commissioner. In 1786 he led another expedition against the Indians in Ohio. His own narrative of the capture of Vincennes is in Milo M. Quarle, ed., *The Capture of Old Vincennes* (1927). See biographies by J. A. James (1928, repr. 1970) and John Bakeless (1957), A. W. Derleth, *Vincennes: Portal to the West* (1968).

Clark, John, 1766-1832, governor of Georgia (1819-23), b. Edgecomb co., N.C. As a boy he served with his father, Elijah Clarke, in the American Revolution and afterwards won distinction as an Indian fighter. He became the hero and leader of the democratic frontiersmen of Georgia in their political struggle with the planters of the coast and the wealthy farmers of the uplands. As governor, he proposed (1821) an amendment to the state constitution to provide for the popular election of governors; it was finally adopted in 1824.

Clark, Jonas Gilman, 1815-1900, founder of Clark Univ., b. Hubbardston, Mass. After a long career in business and finance, he became interested in higher education, making extended trips of observation abroad and interviewing American college presidents. In 1887 he founded Clark Univ. at Worcester, Mass., with an endowment of \$1 million, to which, by his will, was added his residuary estate for the establishment of Clark College, the undergraduate school.

Clark, Kenneth Bancroft, 1914-, American educator and psychologist, b. Panama Canal Zone, grad. Howard (B.A., 1935) and Columbia (Ph.D., 1940). He taught psychology at Howard (1937-38), Hampton Institute (1940-41), and the City College of New York (since 1942). Clark was the author of a study on racial discrimination that was cited by the U.S. Supreme Court in its 1954 school desegregation ruling. An early leader in the civil rights movement, he founded the Northside Center for Child Development and Harlem Youth Opportunities Unlimited (HARYOU, 1962). His works include *Prejudice and Your Child* (1955) and *Dark Ghettos* (1965).

Clark, Kenneth MacKenzie (Lord Clark of Saltwood), 1903-, English art historian. After working with Bernard Berenson in Florence, Clark was keeper of the department of fine art at the Ashmolean Museum, Oxford (1931-34). From 1934 to 1945 he was the director of the National Gallery, London, and thereafter Slade professor of fine arts at Oxford until 1950 and from 1961 to 1962. He became chairman of the Arts Council of Great Britain from

1955 to 1960. Among Clark's outstanding writings are two studies on Leonardo da Vinci, *The Drawings at Windsor Castle* (1935, with Carlo Pedretti) and *Leonardo da Vinci* (2d ed. 1952), a study of the paintings of Piero della Francesca (2d ed. 1969), *Landscape into Art* (1949), *The Nude* (1955), *Rembrandt and the Italian Renaissance* (1966), and *The Romantic Rebellion* (1974). His cultural survey *Civilisation* (1970) is based on his popular lecture series for television. See his bibliography, ed. by R. M. Slythe (rev. ed. 1971).

Clark, Lewis Gaylord, 1808?-1873, American editor and writer, b. near Syracuse, N.Y. He was the editor (1834-60) of the *Knickerbocker Magazine* and made it a leading literary publication of its day. He wrote *Knickerbocker Sketch-Book* (1845) and *Knickerbocker Knacks from an Editor's Table* (1852). His twin brother, Willis Gaylord Clark, 1808?-1841, was co-editor (1834-41) of the *Knickerbocker*. His *Literary Remains* (1844) includes the sketches and verse that he contributed to the magazine. See *The Letters of Willis Gaylord Clark and Lewis Gaylord Clark* (ed. by L. W. Dunlop, 1940).

Clark, Mark Wayne, 1896-, U.S. general, b. Madison Barracks, N.Y. A West Point graduate, he served as a captain in World War I and rose to become (1940) army ground forces chief of staff. During World War II, he commanded (1943-44) the U.S. 5th Army in N. Africa and in Italy, became (1944) Allied commander in Italy, and was promoted (1945) to full general. He served (1945) as head of the U.S. occupation forces in Austria. From May, 1952, to Oct., 1953, he was supreme commander of UN forces in Korea and also commander of U.S. forces in the Far East. Retiring from the army, he served (1954-66) as president of The Citadel, at Charleston, S.C. *Calculated Risk* (1950) and *From the Danube to the Yalu* (1954) are his memoirs of World War II and of the postwar period.

Clark, Ramsey, 1927-, Attorney General of the United States (1967-69), b. Dallas, Texas, son of Tom Campbell Clark. Admitted to the bar in 1951, William Ramsey Clark practiced law in Dallas. After serving as Assistant Attorney General in charge of the lands division (1961-65), Deputy Attorney General (1965-66), and acting Attorney General (Oct., 1966-Feb., 1967), he was appointed by Lyndon B. Johnson to succeed Nicholas Katzenbach. As Attorney General, Clark proved to be a vigorous defender of civil liberties and civil rights, he opposed the use of government wiretaps and initiated the first Northern school desegregation case. He later became active in the antiwar movement, and he visited North Vietnam in 1972. In 1974 he was the Democratic candidate for the U.S. Senate from New York but was defeated by Jacob K. Javits. Clark wrote *Crime in America* (1970). For an account of his career as Attorney General, see *Justice* by Richard Harris (1970).

Clark, Tom Campbell, 1899-, U.S. Attorney General (1945-49), Associate Justice of the U.S. Supreme Court (1949-67), b. Dallas, Texas, father of Ramsey Clark. He received his law degree from the Univ. of Texas. A protégé of Tom Connally, a Democratic Senator from Texas, Clark became (1937) special assistant to the Attorney General, coordinated (1942) war relocation of the West Coast Japanese, and headed the antitrust division (1943) and the criminal division (1945) of the Dept. of Justice. As Attorney General, he was noted for suits against trusts and disloyal groups. He was appointed (Aug., 1949) by President Harry S. Truman to the Supreme Court bench as successor to Frank Murphy. His opinions on the court were generally conservative on criminal and civil rights and control of alleged subversives. Clark retired from the court in 1967 after his son, Ramsey, was named U.S. Attorney General.

Clark, Walter, 1846-1924, American jurist, b. Halifax co., N.C., grad. Univ. of North Carolina (A.B., 1864, A.M., 1867). He entered the Confederate army at 15 and was commended for gallantry in action at Antietam and Fredericksburg. Clark was appointed (1885) judge of the superior court and elected (1889) to the supreme court of North Carolina, where he served until his death. He gained a national reputation for his independent decisions and supported many progressive causes in addresses and articles. Clark prepared an *Annotated Code of Civil Procedure*, annotated 164 volumes of *Supreme Court Reports*, edited 16 volumes of the *State Records of North Carolina*, and did other writing and translating. See his *Papers* (ed. by A. L. Brooks and H. T. Lefler, 2 vol., 1948-51), biography by A. L. Brooks (1944).

Clark, William, 1770-1838, American explorer, one of the leaders of the LEWIS AND CLARK EXPEDITION, b Caroline co, Va, brother of George Rogers Clark. He was an army officer (1792-96), serving in a number of Indian engagements. In 1803 he was chosen by his friend Meriwether Lewis to accompany the overland expedition to the Pacific. His observations of nature enlarged the findings of the expedition, his journals and maps recorded its history. In 1807, after the expedition had returned, Clark was appointed superintendent of Indian affairs, with headquarters at St Louis, and from 1813 to 1821 he was governor of Missouri Territory. During the War of 1812, he led (1814) an expedition against the British and Indians in the upper Mississippi valley, upon reaching Prairie du Chien, Wis, he built Fort Shelby. Later, with Auguste Chouteau, he negotiated a number of important treaties with the Indians and aided in suppressing the Winnebago and Black Hawk uprisings. He was again superintendent of Indian affairs from 1821 until his death. See bibliography under LEWIS AND CLARK EXPEDITION.

Clark, William Andrews, 1839-1925, U.S. Senator and copper magnate, b Fayette co, Pa. He moved to Montana, where he amassed a large fortune from the development of copper mines. He wielded immense power and had a long feud with Marcus DALY for control of the copper deposits and of political forces—virtually for control of Montana. Clark had political ambitions and was president of the Montana constitutional conventions of 1884 and 1889 but was defeated in the 1888 campaign to be territorial delegate to Congress. Daly blocked Clark's moves skillfully, and, although Clark claimed election as one of Montana's first Senators, the Senate instead seated his Republican opponent. In 1893 the state legislature was deadlocked, and Montana was left with only one Senator. After another deadlock in 1899, Clark was declared elected only to resign when confronted by a Senate investigation and a pending resolution to void his election. In 1901 he was duly elected and this time served his term and retired. He tied the exploitation of copper to Eastern capital, winning over such brilliant rivals as F. Augustus Heinze, and was powerful in copper development in Arizona as well as in Montana. See W. D. Mangam, *Clarks: An American Phenomenon* (1941).

Clark, William Smith, 1826-86, American educator, b Ashfield, Mass, grad Amherst, 1848, and studied chemistry and botany at Göttingen (Ph D, 1852). He taught at Amherst until the Civil War, fought in many battles, and emerged from the struggle a brigadier general. He was elected to the Massachusetts General Court in 1864, 1865, and 1867 and while there secured the location at Amherst of the Massachusetts Agricultural College (the present-day Univ of Massachusetts). He was president of this institution from 1867 to 1879, helped organize its work, and taught botany and horticulture. He went to Japan (1876-77) to establish the Imperial College of Agriculture at Sapporo.

Clark, Willis Gaylord. See CLARK, LEWIS GAYLORD.

Clark College: see ATLANTA UNIV. CENTER.

Clarke, Charles Cowden, 1787-1877, English lecturer and author. He was a close friend of Keats, who was a pupil of Clarke's father. Clarke's lectures on Shakespeare were published as *Shakespeare Characters* (1863). He and his wife, Mary Victoria (Novello) Cowden Clarke, 1809-98, wrote *Recollections of Writers* (1878), and she compiled *The Complete Concordance to Shakespeare* (1844-45). See study by R. D. Altick (1948, repr 1973).

Clarke, James Freeman, 1810-88, American Unitarian clergyman and author, b Hanover, N.H. While in charge of the Unitarian church in Louisville, Ky (1833-40), he was for three years editor of the *Western Messenger*. He helped found the Church of the Disciples in Boston in 1841 and was its pastor until 1888, except in the years from 1850 to 1854. He was (1867-71) a nonresident professor in the Harvard Divinity School. The Transcendental Club, with such members as Bronson Alcott and Emerson, included Clarke, and he was active in the anti-slavery, woman-suffrage, and other reform movements. Among his books, influential in their day, were *Ten Great Religions* (2 vol, 1871-83), *Orthodoxy Its Truths and Errors* (1866), and *Essentials and Non-Essentials in Religion* (1878). See biography by E. E. Hale (1891, repr 1968), which includes a fragmentary autobiography, study by A. S. Bolster (1954).

Clarke, John, 1609-76, one of the founders of Rhode Island, b Westhorpe, Suffolk, England. He emigrated to Boston in 1637 and shortly thereafter joined Anne HUTCHINSON (with whom he had sided

in the antinomian controversy) and William CODDINGTON in founding (1638) Portsmouth on Aquidneck (Rhode Island). The next year, he and Coddington withdrew to found Newport, where he was both physician and Baptist pastor. Clarke favored the 1647 union of the Aquidneck settlements with Providence and Warwick and in 1651 went with Roger Williams to England to defend the union against Coddington's attacks. They were successful, and Williams soon returned. Clarke remained in England and was influential in securing the liberal charter of 1663. On his return to Rhode Island he served (1664-69) in the general assembly and was thrice elected deputy governor. His *Ill News from New England* (1652) was an arraignment of Massachusetts authorities for their hostility to religious liberty.

Clarke, Mary Victoria (Novello) Cowden: see under CLARKE, CHARLES COWDEN.

Clarke, Samuel, 1675-1729, English philosopher and divine. His chief interest was rational theology, and, although a critic of the deists, he was in sympathy with some of their ideas. He supported the theories of Newton and argued with Leibniz in defense of the existence of absolute space. Clarke maintained that ethical law is as constant as mathematical law. His published works include many translations, lectures, sermons, and commentaries. His treatise *The Scripture Doctrine of Unity* appeared in 1712. The Leibniz correspondence was published in 1717.

Clarke, Walter, c 1638-1714, colonial governor of Rhode Island, b Newport, R.I. He was deputy governor (1679-86, 1700-1714) and was three times governor (1676-77, 1686, 1696-98) of Rhode Island. He is chiefly remembered for his refusal to surrender the Rhode Island charter upon the demand of Sir Edmund ANDROS.

Clarksburg, city (1970 pop 24,864), seat of Harrison co, N central W Va, at the confluence of Elk Creek and the West Fork of the Monongahela River, inc 1795. It is an industrial and shipping center for an area of coal mines, oil and natural gas fields, and grazing lands. Glass and glass products are the chief manufactures. The city was an important Union supply base in the Civil War, and remains of Federal earthworks are preserved in Lowndes Hill park. A two-year branch of Salem College is in Clarksburg. The city is the birthplace of Stonewall Jackson, a plaque designates the site.

Clarksdale, city (1970 pop 21,673), seat of Coahoma co, NW Miss, on the Sunflower River, inc 1882. It is a processing and distributing center for a cotton producing area. Its manufactures include paper, conveyor belts, house trailers, locks, and rubber products.

Clarkson, Thomas, 1760-1846, English abolitionist. He devoted most of his life to agitation against slavery, and the voluminous information that he gathered on the slave trade helped to influence Parliament. With William WILBERFORCE he shares the chief credit for the act of 1807 abolishing the British slave trade. His best-known books are a history of Parliament's abolition of the slave trade (1805) and a memoir of William Penn (1813). See his correspondence with Henri Christophe, ed by E. L. Griggs and C. H. Prator (1952, repr 1968), biography by E. L. Griggs (1936).

Clarksville. 1 Town (1970 pop 13,806), Clark co, S central Ind, on the Ohio River, opposite Louisville, Ky, founded 1784 by George Rogers Clark. Soap is the chief manufacture. 2 City (1970 pop 31,719), seat of Montgomery co, NW Tenn, on the Cumberland and Red rivers, in a farm, livestock, and tobacco region, platted 1784, inc as a city 1855. It is an important market and processing center for dark and burley tobacco. Its industries include meat-packing and the manufacture of snuff, footwear, tires, and air-conditioning equipment. Austin Peay State Univ is in Clarksville. Part of U.S. Fort Campbell is within the city limits.

Clark University, at Worcester, Mass, coeducational, chartered 1887, opened as a graduate school 1889. It was the second graduate school to be formed in the United States. Its undergraduate college (est 1902) was integrated with the university in 1920.

clary: see SAGE.

class, in taxonomy: see CLASSIFICATION.

class action, in law, device that permits one or more people to sue or to be sued as the representative of a large group of people interested in the matter. In most types of suits all members of the class are bound by the decision, even if they do not appear

It is permitted in Federal and most U.S. state courts. Certain requirements must be met, e.g., the class must be so large that individual suit would be impractical, and the named parties who bring the suit must adequately represent the class. Class actions have been successfully used in civil rights cases. They are more controversial when a small sum, e.g., \$60, is sought by each member and the main financial benefactor will be the lawyer.

classicism, term that, when applied generally, means clearness, elegance, symmetry, and repose produced by attention to traditional forms. It is sometimes synonymous with excellence or artistic quality of high distinction. More precisely, the term refers to the admiration and imitation of Greek and Roman art, architecture, and literature, the stylistic features and aims most particularly admired include restraint, simplicity, balance, unity of design, and a strong sense of form. Conversely, the term implies the absence of subjectivity, emotionalism, and excessive enthusiasm. Because the principles of classicism were derived from the rules and practices of the ancients, the term came to mean the adherence to specific academic canons. The first major revival of classicism, designated neoclassicism, occurred during the Renaissance. As a result of the intensified interest in Greek and Roman culture, especially the works of Plato and Cicero, classical standards were reinstated as the ideal norm. In Florence, Cosimo de' Medici gathered a circle of humanists (see HUMANISM) who collected, studied, expounded, and imitated the classics. A group of Latin literary stylists called the "Ciceronians" would not use any word not found in Cicero's writings. Other writers espoused simpler styles described by Dionysius of Halicarnassus and by Quintilian. Among these were Francis Bacon, who not only reintroduced the empirical method to scientific investigation, but did much to establish plain classical style in the writing of English prose. In applying the same theories to poetry, Ben Jonson did much to correct the artificiality of Petrarchan convention. Also important were the epigrams and *carpe diem* lyrics inspired by the GREEK ANTHOLOGY and other classical writings. Renaissance painters whose works reflect the classical influence include Mantegna, Raphael, and Michelangelo. It is generally thought that neoclassicism found its highest English expression in the Augustan period (during the reign of Queen Anne), particularly in the writings of Dryden and Pope. In France, the Pleiade (see under PLEIAD) had so set the tone for French letters by the end of the 16th cent that it was natural for the playwrights Corneille and Racine to be ruled by the *Poetics* of Aristotle. In Germany, the classical stream was deflected in the last quarter of the 18th cent by the period of STURM UND DRANG, but it was revived later in the century when Goethe and Schiller wrote classical drama and Haydn, Mozart, and Beethoven utilized the principles of classical form in their music. The Napoleonic revival of the idea of the Roman Empire brought with it a new international burst of imitation in architecture (see CLASSIC REVIVAL) and painting (whose foremost exponents were David and Ingres). In 20th-century Europe and America there has been a renewed interest in Greek literature, and classical models have been somewhat revived, as in the work of Ezra Pound and T. S. Eliot. These men, as well as many of the proponents of new criticism (see CRITICISM), have, in their rejection of impressionism and ROMANTICISM, stressed neoclassical restraint in their writings. In art, classical elements can be found in the paintings of Cézanne and the cubists and in the architectural designs of such men as Mies van der Rohe. Spearheading the 20th-century neoclassical revival in music, a reaction to romanticism, were Prokofiev, Stravinsky, and Bartok. See T. S. Eliot, *What Is a Classic?* (1946), Gilbert Highet, *The Classical Tradition* (1949, repr 1957), P. O. Kristeller, *Renaissance Thought* (1961), W. J. Bate, *From Classic to Romantic* (1961), Gilbert Murray, *The Classical Tradition in Poetry* (1927, repr 1968), Charles Rosen, *The Classical Style* (1971), R. R. Bolgar, ed, *Classical Influences on European Culture* (1971).

classic revival, widely diffused phase of taste (known as neoclassic) which influenced architecture and the arts in Europe and the United States during the last years of the 18th and the first half of the 19th cent. The era was characterized by enthusiasm for classical antiquity and for archaeological knowledge, stimulated by the excavations of Roman remains at Pompeii and Herculaneum and by the commencement of archaeological investigation in

Greece by James Stuart and Nicholas Revett in 1751. The results were embodied in their joint work, *Antiquities of Athens*, of which the first volume (1762) is considered to have been responsible for a changed direction in taste. Stuart's garden temple in Greek Doric style (1758) at Hagley, England, was the first example of Greek revival design in Western Europe, but the utilization of Greek material was generally delayed until the latter part of the revival, while the earlier phase confined itself to Roman models. In France the imitation of ancient Rome predominated in the crystallizing of the Empire style sponsored by Napoleon. In the United States, after the Revolution, this same spirit served in the formation of a style for public buildings. Thomas Jefferson's design for the Virginia state capitol (1785) at Richmond marks the return to the monumental Roman temple for inspiration. In America the Greek phase, known as neo-Grec or Greek revival, achieved its first expression, and an exceedingly influential one, in the Bank of Pennsylvania, Philadelphia (1799), it was designed by Benjamin H. Latrobe to imitate a Greek Ionic temple. The Roman and the Greek aspects of the classic revival eventually allied themselves in a Greco-Roman form. The influence of the revival was felt everywhere in Europe and particularly in Great Britain. But in no country did it dominate as in the United States, where classic colonnades were appended to state capitols and to modest farm houses throughout the land. After the Civil War its severe later phase was extinguished by the romantic styles of the Victorian period. Among the important buildings of the American classic revival are the Washington monument, Baltimore (1815), by Robert Mills, Bank of the United States, Philadelphia (1819-24), by William Strickland, campus buildings, Univ. of Virginia (1817-26), by Thomas Jefferson, Merchants' Exchange, Philadelphia (1832-34), by William Strickland, main building, Girard College, Philadelphia (1833-47), by T. U. Walter, and dome and wings of the Capitol at Washington (1851-65), by T. U. Walter. See Talbot Hamlin, *Greek Revival Architecture in America* (1944), D. Wiebenson, *Sources of Greek Revival Architecture* (1969).

classification, in biology, the systematic categorization of organisms into a coherent scheme. The original purpose of biological classification, or systematics, was to organize the vast number of known plants and animals into categories that could be named, remembered, and discussed. Modern classification has the additional purpose of attempting to

show the evolutionary relationships among organisms. A system based on categories that show such relationships is called a natural system of classification, one based on categories assigned for convenience, without regard to significant relationships, is called artificial. (For example, a classification of flowers by color is an artificial system.) Modern classification is part of the broader science of taxonomy, the study of the relationships of organisms, which includes collection, preservation, and study of specimens, and analysis of data provided by various areas of biological research. Nomenclature is the assigning of names to organisms and to the categories in which they are classified. The broadest division of organisms is into kingdoms. Traditionally there have been two kingdoms, Animalia and Plantae, but many unicellular and simple multicellular organisms are not easily classified as either plants or animals. In 1866 the zoologist Ernst Heinrich HAECKEL proposed a third kingdom, the Protista, to include all protozoans, algae, fungi, and bacteria. His proposal found fairly wide acceptance in the 20th cent., however, as the protists include fundamentally dissimilar organisms, a fourth kingdom, the Monera, has been proposed for the bacteria and blue-green algae, which differ from all other organisms in that they lack well-defined cell nuclei. Five- and six-kingdom systems have also been proposed. Kingdoms are divided into a hierarchical system of categories called taxa (sing. taxon). The taxa are, from most to least inclusive: phylum (usually called division in botany), class, order, family, genus, and species. Where these divisions are not adequate for making necessary distinctions, intermediate divisions are added, such as suborder and superfamily. The species, the fundamental unit of classification, consists of populations of genetically similar, interbreeding or potentially interbreeding individuals. If two populations of a species are completely isolated geographically and therefore evolve separately, they will be considered two species once they are no longer capable of mixing genetically if brought together. In a few cases interbreeding is possible between members of closely related but clearly distinct species—for example, horses, asses, and zebras can all interbreed. However, the offspring of such crosses are usually sterile, so that the two groups are nonetheless kept separate by their genetic incompatibility. Populations within a species that show recognizable, inherited differences from one another but are capable of interbreeding freely are called subspecies, races, or varieties. The genus (pl. genera) is a grouping of similar, closely related spe-

cies. For example, the domestic cat and the bobcat are species of the genus *Felis*, dogs, wolves, and jackals belong to the genus *Canis*. Often the genus is an easily recognized grouping with a popular name, for example, the various oak species, such as black oak and live oak, form the oak genus (*Quercus*). Similarly, genera are grouped into families, families into orders, orders into classes, and classes into phyla or divisions. The lower a taxon is in the hierarchy, the more closely related are its members. The earliest known system of classification is that of Aristotle, who attempted in the 4th cent. B.C. to group animals according to such criteria as mode of reproduction and possession or lack of red blood. Aristotle's pupil Theophrastus classified plants according to their uses and their methods of cultivation. Little interest was shown in classification until science became a focal area of activity in the 17th and 18th cent., when botanists and zoologists began to devise the modern scheme of categories. The designation of groups was based almost entirely on superficial anatomical resemblances. Before the idea of EVOLUTION there was no impetus to show more meaningful relationships among species; the species was thought to be uniquely created and fixed in character, the only real, or natural, taxon, while the higher taxa were regarded as artificial means of organizing information. However, since anatomical resemblance is an important indication of relationship, such early classification efforts resulted in a system that in many areas approximated a natural one and (with much modification) is still used. The most extensive work was done in the mid-18th cent. by Carolus LINNAEUS, who devised the presently used system of nomenclature. As biologists came to accept the work of Charles DARWIN in the second half of the 19th cent., they began to stress the significance of evolutionary relationships for classification. Although comparative anatomy remained of foremost importance, other evidence of relationship was sought as well. Paleontology provided fossil evidence of the common ancestry of various groups, embryology provided comparisons of early development in different species, an important clue to their relationships. In the 20th cent., evidence provided by genetics and physiology became increasingly important. Recently there has been much emphasis on the use of biochemistry in taxonomy, as in the comparison of the serum proteins of different animal species. Computers are increasingly used to analyze data relevant to taxonomy. A modern branch of discipline, called numerical taxonomy, uses computers to compare very large numbers of traits without weighting any type of trait—in contrast to the traditional view of certain characteristics as more significant than others in showing relationships. For example, the structure of flower parts is considered more significant than the shape of the leaves in flowering plants because leaf shape appears to evolve much more quickly, with very dissimilar forms sometimes occurring in species with a recent common ancestor. Much of the science of taxonomy has been concerned with judging which traits are most significant. If new evidence reveals a better basis for subdividing a taxon than that previously used, the classification of the group in question may be revised, although there is often disagreement among taxonomists about such revisions. The present system of binomial nomenclature identifies each species by a scientific name of two words, Latin in form and usually derived from Greek or Latin roots. The first name (capitalized) is the genus of the organism, the second (not capitalized) is its species. The scientific name of the white oak is *Quercus alba*, while red oak is *Quercus rubra*. The first name applies to all species of the genus—*Quercus* is the name of all oaks—but the entire binomial applies only to a single species. Many scientific names describe some characteristic of the organism (*alba* = white, *rubra* = red), many are derived from the name of the discoverer or the geographic location of the organism. Genus and species names are always italicized when printed, the names of other taxa (families, etc.) are not. When a species (or several species of the same genus) is mentioned repeatedly, the genus may be abbreviated after its first mention, as in *Q. alba*. Subspecies are indicated by a trinomial, for example, the southern bald eagle is *Haliaeetus leucocephalus leucocephalus*, as distinguished from the northern bald eagle, *H. leucocephalus washingtoniensis*. The advantages of scientific over common names are that they are accepted by speakers of all languages, that each name applies only to one species, and that each species has only one name. This avoids the confusion that often arises

EXAMPLES OF SYSTEMATIC CLASSIFICATION

COMMON NAME	SPECIES NAME	GENUS	FAMILY	ORDER	CLASS	PHYLUM (DIVISION)	KINGDOM	
Man	<i>Homo sapiens</i>	<i>Homo</i>	Hominidae	Primates	Mammalia	Chordata	Animalia	
Rhesus monkey	<i>Macaca mulatta</i>	<i>Macaca</i>	Cercopithecidae					
Leopard frog	<i>Rana pipiens</i>	<i>Rana</i>	Ranidae	Anura	Amphibia			
Wood frog	<i>Rana sylvatica</i>							
Long-winged grasshopper	<i>Dissosteira longipennis</i>	<i>Dissosteira</i>	Acrididae	Orthoptera	Insecta	Arthropoda		
Black widow spider	<i>Latrodectus mactans</i>	<i>Latrodectus</i>	Theridiidae	Araneae	Arachnida			
White clover	<i>Trifolium repens</i>	<i>Trifolium</i>	Leguminosae	Rosales	Magnoliopsida	Magnoliophyta		Plantae
Black cherry	<i>Prunus serotina</i>	<i>Prunus</i>	Rosaceae					
Wood lily	<i>Lilium philadelphicum</i>	<i>Lilium</i>	Liliaceae	Liliales	Liliatae			
Ponderosa pine	<i>Pinus ponderosa</i>	<i>Pinus</i>	Pinaceae	Coniferales	Pinopsida	Pinophyta		
Ginkgo tree	<i>Ginkgo biloba</i>	<i>Ginkgo</i>	Ginkgoaceae	Ginkgoales	Ginkgoopsida			
Haircap moss	<i>Polytrichum juniperum</i>	<i>Polytrichum</i>	Polytrichaceae	Polytrichales	Musci	Bryophyta		

from the use of a common name to designate different things in different places (for example, see ELK), or from the existence of several common names for a single species. There are two international organizations for the determination of the rules of nomenclature and the recording of specific names, one for zoology and one for botany. According to the rules they have established, the first name to be published (from the work of Linnaeus on) is the correct name of any organism, unless it is reclassified in such a way as to affect that name (for example, if it is moved from one genus to another). In such a case definite rules of priority also apply. See G. G. Simpson, *Principles of Animal Taxonomy* (1961), Arthur Cronquist, *Evolution and Classification of Flowering Plants* (1968), Ernst Mayr, *Principles of Systematic Zoology* (1969), O. T. Solbrig, *Principles and Methods of Plant Biosystematics* (1970), A. J. Cain, *Animal Species and Their Evolution* (3d ed. 1971), Nicholas Jardine and Robin Sibson, *Mathematical Taxonomy* (1971), Theodore Savory, *Animal Taxonomy* (1972), D. W. Shimwell, *The Description and Classification of Vegetation* (1972), D. H. Valentine, ed., *Taxonomy, Phytogeography, and Evolution* (1972).

Clatsop Indians, North American Indians of the Penutian linguistic stock (see AMERICAN INDIAN LANGUAGES). They lived on the Northwest coast S of the Columbia River.

Clauda, Greece. see GÁVDHOS.

Claude, Jean (zhāN klōd'), 1619-87, French Protestant theologian. As Protestant pastor at Paris, Claude received considerable attention for his disagreements with the Roman Catholic apologist Jacques Bossuet, Pierre Nicole, and the Jansenist Antoine Arnauld. He was expelled from France after the revocation of the Edict of Nantes.

Claudel, Paul (pōl klōdēl'), 1868-1955, French dramatist, poet, and diplomat. He was ambassador to Tokyo (1921-27), Washington, D.C. (1927-33), and Brussels (1933-35). Claudel's writings deal largely with man's inner spirit, and reveal the influence of his profound and mystical Catholicism. His early plays were inspired by the French symbolists, notably by Rimbaud. Perhaps his finest play is *L'Annonce faite à Marie* (1912, tr. *Tidings Brought to Mary*, 1916). Among his other dramas is the lengthy *Le Soulier de satin* (1929, tr. *The Satin Slipper*, 1931). In his theatrical works Claudel combined extensive use of symbols—primarily religious—and exotic backgrounds with the techniques of pantomime, ballet, music, and the cinema. The rich lyric verse of *Cinq Grandes Odes* (1910) marks his highest poetic achievement. His prose works include *Art poétique* (1906) and writings on the Bible. See study by R. Burchan (1966).

Claude Lorrain (klōd lōrāN'), whose original name was **Claude Gellée** or **Gellée** (zhālā'), 1600-1682, French painter, b. Lorraine. Claude was the foremost landscape painter of his time. In Rome at about 12 years of age he was employed as a pastry cook for the landscape painter Augustino Tassi, whose apprentice he soon became. He traveled in Italy and France, and returned to settle permanently in Rome by 1627. Under the patronage of Pope Urban VIII he rapidly rose to fame. His poetic treatment of landscape raised this subject matter to eminence alongside the more esteemed religious and historical genres. Claude's paintings became so popular and widely imitated that in order to avoid forgeries, he began to record his compositions in a notebook of drawings (Duke of Devonshire Coll., Chatsworth). Engravings of them were later made and published as the *Liber veritatis* (1777). His early works reflect the late mannerist style of Tassi and that of the northerners Brill and Elsheimer. Although he began by using the traditional device of compartmentalized stages—foreground, middle ground, and background—in his later landscapes he opened up unlimited vistas, introducing lyrical variations of light and atmosphere. In *The Expulsion of Hagar* (1668, Munich) he defied conventional composition for strong effect. In his later works light was the primary subject. It dissolved forms, drawing the eye into vast panoramas of land and sea. Claude's harbor scenes and views of the Roman countryside exercised a lasting influence on the art of landscape painting. Poussin was indebted to him, as was Richard Wilson, and he was consciously emulated two centuries later by J. M. W. Turner. Claude's work is best represented in England. It can be seen in the National Gallery, London, the Doria Palace, Rome, the Louvre, the Prado, and in many American collections, including the museums of New York City, Boston, Kansas City, St. Louis, and San Francisco. See study by Marcel Röthlisberger (1961).

Claude Michel: see CLODION.

Claudia (klōd'ēa), Christian who sent greetings to Timothy 2 Tim. 4:21.

Claudian (Claudius Claudianus) (klōd'ēan), d. 404?, last notable Latin classic poet. Probably born in Alexandria, he flourished at court under Arcadius and Honorius. Besides panegyrics, idylls, epigrams, and occasional poems, he wrote several epics, the most ambitious of which is the *Rape of Proserpine*, perhaps inferior to his epic attack *Against Rufinus*. He has been highly regarded as a vigorous, skillful, and imaginative writer. See T. Hodgkin, *Claudian, the Last of the Roman Poets* (1875), study by Alan Cameron (1970).

Claudius I (Tiberius Claudius Drusus Nero Germanicus) (klōd'ēas), 10 B.C.-A.D. 54, Roman emperor (A.D. 41-A.D. 54), son of Nero Claudius Drusus Germanicus and thus nephew of Tiberius. When CAUGULA was murdered (A.D. 41), the soldiers found Claudius, who had been of little importance, hiding in abject terror behind a curtain in the palace. They hauled him forth, and the Praetorians proclaimed him emperor. This act offended the senators, who never forgave Claudius. It also made him favor the army. He annexed Mauretania and landed in A.D. 43 in Britain, which he made a province. Agrippa's kingdom of Judaea and the kingdom of Thrace were reabsorbed into the empire, and the authority of the provincial procurators was extended. He caused MESSALINA, his third wife, to be executed and was in turn supposedly poisoned by her successor, AGRIPPA II, after she had persuaded him to pass over his son BRITANNICUS as heir in favor of NERO, her son by a former husband. Claudius was much reviled by his enemies and historians have accused him of being only a tool in the hands of his freedmen-secretaries and his wives, there are indications, however, that he had considerable administrative ability. Claudius' literary works are lost. He is the chief figure in two novels by Robert Graves, *I, Claudius* (1934) and *Claudius the God* (1935). See studies by Arnaldo Momigliano (tr. 1962) and V. M. Sramuzza (1940).

Claudius II (Marcus Aurelius Claudius), d. 270, Roman emperor (268-70), called Gothicus. A successful general under Valerian, Claudius put down the revolt in which GALLIENUS was killed. He succeeded Gallienus and went to the East to resist the Goths who were overrunning the empire. In 269, Claudius overwhelmed the Goths at Naissus (now Nis, Yugoslavia). He died of the plague the following year and was succeeded by AURELIAN.

Claudius, ancient Roman gens. **Appius Claudius Sabinus Inregillensis** or **Regillensis** was a Sabine, he came (c. 504 B.C.) with his tribe to Rome. While consul (495), he caused the withdrawal of the plebeians to the sacred mount because of his severe interpretation of the laws of debt. His Sabine name was Attius Clausus. **Appius Claudius Crassus** was decemvir (451-449 B.C.). He seems to have sought to placate the plebeians and was known as a lawgiver, but his career ended in failure. Legend says that his attempt to rape VIRGINIA caused a revolt in which he was killed and which led to the fall of the decemvirs. **Appius Claudius Caecus**, while censor (312-308 B.C.), increased the role taken by the lower classes in public affairs. He was consul (307 and 296) and later persuaded the senate to reject the peace proposals of PYRRHUS. He constructed the first Roman aqueduct and began construction of the Appian Way. **Publius Claudius Pulcher**, while consul (249 B.C.), attacked the Carthaginian fleet at Drepanum and was defeated. It was believed that he was defeated because he threw the sacred chickens into the sea. **Appius Claudius Pulcher**, d. c. 48 B.C., campaigned in Asia (72 B.C.). He became praetor (57 B.C.), propraetor in Sardinia (56 B.C.), consul (54 B.C.), and proconsul of Cilicia (53 B.C.). He sought through Pompey the assistance of his rival Cicero to secure his acquittal from impeachment for bribery. He joined Pompey in the civil war and died in Euboea before the battle at Pharsala. For **Publius Claudius Pulcher**, see CLODIUS.

Claudius Lysias (līs'ēas), official at Jerusalem who saved Paul from the mob. Acts 23:24.

Clausel or **Claudel, Bertrand** (bētrāN' klōzēl'), 1772-1842, marshal of France. Having served in the French Revolutionary Wars and in the Napoleonic campaigns, particularly in the Peninsular War, he was created count (1813). He joined Napoleon in the Hundred Days (1815) and after the Restoration spent some time in exile in the United States, returning (1820) to France to become a deputy of the opposition. After the July Revolution he was sent to Algeria as commander in chief (1830) and was made

marshal (1831). Again commander in chief and governor general in Algeria (1835-37), he was blamed for French reverses there.

Clausewitz, Karl von (karl fən klou'zavīts), 1780-1831, Prussian general and writer on military strategy. He served in the Rhine campaigns (1793-94), won the regard of Gerhard von Scharnhorst at the Berlin Military Academy, and served in the wars against Napoleon Bonaparte. In the service of Russia from 1812 until 1814, he helped negotiate the convention of Tauroggen (1812), which prepared the way for the alliance of Prussia, Russia, and Great Britain against Napoleon. Later he reentered the Prussian army, fought at Waterloo, and was appointed (1818) director of the Prussian war college. His masterpiece, *On War*, was unfinished and was published after his death. The doctrines expounded in it, including that of total war (that all citizens, territory, and property of the enemy nation should be attacked in every way possible) and that of war itself as a political act (a continuation of diplomacy by other means, in which political leaders of the state must determine the war's scope and objectives and exercise control of its direction) had an enormous effect on military strategy and tactics.

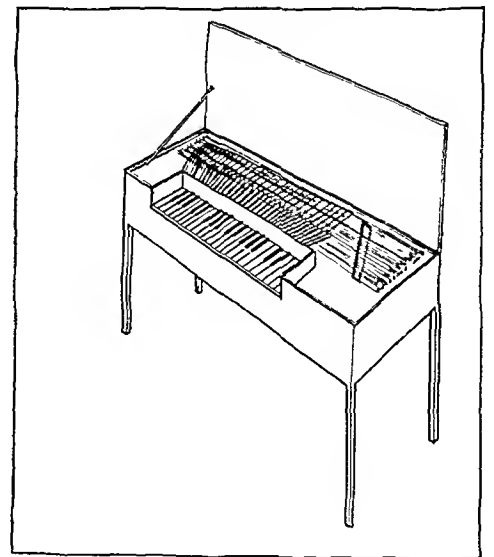
Clausius, Rudolf Julius Emanuel (rōdōlf yōō'lyōōs āma'nōōēl klou'zēōōs), 1822-88, German mathematical physicist. A pioneer in the science of thermodynamics, he introduced the concept of entropy and restated the second law of thermodynamics: heat cannot of itself pass from a colder to a hotter body. He applied his researches on heat, electricity, and molecular physics to the development of the kinetic theory of gases and in formulating a theory of electrolysis wherein he states that electric forces are merely directing agents in the interchange of ions. A professor at the Polytechnic Institute, Zurich (1855-67), and at the universities of Würzburg (1867-69) and Bonn (from 1869), he wrote *Die Potentialfunktion und das Potential* (1859) and *Die mechanische Wärmetheorie* (1865-67, tr. *The Mechanical Theory of Heat*, 1879).

Clausthal-Zellerfeld (klous'tāl-tsēl'arfēlt), town (1970 pop. 14,821), Lower Saxony, E. West Germany, a resort in the Harz mts. Its manufactures include textiles and wood products. The town was once a center for the mining of copper, zinc, and lead ores.

Claudel, Bertrand. see CLAUSÉL BERTRAND.

Claverhouse, John Graham of: see DUNDEE, JOHN GRAHAM OF CLAVERHOUSE 1ST VISCOUNT.

clavichord (klāv'ikōrd), keyboard musical instrument invented in the Middle Ages. It consists of a small rectangular wooden box, placed upon a table or upon legs, containing a sounding board and a set



Clavichord

of strings. Keys caused the strings to be struck with small wedges of metal called tangents, which not only set the string into vibration but determined its vibrating length by means of a sort of fretting (see FRETTED INSTRUMENT). Thus one string sufficed for about four keys. Early in the 18th cent., clavichords were built with a string for each key, such instruments were more expensive and harder to tune, but gradually supplanted the older ones. The clavichord became musically important in the 16th cent. and remained popular until the end of the 18th cent.

when it was displaced by the pianoforte. It is a drawing room instrument with a delicate, expressive tone. See Philip James, *Early Keyboard Instruments* (1930), Denis Matthews, ed., *Keyboard Music* (1972).

Clavière, Étienne (ätyēn' klavyēr'), 1735-93, French financier. A merchant and banker of Geneva, he participated (1782) in the popular revolution at Geneva and was forced to leave when the aristocrats returned to power in the same year. He settled in Paris. During the French Revolution Clavière was an adviser to the comte de Mirabeau on financial policy and had a part in the issuing of ASSIGNATS. He was finance minister in the king's Girondist cabinet of March-June, 1792. Clavière fell with the GIRONDISTS and committed suicide rather than face the Revolutionary Tribunal.

Clavijero, Francisco Javier (fransēs'kō havyēr' klavēhārō), 1731-87, Mexican scholar and historian. A Jesuit, he taught in Mexico until the expulsion of the order (1767). From his refuge in Italy he wrote several works, the most important being *The History of Mexico* (tr. 1787), which shows an immense knowledge of Indian languages, customs, and history.

Clavius, Cristoph (krīs'tōf klāvēās), 1537-1612, German astronomer and mathematician. He entered the Jesuit order in 1555 and studied at Coimbra and Rome. He taught mathematics at the Collegio Romano from 1565. In a commentary on Euclid (1574) and other works, Clavius collected mathematical knowledge, adding some proofs and methods of his own, he helped spread elements of modern algebraic notation such as the plus sign and parentheses. His *Commentary on the Sphere of Sacrobosco* (1581), which had many editions, was the standard astronomical text of his time. In 1582 his proposed reform of the calendar was adopted by Pope Gregory XIII. In the last years of his life he confirmed Galileo's telescopic observations, although he did not accept them as proof of the Copernican theory.

Clawson, city (1970 pop. 17,617), Oakland co., SE Mich., a residential suburb between Pontiac and Detroit, settled c. 1833, inc. 1920.

Claxton, Philander Priestly, 1862-1957, American educator, b. Bedford co., Tenn., grad. Univ. of Tennessee (B.A., 1882, M.A., 1887) and studied at Johns Hopkins Univ. and in Germany. After several years' experience as a superintendent of schools in North Carolina, he taught at the North Carolina State Normal and Industrial College (1893-1902) and later was professor of education at the Univ. of Tennessee (1902-11). He served (1911-21) as U.S. commissioner of education, his administration being distinguished by marked expansion of the activities of the Bureau of Education. Claxton was afterwards provost (1921-23) of the Univ. of Alabama and superintendent of schools (1923-29), Tulsa, Okla., and from 1930 was president of the Austin Peay Normal School in Clarksville, Tenn. See biography by C. L. Lewis (1948).

Clay, Cassius Marcellus, 1810-1903, American politician and diplomat, b. Madison co., Ky. Although he came from a slaveholding family, Clay early came to abhor the institution of slavery. In 1845 he established at Lexington, Ky., the *True American*, an abolitionist paper. His press was in his absence moved by his enemies to Cincinnati, and he continued its publication there and at Louisville. He served as a captain in the Mexican War and was captured and for a time imprisoned. In 1851 he was an unsuccessful candidate for governor of Kentucky on an anti-slavery ticket, he captured enough votes, however, to cause the defeat of the Whig candidate and thus hastened the collapse of the Whigs in Kentucky. He was minister to Russia (1861-62, 1863-69) and served briefly in the Civil War as a major general of volunteers. See his autobiography (1866), his writings, ed. by Horace Greeley (1848, repr. 1969), biographies by D. L. Smiley (1962) and W. H. Townsend (1967).

Clay, Cassius Marcellus, Jr.: see ALI, MUHAMMAD
Clay, Clement Claiborne, 1816-82, U.S. Senator (1853-61), b. Huntsville, Ala. A legislator and then a judge in his native state, he was twice elected to the U.S. Senate and became an ardent defender of the states' rights doctrine. He left the Senate upon Alabama's secession and entered the Confederate senate, refusing the appointment as Secretary of War in the Confederacy. In 1864 he was sent by Jefferson Davis with two others on a diplomatic mission to Canada, which was intended to open peace negotiations with the Federal government. Lincoln finally decided not to see him, and after a year in Canada, Clay returned to the South. After the assassination

of Lincoln, he was accused of having taken part in a plot in Canada against Lincoln's life and also of having planned raids across the border, and a reward was offered for him. He gave himself up, was held at Fortress Monroe for almost a year without trial, and then was freed. His wife, Virginia Clay-Clopton, wrote *A Belle of the Fifties* (1904), a description of their Washington, D.C., home when it was a gathering place of capital society.

Clay, Henry, 1777-1852, American statesman, b. Hanover co., Va. His father died when Henry was four years old, and Clay's formal schooling was limited to three years. His stepfather secured (1792) for him a clerk's position in the Virginia high court of chancery. There he gained the regard of George WYTHE, who directed his reading. Clay also read law under Robert Brooke, attorney general of Virginia, and in 1797 he was licensed to practice. Moving in the same year to Lexington, Ky., he quickly gained wide reputation as a lawyer and orator. He served (1803-6) in the Kentucky legislature and was (1805-7) professor of law at Transylvania Univ. Having spent the short session of 1806-7 in the U.S. Senate, he returned (1807) to the state legislature, became (1808) speaker, and remained there until he was chosen to fill an unexpired term (1810-11) in the U.S. Senate. In 1810 he was elected to the U.S. House of Representatives and served (1811-14) as speaker. As spokesman of Western expansionist interests and leader of the "war hawks," Clay stirred up enthusiasm for war with Great Britain and helped bring on the War of 1812. He resigned (1814) from Congress to aid in the peace negotiations leading to the Treaty of Ghent. He again served (1815-21) in the House, again was speaker (1815-20), and began to formulate his "American system," a national program that ultimately included Federal aid for internal improvements and tariff protection of American industries. In 1821, Clay, to pacify sectional interests, pushed the MISSOURI COMPROMISE through the House. In the House for the last time (1823-25), he once more became (1823) speaker, and he did much to augment the powers of that office. In this session he secured the western extension of the NATIONAL ROAD and, against much opposition, eloquently carried through the Tariff of 1824. As a candidate for the presidency in 1824, Clay had the fourth largest number of electoral votes, and, with no candidate having a majority, the election went to the House, where the three highest were to be voted upon. It became Clay's duty to vote for one of his rivals. Despite the Western interests of Andrew JACKSON and despite the instructions of Kentucky to vote for him, Clay's dislike for the military hero was so intense that he voted for John Quincy ADAMS. When President Adams appointed Clay Secretary of State, Jackson's friends cried "corrupt bargain" and charged Clay with political collusion. Evidence has not been found to prove this, but the accusation impeded Clay's future political fortunes. As Secretary of State (1825-29), he secured congressional approval—which came too late for the American delegates to attend—of U.S. participation in the Pan American Congress of 1826. In 1828, Clay again supported Adams for President, and Jackson's success bitterly disappointed him. Although he intended to retire from politics, Clay was elected (1831) to the U.S. Senate and now led the National Republicans, who were beginning to call themselves Whigs (because they opposed Jackson's "tyranny"). Hoping to embarrass Jackson, Clay led the opposition in the Senate to the President's policies, but when the election came Jackson was overwhelmingly reelected. Clay's chagrin was buried in the crisis developing over the tariff. South Carolina's NULLIFICATION of the tariffs of 1828 and 1832 as well as Jackson's threats of armed invasion of that state allowed Clay to gain politically—working, even at the cost of his own protectionist views, toward a compromise with the John C. CALHOUN faction, he helped to promote the Compromise Tariff of 1833. Clay opposed the Jackson regime at every turn, particularly on the bank issue. When Jackson had the deposits removed (1833) from the BANK OF THE UNITED STATES to his "pet banks," Clay secured in the Senate passage of a resolution—later expunged (Jan., 1837) from the record—censuring the President for his act. Refusing to run for President in 1836, Clay continued his opposition tactics against Van Buren's administration and fought the SUBTREASURY system in vain. In 1840, Clay lost the Whig nomination to William H. Harrison, mainly because of Thurlow Weed's adroit politics. Clay supported Harrison and, when Harrison was elected, was offered the post of Secretary of State, but he chose to stay in the Senate. He now planned to reestablish the Bank of the United States, but the unexpected accession of John TYLER to the presidency and his vetoes of Clay's bills caused Clay to resign his Senate seat. In 1844 he ran against James K. POLK, an avowed expansionist. Earlier Clay had publicly opposed the annexation of Texas, and he restated his position in the "Alabama Letters," agreeing to annexation if it could be accomplished with the common consent of the Union and without war. This maneuver probably lost him New York state, with which he could have won the election. His failure was crushing for him and for the Whig party. In 1848 his party refused him its nomination, feeling that he had no chance, so that his presidential aspirations were never fulfilled. He reentered (1849) the Senate when the country faced the slavery question in the territory newly acquired by the Mexican War. Clay denounced the extremists in both North and South, asserted the superior claims of the Union, and was chiefly instrumental in shaping the COMPROMISE OF 1850. It was the third time that he saved the Union in a crisis, and thus he has been called the Great Pacifier and the Great Compromiser. Publication of his papers (ed. by James Hopkins) was begun in 1959. See also his works (7 vol., 1896), biographies by Carl Schurz (1887, repr. 1968), Glyndon Van Deusen (1937), and Bernard Mayo (1937, repr. 1966).

Clay, Lucius DuBignon, 1897-, American general, b. Marietta, Ga. A graduate of West Point and an engineering officer, he held many army administrative posts and became (1944) deputy director of the office of War Mobilization and Reconversion. Clay was (1945-47) deputy chief of the U.S. military government in Germany before he directed operations in the Berlin blockade as U.S. military governor (1947-49). Clay retired from the army as a full general in May, 1949, to enter private business. After the closing of the borders between East and West Berlin by the Communists, he served (Sept., 1961-May, 1962) as President Kennedy's personal representative in Berlin with the rank of ambassador. He wrote *Decision in Germany* (1950).

clay, common name for a number of fine-grained, earthy materials that become plastic when wet. The individual clay particles are always smaller than 0.004 mm. Clays often form colloidal suspensions when immersed in water, but the clay particles flocculate (clump) and settle quickly in saline water. Clays are easily molded into a form that they retain when dry, and they become hard and lose their plasticity when subjected to heat. Chemically, clays are hydrous aluminum silicates, ordinarily containing impurities, e.g., potassium, sodium, calcium, magnesium, or iron, in small amounts. Clay consists of a sheet of interconnected silicates combined with a second sheetlike grouping of metallic atoms, oxygen, and hydroxyl, forming a two-layer mineral such as KAOLINITE. Sometimes the latter sheetlike structure is found sandwiched between two silica sheets, forming a three-layer mineral such as vermiculite. Clays are divided into two classes: residual clay, found in the place of origin, and transported clay, also known as sedimentary clay, removed from the place of origin by an agent of erosion and deposited in a new and possibly distant position. Residual clays are most commonly formed by surface weathering, which gives rise to clay in three ways—by the chemical decomposition of rocks, such as granite, containing silica and alumina, by the solution of rocks, such as limestone, containing clayey impurities, which, being insoluble, are deposited as clay, and by the disintegration and solution of shale. One of the commonest processes of clay formation is the chemical decomposition of FELDSPAR. In the lithification process, compacted clay layers can be transformed into shale. Under the intense heat and pressure that may develop in the layers, the shale can be metamorphosed into slate. From prehistoric times, clay has been indispensable in architecture, in industry, and in agriculture. As a building material, it is used in the form of BRICK, either sun-dried (adobe) or fired. Clays are also of great industrial importance, e.g., in the manufacture of TILE for wall and floor coverings, of porcelain, china, and earthenware, and of pipe for drainage and sewage. Properties of the clays used in such products that must be taken into consideration include plasticity, shrinkage under firing and under air drying, fineness of grain, color after firing, hardness, cohesion, and capacity of the surface to take decoration. On the basis of such qualities clays are variously divided into classes or groups, products are generally made

from mixtures of clays and other substances. The purest clays are the CHINA CLAYS and kaolins. "Ball clay" is a name for a group of plastic, refractory clays used with other clays to improve their plasticity and to increase their strength. Bentonites are clays composed of very fine particles derived usually from volcanic ash. They are composed chiefly of the hydrous magnesium-calcium-aluminum silicate called montmorillonite. Highly absorbent, bentonite is much used in foundry work for facing the molds and preparing the molding sands for casting metals. The less absorbent bentonites are used chiefly in the oil industry, e.g., as filtering and deodorizing agents in the refining of petroleum and, mixed with other materials, as drilling muds to protect the cutting bit while drilling. Other uses are in the making of fillers, sizings, and dressings in construction, in clarifying water and wine, in purifying sewage, and in the paper, ceramics, plastics, and rubber industries. Clay is one of the three principal types of soil, the other two being sand and loam. A certain amount of clay is a desirable constituent of soil, since it binds other kinds of particles together and makes the whole retentive of water. Excessively clayey soils, however, are exceedingly difficult to cultivate. Their stiffness presents resistance to implements, impedes the growth of the plants, and prevents free circulation of air around the roots. They are cold and sticky in wet weather, while in dry weather they bake hard and crack. Clods form very often in clayey soils. Clays can be improved by the addition of lime, chalk, or organic matter, sodium nitrate, however, intensifies the injurious effects. In spite of their disadvantages, the richness of clay soils makes them favorable to the growth of crops that have been started in other soil. See also FULLER'S EARTH. See R. E. Grim, *Clay Mineralogy* (2d ed 1968), R. W. Grimshaw, *The Chemistry and Physics of Clays and Allied Ceramic Materials* (4th ed 1971).

clay pan* see HARDPAN

Clayton, Henry De Lamar, 1857-1929, U.S. Congressman, b. Barbour co., Ala. A Democrat, he was a member of the House of Representatives from 1897 to 1915 and later a Federal district judge. He is chiefly remembered as the author of the CLAYTON ANTITRUST ACT.

Clayton, John Middleton, 1796-1856, American statesman, b. Sussex co., Del. Admitted (1819) to the bar, he practiced at Dover, Del., held many state offices, and was twice (1828, 1845) elected to the U.S. Senate. In the presidential election of 1848 he gave his support to Zachary Taylor and was rewarded with the position of Secretary of State, an office he held until Taylor's death in 1850. As Secretary of State he negotiated the CLAYTON-BULWER TREATY, which checked British expansion in Central America and temporarily settled a rivalry that had brought England and the United States into conflict. He reentered the Senate in 1852.

Clayton, city (1970 pop. 16,222), seat of St. Louis co., E central Mo., a suburb of St. Louis, inc. 1919.

Clayton Antitrust Act, 1914, passed by the U.S. Congress as an amendment to clarify and supplement the SHERMAN ANTITRUST ACT of 1890. It was drafted by Henry De Lamar Clayton. The act prohibited exclusive sales contracts, local price cutting to freeze out competitors, rebates, interlocking directorates in corporations capitalized at \$1 million or more in the same field of business, and intercorporate stock holdings. Labor unions and agricultural cooperatives were excluded from the forbidden combinations in the restraint of trade. The act restricted the use of the INJUNCTION against labor, and it legalized peaceful strikes, picketing, and boycotts. It declared that "the labor of a human being is not a commodity or article of commerce." Organized labor was as heartened by the act as it had been dejected by the doctrine of the DANBURY HATTERS CASE, but judicial construction soon made the labor provisions of the act meaningless. The Clayton Antitrust Act was the basis for a great many important and much-publicized suits against large corporations. Later amendments to the act strengthened its provisions against unfair price cutting (1936) and intercorporate stock holdings (1950).

Clayton-Bulwer Treaty, concluded (April 19, 1850) at Washington, D.C., between the United States, represented by Secretary of State John M. Clayton, and Great Britain, represented by the British plenipotentiary Sir Henry Bulwer. American and British rivalries in Central America, particularly over a proposed isthmian canal, led to the treaty. Its most important article provided "that neither will ever obtain or maintain for itself any exclusive control over the said ship canal that neither will ever

erect or maintain any fortifications commanding the same or occupy, or fortify, or colonize or assume, or exercise any dominion over Nicaragua, Costa Rica, the Mosquito coast [in present-day Honduras and Nicaragua], or any part of Central America." Although the treaty was soon ratified by the Senate, it was one of the most unpopular in U.S. history, viewed by some as a betrayal of the Monroe Doctrine. Successive Secretaries of State tried in vain to secure modifications that would enable the United States to build its own canal and exercise, under restrictions, political control over it, but it was not until 1901, with the HAY-PAUNCEFOTE TREATIES, that this end was finally achieved. See M. W. Williams, *Anglo-American Isthmian Diplomacy, 1815-1915* (1916, repr. 1965).

Clazomenae (klāzōm'ānē), ancient city of W Asia Minor, 20 mi (32 km) W of present-day Izmir, Turkey. It was one of the 12 Ionian cities of Asia Minor. The city was founded on the mainland but was later moved to a small island, and Alexander the Great built a causeway to it. The town continued to flourish through the Hellenistic and Roman periods. It was the birthplace of the philosopher Anaxagoras and was famous for its black-figure pottery and its terra-cotta sarcophagi.

Cleanthes (klēān'thēz), 3d cent. B.C., Greek philosopher, head of the Stoic school following Zeno.

Cleararchus (klēār'kās), d. 401 B.C., Spartan officer, celebrated as the leader of the Ten Thousand (see ANABASIS). Sent in 410 to govern Byzantium, he made himself unpopular by his harsh discipline, and Alcibiades took the city in 408 B.C. Cleararchus later returned and made himself virtual ruler, thereby incurring the anger of the Spartans, who forced him to leave (403). He sought refuge with Cyrus the Younger of Persia, who used him to recruit and later command the Greek mercenary force in support of Cyrus' claim to the throne. At CUNAXA, Cleararchus fought boldly, but Cyrus' forces were defeated. After the battle he led the Greek force (the Ten Thousand) in retreat, but was lured into a conference by TISSAPHERNES and treacherously murdered. The story of the retreat was made famous by Xenophon.

clearcutting: see FORESTRY

Clearfield, city (1970 pop. 13,316), Davis co., N Utah, inc. 1922. Hill Air Force Base and a naval supply depot are the major employers.

clearing, in banking, the periodic settling of bankers' claims against each other. For that purpose local banks form clearinghouse associations. Clearinghouses are said to have existed in Florence by A.D. 800. They were certainly perfected in Lyons by 1463, and their use was widespread in 18th-century Europe. The first modern clearinghouse was either at Edinburgh (1760) or at London (1773), clearinghouses were then established in Dublin (1846), New York (1853), Paris (1872), and Berlin (1883). Before the introduction of clearinghouses each bank periodically sent runners to other banks to adjust claims bilaterally. The clearinghouse instead holds meetings of representatives of all banks in a given area to adjust claims and is thus a major labor-saving device. The New York Clearing House, for example, clears checks, stock certificates, and coupons several times daily. Each bank sends a delivery clerk and a settling clerk to the house, they bring with them bundles of checks and other obligations due their banks from other banks, each bank being represented by a separate package. Lists of such obligations are handed to an inspector before clearing begins, the total of the lists is the total amount to be settled that day. When clearing begins, each delivery clerk passes from one desk to another, depositing on each his bank's claims upon the bank represented at that desk. When a settling clerk at any one desk has received all his packages, he draws up a statement of the demands made upon his bank, as shown by the totals of the packages. He sends the statement to the manager of the clearinghouse, along with the total that his bank is owed. When all settling clerks have finished, the accounts are examined and proved, and the manager certifies the amounts that each bank owes to and is entitled to receive from the other banks. The balance (debit or credit) for each bank is forwarded to the Federal Reserve bank, which adjusts the accounts of each bank. All packages of claims are accepted at the clearinghouse desks without examination, they are later carried back to the banks receiving them and are there examined. If any claims are found invalid, the banks concerned rectify the error without using the clearinghouse. Dues, usually in proportion to the number of transactions presented by each bank per year, support the clearinghouse. With the consent of the

clearing association, nonmembers may be permitted to clear through members. Intercity balances in the United States are settled on the books of the Federal Reserve banks daily by telegraphic transfers. Clearing is practiced also by stock and commodity exchanges. International claims are settled by clearing unions, groups of central banks and other major financial institutions. The most famous such group is the European Payments Union (created 1950). See F. P. Thomson, *Money in the Computer Age* (1968).

Clear Lake, 65 sq mi (168 sq km), W Calif., in wooded hills NW of San Francisco. It is the largest freshwater lake entirely within California and is a fishing resort. Mt. Konochi rises nearly 3,000 ft (910 m) on the west shore.

clearstory: see CLERESTORY

Clearwater, residential and resort city (1970 pop. 52,074), seat of Pinellas co., W Fla., on the Pinellas peninsula, on Clearwater Bay and the Gulf of Mexico, inc. 1891. Its thriving tourist industry dates from 1896. A landscaped causeway connects the city proper with a 4-mi (6.4-km) long island of white sand beaches fronting on the Gulf. Several national corporate headquarters are in the city. Clearwater was settled after the establishment there of Fort Harrison in 1841. It is linked with Tampa by a causeway across Old Tampa Bay to the east. It is the seat of Clearwater Christian College and a junior college, and has an art center, a theater, and many recreational facilities.

Clearwater, river, c.190 mi (305 km) long, rising in several branches in the Bitterroot Range, N Idaho, and flowing west to join the Snake River at Lewiston, Idaho. The gold-mining era in Idaho began in 1860, when gold was discovered and mining camps were set up on the river's southern fork.

cleavage, tendency of many minerals to split along definite smooth planar surfaces determined by their crystal structure. The directions of these surfaces are related to weaknesses in the atomic structure of the mineral and are always parallel to a possible crystal face. The property of cleavage is useful in identifying a mineral species. The tendency for certain varieties of metamorphic and sedimentary rock to split along more or less smooth surfaces is sometimes referred to as rock cleavage. Flagstone, slate, and schist are noted for this property, which arises from the parallel alignment of fine, platy mineral grains themselves displaying cleavage.

Cleaveland, Moses, 1754-1806, American pioneer, b. Canterbury, Conn. After serving (1777-81) in the American Revolution, he practiced law in his native town and entered (1787) the state legislature. When the Connecticut Land Company purchased (1795) land in the WESTERN RESERVE region of Ohio, Cleaveland was chosen as one of the directors and surveyors of the company. In 1796 he led a party of men to the mouth of the Cuyahoga River, where he determined to develop the main settlement. The surveyors named the site Cleaveland, which name it bore until c.1830, when it became Cleveland.

Cleburne, Patrick Ronayne (klē'bərən), 1828-64, Confederate general, b. Co. Cork, Ireland. He emigrated to America in 1849 and was practicing law in Helena, Ark., when the Civil War broke out. Cleburne, who had served in the British army, was made a brigadier general in March, 1862. He commanded a brigade at Shiloh (April), and a division at Richmond (Aug.) and Perryville, Ky. (Oct.). Promoted to major general (Dec.), he distinguished himself further at Murfreesboro and in the campaigns around Chattanooga and Atlanta. Cleburne was one of the most persistent of the group of Southern generals who advocated that slaves be freed and used as soldiers. His last service was in the Tennessee campaign of 1864, he was killed at the battle of Franklin (Nov.). See biography by Howell and Elizabeth Purdue, Ella Lonn, *Foreigners in the Confederacy* (1940, repr. 1965).

Cleburne, city (1970 pop. 16,015), seat of Johnson co., N Texas, inc. 1907. It is a rail, processing, and medical center in a farming area. The city has huge railroad shops, cotton mills, limestone-processing plants, and factories producing a variety of products. Two rodeos are held there annually. A state park is nearby.

Cleef or Cleve, Joos van (yōs vān klāf, klā'və), c.1485-1540, early Flemish portrait painter. Much of his life was spent in Antwerp. He is often identified with the Master of the Death of the Virgin from altarpieces in Munich and Cologne. Portraits of Henry VIII (Hampton Court) and Francis I (Johnson Coll., Philadelphia) are attributed to him. A sentimental *Holy Family* by Joos is in the National Gallery, London.

Cleethorpes (klē'thōrps), municipal borough (1971 pop 35,785), in the Parts of Lindsey, Lincolnshire, E central England, on the Humber River estuary. It is a popular resort, with many recreational facilities. The nearby Church of Old Clew was dedicated in 1192 by the bishop of Lincoln. In 1974, Cleethorpes became part of the new nonmetropolitan county of Humberside.

clef, in music see MUSICAL NOTATION

cleft palate, incomplete fusion of bones of the palate. The cleft may be confined to the soft palate at the back of the mouth, it may include the hard palate, or roof of the mouth, or it may extend through the gum and lip, producing a gap in the teeth and a HARELIP. The condition appears to be hereditary but not under the control of a single pair of genes. A cleft palate causes separation between the oral and nasal cavities. An infant cannot develop proper suction for drinking, and there is the danger of milk entering the nasal cavity and being aspirated into the lungs. Formula must be carefully placed at the back of the tongue for normal swallowing to take place. Ear infection may result from food or fluid passing from the nasal cavity to the middle ear by way of the Eustachian tubes. Proper speech articulation is difficult unless the cleft is surgically closed. The proper time for such an operation is in dispute, some authorities prefer early closure, before the cleft interferes with development of normal speech habits, while others prefer to wait for several years until facial growth has been completed.

Cleisthenes, fl. 510 B.C., Athenian statesman. He was the head of his family, the ALKMAEONIDAE, after the exile of Hippias, and with Spartan help had made himself undisputed ruler of Athens by 506 B.C. He established a more democratic constitution by weakening the clan system and the local parties and by organizing the districts into political rather than social divisions. The Alkmaeonidae thus became leaders of a democratic party, a reorientation making them anti-Spartan instead of pro-Spartan as earlier. An attempt of his rival, Isagoras, to overturn the reforms of Cleisthenes after Cleisthenes had been sent into exile failed, and Cleisthenes was recalled. Sparta aided Isagoras, and Spartan hatred of the Alkmaeonidae began with Cleisthenes. The name also appears as Clisthenes.

Cleveland, John see CLEVELAND, JOHN

clématis (klēm'ātis), any plant of the large genus *Clematis* (sometimes subdivided into three or four genera), widely distributed herbs or vines of the family Ranunculaceae (BUTTERCUP family), many of them native. The vines are the more popular and are usually profuse bloomers, some have an irritating juice, leafstalks serving as tendrils, and small dry fruits with a feathery taillike appendage. The flowers are varied in shape and color. Most popular in North America are the Jackman *clematis* (*C. jackmanii*), a large purple hybrid, and the Japanese *clematis* (*C. paniculata*) with small white flowers. Some *clematis* are called virgin's-bower, traveler's-joy, leatherflower, and old-man's-beard. *Clematis* is classified in the division MAGNOLIOPHYTES, class Magnoliopsida, order Ranunculales, family Ranunculaceae.

Clemenceau, Georges (zhōrzh klāmaNsō'), 1841-1929, French political figure, twice premier (1906-9, 1917-20), called "the Tiger." He was trained as a doctor, but his republicanism brought him into conflict with the government of Napoleon III, and he went (1865) to the United States, where he spent several years as a journalist and a teacher. Returning to France in 1869, he was mayor of Montmartre in Paris after the overthrow (1870) of Napoleon III. His political career, beginning in revolution, continued to be a stormy one punctuated by verbal and physical duels. As a Socialist, he opposed the moderate Léon GAMBETTA, drove Jules FERRY from power, and first supported but then bitterly opposed General BOULANGER. A member of the chamber of deputies from 1876, he failed to win reelection in 1893 after being implicated in the Panama Canal scandal, and then unjustly accused of being in the pay of the British. During the next nine years he devoted himself to journalism, writing a daily article in *La Justice*, and founding (1900) *Le Bloc*. He was a passionate defender of Alfred Dreyfus in the DREYFUS AFFAIR. In 1902, Clemenceau was elected senator, and in 1906 he became minister of the interior and then premier. During his tenure the first crisis over MOROCCO was settled and the alliance with Great Britain strengthened. Clemenceau's harsh measures against strikers caused his final breach with the Socialists. In 1909 his cabinet fell and Aristide BRIAND became premier. In the next years Clemenceau vigorously attacked Germany and pressed for military pre-

paredness. His newspaper, *L'Homme libre* (after its suppression in 1914, *L'Homme enchaîné*) attacked the government for defeatism even after the outbreak of World War I. Succeeding Paul PAINLEVÉ as premier in Nov., 1917, Clemenceau formed a coalition cabinet in which he was also minister of war. He renewed the dispirited morale of France and pushed the war vigorously until the final victory. Leading the French delegation at the Paris Peace Conference, Clemenceau was the main antagonist of Woodrow WILSON; he regarded the Versailles Treaty as inadequate in guaranteeing the security of France. Ironically, he was defeated in the presidential election of 1920 because of what was regarded as his leniency toward Germany. Alexandre Millebrand succeeded him as premier. Clemenceau retired to his native Vendée, where he wrote *In the Evening of My Thought* (tr. 1929) and other works. See biographies by Geoffrey Bruun (1943, repr. 1962) and J. H. Jackson (1946, repr. 1962), Wythe Williams, *The Tiger of France* (1949).

Clemens, Samuel Langhorne: see TWAIN, MARK

Clement I, Saint, or Clement of Rome, d. A.D. 97?, pope (A.D. 88?-A.D. 97?), martyr, successor of St. Cletus. He may have known the apostles Peter and Paul, and after them he was the most esteemed figure in the church. His letter to the church at Corinth was considered canonical by some until the 4th cent. It is notable for the authority Clement assumes in resolving the factionalism that was afflicting the Corinthians and in enjoining the need for order in the church. St. Clement was the first Christian writer to use the myth of the phoenix as an allegory of the Resurrection. Many writings have been wrongly attributed to him, particularly the so-called Second Epistle of St. Clement to the Corinthians. He is represented in frescoes in the Church of San Clemente, Rome. He was succeeded by St. Evaristus. Feast Nov. 23. See J. A. Kleist, tr., *The Epistles of St. Clement of Rome and St. Ignatius of Antioch* (1946).

Clement III, antipope see GUIBERT OF RAVENNA

Clement IV, d. 1268, pope (1265-68), a Frenchman named Guy le Gros Foulques, successor of Urban IV. He was a lay adviser of King Louis IX of France, but after his wife's death he entered the church. As pope he continued the struggle against the HOHENSTAUFEN by confirming the agreement with CHARLES I (Charles of Anjou) that gave Charles the crown of Naples, by raising an army for him, and by investing him with the kingdom. When CONRADIN attacked Charles, Clement had a crusade preached against him. He was a strong opponent of nepotism, and he was the patron of Roger BACON. He was succeeded by Gregory X.

Clement V, 1264-1314, pope (1305-14), a Frenchman named Bertrand de Got, successor of Benedict XII. He was made archbishop of Bordeaux by BONIFACE VIII, who trusted him, surprisingly, he was also in some favor at the court of PHILIP IV, even though Philip and the pope were archenemies. He was crowned pope at Lyons in Philip's presence and lived the rest of his life in France. In 1309 he settled at Avignon, beginning the long, controversial residency of the PAPACY there. The pontificate of Clement is one long chronicle of dictation by the French king. Although Clement effectively squelched Philip's effort to have Boniface posthumously condemned as a heretic—an act that would have been disastrous to the papacy—he supported Philip in the infamous suppression of the KNIGHTS TEMPLARS. He called the Council of Vienne (1311, see VIENNE, COUNCIL OF) to settle the issue and to deal with questions of heresy and church reform. He opposed Philip by supporting the election and coronation (1312) of Henry VII as Holy Roman emperor, but later renounced Henry for his policies in Italy. The *Constitutiones Clementinae*, issued by the pope in 1313, are important in canon law. He was succeeded by John XXII.

Clement VI, 1291-1352, pope (1342-52), a Frenchman named Pierre Roger, successor of Benedict XII. His court was at Avignon. He had been archbishop of Sens, archbishop of Rouen, and cardinal (1338). The principal event of his pontificate was the PLAGUE known as the Black Death (1348-50), Clement did what he could for sufferers. He tried to stem the wave of anti-Semitism brought on by the plague, and he did much to protect the Jews. In Roman affairs Clement at first favored Cola di Rienzi, then helped to defeat him. He had a quarrel with Holy Roman Emperor LOUIS IV over the annulment of Margaret Maultasch's marriage; the struggle was aggravated by enmity between the pope and the German archbishops, caused by the elevation of Prague into an archbishopric, detaching it from Mainz. The

years before the Black Death were the heyday of papal AVIGNON, which Clement purchased (1348) from JOANNA I. Clement spent extravagantly, had an elegant court, patronized the arts, and vastly favored his relatives. He was completely pro-French. He was succeeded by Innocent VI.

Clement VII, antipope (1378-94) see ROBERT OF GENÈVA

Clement VII, c. 1475-1534, pope (1523-34), a Florentine named Giulio de' Medici, successor of Adrian VI. He was the son of Giuliano de' Medici, who was the younger brother of Lorenzo de' Medici, Clement was therefore first cousin of Pope Leo X. In 1513 he became a cardinal and as archbishop of Florence, was noted as a reformer. He was a chief supporter and adviser of Adrian in his attempts to reform the church. As pope, however, he proved to be unaware of the menace of Lutheranism to the church and certainly not the man for the opening battles of the Reformation. His relations with Holy Roman Emperor CHARLES V were never very cordial, since Clement allied himself with FRANCIS I of France in the League of Cognac (1526). As a result of his hostility to the emperor, the imperial troops under Charles de Bourbon attacked Rome in 1527, sacked the city, and held the pope for some months. Eventually (1529) peace was achieved between Clement and Charles V, and he crowned Charles emperor. About 1527 the first stage of the struggle of HENRY VIII of England against the church began. Clement's behavior in the matter of the divorce and the dispensations for a new marriage has been called vacillating, but when the situation became critical, he put the irrevocable Cardinal CAMPEGIO in charge of the case with Cardinal Wolsey. Later canon lawyers have steadily maintained that, whether he was influenced by Charles V or not, Clement followed the only course possible on legal grounds. He was a patron of Raphael, Michelangelo, and Benvenuto Cellini. He was succeeded by Paul III.

Clement VIII, 1536-1605, pope (1592-1605), a Florentine named Ippolito Aldobrandini, successor of Innocent IX. He reversed the policy of his predecessors by allying the Holy See with France rather than with Spain, which had assumed a dictatorial attitude over the papacy. Clement absolved HENRY IV of France after his abjuration of Protestantism, and the two rulers were thereafter on most friendly terms. Clement was distinguished for his piety, and he labored for the improvement of the clergy and of the charitable institutions of Rome. His confessors were St. PHILIP NERI and BARONIUS, whom he created cardinal. He was succeeded by Leo XI.

Clement XI, 1649-1721, pope (1700-1721), an Italian (b. Urbino) named Giovanni Francesco Albani, successor of Innocent XII. He was known in his youth for his prodigious learning and brilliance. He became cardinal in 1690. As pope he was involved in the struggle between France and Austria over the throne of Spain; he recognized PHILIP V but later was forced into recognizing Charles of Hapsburg, the other claimant. The chief spiritual concern of his pontificate was that of Jansenism (see under JANSEN, CORNELIS). The brief *Vineam Domini* (1705) condemned the Jansenist ideas on papal infallibility, and in 1713 he issued the bull *Unigenitus*, which condemned certain other Jansenist propositions. He was succeeded by Innocent XIII.

Clement XIV, 1705-74, pope (1769-74), an Italian (b. near Rimini) named Lorenzo Ganganelli, successor of Clement XIII. He was prominent for many years in pontifical affairs at Rome, and he was created cardinal in 1759. He was a Conventual Franciscan. He inherited from his predecessor the hostility of every state of Catholic Europe. Clement XIV's part in the suppression of the Jesuits (see JESUS, SOCIETY OF) has been greatly discussed; he was probably pressured into it. The suppression removed the pope's only independent support and put the church wholly into the hands of the secular princes. He was succeeded by Pius VI.

Clement, one of Paul's co-workers. Philip 4:3. He is traditionally identified with St. Clement.

Clement, Jacques (zhak klāman'), 1567-89, French Dominican monk, assassin of HENRY III of France. An adherent of the LEAGUE, he thought Henry a danger to the Church because of his recognition of a Protestant successor. Clement was killed by the king's attendants immediately after the stabbing.

Clemente, Roberto Walker, 1934-72, Puerto Rican baseball player, b. Carolina, Puerto Rico. He played his entire major league career with the Pittsburgh Pirates (1955-72) and was the mainspring of their successes for 18 years. He was one of 11 players to reach the 3,000-hit plateau. A right fielder, Clemente

was capable of throwing out a runner from his knees. He had a lifetime batting average of .317 and hit 240 home runs. He died in an airplane crash while attempting to take food and medicine to earthquake victims in Nicaragua in Dec., 1972. He is a national hero in Puerto Rico.

Clementi, Muzio (mōō'sēō klāmēn'tē), 1752-1832, Italian composer, pianist, and conductor. He wrote more than 100 piano sonatas, which set the definitive form, and he had an enormous influence on almost everything concerning the piano. Educated in Italy, he went (1766) to England to live and study. In 1773 he caused a sensation in London as a pianist, and he conducted the Italian Opera there from 1777 to 1780. In 1781 he went on a concert tour of Europe, which climaxed in a piano contest with Mozart, who disparaged his talents. He returned to London in 1782 and, except for tours on the Continent, spent the rest of his life there. Clementi amassed a fortune as performer, conductor, and proprietor of a piano factory and publishing house. Teacher of many musicians, including the pianists J. B. Cramer and John Field and the composer Meyerbeer, he is especially remembered for his series of etudes, *Gravitas ad Parnassum* (1817), he also wrote several symphonies. See catalog by A. Tyson (1967).

Clement of Alexandria (Titus Flavius Clemens), d. c.215, Greek theologian. Born in Athens, he traveled widely and was converted to Christianity. He studied and taught at the catechetical school in Alexandria until the persecution of 202. ORIGEN was his pupil there. He probably died in Caesarea, Cappadocia. Clement was one of the first to attempt a synthesis of Platonic and Christian thought, in this his successors in the Alexandrian school were more successful. Only a few works survive. The *Address to the Greeks* (*Protrepticus*) sets forth the inferiority of Greek thought to Christianity. Appended to the *Tutor* (*Pedagogus*) are two hymns, among the earliest Christian poems. His homily, *Who Is the Rich Man? Who Is Saved?* is a well-written fragment. The *Miscellanies* (*Stromateis*) is a collection of notes on Gnosticism. He attacked Gnosticism, but he himself has been called a Christian Gnostic. Although Clement remained entirely orthodox, in his writing he strove to state the faith in terms of contemporary thought. He was long venerated as a saint, but PHOTIUS, in the 9th cent., regarded Clement as a heretic. Because of Photius's contentions the name of Clement was removed from the Roman martyrology. See studies by E. F. Osborn (1957), W. E. G. Floyd (1971), S. R. Lilla (1971), and Morton Smith (1973).

Clement of Rome. see CLEMENT I, SAINT

Clements, Frederic Edward, 1874-1945, American plant ecologist and pioneer in the study of succession (see ECOLOGY), b. Lincoln, Nebr., grad. Univ. of Nebraska, 1894. From 1917 to 1941 he was in charge of ecological research at Carnegie Institution, Washington. Among his works are *Research Methods in Ecology* (1905), *Plant Succession and Indicators* (1928, repr. 1973), *Flower Families and Ancestors* (1928, with Edith Clements), *Plant Ecology* (1929, with J. E. Weaver), and *The Genera of Fungi* (1931, repr. 1965, with C. L. Shear).

Clemson University, mainly at Clemson, S.C., co-educational, land-grant, state supported, opened in 1893 as a college, gained university status in 1964. There are branches at Greenville and Sumter. The university includes programs in textile and computer research and maintains an institute in forestry, wildlife science, and marine biology.

Cleobis see BITON

Cleobulus (klēabyōō'las), fl. 6th cent. ? B.C., one of the SEVEN WISE MEN OF GREECE, tyrant of Lindus on Rhodes, and a writer of verse. He was said to have first put riddles in literary form.

Cleomedes (klēōmē'dēz, klēō'-), fl. 2d cent., Greek astronomer. In a treatise on the circular theory of heavenly bodies, he recorded several hypotheses, e.g., the earth's spherical form and the moon's revolutions, which were established by later scientists.

Cleomenes I (klēōm'tnēz), d. c.489 B.C., king of Sparta after 518 B.C. In accordance with Sparta's policy of helping oligarchies in other states at the expense of the tyrants or the people, Cleomenes joined the Athenians in ousting the tyrant Hippas, but to Cleomenes' dismay CLEISTHENES, the principal Athenian aristocrat, sided with the people and took the power (510 B.C.). Twice Cleomenes attacked democratic Athens. The first time he expelled Cleisthenes, who, however, quickly returned to power, thus halting Spartan influence. The second time Corinth checkmated Sparta by refusing to help in an attack that would have disturbed the balance of

power. Cleomenes' reputation for ruthlessness is due chiefly to his attack (c.494 B.C.) on Argos, in which he slaughtered 6,000 Argives—an exploit that gave Sparta hegemony in S. Greece for many years. **Cleomenes III**, c.260-219 B.C., king of Sparta (235-221 B.C.). He was probably the most energetic king Sparta ever had, a conscious imitator of AGIS III. In his determined effort to restore the prestige of the city, he began (227 B.C.) a war against the ACHAean LEAGUE and was successful in many battles. At home his reforms were revolutionary: the kingship was made the supreme power, the ephorate was abolished, and the citizenship was widely extended, apparently to decrease the danger of discontent and to ally the people with the king. Cleomenes came to his downfall suddenly in 222 B.C. (or possibly 221 B.C.) when the Achaean League, allied with ANTI-GONUS III of Macedon, routed the Spartan army. Cleomenes fled to Egypt to the protection of his patron, Ptolemy III. Imprisoned by Ptolemy's successor, he escaped, but, failing in an attempt to stir up a revolt in Alexandria, he committed suicide.

Cleon (klē'ōn), d. 422 B.C., Athenian political leader. The son of a tanner, he had little education, nevertheless, he was a gifted speaker. He began his political career with a series of relentless attacks on PERICLES. He was antagonistic to Sparta and successfully opposed (425 B.C.) Sparta's peace proposals. In the same year he was given command of the Athenian force blockading Sphacteria (an island at the mouth of the Bay of Pylos) and was brilliantly successful against the Spartans. Three years later he was given another command against the Spartans at Amphipolis, but he failed and was killed in action. His reputation as a vulgar and unprincipled demagogue is chiefly due to accounts by his enemies Thucydides and Aristophanes.

Cleopas (klēō'pās), one of the two who met the risen Jesus on the way to Emmaus. Luke 24:18. Perhaps the same as CLEOPHAS.

Cleopatra (klēōpā'trā, -pā'-, -pā'-), 69 B.C.-30 B.C., queen of Egypt, one of the great romantic heroines of all time. Her name was widely used in the Ptolemaic family, there were many earlier Cleopatras. The daughter of Ptolemy XI, she was married at the age of 17 (as was the family custom) to her younger brother PTOLEMY XII. The force and character of the royal pair was, however, concentrated in the alluring (though apparently not beautiful) and ambitious queen. She led a revolt against her brother, and, obtaining the aid of Julius Caesar, she won the kingdom, although it remained a vassal of Rome. Her young brother-husband was accidentally drowned in the Nile. She then married her still younger brother PTOLEMY XIII, but she was the mistress of Caesar and followed him to Rome, there she bore a son, Caesarion (later PTOLEMY XIV), who was said to be his. Returning to Egypt after the murder of Caesar and the battle of PHILIPPI, she was visited (42 B.C.) by Marc ANTONY, who had come to demand an account of her actions. He fell hopelessly in love with her, and Cleopatra, conscious of her royalty and even her claims to divinity as the pharaoh's daughter, seems to have hoped to use Antony to reestablish the real power of the Egyptian throne. They were married in 36 B.C. Most of the Romans feared and hated Cleopatra, and Octavian (later AUGUSTUS) undertook to destroy the two lovers. Antony and Cleopatra were defeated off Actium in 31 B.C., and, returning to Alexandria, they undertook to defend themselves in Egypt. When they failed, Antony committed suicide by falling on his sword. Cleopatra, faced by the cold and unmoved Octavian, also killed herself. Her schemes failed, but her ambition, capability, and remarkable charm have left a great impression on history. Shakespeare's Antony and Cleopatra, based on Plutarch, describes the tragic end of the queen's career, and Dryden's *All for Love* or, *The World Well Lost* is a reworking of Shakespeare. Caesar and Cleopatra, the comedy by G. B. Shaw, deals with the early years of her story. See biographies by Jack Lindsay (1971) and Michael Grant (1973), study by H. Volkmann (tr. 1958).

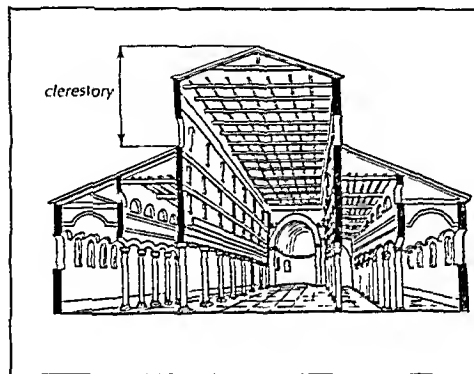
Cleopatra's Needles, name in popular use for two obelisks of red granite from Egypt. Originally erected at Heliopolis (c.1475 B.C.) by Thutmose III, they were transported to Alexandria (c.14 B.C.) under Augustus and in the 19th cent. were sent separately as gifts of Ismail Pasha to England (1878) and the United States (1880). The British ONEUSK, 68.5 ft (20.9 m) high, stands on the Thames embankment in London. The American one, 69.5 ft (21.2 m) high, is in Central Park in New York City. The hieroglyphic inscriptions of Thutmose III and Ramses II covering its sides have suffered more from erosion, because

of air pollution, in the few years since the stone came to the Western world than in the many centuries before it left Egypt.

Cleophas (klēō'fās), husband of one of the Marys who stood at the foot of the Cross. John 19:25. This is apparently Mary the mother of St. James the Less. Mat. 27:56, Mark 15:40. But the father of James the Less is Alphaeus. Mat. 10:3, Mark 3:18, Luke 6:15. An explanation is that Cleophas is the Aramaic form and Alphaeus the Greek form of the same name. Some identify CLEOPAS with Cleophas.

Clepsydra (klēp'sīdrā) or **water clock**, ancient device for measuring time by means of the flow of water from a container. A simple form of clepsydra was an earthenware vessel with a small opening through which the water dripped, as the water level dropped, it exposed marks on the walls of the vessel that indicated the time that had elapsed since the vessel was full. More elaborate clepsydres were later developed. Some were double vessels, the larger one below containing a float that rose with the water and marked the hours on a scale. A form more closely foreshadowing the clock had a cord fastened to the float so that it turned a wheel, whose movement indicated the time. A further step was the use of gear wheels and a turning pointer. It is believed that clepsydres were used in Egypt c.2000 B.C., from Egypt they were introduced into Greece and later from there into Rome.

clerestory or clearstory (both klēr'stōr'ē), a part of a building whose walls rise higher than the roofs of adjoining parts of the structure. Pierced by windows, it is chiefly a device for obtaining extra light.



Clerestory

It had an early use in certain Egyptian temples, as at Karnak, and was used later in the great halls of Roman basilicas. It became a characteristic element of medieval churches, receiving its fullest development in churches of the Gothic period.

clergy: see MINISTRY, MONASTICISM, ORDERS, HOLY

clergy, benefit of: see BENEFIT OF CLERGY

Clergy Reserves, those lands set apart in Upper and Lower Canada under the British Constitutional Act of 1791 "for the support and maintenance of a Protestant clergy." "Protestant clergy" was interpreted to mean the clergy of the Church of England. This interpretation was fiercely upheld by John Strachan and others but dissatisfied other Protestant denominations and became an issue in the Rebellion of 1837. The method of allotting reserves kept discontinuous plots out of cultivation and prevented settlement and the expansion of roads. An act of 1840 by the assembly of Upper Canada provided for the sale and distribution of the reserves, but this was disallowed by the British government. In 1854 the government finally passed a law secularizing the reserves, but the Anglican and Presbyterian churches retained the endowments that had been granted them.

Clericus, Johannes: see LE CLERC, JEAN

Clerk-Maxwell, James: see MAXWELL, JAMES CLERK

Clermont-Ferrand (klēmōn'-fērān'), city (1968 pop. 148,896), capital of Puy-de-Dôme dept., central France, in Auvergne, on the Tretaine River. It is an industrial center, home of the Michelin and other tire factories, and of important metallurgical works. The capital of the former province of Auvergne, it was formed in 1731 by the merger of Clermont and Montferrand. Clermont was built in Roman times near the site of Gergovia, which Vercingetorix held against Julius Caesar in 52 B.C. and which was later destroyed. An episcopal see since the 3d cent., it was the site of several church councils, notably that of 1095, where Pope Urban II preached the First Crusade (see CRUSADES). The city is picturesquely

situated near the Puy de Dôme peak. It is built largely of the dark volcanic rock of the region. The Gothic Cathedral of Notre-Dame (13th-14th cent.) and the Romanesque Church of Notre-Dame du Port (12th cent.) are among the notable buildings. Blaise Pascal was born in Clermont-Ferrand. There is a university (founded 1854) in the city.

Cletus (klĕ'təs) or **Anacletus, Saint** (ănăklĕ'təs), d. A.D. 88?, pope (A.D. 76–A.D. 88?), martyr, a Roman, successor of St. Linus and predecessor of St. Clement I. He is mentioned in the Canon of the Mass. Feast: April 26.

Cleve, Joos van* see CLEEF, JOOS VAN

Cleveland, Barbara Villiers, duchess of (vīl'ərz, vīl'yərz), 1641–1709, mistress of King Charles II of England. She became Charles's mistress at 8reda in 1660 and returned with him to England at the Restoration. The king made her husband, Roger Palmer, earl of Castlemaine. Lady Castlemaine was the arch-enemy of the earl of Clarendon, the lord chancellor, and her glee at his downfall (1667) is recorded in Pepys's diary. She was made duchess in 1670, but by 1671 had been supplanted in Charles's affections by Louise de Keroualle (the future duchess of Portsmouth). She had borne the king several children. See biographies by Margaret Gilmour (1941) and Allen Andrews (1970).

Cleveland, Frederick Albert, 1865–1946, American economist, b. Sterling, Ill., studied at DePauw Univ. and at the Univ. of Chicago, Ph.D. Univ. of Pennsylvania, 1900. He taught at the Univ. of Pennsylvania (1900–1903) and was professor of finance at New York Univ. (1903–5). He was a leader in budget reform and a member of several committees investigating public finances, serving as director (1907–17) of the bureau of municipal research in New York City and Philadelphia, as financial adviser (1910–13) to President Taft, and as financial adviser (1929–35) to the Chinese government. From 1919 until his retirement in 1939 he was professor of U.S. citizenship at Boston Univ. He wrote many books on finance and government, including *Funds and Their Uses* (rev. ed. 1922), *American Citizenship* (1927), and *Modern Scientific Knowledge* (1929).

Cleveland, Grover (Stephen Grover Cleveland), 1837–1908, 22d (1885–89) and 24th (1893–97) President of the United States, b. Caldwell, N.J., son of a Presbyterian clergyman. A lawyer in Buffalo, N.Y., he became (1882) the "veto mayor" who drove corruption from the city administration. He won the attention of Daniel MANNING and the reform Democrats and was elected governor of New York. Cleveland further built his reputation as an enemy of machine politics by breaking violently with the Tammany leader, John KELLY, and supporting the bills prepared by Theodore Roosevelt to improve the government of New York City. By 1884 he was a national figure, and he was nominated as Democratic "clean-government" candidate for President to oppose James B. BLAINE. Cleveland, hated by Tammany and favored by political reformers, got the votes of many reform Republicans—the "mugwumps," who voted against their party. The campaign was notably bitter and was marked by the "Rum, Romanism, and Rebellion" speech of a Blaine supporter, which deeply offended Roman Catholics and may have swung the vote to Cleveland in the key state of New York. Cleveland as President continued his independent, conscientious, but conservative course. He did not go far enough in civil service reform to satisfy the zealots, but at the same time by keeping Republican government employees who were not "offensive partisans" he offended the Democratic spoilsmen. Cleveland was continually at odds with the Republican-controlled Senate. The surplus revenue accumulating in the treasury largely because high Civil War tariffs were still in force fostered much "pork barrel" legislation. Cleveland vetoed such laws and argued for a lower tariff, devoting the whole of his annual message to Congress in 1887 to the question. The tariff was a major issue in the 1888 election. Cleveland received a popular majority but lost the electoral majority to his Republican opponent, Benjamin HARRISON. A romantic note in his first administration was his marriage (1886) in the White House to his former ward, Frances Folsom. In 1889 he retired to private life as a New York City lawyer, but opposition to measures of the Republican administration, notably the McKinley Tariff Act of 1890, brought him a new following. In 1892 he was again elected President. The Panic of 1893 struck a hard blow at his administration. Though the more radical Democrats saw salvation in free coinage of silver, the independent President sought to improve the economic situation by securing repeal of the SHER-

MAN SILVER PURCHASE ACT with the help of conservative Republicans. Cleveland still urged lower tariffs, although the best opportunity had passed, since the treasury now had a deficit rather than a surplus. The Wilson Bill, embodying Cleveland's tariff ideas, passed the House of Representatives but was so altered by Senator A. P. GORMAN and other protectionist Democrats that Cleveland, in disgust, refused to sign it. The rift between the President and the radical Democrats widened, especially over the gold standard, which Cleveland upheld. In the Pullman strike in 1894, Cleveland, on the grounds that the movement of U.S. mail was being halted by the strikers under Eugene V. DEBS, sent troops into the area over the protest of Gov. J. P. ALTGELD of Illinois. The strike was broken by the use of Federal injunctions and the arrest of the strike leaders. In foreign affairs both of Cleveland's administrations were marked by a strong stand on the VENEZUELA BOUNDARY DISPUTE, which called forth a statement greatly enlarging the scope of the Monroe Doctrine. He refused to recognize the government set up in Hawaii by a revolution that was engineered by Americans who expected speedy annexation to the United States (although he recognized the republic in 1894), and he tried to discourage support of the revolutionists in Cuba. The more radical wing of the Democrats—the silver Democrats—got control of the party in 1896 and nominated William Jennings Bryan, repudiating Cleveland. His strong second term had put him at odds with many (he was nicknamed the Great Obstructionist), and his *Presidential Problems* (1904) was mainly a defense of his own attitude on some of the major issues. Cleveland's independence and conscientiousness in office marked him as a man of courage and personal integrity. See biographies by Robert McElroy (1923), Allan Nevins (1932), H. S. Merrill (1957), and R. G. Tugwell (1968).

Cleveland or Cleveland, John, 1613–58, English poet and political satirist. He served the royalist cause both as soldier and poet. His best-known work was *The Rebel Scot* (1644). Though his contemporary fame was great, and his works originally went through 20 editions, he is known today chiefly for the lyrics "Fuscará" and "Mark Antony." See editions of his poems by J. M. Berdan (1911) and by Brian Morris and Eleanor Withington (1967).

Cleveland, nonmetropolitan county (1972 est. pop. 567,000), NE England, created under the Local Government Act of 1972 (effective 1974). It is composed of the county boroughs of Harlepool and Teesside and parts of the former counties of Durham and Yorkshire (North Riding).

Cleveland, 1 City (1970 pop. 13,327), seat of Bolivar co., NW Miss., in the rich delta cotton country, inc. 1886. It is a farm market center (rice and soybeans are also grown in the area), and its manufactures include pharmaceuticals, aluminum doors, tiles, and pens and pencils. The city is the seat of Delta State College and has a coliseum. 2 City (1970 pop. 750,879), seat of Cuyahoga co., NE Ohio, a port of entry on Lake Erie at the mouth of the Cuyahoga River, laid out (1796) by Moses Cleaveland, chartered as a city 1836. Ohio's largest city and the tenth largest in the United States (1970), it is a great ore port, a large Great Lakes shipping point, and one of the nation's leading iron and steel centers. In addition to many metallurgical manufactures, it has chemical, oil-refining, electrical, automobile, garment, and food-processing industries. There are also numerous research firms, the National Aeronautics and Space Administration has a large research center there, and the research laboratory headquarters of the General Electric Company are in nearby Nela Park. Cleveland grew rapidly after the opening of the first section of the Ohio and Erie Canal in 1827 and the arrival of the railroad in 1851. Its central location midway between the coal and oil fields of Pennsylvania and (via the Great Lakes) the Minnesota iron mines spurred its industrialization, it was there that John D. Rockefeller began his oil dynasty. Cleveland is the seat of Case Western Reserve Univ., Cleveland State Univ., John Carroll Univ., Notre Dame College, St. John College of Cleveland, Ursuline College, Ohio College of Podiatric Medicine, St. Mary Seminary, the Cleveland Institute of Art, the Cleveland Institute of Music, and a large community college. The many points of interest include the Mall (civic center), the Terminal Tower, the Western Reserve Historical Society Museum, the museum of natural history, with a planetarium, Wade Park, with the Cleveland Museum of Art and the Fine Arts Garden, Rockefeller Park, enclosing the Shakespeare and Cultural Gardens, Severance Hall, where con-

certs of the Cleveland Symphony Orchestra are performed, Gordon Park, with an aquarium, a museum of historical medicine, and Cleveland zoo. The city also has a fine public library. The *Cleveland Plain Dealer* is a nationally known newspaper. In Lake View Cemetery are the graves of James A. Garfield, Mark Hanna (who made his fortune in Cleveland), John Hay, and John D. Rockefeller. Although the city has been a leader in urban renewal and slum clearance projects, it was plagued during the 1960s by racial disorders, especially in the Hough and Glenville sections, riots in the summer of 1968 resulted in 11 deaths and much property damage. See W. H. Alburn and M. R. Alburn, *This Cleveland of Ours* (4 vol., 1933), E. J. Benton, *Cultural Story of an American City: Cleveland* (3 vol., 1943–46), E. H. Chapman, *Cleveland Village to Metropolis* (1964). 3 City (1970 pop. 20,561), seat of Bradley co., SE Tenn., in a farm and timber area, inc. 1838. Lee College and two junior colleges are there. Cleveland is headquarters of Cherokee National Forest.

Cleveland Heights, city (1970 pop. 60,767), Cuyahoga co., NE Ohio, a residential suburb of Cleveland, inc. 1903. It is known for its beautiful homes. Forest Hills Park, once part of an estate owned by John D. Rockefeller, offers recreational facilities.

Cleveland Orchestra, one of the foremost orchestras in the United States. It gave its first performance in 1918 under the direction of Nikolai Sokoloff, who was conductor until 1933. In its early years the orchestra played in the Cleveland Masonic Temple, but in 1931 it moved into Severance Hall, the gift of John L. Severance. Sokoloff was succeeded as conductor by Artur Rodzinski (1933–43) and Erich Leinsdorf (1943–44), but the orchestra's peak of fame was achieved under the direction of George SZELL (1946–71). Szell, a perfectionist and disciplinarian, brought the orchestra to international attention, leading it on several European tours. He was succeeded by Lorin Maazel.

Cleveland State University, at Cleveland, Ohio, coeducational, founded 1964, incorporating Fenn College (est. 1923). The university consists of six colleges, including graduate studies and law. Among its research facilities are an Institute of Urban Studies and a Computer Center.

Cleves (klĕvz), Ger. Kleve or Cleve, city (1970 pop. 43,447), North Rhine-Westphalia, W. West Germany, near the Dutch border. Its manufactures include shoes and food and tobacco products. It is a rail junction and popular resort. Among its noteworthy buildings are the collegiate church (14th–15th cent.), which contains the tombs of the dukes of Cleves, and the 11th-century Schwanenburg [Ger. = swans' castle], which is associated with the legend of Lohengrin.

Cleves, duchy of, former state, W. West Germany, on both sides of the lower Rhine, bordering on the Netherlands. Cleves was the capital. A county from late Carolingian times, it acquired (late 14th cent.) the county of Mark, in Westphalia, and in 1417 was made a duchy. In 1521, Duke John III of Cleves inherited through marriage the duchies of Julich and Berg and the county of Ravensberg. His daughter, Anne of Cleves, was married in 1540 to Henry VIII of England. In 1609 the male line became extinct, and a complicated dynastic quarrel for the succession followed. Brandenburg acquired (1614) Cleves, Mark, and Ravensberg, the Palatinate-Neuburg line of the Bavarian house of Wittelsbach took Julich and Berg. The succession was not finally settled until 1666, when the Treaty of Cleves confirmed the division. Cleves was held by France during the French Revolutionary Wars and in 1815 was returned to Prussia.

Clew Bay, inlet of the Atlantic Ocean, c. 15 mi (25 km) long and 10 mi (16.1 km) wide, Co. Mayo, W. Republic of Ireland. There are about 300 islands in the eastern part of the bay, some of which are cultivated. Clare Island is at the entrance.

Clews, Henry, c. 1836–1923, American financier, b. England. He emigrated to the United States c. 1850 and joined an import business as a junior clerk. In 1859 he cofounded the banking firm that later became Livermore, Clews, and Company, the second largest marketer of Federal bonds during the Civil War. His own firm, Clews and Company, was formed in 1877. Refusing public office, he nevertheless organized the "Committee of 70," which deposited the Tweed Ring in New York City. He served as President Grant's economic consultant in Japan and wrote and lectured widely on diverse social, political, and economic issues. He wrote *Fifty Years in Wall Street* (1908).

Cliburn, Van (Harvey Lavan Cliburn) (klī'bərən), 1934–, American pianist, b. Shreveport, La. Until

1951, Cliburn studied with his mother, a concert pianist. He later became a pupil of Rosina Lhevinne at the Juilliard School of Music. Cliburn was catapulted to fame as winner of the 1958 International Tchaikovsky Piano Competition in Moscow. His superb technique and romantic interpretations are especially well-suited to Romantic music.

Clichy (klĕshĕ'), suburb N of Paris (1968 pop. 52,704), Hauts-de-Seine dept., N central France. It is a modern industrial city with iron works, automobile parts, metal products, machinery, and plastics are also manufactured. Clichy was once a residence of Merovingian kings and was called Clippiacum in Latin. Dagobert I, king of the Franks, also resided there (7th cent.). The Church of St. Vincent de Paul, named for the saint who was parish priest to Clichy, is a major landmark.

click beetle, common name for members of the widespread BEETLE family Elateridae. Also called elater beetle, the click beetle has a hinge across the front of the body that allows it to flex, and a spine-and-groove arrangement on the underside of the body that provides a snapping mechanism. When a click beetle is turned on its back it cannot right itself by rolling onto its short legs. It arches its body upward so that only the ends touch the ground, then straightens suddenly, causing the spine to slide into the groove. This sends the beetle spinning through the air and produces a loud click. If the beetle lands on its back again it repeats the performance. A click beetle also snaps its body when it is picked up, which may cause the predator to drop it. Click beetles have long, flat bodies, generally rectangular, but curved at the ends. They range in length from 1/4 in. to 4 in. (6.4–102 mm), most are black or brown. Most adults are nocturnal leaf-eaters. The larvae, called WIREWORMS, are destructive to a large variety of plants. Some tropical click beetles are brilliantly luminescent. Click beetles are classified in the phylum ARTHROPODA, class Insecta, order Coleoptera, family Elateridae.

cliff dwellers, American Indians of the Anasazi culture who were builders of the ancient cliff dwellings found in the canyons and on the mesas of the U.S. Southwest, principally on the tributaries of the Rio Grande and the Colorado River in New Mexico, Arizona, Utah, and Colorado. It was once thought that these ruins were the work of an extinct aboriginal people, but it has been established that they were built (11th–14th cent.) by the ancestors of the present PUEBLO INDIANS. The dwellings were large communal habitations built on ledges in the canyon walls and on the flat tops of the mesas. Access to the cliffs was very difficult and thus highly defensible against nomadic predatory tribes such as the Navaho. The cliff dwellers were sedentary agriculturists who planted crops in the river valleys below their high-perched houses. They were experts at irrigating the fields. Their lives were organized on a communal pattern, and the many kivas (see KIVA) show that their religious ceremonies were like those of the Pueblo Indians today. Many of the dwellings are now in national parks. Some of the better-known ones are those of the Mesa Verde National Park, in Colorado, where there are more than 300 dwellings, Yucca House National Monument, also in Colorado, Hovenweep National Monument, in Utah, and Casa Grande, Montezuma Castle, and Wupatki national monuments, in Arizona. See William Current, *Pueblo Architecture of the Southwest* (1971).

Clifford, Clark McAdams, 1906–, U.S. government official, b. Fort Scott, Kansas. Admitted to the bar in 1928, he engaged in private practice before serving (1944–46) in the U.S. navy during World War II. As special adviser (1946–50) to President Harry S. Truman, Clifford was influential in foreign policy and defense matters, helping to formulate the Truman Doctrine (1947) and the legislation that created (1949) the Department of Defense. He also planned Truman's successful campaign strategy in 1948. After a period of private law practice, Clifford served (1961–63) as a foreign policy adviser to President John F. Kennedy and then became (1963) chairman of the Foreign Intelligence Advisory Board. In this capacity he supervised all U.S. espionage operations and played a crucial role in determining U.S. military policy in Vietnam. Clifford also served (1968–69) as Secretary of Defense in Lyndon B. Johnson's cabinet.

Clifford of Chudleigh, Thomas Clifford, 1st Baron (chŭd'le), 1630–73, English statesman. Member (1667–73) of the CABAL at Charles II's court, he held a number of offices, rising to be acting secretary of state and lord treasurer (1672). He was created Baron Clifford in 1672. Henry Bennet, earl of Arlington,

and Clifford, both alleged Roman Catholics, knew of the secret clauses of the Treaty of Dover (1670), which provided for the reestablishment of Roman Catholicism in England. He was forced to resign by passage of the Test Act (1673), which excluded Roman Catholics from office. He died soon afterward, possibly by suicide.

Cliffside Park, borough (1970 pop. 14,387), Bergen co., NE N.J., on the palisades above the Hudson River, opposite New York City, inc. 1895. A residential suburb, it has some light industry.

Clifton, industrial city (1970 pop. 82,437), Passaic co., NE N.J., on the Passaic River, settled 1685, set off from Passaic and inc. 1917. It has steel, textile, chemical, and electronic industries.

climacteric: see MENOPAUSE

climate, average weather condition over a long period of time, taking into account temperature, precipitation (see RAIN), HUMIDITY, WIND, barometric pressure, and other phenomena. The major influence governing the climate of a region is its latitude, and this is modified by one or more secondary influences including position relative to land and water masses, altitude, TOPOGRAPHY, prevailing winds, OCEAN currents, and prevalence of cyclonic storms. A broad latitudinal division of the earth's surface into climatic zones includes the equatorial zone, or DOLDRUMS, characterized by high temperatures with small seasonal and diurnal change and heavy rainfall, the subtropical, including the trade-wind belts and the HORSE LATITUDES, a dry region with uniformly mild temperatures and little wind, the intermediate, the region of the prevailing westerlies that, because of several secondary influences, displays wide temperature ranges and marked changeability of weather, and the polar, a region of short summers and long winters, where the ground is generally perpetually frozen (see PERMAFROST). The transitional climate between those of the subtropical and intermediate zones, known as the Mediterranean type, is found in areas bordering the Mediterranean Sea and on the west coasts of continents. It is characterized by mild temperatures with moderate winter rainfall under the influence of the moisture-laden prevailing westerlies and dry summers under the influence of the horse latitudes or the trade winds. Climatic types combining the basic factor of latitude with one or more secondary influences include the continental and the marine. Except in the equatorial region, the continental type is marked by dry, sunny weather with low humidity and seasonal extremes in temperature, noteworthy are the Sahara (with the highest temperature on record, 136°F, or 58°C, at Tripoli) and Siberia (with the lowest recorded surface temperature, –93.6°F, or –70°C, at Verkhoyansk). The marine is characterized by small annual and diurnal temperature variation and by copious rainfall on the windward side of coastal highlands and mountainous islands, notable is the mean annual precipitation of 451 in. at Mt. Waialeale, Hawaii. The coastal, or littoral, climate is one in which the direction of the prevailing winds plays a dominant role—the east coasts having generally the heavier rainfall in the trade-wind belts, the west coasts in westerly belts. Both coasts have a climate resembling the continental during the season when the wind is blowing from the interior of the continent. An instance of the coastal type, in which the precipitation is accentuated by the nearness of a mountain barrier, is the west coast of North America from Alaska to Oregon, where the mean annual precipitation averages 80 to 100 in., almost all of it falling during the winter months. Also included are the mountain and plateau climates, where elevation is the dominant factor (the temperature decreasing about 3°F per 1,000 ft., or 5.5°C per 1,000 m, of ascent and rainfall increasing with altitude up to about 6,000 ft./1,800 m, then decreasing with further elevation). Climatology, the science of climate and its relation to plant and animal life, is important in many fields, including agriculture, aviation, medicine, botany, zoology, geology, and geography. The effect of climate on man is sometimes thought to explain the relatively greater development of lands having a variable climate, usually in middle latitudes, where the annual temperature range is conducive to both mental and physical activity. Changes in climate affect the plant and animal life of a given area. Fossils of animals discovered in North America, Greenland, and Siberia and the presence of coal beds in North America and Europe, on one hand, and evidence of glaciation in these same areas, on the other, indicate that they must have experienced alternately warmer and colder climates than they now possess. Despite yearly fluctuations of climatic elements, there has been, appar-

ently, little overall change during the period of recorded history. Climatic cycles (variations in weather elements that recur with considerable regularity) have been claimed to exist, the 35-year cycle postulated by Eduard Bruckner, German geographer and meteorologist, was well investigated in Europe, and an 11-year sunspot cycle has been advanced. There is currently much concern that human activities are changing the earth's climate in harmful ways. For example, some scientists believe that the release of large quantities of gases and particulates into the atmosphere from the burning of fuel and from industrial processes is at least partly responsible for a slight lowering of mean temperatures throughout the world. If the trend continues, another ice age may be triggered. See Robert Silverberg, *The Challenge of Climate* (1969), H. H. Lamb, *Climate Present, Past and Future* (Vol. 1, 1972).

Climax, Saint John: see JOHN CLIMAX, SAINT

climax community: see ECOLOGY

climbing perch or walking fish, member of the labyrinth fish family, adapted to living in oxygen-depleted water or on dry land. It is not related to the true perch. Labyrinth fishes are spiny-finned fishes of Africa and SE Asia, which have a labyrinthine chamber over the gills that enables them to absorb and retain atmospheric oxygen. Members of some species can remain out of water for several days and will even suffocate (drown) if held under water. The climbing perch, *Anabas testudineus*, of SE Asia, is brown and reaches a length of 10 in. (25 cm). Climbing perches travel in search of water when their ponds dry up, they walk with jerky movements, supported by the spiny edges of the gill plates and propelled by the fins and tail. They are said to climb low trees. The family also includes the PARADISE FISHES, the BETTA, and the GOURAMI, all are popular aquarium fishes. The land-walking MUDDSKIPPER is of a different family. Climbing perches are classified in the phylum CHORDATA, subphylum Vertebrata, class Osteichthyes, order Perciformes, family Anabantidae.

climbing plant, any plant that in growing to its full height requires some support. Climbing plants may clamber over a support (climbing rose), twine up a slender support (hop, honeysuckle), or grasp the support by special processes such as adventitious aerial roots (English ivy, poison ivy, trumpet creeper), tendrils (see TENDRIL), or hook-tipped leaves (gloriosa lily, rattan). Some climbing plants when not supported become trailing plants (English ivy). Climbing types are to be found in nearly every group of plant, e.g., the ferns (climbing fern), palms (rattan), grasses (some bamboos), lilies (gloriosa lily), and cacti (night-blooming cereus). Tropical kinds—usually called lianas—are particularly abundant. A sturdy vine may strangle a supporting tree, and then, as the strangler fig, become a tree itself.

Clinch, river, c. 300 mi (480 km) long, formed by the junction of two forks in SW Va., and flowing generally SW across E Tenn. to the Tennessee River at Kingston. Its waters and those of its tributary, the Powell, are used to make a reservoir at Norris Dam, at its mouth the Clinch forms Watts Bar Reservoir. The river is thus an important part of the system of the Tennessee Valley Authority. In late colonial days the Clinch was one of the routes for settlers going to Tennessee.

cline, in biology, any gradual change in a particular characteristic of a population of organisms from one end of the geographical range of the population to the other. Gradients of characteristics usually accompany, and are responses to, environmental gradients, for example, a mountain range features gradients from top to bottom such as a temperature gradient (colder to warmer) and a humidity gradient (wetter to drier). In species of birds and mammals, there is usually a cline in body size, with smaller individuals in warm climates and larger individuals tending to be found in colder climates.

Clingmans Dome, mountain, Tenn. see GREAT SMOKY MOUNTAINS

clinic, name for an institution providing medical diagnosis and treatment for ambulatory patients. The forerunner of the modern clinic was the dispensary, which dispensed free drugs and served only those who could not afford to pay a fee. Dispensaries began to appear in London toward the end of the 17th cent. In the United States the first dispensary was founded in Philadelphia in 1786 through the efforts of Benjamin Rush. Another was established in New York City in 1791, and one in Boston in 1796. Home care was often provided by the early clinics, but later they evolved as places for treatment of those who could visit them. As the clinic movement grew and

concern for public health increased, facilities for providing diagnosis and treatment improved. Present-day clinics are maintained by private and city hospitals, by city health departments, by industrial and labor organizations, and by groups of private physicians. Some clinics specialize in vaccination and other measures to prevent infectious disease. Some are established to promote the health of babies and mothers. Others exist to facilitate the diagnosis of tuberculosis or cancer so that these diseases may be treated as early as possible. There are also clinics concerned with mental health. Clinics designated as health centers offer all the health services that are considered essential. They provide free, comprehensive service for people who cannot afford private care. In some areas mobile units travel from place to place providing various kinds of medical and dental care. Clinics maintained by industrial and labor organizations are often free for members, but others charge a nominal fee, in hospital clinics the fee is usually based on the individual's ability to pay.

Clink, district in Southwark, a Greater London borough, England. The Clink prison was used from the 13th cent as a detention place for heretics. Its name is now a slang term for a prison or jail.

Clinton, De Witt, 1769-1828, American statesman, b. New Windsor, N.Y., son of James CLINTON. He was admitted (1790) to the New York state bar but soon became secretary to his uncle, George CLINTON, first governor of the state, and in that position (1790-95) he gained considerable political experience and influence at an early age. In 1797 he entered the state legislature. As a U.S. Senator (1802-3), Clinton introduced the Twelfth Amendment to the Constitution and opposed sentiment for hostilities against Spain. In 1803 he became mayor of New York City, and in 10 annual terms (between 1803 and 1815) he promoted public education, city planning, city fortifications, public sanitation, and relief for the poor. While mayor he was successful in dictating the nomination of two governors. Clinton also held office as state senator (1806-11) and lieutenant governor (1811-13). He advocated removal of the political disabilities of Roman Catholics, abolition of slavery, and amelioration of severe punishment for debt and misdemeanors. He ran unsuccessfully for President against James Madison in 1812, with support from both Federalists and Republicans. As canal commissioner after 1810, Clinton sponsored the ERIE CANAL and the Champlain-Hudson Canal. From 1817 to 1823 he was governor. Clinton continued to give constant support to the canal projects, but in 1824, after suffering temporary political reverses and through the opposition of the ALBANY REGENCY and TAMMANY, he was deprived of his post as canal commissioner. Again governor from 1825 until his death, Clinton celebrated the completion of the canals and promoted public and normal schools, manufacturing, and legal reform. See biography by Dorothy Bobbe (1933, rev. ed. 1962), H. L. McBain, *De Witt Clinton and the Origin of the Spoils System* (1907, repr. 1967), Dixon Ryan Fox, *Decline of Aristocracy in the Politics of New York* (1919, repr. 1965).

Clinton, George, c. 1686-1761, colonial governor of New York (1743-53), b. England, father of Sir Henry Clinton. He entered (1708) the British navy and rose to the rank of admiral in 1747. Through family connections, Clinton was appointed (1741) governor of New York and arrived in the colony in 1743. Under the influence of James DeLancey he tried to conciliate the assembly and acquiesced on the issue of increased legislative control over revenues. Clinton later quarreled with DeLancey, his attempts to regain his lost powers failed, and his administration resulted in a permanent weakening of royal government in New York. Clinton was recalled (1753) to England and later served (1754-60) in Parliament.

Clinton, George, 1739-1812, American statesman, Vice President of the United States (1805-1812), b. Little Britain, N.Y. Before he was 20 he served on a privateer and, in the French and Indian War, accompanied the regiment of his father, Charles Clinton, in the expedition against Fort Frontenac led by John Bradstreet. After studying law in New York City he began practice in Ulster co. and was elected (1768) to the provincial assembly, where he became a leader of the anti-British faction. In 1775, Clinton was elected one of the state's delegates to the Second Continental Congress. Military duties as a brigadier general in the Continental Army prevented his signing the Declaration of Independence. Clinton's defense of the Hudson, although courageous, resulted in the capture of Fort Clinton and Fort Montgomery by the British general, Sir Henry CLINTON.

Under the new state constitution, which George Clinton helped to frame, he was elected (June, 1777) the first governor of New York state. His energy and leadership as governor for six successive terms (1777-95) led to his being called the father of New York state. He managed trade and public welfare problems ably, and he successfully settled the Indian troubles in W. New York. He advanced New York's claims to the NEW HAMPSHIRE GRANTS (now Vermont), initiated action on building canals (later realized by his nephew, De Witt CLINTON), and unsuccessfully fought the transfer from New York to the United States of the right to collect duties at the port of New York. An advocate of state sovereignty, Clinton was one of the chief opponents of the Federal Constitution, writing seven letters against ratification, signed Cato, in the *New York Journal*. These were answered by Alexander HAMILTON in his letters, signed Caesar, in the *Daily Advertiser*. Clinton's views on the Constitution were opposed by a rapidly growing party, the Federalists, under the leadership of John JAY Jay, running against Clinton for governor, lost the election of 1792 only by a questionable manipulation of returns on the part of the Clintonians, and in 1795 Jay won with ease, Clinton having declined to become a candidate. As a result of his alliance with the Livingstons and Aaron Burr, Clinton became governor for a seventh term in the Republican triumph of 1800. In 1804 he was elected Vice President for President Jefferson's second term. He sought the presidency in 1808, having won support for that office in previous elections, but again he received only the vice presidency, this time under James Madison. See his *Public Papers* (ed. by Hugh Hastings and J. A. Holden, 10 vol., 1899-1914), E. W. Spaulding, *His Excellency George Clinton* (1938, repr. 1964) and *New York in the Critical Period, 1783-1789* (1932, repr. 1960).

Clinton, Sir Henry, 1738?-1795, British general in the American Revolution, b. Newfoundland, son of George Clinton (1686?-1761). He was an officer in the New York militia and then in the Coldstream Guards. He had distinguished himself in America by service in the French and Indian Wars long before he arrived in Boston in 1775 with the reinforcements for Gov. Thomas Gage. He took part in the battle of Bunker Hill (1775), commanded (1776) an unsuccessful expedition against Charleston, S.C., and served under Sir William HOWE in the battle of Long Island, in the occupation of New York, and at White Plains. In 1777 he headed the British occupation of Rhode Island. When Howe moved on Philadelphia, Clinton assumed the command of New York. He did not fulfill the part expected of the New York command in the British strategy that resulted in defeat with the SARATOGA CAMPAIGN, he advanced up the Hudson valley, capturing the patriot strongholds of Fort Clinton (strongly defended by James Clinton) and Fort Montgomery, but after burning Kingston he turned back. Sir Henry (knighted 1777) succeeded Howe in the supreme command in America in 1778. Acting on orders from London, he evacuated Philadelphia and, after Washington's attempt to halt him failed (see MONMOUTH, BATTLE OF), he reached New York. He complained that Lord George Germain did not answer his requests for supplies and twice tried to resign. In Dec., 1779, he left Baron KNYPSHAUSEN in command in New York and redeemed his failure of 1776 by capturing Charleston (1780). After placing Cornwallis in command in the Carolinas, he returned to New York. In 1781, expecting Washington to attack, he remained in New York too long and failed to aid Cornwallis in the YORKTOWN CAMPAIGN. He resigned and was succeeded by Sir Guy CARLETON. He was later (1794-95) governor of Gibraltar. He recorded his campaigns from 1775 to 1782 (published in 1954 as *The American Rebellion*, ed. by W. B. Willcox). Cornwallis criticized his account, and the controversy between the two continued until Clinton's death. See W. B. Willcox, *Portrait of a General* (1964).

Clinton, James, 1733-1812, American Revolutionary general, b. Orange co., N.Y., brother of George Clinton and father of De Witt Clinton. He served in the French and Indian Wars and early in the Revolution took part in the disastrous Quebec campaign. His most noted exploit was his heroic but futile defense of Fort Clinton (near Kingston, N.Y.) against the British drive up the Hudson valley under Sir Henry CLINTON. In 1777 James Clinton later fought (1779) with Gen. John Sullivan against the Indians and served at Yorktown (1781).

Clinton, 1. Resort town (1970 pop. 10,267), Middlesex co., S. Conn., on Long Island Sound, settled 1663, set off from Killingworth and inc. 1838. A monu-

ment commemorates the early years of the school that later became Yale Univ. 2. City (1970 pop. 34,719), seat of Clinton co., E. central Iowa, on the Mississippi, in a rich corn and livestock area, inc. 1859. An industrial and rail center, it has food-processing (especially corn) and diverse manufacturing industries. Clinton grew as a lumbering town and in the 1880s was the greatest sawmill center in the Midwest. Two junior colleges are there. 3. Industrial town (1970 pop. 13,383), Worcester co., E. central Mass., on the Nashua River, near Wachusett Reservoir, in a farm and wooded area, settled c. 1654, set off from Lancaster and inc. 1850. Once an important textile center, it now has chemical and metallurgical industries.

Clio: see MUSES

clipper, type of sailing ship, designed for speed. Long and narrow, the clipper had the greatest beam aft of the center, the bow cleaved the waves, and the ship carried, besides topgallant and royal sails, skysails and moonrakers—a veritable cloud of sails. The type originated in the United States. Baltimore clippers and Atlantic packet ships were the forerunners of the true Yankee clipper, which may be said to have emerged with the *Ann McKim*, completed in Baltimore in 1833. The Yankee clipper was brought to perfection by Donald McKay of Boston, who built such vessels as the *Flying Cloud*, the *Glory of the Seas*, and the *Lightning*. U.S. and British clippers came to be known as China clippers because they utilized their speed to carry on a flourishing China trade in tea and opium. Clippers sailed from the U.S. Atlantic coast around Cape Horn to California in the days of the gold rush. They steadily reduced the time for their long voyages and held famous races. The clipper came into being only after its finally successful rival, the steamship, was engaging in transoceanic voyages. In the early days the clipper easily outran the plodding steam vessel, but, ironically, the improved steamship began to forge ahead even as some of the fastest and most beautiful clippers were being built. When the *Cutty Sark*, one of the swiftest and most celebrated British clippers, was completed at Dunbarton, Scotland, in 1869, the era of the commercial sailing ship had nearly come to an end. See Howard I. Chapelle, *The History of American Sailing Ships* (1935).

Clipperton Island, uninhabited atoll, c. 2 sq. mi (5.2 sq. km), in the Pacific Ocean, c. 800 mi (1,290 km) SW of Mexico. It was used as a base by John Clipperton, an English pirate. The French claimed it in 1858, the Americans held it for a time in the Spanish-American War, and Mexican troops occupied it in 1897. The conflict between France and Mexico was referred to the king of Italy for arbitration in 1908. The award was made (1931) in favor of France, and Mexico surrendered the island in 1932.

Clisson, Olivier de (ôlèv'ä' da klësôn'), 1336-1407, French soldier, b. Brittany. He fought on the English side in the War of the BRETON SUCCESSION but entered the French service as companion in arms to Bertrand Du Guesclin. In 1380 he became constable of France. He defeated (1382) the insurgents of Ghent under Philip van ARTEVELDE at Roosebeke. One of the MARMOUSETS, he made use of his position to satisfy his boundless avidity, he became one of the richest men of his time. After King Charles VI became (1392) insane, Clisson retired to Brittany, where he served as guardian of the duchy after the death (1399) of Duke John de Montfort.

Clisthenes: see CLEISTHENES

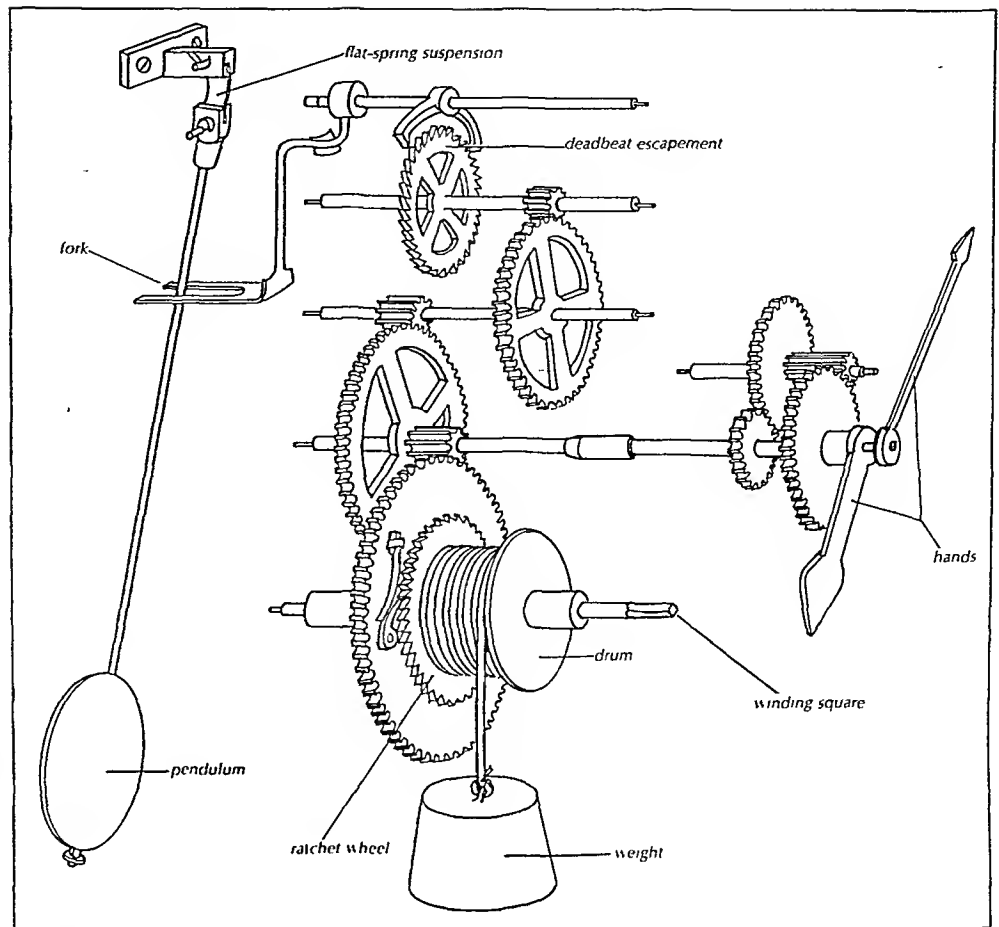
Clive, Kitty (Catherine Raftor), 1711-85, English singer and actress. She made her debut (c. 1728) at Drury Lane under the management of Colley Cibber and worked for many years with David Garrick, with whom she never got along. Her charm, wit, and vivacity, linked with a fine singing voice, brought her great success in light comedy and farce. She was a friend of Samuel Johnson, of Fielding, in whose plays and adaptations she appeared, and of Horace Walpole, who gave her a cottage, Clive's-Den, upon her retirement. There she held an informal salon and wrote several farces. She was painted by Hogarth.

Clive, Robert, Baron Clive of Plassey (pläs'ë), 1725-74, British soldier and statesman. He went to India in 1743 as a clerk for the British East India Company and entered the military service of the company in 1744, he soon distinguished himself in the fighting against the French. Clive's brilliant capture of Arcot (1751) and the relief of the siege of Trichinopoly (1752) thwarted DUPLEX, who had been on the verge of achieving French hegemony in S. India. In 1757, Clive, then governor of Fort St. David

near Madras, recovered Calcutta from the nawab of Bengal, Siraj-ud-daula. Then, after defeating the nawab at Plassey, he replaced him with the more compliant Mir Jafar. Bengal thus passed under effective British control, and Clive became the first governor. His victories over the Dutch at Biderra (1759) consolidated the British position as the dominant European power in India. Returning (1760) to England, he was given an Irish peerage as Baron Clive of Plassey. As governor of Bengal again from 1765 to 1767, Clive greatly reduced corruption and inefficiency in a formerly disordered administration and reached a settlement with the states of Bihar and Orissa. But his assumption of the right to collect the revenues of those states involved the company in the complexities of wide territorial administration, which it was ill equipped to handle. This was one of the factors that eventually led the British government to assume responsibility for British rule in India. After his return to England, Clive was bitterly attacked by politicians and others and was accused by Parliament of peculation. He was acquitted (1773) after a long investigation, but, broken in health, he committed suicide. See the famous *Essay on Clive* by T. B. Macaulay, biography by A. M. Davies (1939), H. H. Dodwell, *Dupleix and Clive* (1920, repr. 1967), R. J. Minney, *Clive of India* (rev. ed. 1957), G. B. Malleson, *Lord Clive and the Establishment of the English in India* (1962), Michael Edwardes, *Plassey: The Founding of an Empire* (1970).

cloaca (klōā'ka), in biology, enlarged posterior end of the digestive tract of some animals. The cloaca, from the Latin word for sewer, is a single chamber into which passes solid and liquid waste materials as well as the products of the reproductive organs, the gametes. Cloacas are found in amphibians, reptiles, birds, and lower mammals; higher mammals have a separate rectal outlet, the anus. The term cloaca is also used for analogous chambers in many invertebrates, such as animals of the phylum Aschelminthes.

clock, instrument for measuring and indicating time. Predecessors of the clock were the **SUNDIAL**, the **HOURGLASS**, and the **CLEPSYDRA**. The operation of a clock depends on a stable mechanical oscillator, such as a swinging pendulum or a mass connected to a spring, by means of which the energy stored in a raised weight or coiled spring advances a pointer or other indicating device at a controlled rate. It is not definitely known when the first mechanical clocks were invented. Some authorities attribute the first weight-driven clock to Pacificus, archdeacon of Verona in the 9th cent. Gerbert, a learned monk who became Pope Sylvester II, is often credited with the invention of a mechanical clock, c.996. Mechanical figures that struck a bell on the hour were installed in St. Paul's Cathedral, London, in 1286, a dial was added to the clock in the 14th cent. Clocks were placed in a clock tower at Westminster Hall, London, in 1288 and in the cathedral at Canterbury in 1292. In France, Rouen was especially noted for the skill of its clockmakers and watchmakers. One of the most famous clocks is in the cathedral of Strasbourg; the clock was first placed in the cathedral in 1352, and in the 16th cent. it was reconstructed. In the 19th cent. a new astronomical clock similar to the first two clocks was constructed. Its elaborate mechanical devices include the Twelve Apostles, a crowing cock, a revolving celestial globe, and an automatic calendar dial. Probably the early clock closest to the modern ones was that constructed in the 14th cent. for the tower of the palace (later the Palais de Justice) of Charles V of France by the clockmaker Henry de Vick (Vic, Wieck, Wyck) of Wurttemberg. Until the 17th cent. few mechanical clocks were found outside of cathedral towers, monasteries, abbeys, and public squares. The early clocks driven by hanging weights were bulky and heavy. When the coiled spring came into use (c.1500), it made possible the construction of the smaller and lighter-weight types. By applying Galileo's law of the pendulum, the Dutch scientist Christiaan Huygens invented (1656 or 1657) a pendulum clock, probably the first. Early clocks used in dwellings in the 17th cent. were variously known as lantern clocks, birdcage clocks, and sheep's-head clocks; they were of brass, sometimes ornate, with a gong bell at the top supported by a frame. Before the pendulum was introduced, they were spring-driven or weight-driven, those driven by weights had to be placed on a wall bracket to allow space for the falling weights. These clocks, probably obtained chiefly from England and Holland, were used in the Virginia and New England colonies. Clocks with long cases to conceal the long pendulums and



A pendulum clock. Weight-driven clock mechanism

weights came into use after the mid-17th cent., these were the forerunners of the grandfather clocks. With the development of the craft of cabinetmaking, more attention was concentrated on the clock case. In France the tall cabinet clocks, or grandfather clocks, were often of oak elaborately ornamented with brass and gilt. Those made in England were at first of oak and later of walnut and mahogany, simpler in style, their chief decoration was inlay work. Among the well-known clocks of the world are the clock known as Big Ben in the tower next to Westminster Bridge in the British Houses of Parliament and the tower clock in the Metropolitan Life Insurance Company building, New York City. Electric clocks were made in the second half of the 19th cent. but were not used extensively in homes until after c.1930. The hands of an electric clock are driven by a synchronous electric motor supplied with alternating current of a stable frequency. The quartz clock, invented c.1929, uses the vibrations of a quartz crystal to drive a synchronous motor at a very precise rate. Some quartz clocks have an error of less than one thousandth of a second per day. The **ATOMIC CLOCK** is even more precise. See **WATCH**. See C. W. Drepper, *American Clocks & Clockmakers* (2d ed. 1958), H. A. Lloyd, *The Complete Book of Old Clocks* (1965), Brooks Palmer, *A Treasury of American Clocks* (1967), Eric Bruton, *Clocks and Watches, 1400-1900* (1967), F. J. Britten, *Old Clocks and Watches and Their Makers* (8th ed. 1973), Kenneth Welch, *The History of Clocks and Watches* (1972).

Clodia (klō'dēā), fl. 1st cent. B.C., Roman matron, famous among the ancient Romans for her beauty, sister of Publius Clodius. She was suspected of murdering her husband, Quintus Caecilius Metellus Celer (see **METELLUS**, family), and she accused her lover, Marcus Caelius Rufus, of trying to murder her. According to tradition one of her many lovers was the poet **CATULLUS**, if this is true then it was she whom he immortalized as **Lesbia**.

Clodion (klō'dēōn') or **Claude Michel** (klōd mē-shēl'), 1738-1814, French rococo sculptor. He executed several important commissions under Louis XVI but is best remembered for his bas-reliefs and small figure groups in bronze and terra-cotta representing fauns, nymphs, and children. He is represented in the Louvre and in the Metropolitan Museum.

Clodius (Publius Clodius Pulcher) (klō'dēās), d. 52 B.C., Roman politician. He belonged to the Claudian gens (see **CLAUDIUS**), and his name is also written as Publius Claudius Pulcher. He was brother to Appius Claudius Pulcher and to the notorious Clodia. In 62 B.C. he created a tremendous scandal when, disguised as a woman, he entered the house of Julius Caesar at the time of the women's mysteries of Bona Dea. Cicero prosecuted him for sacrilege, but Clodius, probably by heavy bribery, won an acquittal. The results were that Caesar divorced his wife Pompeia, and Cicero earned Clodius' unswerving hatred. In 58 B.C., Clodius was tribune of the people, put into office by the First Triumvirate (Caesar, Crassus, and Pompey) probably under the mistaken impression that he would be a tool. Instead, he proved himself a demagogue, seeking popularity in every way. He exiled Cicero on specious charges arising from the conspiracy of Catiline, and he sent Cato the Younger to Cyprus. Clodius spent much of his money in organizing gangs of bullies to intimidate the city. The tribune Milo (initially supported by Pompey) organized a conservative gang, and Rome was plagued with bloody rioting until Clodius was killed by Milo's gang. His irresponsible actions had prepared the way for the civil war of Caesar and Pompey.

Clogher (klōkh'ər), rural district (1971 pop. 9,554), Co. Tyrone, central Northern Ireland, on the Blackwater River. A religious center since St. Patrick's time, Clogher is the seat of a Protestant bishop; its cathedral was rebuilt in the 18th cent. and restored in 1956. The cathedral of the Roman Catholic bishop of Clogher is at Monaghan, Republic of Ireland.

cloisonné (klōizənā', -sənā'), method of enamel decoration of metal surfaces, such as vases and jewel boxes. Metal filaments (which form the **cloisons** or separating elements) are attached at right angles to the surface outlining the design to be used. These miniature compartments are filled with colored enamel in paste form, and the object is then heated in order to fuse the enamel to the surface and develop its transparency and permanent colors. When finished, the enamel and **cloisons** are closely joined in a smooth, even surface showing the pattern in various colors defined by the metal partitions which prevented their fusing with one another. Probably invented in the Middle East, cloisonné has been

highly perfected by the Chinese, the Japanese, and the French

cloister, unroofed space forming part of a religious establishment and surrounded by the various buildings or by enclosing walls. Generally, it is provided on all sides with a vaulted passageway consisting of continuous colonnades or arcades opening onto a court. The cloister is a characteristic part of monastic institutions (see ABBEY), serving both as sheltered access to the various units of the group and for the recreation of the monks. Cloisters became an important architectural form in the 11th cent., a period marked by active monastery building all over Europe. They were not limited to monastic houses, but were built in some English colleges, as at Oxford and Eton, and in some churches, mostly in England and Spain. In N France many of the original cloisters have disappeared, but superb Romanesque cloisters remain in 5 France, Italy and Sicily, and 5 Spain. In the typical examples the arches are supported by delicate columns, generally coupled, the elaborate capitals of the paired columns sometimes being interlaced. The 13th-century cloisters of two Roman churches, St John Lateran and St Paul's outside the Walls, are notable Romanesque examples, distinguished by twin spiral columns inlaid with rich glass mosaics. Of the Gothic period, the English cloisters are especially fine, as at Salisbury, Wells, and Westminster Abbey. The Renaissance cloisters are confined chiefly to Italy and Spain. In the New World the Spanish colonists began in the 16th cent to build simple cloisters, generally arcaded, in Mexico, Cuba, and California.

Cloisters, the, museum of medieval art, in Fort Tryon Park, New York City, overlooking the Hudson River. A branch of the Metropolitan Museum of Art, it was opened to the public in May, 1938. The building includes four French cloisters, a 12th-century Romanesque chapel, and a chapter house. The core of the collection it houses consists of six or seven hundred examples of medieval painting, sculpture, and other forms of art gathered in France by George Grey BARNARD. This collection was bought by John D. Rockefeller, Jr., in 1925, and presented to the Metropolitan Museum. Later additions to it include a series of 15th-century tapestries, *Hunt of the Unicorn*, a tapestry series of the 14th cent, *The Nine Heroes*, the famous *Mérode Altarpiece* by Robert Campin, and the Bury St Edmunds ivory crucifix (see J. J. Rorimer, *The Cloisters* (3d ed 1963) and *Medieval Monuments at the Cloisters* (rev ed 1972)).

Clomid (klō'mīd) see FERTILITY DRUG

clone, group of organisms, all of which are descended from a single individual through asexual reproduction, as in a pure cell culture of bacteria. Except for changes in the hereditary material that come about by MUTATION, all members of a clone are genetically identical. Laboratory experiments in cloning have resulted in the development of a frog from a cell of an existing animal, and the laboratory fertilization and early development of human eggs, such experiments have raised questions about the eventual possibility of cloning of identical humans from cells of a preexisting individual.

Clonmacnoise (klōnmāknoiz'), village, Co. Offaly, central Republic of Ireland, on the Shannon River. The monastery founded (548) on the site by St. Kieran became the most famous in Ireland. It survived 1,000 years of raids and invasions, until it was destroyed by the English in 1552. Today there are ruins of a cathedral (first built 904), several churches, two round towers, three sculptured crosses, over 200 inscribed stones, and a castle (built 1214). The ruins comprise a national monument. The annual feast of St. Kieran is held at Clonmacnoise.

Clonmel (klōnmēl'), municipal borough (1971 pop 11,630), administrative center of South Riding, Co. Tipperary, S Republic of Ireland, on the Suir River. Footwear, cider, enamelware, tubular steel furniture, perambulators, and canned meat are produced there. It is also a tourist center with good hunting and salmon fishing. Clonmel was once a stronghold of the powerful Anglo-Norman Butler family. Oliver Cromwell captured it in 1650. There are a number of restored ecclesiastical sites. Laurence Sterne was born in Clonmel.

Clontarf (klōntarf'), suburb of Dublin, Co. Dublin, E Republic of Ireland. It was the scene of a decisive defeat (1014) of the Danes by the Irish under Brian Boru, who himself was killed in the fighting. Clontarf Castle was built in 1835 on the site of an ancient castle that belonged successively to the Knights Templars and the Knights Hospitallers.

Clootz or Cloots, Anacharsis (anakarsēs' klōts), 1755-94, French revolutionary, self-styled Orator of the Human Race. Born near Cleves and a member of the lesser German nobility, his given name was originally Jean Baptiste. Fanatically devoted to humanitarian ideals and to the liberal ideas of the ENCYCLOPÉDIE, he came to Paris in 1776 and spent his large fortune for the advancement of those ideas. After the outbreak of the French Revolution, he headed (1790) a delegation of foreigners as "ambassadors of the human race" to the National Assembly, he adopted the name Anacharsis and was elected to the Convention, the revolutionary assembly. His enthusiasm was sincere but bordered on eccentricity. Clootz was executed during the REIGN OF TERROR.

closed-end investment company: see MUTUAL FUND

closed shop and open shop. The term "closed shop" is used to signify an establishment employing only members of a labor union. The union shop, a closely allied term, indicates a company where employees do not have to belong to a labor union when hired but are required to join within a specified period of time in order to keep their jobs. An open shop, strictly speaking, is one that does not restrict its employees to union members. The medieval trade guilds acted as closed shops, as did the 18th-century trade clubs. Among European workers the issue of the closed shop has not been so sharply contested as in the United States, where since c 1840 the closed-shop policy had been adopted by most labor unions. Judicial decisions from 1850 to 1898 usually decided that strikes held to achieve a closed shop were illegal. For a period of time after the passage of the Wagner Act (see NATIONAL LABOR RELATIONS BOARD) in 1935, decisions of the Federal courts tended to uphold the legality of the closed shop. Many states, however, either by legislation or by court decision, have banned the closed shop. In 1947 the TAFT-HARTLEY ACT declared the closed shop illegal and union shops were also prohibited unless authorized in a secret poll by a majority of the workers; it was amended (1951) to allow union shops without a vote of the majority of the workers. Thereafter, a campaign was begun by business leaders in certain industries to have so-called right-to-work laws enacted at the state level. More than one third of the states passed such laws, the effect being to declare the union shop illegal. It is argued in favor of the closed shop that unions can win a fair return for their labor only through solidarity, since there is always—except in wartime—an oversupply of labor, and that, since all employees of a plant share in the advantages won through collective bargaining, all workers should contribute to union funds. Arguments in favor of the open shop are that forcing unwilling workers to pay union dues is an infringement of their rights, that union membership is sometimes closed to certain workers or the initiation fee so high as to be an effective bar to membership, and that employers are deprived of the privilege of hiring competent workers or firing incompetent ones. See J. E. Johnsen, comp., *The Closed Shop* (1942), a summary of the arguments on both sides, J. R. Dempsey, *The Operation of the Right to Work Laws* (1958, repr 1961), W. E. J. McCarthy, *The Closed Shop in Britain* (1964).

closet drama, a play that is meant to be read rather than performed. Precursors of the form existed in classical times. Plato's *Apology* is often regarded as tragic drama rather than philosophic dialogue. The dialogues of Cicero, Strabo, and Seneca were probably declaimed rather than acted, since only the comic theater survived transplantation from Greece to Rome. Closet dramas were particularly popular in the early 19th cent. when melodrama and burlesque dominated the theater, and poets attempted to raise dramatic standards by reviving past traditions. Byron's *Manfred* (1817) and Shelley's *The Cenci* (1819) imitate Shakespeare, and Goethe's *Faust* (Part I, 1808, Part II, 1832) draws in part on the Elizabethan tradition. Milton's *Samson Agonistes* (1671) and Shelley's *Prometheus Unbound* (1819) are based on Greek tragedies. Notable among other closet dramas are Robert Browning's *Stratford* (1837) and *Pippa Passes* (1841).

Cloatare I (klōtār'), d. 561, Frankish king, son of CLOVIS I. On his father's death (511) he and his brothers received equal shares of the Frankish kingdom. His capital was at Soissons. In 524 he and his brother CHILDEBERT I divided the kingdom of their deceased brother Clodomir, whose children they murdered. With his brother Theodoric he conquered Thuringia. In 534 Cloatare and Childebert seized and divided the First Kingdom of Burgundy, and in 542

they attacked the Visigoths of Spain but were repulsed before Saragossa. The deaths of Theodebald, Theodoric's grandson (555), and of Childebert (558) made Cloatare sole king of the Franks. His sons Chilperic I and Sigebert I inherited Neustria and Austrasia respectively, his sons Charibert and GUNTRAM divided the remainder of the kingdom.

Cloatare II, d. 629, Frankish king, son of CHILPERIC I and FREDGUNE. He succeeded (584) his father as king of Neustria, but his mother ruled for him until her death (597). In 613, after the death of his cousin Theodoric II, king of AUSTRASIA, he was called in by Austrasian nobles to assume rule. He thus became king of all the Franks. He put BRUNHILDA to death, restored peace with the help of the nobility, and was compelled to grant (614) a charter giving far-reaching privileges to nobles and clergy. He was also forced to agree that each of the component parts of the Frankish lands, Austrasia, Neustria, and Burgundy, was to have its own mayor of the palace, the mayors of the palace were the chief royal administrators. In 623 he sent his son DAGOBERT I to be king of Austrasia. Dagobert later succeeded to all the Frankish lands.

clotbur see COCKLEBUR

clothes moth, name for several species of moths of the family Tineidae, whose larvae feed on wool, furs, feathers, upholstery, and a variety of animal products. Clothes moths are of Old World origin. Those commonest in North America are the case-bearing clothes moth, *Tinea pellionella*, and the webbing clothes moth, *Tineola bisselliella*. The adults are yellowish or buff moths, often called millers, with a wingspread of about 1/2 in. (1.2 cm). They lay 100 to 150 eggs on the material which is to provide food for the larvae, they do not feed on fabrics themselves. The larva of the case-bearing clothes moth makes an open-ended case out of food fibers and its own silk; it feeds and pupates (see INSECT) within the case. The webbing clothes moth larva makes no case, but when it pupates it builds a cocoon of silk and fibers. The life cycle is completed most rapidly at average room temperature and about 75% humidity. The tapestry, or carpet, moth, *Trichophaga tapetzella*, attacks upholstery. Fumigation, sunning, cleaning, brushing, and cold storage help to prevent damage. Clothes moths are classified in the phylum ARTHROPODA, class Insecta, order Lepidoptera, family Tineidae.

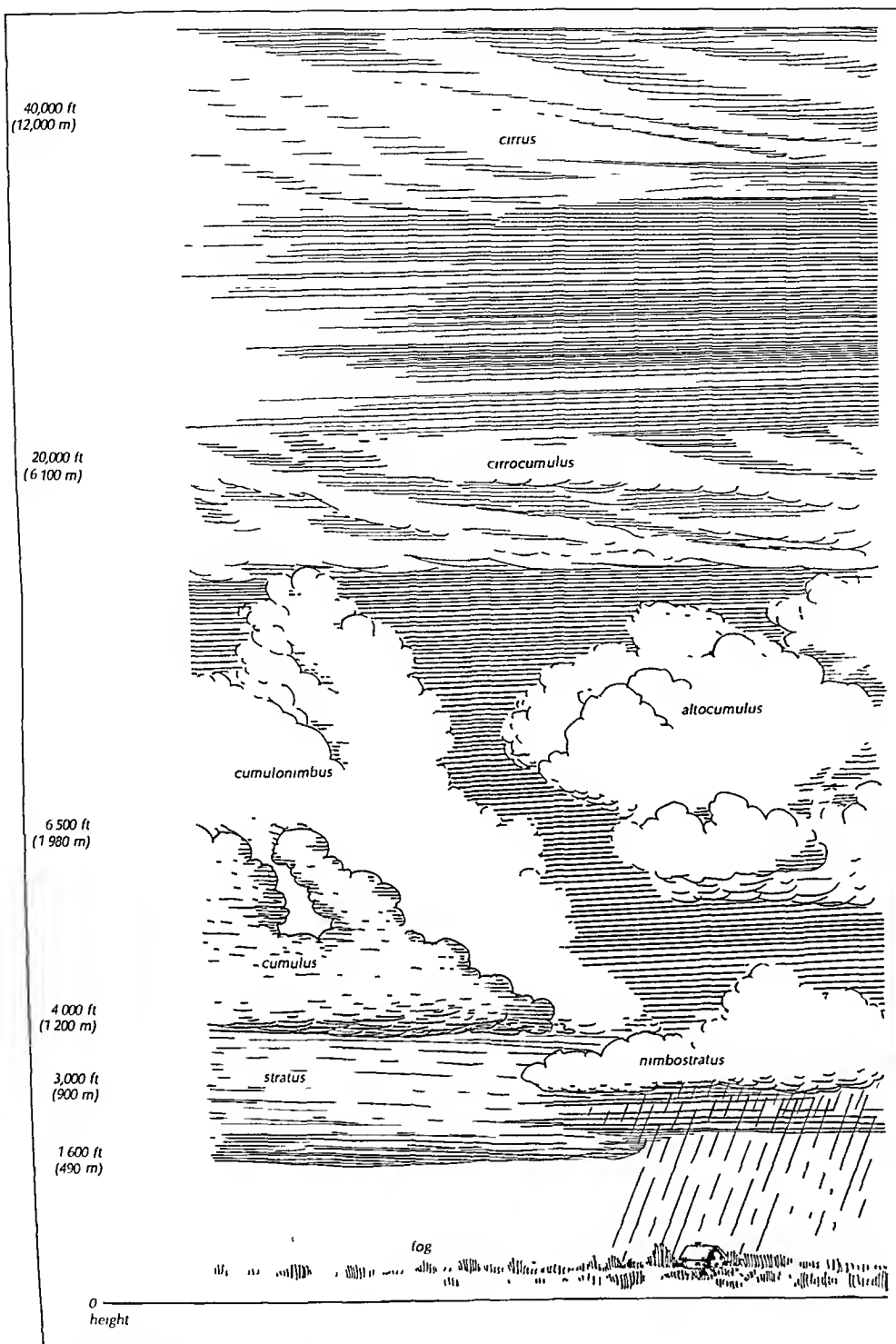
clothing: see COSTUME

Clotho: see FATES

cloth of gold, fabric woven wholly or partly of gold threads. From remote times gold has been used as material for weaving either alone or with other fibers. In India tapestries were made from gold threads as fine as silk. Cloth of gold was woven on Byzantine looms from the 7th to the 9th cent. and on those of Sicily, Cyprus, Lucca, and Venice in the 10th cent. Some narrow webs were woven in England, as well as palls of gold and silver cloth. Cloths of estate were magnificent gold tissues used to canopy or cover thrones. Baldachin, or fine cloth with gold warp and silk weft, was used ceremonially and also for rich clothing. The use of gold textiles and embroideries in the Middle Ages is illustrated by the pageantry at the meeting of the FIELD OF THE CLOTH OF GOLD (1520). Gold thread for weaving and embroidery is still made in India, Delhi alone producing many miles per annum, working in the ancient manner. Gold or silver gilt wire is drawn through holes, successively smaller, in a specially devised metal plate, and is used either round or flattened. Modern metallic cloth, known as lame, is commonly made of a core yarn wound with a thin metal thread, or lame. Various artificial metallic cloths are also produced.

Clotilda, Saint, d. 545, Frankish queen. She converted her husband, CLOVIS I, to Christianity and built with him in Paris the Church of the Apostles Peter and Paul, later renamed (10th cent.) Sainte-Genevieve. After her husband's death she spent her life caring for the poor. Feast: June 3.

cloud, aggregation of minute particles of water or ice suspended in the air. Clouds are formed when air containing water vapor is cooled below a critical temperature called the DEW point, and the resulting moisture condenses into droplets on microscopic dust particles (condensation nuclei) in the atmosphere. The air is normally cooled by expansion during its upward movement. Clouds are occasionally produced by a reduction of pressure aloft or by the mixing of warmer and cooler air currents. Upward flow of air in the atmosphere may be caused by convection resulting from intense solar heating of



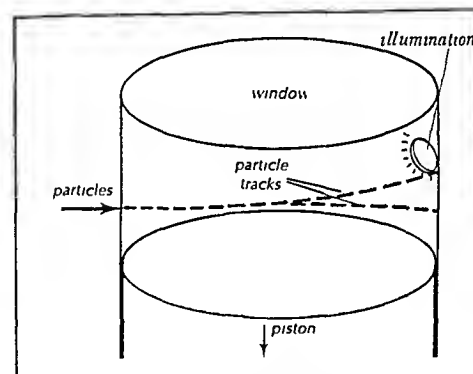
Approximate heights of some types of clouds

the ground, by a cold wedge of air (cold front) near the ground causing a mass of warm air to be forced aloft, or by a mountain range at an angle to the wind. A classification of cloud forms was first made (1801) by French naturalist Jean Lamarck. In 1803, Luke Howard, an English scientist, devised a classification that was adopted by the International Meteorological Commission (1929). His designations for three primary cloud types, cirrus, cumulus, and stratus, and their compound forms, are still widely used in modified form. The classification used today comprises four main divisions: high clouds, 20,000 to 40,000 ft (6,100–12,200 m), intermediate clouds, 6,500 to 20,000 ft (1,980–6,100 m), low clouds, near ground level to 6,500 ft (1,980 m), and clouds with vertical development, 1,600 ft to over 20,000 ft (490–6,100 m). High cloud forms include *cirrus*, detached clouds of delicate and fibrous appearance, without shading, generally white in color, often resembling tufts or featherlike plumes, and composed entirely of ice crystals, *cirrocumulus* (mackerel sky), composed of small white flakes or very small globular

masses, arranged in groups, lines, or ripples, and *cirrostratus*, a thin whitish veil, sometimes giving the entire sky a milky appearance, which does not blur the outline of the sun or moon but frequently produces a halo. Intermediate clouds include *altocumulus*, a layer or patches composed of flattened globular masses arranged in groups, lines, or waves, with individual clouds sometimes so close together that their edges join, and *altostratus*, resembling thick cirrostratus without halo phenomena, like a gray veil, through which the sun or the moon shows vaguely or is sometimes completely hidden. Low clouds include *stratocumulus*, a cloud layer or patches composed of fairly large globular masses or flakes, soft and gray with darker parts, arranged in groups, lines, or rolls, often with the rolls so close together that their edges join, *stratus*, a uniform layer resembling fog but not resting on the ground, and *nimbostratus*, a nearly uniform, dark gray layer, amorphous in character and usually producing continuous rain or snow. Clouds having vertical development include *cumulus*, a thick, detached cloud,

generally associated with fair weather, usually with a horizontal base and a dome-shaped upper surface that frequently resembles a head of cauliflower and shows strong contrasts of light and shadow when the sun illuminates it from the side, and *cumulonimbus*, the thunderstorm cloud, heavy masses of great vertical development whose summits rise in the form of mountains or towers, the upper parts having a fibrous texture, often spreading out in the shape of an anvil, and sometimes reaching the STRATOSPHERE. Cumulonimbus generally produces showers of rain, snow, hailstorms, or thunderstorms. Cloudiness (or proportion of the sky covered by any form of cloud), measured in tenths, is one of the elements of climate. WEATHER is called clear when the sky is less than $\frac{3}{10}$ clouded, partly cloudy when it is $\frac{3}{10}$ to $\frac{7}{10}$ clouded, and cloudy when it is more than $\frac{7}{10}$ clouded, the extremes are cloudless and overcast. The cloudiness of the United States averages somewhat less than 50% (i.e., the country receives somewhat more than 50% of the possible sunshine), the Great Lakes region and the coast of Washington and Oregon have the greatest cloudiness (60–70%), and the SW United States—Arizona and adjacent areas—are the least cloudy (10–30%). In aviation, the base of any cloud layer that, when considered in combination with clouds below, results in a cover of more than $\frac{5}{10}$ of the celestial dome, is termed the ceiling. See A. H. Gordon, *Elements of Dynamic Meteorology* (1962); R. S. Scorer, *Clouds of the World* (1972).

cloud chamber, device used to detect ELEMENTARY PARTICLES and other ionizing radiation. A cloud chamber consists essentially of a closed container filled with a supersaturated vapor, e.g., water in air. When ionizing radiation passes through the vapor, it leaves a trail of charged particles (ions) that serve as condensation centers for the vapor, which condenses around them. The path of the radiation is thus indicated by tracks of tiny liquid droplets in the supersaturated vapor. The cloud chamber was invented c. 1900 by C. T. R. Wilson. In the type devised by him, which is often called the Wilson cloud chamber, air or another gas is saturated with water



Simplified cloud chamber. A supersaturated vapor is created by withdrawing the piston. Particles enter the chamber and leave visible tracks by ionizing air molecules, which serve as condensation nuclei to form cloud droplets.

vapor and enclosed in a cylinder fitted with a transparent window at the top and a piston or other pressure-regulating device at the bottom. When the pressure in the chamber is suddenly reduced, e.g., by lowering the piston, the gas-vapor mixture is cooled, producing supersaturation. Cloud chambers of this design are sometimes called the pulsed type, since they do not maintain a continuous state of supersaturation of the vapor. A more recent design is the diffusion cloud chamber. In this device a large temperature difference is maintained between the top and bottom of the chamber, usually by cooling the bottom of the chamber with dry ice. The gas in the chamber, usually air, is saturated with a vapor, usually alcohol, the air-vapor mixture cools as it diffuses toward the cool bottom, becoming supersaturated. If the gas is kept saturated with a fresh supply of vapor, e.g., by an alcohol-soaked pad inside the top of the chamber, the operation of the chamber can be essentially continuous. One disadvantage of the cloud chamber is the relatively low density of the gas, which limits the number of interactions between ionizing radiation and molecules of the gas. For this reason physicists have developed other particle detectors, notably the BUBBLE CHAMBER and the SPARK CHAMBER.

Clouet, Jean (zhaN klōōā'), called **Janet** or **Jehan-net**, c 1485–1540, portrait and miniature painter. He was court painter and valet de chambre to the French king Francis I. He is thought to have been Flemish and may have been related to Jehan Clouet, painter to the duke of Burgundy in the late 15th cent. None of the work attributed to Jean Clouet can be proved to have been his. It includes portraits of Francis I (Louvre), the dauphin Francis (Antwerp), and Charles de Cosse (Metropolitan Mus.), seven miniature portraits (Bibliothèque nationale), and a large number of portrait drawings, all of the highest quality. The drawings are characterized by a geometric simplicity of form and softness of modeling. His son, **François Clouet**, c 1510–c 1572, also called Janet or Jehannet, inherited his father's talent and position, serving as court painter successively under Francis I, Henry II, Francis II, and Charles IX. His work is unsurpassed in clarity and precision of draughtsmanship. He enjoyed a high reputation and was patronized by all the notables of the court. Attributed to him are two portraits of Francis (Uffizi, Louvre), portraits of Catherine de' Medici (Versailles), Elizabeth of Austria (Louvre), and Charles IX (Vienna), and one thought to be of Diane de Poitiers (called Lady in Her Bath, National Gall., Washington, D.C.). There are also a large number of portrait drawings preserved in Chantilly and in the Bibliothèque nationale and the Cabinet des Estampes, Paris. See his complete drawings, miniatures, and paintings, ed. by Peter Mellen (1971).

Clough, Arthur Hugh (klūf), 1819–61, English poet. He was educated at Rugby and Balliol College, Oxford, where he became friends with Matthew Arnold. After graduation (1941) he was fellow and tutor of Oriel College until 1848 when he resigned. During the next few years he traveled on the Continent. In 1852, inspired by his friendship with Emerson, he went to Harvard and lectured. He pursued a civil service career until his health failed in 1860. His first published work, *The Bothie of Toper-na-Vuo-llich*, a narrative in hexameters, appeared in 1848, followed by *Ambarvalia*, a collection of lyrics, in 1849. His posthumous poems include "Amours de Voyage," the dialogues "Dyspichus," and the tales "Mari Magno." He is perhaps best known for the short lyric, "Say not the struggle naught availeth," and as the subject of Arnold's elegy, "Thyrsis." Skeptical, somewhat cynical, Clough was closer in spirit to the 20th cent. than to the 19th. His poetry reveals not only his doubts about religion and about himself but also his awareness of the social and intellectual problems of his day. Clough's sister, Anne Jemima Clough (1820–92) was important as a leader in the education of women. See his complete poems (ed. by H. F. Lowry and others, 1951), his letters (ed. by F. L. Mulhauser, 1957), biography by K. C. Chorley (1962), studies by F. J. Woodward (1954), W. E. Houghton (1963), E. B. Greenberger (1970), and R. K. Biswas (1972).

clove, name for a small evergreen tree (*Syzygium aromaticum* or *Eugenia caryophyllata*) of the family Myrtaceae (MYRTLE family) and for its unopened flower bud, an important spice. The buds, whose folded petals are enclosed in four toothlike lobes of the calyx, are gathered by hand, dried, and marketed either whole or ground for culinary purposes. Clove oil, obtained by distillation, is widely used in synthetic vanilla and other flavorings as well as in perfumes; it is often considered medicinal and antiseptic. The spicy fragrance of cloves was used by the Chinese (c 3d cent. B.C.) and by the Romans, but the first instance of finding the tree growing wild was recorded by the Portuguese when they discovered the Spice Islands. The Portuguese and then the Dutch held the clove trade in monopoly, eliminating the tree from all but a single island, until the late 18th cent. Today cloves are products also of other tropical areas, e.g., the West Indies and islands off E. Africa such as Madagascar and Zanzibar. Clove is classified in the division MAGNOLIOPHYTA, class Magnoliopsida, order Myrtales, family Myrtaceae.

clover, any plant of the genus *Trifolium*, leguminous hay and forage plants of the family Leguminosae (PULSE family). Most of the species are native to north temperate or subtropical regions, and all the American cultivated forms have been introduced from Europe. Red clover (*T. pratense*), the state flower of Vermont, was the leading leguminous hay crop of the northeastern regions until it was surpassed by alfalfa. It is frequently seeded with timothy. Swedish, or alsike, clover (*T. hybridum*) is similarly used in the same area. The common white, or Dutch, clover (*T. repens*) is also cultivated at times but is considered a weed in fields and pastures,

where it spreads rapidly. Its dried flower and seed heads have been used for making bread during famines in Ireland and the leaves are eaten as salad in some parts of the United States. The clovers are excellent honey plants. Other plants are sometimes called clover, e.g., the related melilot, or SWEET CLOVER. Clover was used by the Greeks in garlands and other decorations. The druids held it sacred. It is said to have been the early emblem of Ireland from which the shamrock is derived, and it is an emblem of the Trinity. English and American poets have celebrated it. A four-leaved clover is thought to bring good luck. See also LESPEDEZA, TREFOIL. Clover is classified in the division MAGNOLIOPHYTA, class Magnoliopsida, order Rosales, family Leguminosae. See bulletins of the U.S. Dept. of Agriculture.

Clovio, Giorgio Giulio (jōr'jō jōō'lyō klō'vyō), 1498–1578, Italian illuminator, miniaturist, and painter, also called Macedo or Il Macedone because of his Macedonian origin. He studied at Rome with Giulio Romano and at Verona under Girolamo de' Libri, from whom he learned illuminating. Clovio was employed by Louis II of Hungary, Cardinal Farnese at Rome, and other princely patrons. Among the best known of the many works ascribed to him are the illuminations for the *Book of the Hours of the Blessed Virgin*, his masterpiece, the manuscript biography of Frederick, duke of Urbino (Vatican Library), Cardinal Grimani's *Commentary on the Epistle to the Romans* (Soane Mus., London), *The Victories of Emperor Charles V* (British Mus.), and the *Farnese Breviary* (Pierpont Morgan Library, New York).

Clovis I (klō'vīs), c 466–511, Frankish king (481–511), son of Childeric I and founder of the Merovingian monarchy. Originally little more than a tribal chieftain, he became sole leader of the Salian FRANKS by force of perseverance and by murdering a number of relatives. In 486 he defeated the Roman legions under Syagrius at Soissons, virtually ending Roman domination over Gaul. He then subdued the Thuringians. After his marriage (493) to the Burgundian princess CLOTILDA, he had his children baptized but was not immediately converted himself. In 496, while locked in battle with the Alemanni, he vowed to become a Christian if he gained the victory. Clovis defeated the Alemanni and was baptized, reputedly with 3,000 of his followers, by St. Remi, bishop of Rheims. Thereafter Clovis was the champion of orthodox Christianity against the Arian heretics, the Burgundians, and the Visigoths. He attacked the Burgundians (500) at Dijon and the Visigoths (507) under ALARIC II at Vouille. When he died, he was master of most of Gaul—except Burgundy, Gascony, Provence, and Septimania—and of SW Germany. Shortly before his death he probably had the Salian Law revised and put into writing. Clovis united all Franks under his rule, gained the support of the Gallic clergy, made Paris his base of operations, and extended his conquests into Germany. He thus laid the foundation, which even 400 years of chaos and misrule could not destroy, of the French monarchy and foreshadowed the conquests of Charlemagne. He was succeeded by his four sons, THEODORIC I, Clodomir, CHILDEBERT I, and CLOTAIRE I. See the history of GREGORY OF TOURS, Ferdinand Lot, *The End of the Ancient World and the Beginnings of the Middle Ages* (1927, tr. 1953, repr. 1961).

Clovis 1 City (1970 pop. 13,856), Fresno co., S central Calif., near the foothills of the Sierra Nevada range, inc. 1912. It is a trade center in a farm and vineyard area. **2** City (1970 pop. 28,495), seat of Curry co., E N. Mex., near the Texas line, inc. 1909. It is a railroad division point, the trade center of a cattle and irrigated farm area (with large stockyards), and the home of Cannon Air Force Base, a tactical air command facility. A junior college is in Clovis, and a state park is nearby. A huge county fair and a rodeo are annual events there.

clown, a jester or buffoon, in a circus or a pantomime. See FOOL.

clubfoot or **talipes** (tāl'apēz'), deformity in which the foot is twisted out of position. Maldevelopment is usually congenital, although it can result from injury or disease (e.g., poliomyelitis) after birth. It can affect one or both feet. Often the foot is twisted downward, with the heel and toe turning inward, causing only part of the foot—the heel, the toes, or the outer margin—to touch the ground, walking is difficult or impossible. Correction can be made in infancy by manipulation, braces, and casts, in severe cases only surgery can correct the condition.

club moss, name generally used for the living species of the class Lycopodiopsida, a primitive subdivision of vascular plants. The Lycopodiopsida

reached their zenith in the Carboniferous period, when they reached the size of trees, and contributed to the coal deposits then being formed. They are now close to extinction. Although they resemble the mosses, they are considered to be evolutionarily more advanced because they are vascular. Club mosses are usually creeping or epiphytic and often inhabit moist places, especially in tropical and subtropical forests. They reproduce by means of spores, either clustered into small cones or borne in the axils of the small scalelike leaves. The principal genera are *Lycopodium* and *Selaginella*. Some species of *Lycopodium* are called ground pine or creeping cedar, especially those that resemble miniature hemlocks with flattened fan-shaped branches, and are often used for Christmas decorations. The spores of *L. clavatum* are gathered and sold as lycopodium powder, or vegetable sulfur, a highly inflammable yellow powder sometimes used for pharmaceutical purposes (e.g., as an absorbent powder) and in fireworks. *Selaginella* species, often incorrectly called *Lycopodium*, are frequently grown as ornamentals. One of the best known is a RESURRECTION PLANT. Club mosses constitute the division LYCOPODIOPHYTA, class Lycopodiopsida.

clubroot, disease of cabbages, turnips, radishes, and other plants belonging to the family Cruciferae (MUSTARD family). It is induced by a slime mold that attacks the roots, causing, in the cabbage, undeveloped heads or a failure to head at all. Clubroot can be partially or in some cases completely controlled by the application of lime (if the soil is very acid), by rotation of crops, and by soil sterilization. The disease is also called finger-and-toe from the swollen shape it gives to roots. Slime molds (class Myxomycetes) are classified in the division FUNGI.

club rush: see CATTAIL, SEDGE.

Cluj (klōōzh), Hung. *Kolozsvár*, Ger. *Klausenburg*, city (1970 est. pop. 203,000), W. central Rumania, in Transylvania, on the Someșul River. The largest city in Transylvania and the second largest in Rumania, it is the administrative center of an agricultural and mineral-rich area. Its diverse manufactures include machinery, metal products, electrical equipment, chemicals, textiles, and footwear. The city is also a noted educational center with two universities, a branch of the Rumanian Academy of Sciences, a fine arts institute, a polytechnic institute, and several scientific research centers. Cluj was founded by German colonists in the 12th cent. and became a thriving commercial and cultural center in the Middle Ages. It was made a free city in 1405 by the king of Hungary. Stephen Bathory founded (1581) a Jesuit academy there, and the city became (16th cent.) the chief cultural and religious center of Transylvania. It was incorporated into Austria-Hungary in 1867 and was transferred to Rumania in 1920. Hungarian forces occupied the city during World War II. Landmarks include the 14th-century Gothic Church of St. Michael, the house where King Matthias I of Hungary was born (1440), and the ruins of an 11th-century church. Cluj is also noted for its botanical gardens. About half the population is Hungarian.

clumber spaniel, breed of medium-sized SPORTING DOG developed in France and perfected at Clumber Park, an English estate. It stands about 17 in. (43.2 cm) high at the shoulder and weighs between 50 and 60 lb (22.7–27.2 kg). Its dense coat of straight, silky hair is lemon and white or orange and white and forms long, luxuriant fringes, or feathers, on the chest and legs. The heavy-boned, low, short body of the clumber resembles no other spaniel and suggests early crossbreeding with the basset hound. The tail is docked. Although a slow worker, the clumber makes an excellent hunter and retriever when trained. See DOG.

Cluniac order, medieval organization of BENEDICTINES centered at the abbey of CLUNY, France. Founded in 910 by the monk Berno, the abbey's unique constitution provided it freedom from lay supervision and (after 1016) from jurisdiction of the local bishop. With its independence thus guaranteed, Cluny became the fountainhead of the most far-reaching religious reform movement in the Middle Ages. During its height (c 950–c 1130) it was second only to the papacy as the chief religious force in Europe. Hundreds of priories were opened, and many Benedictine abbeys were reformed, some joining the strict Cluniac obedience. In all, nearly 1,000 houses located in many countries were under obedience to the abbot of Cluny. Many Cluniac monks became bishops and through provincial synods were thus able to spread reform in church life throughout Europe. Churches were built, the liturgy was beautified, and schools were opened. Cluny

stoutly supported the popes (and was itself under papal protection) and served vitally in the great reform program of Pope St. Gregory VII, particularly in the matter of church independence from lay control. Cluniac zeal diminished in the 12th cent., and the order fell into a state of wealthy decline as the reforming initiative was taken up by the Cistercians. The French Revolution suppressed the remnants of the order and destroyed the abbey at Cluny. The highly centralized organization of the Cluniacs had a permanent effect on Western monasticism.

Cluny (klōō'nē, Fr klūnē'), former abbey, E France, in the present Saône-et-Loire dept., founded (910) by St. Berno, a Burgundian monk. He and his successors, all vigorous reformers, made their abbey the center of the CLUNIAC ORDER. Cluny became one of the chief religious and cultural centers of Europe. The abbey remains presently house a national school of arts and trades. The abbey church (10th cent. in part), once the largest church in the world, and the churches of Notre Dame (13th cent.) and of St. Marcellus (12th cent.) are there.

Cluny Museum, 14th- and 15th-century Gothic and Renaissance structure in Paris, built by Pierre de Chalus, abbot of Cluny, and rebuilt by Jacques d'Ambroise. The site is that of the ancient Roman baths of Emperor Julian. Acquired by the nation after the Revolution, it was subsequently purchased by the antiquarian Du Sommerard, who installed his collection of art objects of the Middle Ages and the Renaissance. The city of Paris purchased the entire property at Du Sommerard's death (1842) and presented it to the state. The museum's 24 galleries display a variety of medieval works, with emphasis on carved wood, metalwork, textiles, and stained glass. A number of superb tapestries of the 15th and 16th cent., produced in Flanders and the Loire valley, are among the museum's greatest treasures.

Clurman, Harold, 1901-, American director, manager, critic, and author, b. New York City. In his early years he acted in minor roles, becoming associated with New York's Group Theatre as founder and managing director in 1931. After his debut as a director with *Awake and Sing*, he became known for his direction of works by Tennessee Williams, Arthur Miller, Eugene O'Neill, and William Inge, among many others. Clurman has written much theater criticism and several books, including *The Fervent Years* (1945), a history of the Group Theatre. See his *On Directing* (1972) and *All People are Famous* (1974).

Clusium, see CHIUSI, Italy.

cluster, in astronomy, see STAR CLUSTER, GALAXY.

clutch, in automobiles, see TRANSMISSION.

Clwyd (klōō'id), nonmetropolitan county (1972 est. pop. 354,000), N Wales, created under the Local Government Act of 1972 (effective 1974). It comprises the former county of FLINTSHIRE and portions of the former counties of Denbigh and Merioneth.

Clwyd, river, c. 30 mi (50 km) long, rising in Clwyd (Denbighshire), N Wales. It flows N through the Vale of Clwyd to the Irish Sea at Rhyl. The vale is notable for its excellent pastureland.

Clyde, Colin Campbell, Baron, see CAMPBELL, COLIN, BARON CLYDE.

Clyde, principal river of SW Scotland, 106 mi (171 km) long, rising in the Southern Uplands and flowing generally NW through Glasgow to the Firth of Clyde. It drains c. 1,480 sq mi (3,830 sq km). The lower Clyde, traversing the heart of Clydeside (Scotland's great population, industrial, and shipbuilding region), is the main route of commercial water traffic in Scotland. The river has been deepened and widened and is navigable for oceangoing vessels to Glasgow. It is connected with the Firth of Forth by the Forth and Clyde Canal. Clydeport, which includes the docks at Glasgow, Clydebank, and Greenock, is an important general cargo, ore, oil, and container port. Erskine Bridge (1,000 ft/305 m long, opened 1970), between Clydebank and Renfrew, is one of the world's longest cable-stayed bridges. A 10-lane bridge (opened 1970) crosses the Clyde at Glasgow. The middle course of the river flows through Clydesdale, a noted farming and orchard region. Bonnington (9,840-kw capacity) and Stonebyres (5,680-kw capacity) are hydroelectric power stations at the Falls of the Clyde near Lanark. The Firth of Clyde, c. 50 mi (80 km) wide and 2 to 25 mi (3.2-40 km) wide, an arm of the North Channel, extends SW from Dunoon to Ailsa Craig. It is rimmed by yacht basins, summer resorts, and small ports. Bute, Arran, and the Cumbraes are the chief islands.

Clydebank, burgh (1971 pop. 48,296), Dumbartonshire, W central Scotland, on the north bank of the

Clyde River. The chief industry is shipbuilding. The ocean liners *Queen Mary* and *Queen Elizabeth* were built there. In 1975, Clydebank became part of the Strathclyde region.

Clydesdale horse, breed of DRAFT HORSE developed in Scotland. It closely resembles the SHIRE HORSE, although it is not as heavy. The Clydesdale is characterized by its graceful, springy step. Initially imported by the United States from Canada, the breed became widely popular owing to its good disposition. It was particularly favored by merchants, who used it to spectacular advantage in the transportation of commercial goods. It is still retained today by horse buffs and private patrons. It averages about 16 hands (64 in./160 cm) high, weighs around 1,800 lb (800 kg), and is characteristically colored rich brown or bay. It has white markings on the face and on the legs, which have luxurious feathering around the fetlocks.

Clymene (klīm'anē), in Greek mythology, 1 Daughter of the Titan Oceanus. The wife of Iapetus, she bore him Atlas, Prometheus, Epimetheus, and Menoetius. 2 Nymph, wife of Helios and mother of Phaëthon.

Clymer, George (klī'mar), 1739-1813, American political leader, signer of the Declaration of Independence, b. Philadelphia. A prosperous merchant, he ardently supported the colonial cause before the American Revolution and served (1775-76) as one of the Continental treasurers. In 1776 he served as delegate to the Continental Congress, where he signed the Declaration of Independence. He was again (1780-83) a delegate to the Continental Congress. Clymer was the first president of the Bank of Philadelphia, and he helped to organize the Bank of North America. While in the Pennsylvania legislature (1785-88), he wrote a report leading to penal code reforms. Clymer, a delegate to the Federal Convention, was a member (1789-91) of the first U.S. Congress.

Clytemnestra (klī'təm'nēs'trā), in Greek mythology, the daughter of Leda and Tyndareus. Homer described her as the noble-minded wife of Agamemnon, persuaded to infidelity by the tyrant Aegisthus. However, the Greek tragedians, most specifically Aeschylus, depicted her as remorseless and vengeful. She was the mother by Agamemnon of Orestes, Electra, and Iphigenia. She conspired with Aegisthus to murder Agamemnon on his return from the Trojan War, giving various justifications, most notably the sacrifice of Iphigenia by Agamemnon at the onset of the war. Orestes, who had been living in exile, returned and avenged the death of his father by killing his mother and Aegisthus.

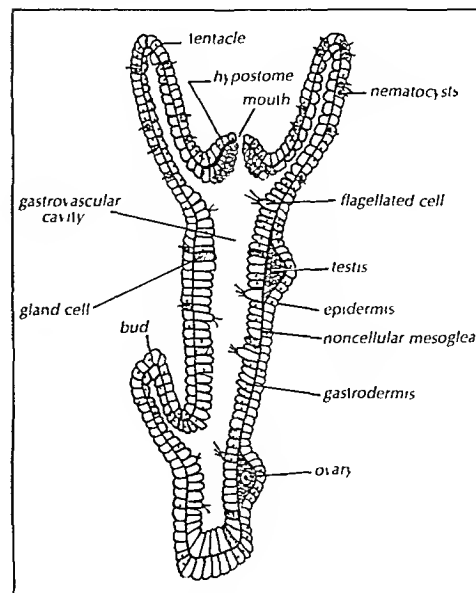
Cm, chemical symbol of the element CURIUM.

CMP (cytidine monophosphate) see CYTOSINE.

CN, ordinary TEAR GAS. The chemical name for CN is chloroacetophenone.

Cnidaria (nīdār'ēə) or **Coelenterata** (sālēntērā'tā), phylum of invertebrate animals comprising the SEA ANEMONES, CORALS, JELLYFISH, and HYDROIDS. Cnidarians are radially symmetrical (see SYMMETRY, BIOLOGICAL). The mouth, located at the center of one end of the body, opens into a gastrovascular cavity, which is used for digestion and distribution of food, an anus is lacking. Cnidarians are further characterized by having a body wall composed of three layers: an outer epidermis, an inner gastrodermis, and a middle mesoglea. Tentacles encircle the mouth and are used in part for food capture. Specialized stinging structures, called nematocysts, are a characteristic of the phylum and are borne in the tentacles and often in other body parts. These contain a coiled fiber that can be extruded suddenly. Some nematocysts contain toxic substances and are defense mechanisms, while others are adhesive, helping to anchor the animal or to entangle prey. Two body forms and two life styles are characteristic of the Cnidaria (see POLYP AND MEDUSA). The sessile hydroid, or polyp, form is more or less cylindrical, attached to its substratum at its aboral (opposite the mouth) end, with the mouth and surrounding tentacles at the upper, oral, free end. Colonies of hydroids comprise several different types of individuals: some function in feeding, some in defense, and some in reproduction. The motile jellyfish, or medusoid form, is flattened, with the tentacles usually located at the body margin. The medusoid's convex aboral surface is oriented upward, and the concave oral surface is oriented downward. With few exceptions, the cnidarians are marine. There are over 9,000 known living species; fossil records of cnidarians date back to the Ordovician era. Cnidarians are carnivorous, the major part of their diet con-

sisting of crustaceans. Animals in this phylum have no specialized excretory or respiratory organs and possess a primitive nervous system. Both sexual and asexual reproduction occur. There are three classes of cnidarians.



Internal anatomy of Hydra, representative of the phylum Cnidaria.

Class Hydrozoa. The Hydrozoa include solitary or colonial cnidarians, which have a noncellular mesoglea, lack tentacles within the gastrovascular cavity, and have no gullet. As a rule, the hydroid stage predominates in the life cycle, although in some the jellyfish stage is larger. The order Hydrida includes the many small, colonial hydroids so often seen clinging to wharfs and submerged objects along the sea coasts everywhere, economically important because they foul surfaces. The order also includes solitary hydroids, some reaching several inches in height. One, in the genus *Branchiocerianthus*, is said to reach 8 or 9 ft (244-274.5 cm) in length. The common fresh-water genus *Hydra* also belongs to this order, as does the fresh-water jellyfish, genus *Craspedacusta*, and the commonly studied hydroid jellyfish, genus *Gonionemus*. There are also pelagic hydroid colonies, unusual in having one very large hydroid member, which lives with its mouth downward and its aboral surface upward, like a jellyfish. The aboral end is equipped with a projecting sail. *Velella*, the purple sailor, is an example. The order Milleporina includes colonial organisms that form a massive, porous exoskeleton, somewhat resembling corals. They are sometimes abundant in tropical seas and may contribute to coral reef formation. The order Siphonophora includes often large, floating colonies made up of members of varying form and function. Typical is *Physalia*, the Portuguese man-of-war. Its colorful float is a gas-filled member of the colony and attains lengths up to 1 ft (30 cm). Other members of the colony hang downward from the lower surface of the float, some of these have very powerful nematocysts able to cause severe physiological reaction in swimmers coming in contact with them. These organisms are able to kill sizable fish with their tentacles.

Class Scyphozoa. Cnidarians of class Scyphozoa have a predominant jellyfish stage. They are characterized by a cellular mesoglea and tentacles in their gastrovascular cavity. All of the largest jellyfish belong to this class. The common *Aurelia aurita* is seen in bays and harbors, sometimes in large numbers. It is pallid, unlike some of the more colorful species in the genus *Cyanea*. Stalked jellyfish, the Stauromedusae, are unusual members of the Scyphozoa; they are found attached to seaweed, especially in cooler marine habitats. The order Rhizostomea includes jellyfish in which the original mouth has closed, and which have many subsidiary mouths found in frilled oral arms. *Cassiopea* is a well-known example, living in warmer, shallow waters, where it is often found lying on the bottom upside down, exposing its green algal symbionts to the sun.

Class Anthozoa. Class Anthozoa includes Cnidaria that have no jellyfish stage. This is the largest class of cnidarians, containing over 6,000 species. A gullet

extends for a short distance into the gastrovascular cavity, and septa are present, which increase the surface for digestion and absorption. Anthozoa are flower animals, including a great many beautiful and colorful organisms, e.g., the SEA ANEMONE, SEA PANSY, SEA FAN, and CORAL. Anthozoans are colonial or solitary organisms. Subclass Alcyonaria includes almost universally colonial organisms in which each of the polyps, or hydroid members, has eight feathery tentacles. Most of them produce a skeleton, and many make some contributions to CORAL REEFS. While some are found in temperate seas, they are especially common in subtropical to tropical regions. The organ pipe coral (*Tubipora*), a soft coral (*Alcyonium*), the Indo-Pacific blue coral (*Helio-pora*), and the SEA PENS, which have a stalk extending into the bottom mud or sand, are some typical alcyonarian corals. Horny corals, of the order Gorgonacea, are, perhaps, the best known. These form branching, upright colonies and have a skeleton that is partly composed of a horny material called gorgonin. These are the SEA WHIPS and sea fans, so characteristic of shallow tropical waters. The subclass Zoantharia includes both solitary and colonial forms, in which the polyp has more than 8 tentacles. The solitary sea anemones belong here, in the order Actiniaria, characterized by the lack of a skeleton. The stony corals so important in forming coral reefs belong to the order Madreporaria; they are especially characterized by their calcium carbonate exoskeleton, marked by many cups for the polyps, each of which contains stony septa dividing the gastrovascular cavity into compartments. The shape of coral skeletons depends on the pattern of growth of the colony. For example, in brain corals the polyps are arranged linearly, in the eyed coral (*Oculina*) the polyps are separated from each other by spaces, giving the skeleton a pitted appearance. The burrowing anemone, *Cerianthus*, lives in burrows in the sand and has a greatly elongated body. It is characteristic of the order Ceriantharia. See W. J. Rees, ed., *The Cnidaria and Their Evolution* (1966).

Cnidus or **Cnidus** (both nī'das), ancient Greek city of Caria, SW Asia Minor, on Cape Krio, in present SW Asiatic Turkey. It was partly on the peninsula and partly on an island that had been created by cutting through the peninsula. One of the cities of the Dorian Hexapolis, it sought to maintain its independence but fell (540 B.C.) under Persian rule. It had a large trade, particularly in wine, and was also noted for its medical school and other institutions of learning. One of the most famous statues of the ancient world, Aphrodite by Praxiteles, was there. In the waters off Cnidus the Athenians under Conon defeated the Spartans under Pisander in 394 B.C. Cnidus retained its importance in Roman times and is mentioned in the Bible (Acts 27:7, 1 Mac 15:23).

Cnossus or **Knossos** (both nōs'as), ancient city of Crete, on the north coast, near modern Iraklion. The site was occupied long before 3000 B.C., and it was the center of an important Bronze Age culture. It is from a study of the great palace, as well as other sites in Crete, that knowledge of the MINOAN CIVILIZATION has been drawn. The city was destroyed before 1500 B.C. (possibly by earthquake) and was splendidly rebuilt only to be destroyed again c. 1400 B.C., probably at the hands of invaders from the Greek mainland. This marked the end of Minoan culture. Cnossus later became an ordinary but flourishing Greek city, and it continued to exist through the Roman period until the 4th cent. A.D. In Greek legend it was the capital of King Minos and the site of the labyrinth. The name also appears as Cnosus and Knossus. See Sir A. J. Evans, *Palace of Minos* (4 vol., 1921-35), Leonard Cottrell, *Bull of Minos* (1953), E. L. Bennett, *The Knossos Tablets* (1956), L. R. Palmer, *A New Guide to the Palace of Knossos* (1969).

Co, chemical symbol of the element COBALT.

coach dog: see DALMATIAN.

Coachella Valley (kō'achē'l'a), arid region, SE Calif., N of the Salton Sea. Water is brought into the region by artesian wells and by the Coachella Canal (123 mi/198 km long), a branch of the All-American Canal built between 1938 and 1948, more than 100,000 acres (40,500 hectares) have been irrigated. Truck crops, dates (90% of U.S. production), citrus fruits, and alfalfa are grown in the region.

coachwhip snake: see RACER.

coagulation (kōäg'yōlā'shən), the collecting into a mass of minute particles of a solid dispersed throughout a liquid (a sol), usually followed by the precipitation or separation of the solid mass from the liquid. The casein in milk is coagulated (curdled) by the addition of acetic acid or citric acid.

The albumin in egg white is coagulated by heating. The clotting of blood is another example of coagulation. Coagulation usually involves a chemical reaction. Lyophobic particles (see COLLOID) lose their electric charge by reacting with oppositely charged particles. Lyophilic particles undergo a reaction that causes them to lose their solubility. In either case coagulation occurs. The formation of a gel by evaporation or cooling of a sol is usually called gelation rather than coagulation.

Coahuila (kōawē'l'a), state (1970 pop. 1,140,959), 58,067 sq mi (150,394 sq km), N Mexico, on the northward bulge of the Rio Grande, S of Texas. SALTILLO is the capital. In the eastern part of the state, where peaks of the Sierra Madre Oriental rise, are quantities of silver, copper, lead, iron, and zinc. Coahuila is Mexico's chief coal-producing state and a leading national producer of iron and steel. Lumbering is important, and northeast of the mountains, in the drainage area of the Rio Grande, there is considerable cattle raising. Across W Coahuila and E Chihuahua lie vast and arid plains (some of them recently irrigated), which are broken by barren mountains, most notable of these plains is the Bolson de Mapimi, extending into Chihuahua. South of the Bolson is a fertile lake region, center of a vast inland basin, which absorbs rivers with no outlet to the sea. A considerable portion of the LAGUNA DISTRICT lies in this area. TORREÓN is the chief metropolis. Coahuila produces cotton, corn, grapes, and most temperate grains and tropical fruits. Exploration of the territory began in the 16th cent. but was hampered by Indian hostility. After playing some part in the war against Spain, Coahuila was combined (1830) with Texas, a proceeding that caused dissatisfaction among the American minority and contributed to the Texas Revolution (1835-36). During the Mexican War, Saltillo was of strategic importance, and the battle of Buena Vista was fought nearby. Joined with Nuevo Leon by the constitution of 1857, Coahuila regained its separate status in 1868. The revolutionary leaders Francisco I. Madero and Venustiano Carranza were born in the state.

coal, fuel substance of plant origin, largely or almost entirely composed of carbon with varying amounts of mineral matter. There is a complete series of carbonaceous fuels, which differ from each other in the relative amounts of moisture, volatile matter, and fixed carbon they contain. Of the carbonaceous fuels, those containing the largest amounts of fixed carbon and the smallest amounts of moisture and volatile matter are the most useful to man. The lowest in carbon content, *peat*, is followed in ascending order by LIGNITE and the various forms of coal—subbituminous coal or black lignite (a slightly higher grade than lignite), bituminous coal, semibituminous (a high-grade bituminous coal), semianthracite (a low-grade anthracite), and anthracite. Lignite and subbituminous coal, because of the high percentage of moisture they contain, tend to crumble on exposure to the air. Bituminous coal, being more consolidated, does not crumble easily, it is a deep black in color, burns readily, and is used extensively as fuel in industries and on railroads and in making COKE. Anthracite, which is nearly pure carbon, is very hard, black, and lustrous, and is extensively used as a domestic fuel. Cannel coal, a dull, homogeneous variety of bituminous coal, is composed of pollen grains, spores, and other particles of plant origin. It ignites and burns easily, with a candlelike flame, but its fuel value is low. Coal is found in beds or seams interstratified with shales, clays, sandstones, or (rarely) limestones. It is usually underlain by an underclay (a layer of clay containing roots of plants). The vegetable origin of coal is supported by the presence in coal of carbonized fibers, stems, leaves, and seeds of plants, which can be detected with the naked eye in the softer varieties and with the microscope in harder coal. Sometimes carbonized tree stumps have been found standing in layers of coal. The general interpretation of these facts is that coal originated in swamps similar to present-day peat bogs and in lagoons, probably partly from plants growing in the area and partly from plant material carried in by water and wind. From the thickness of coal seams, it is assumed that the coal swamps were located near sea level and were subject to repeated submergence, so that a great quantity of vegetable matter accumulated over a long period of time. The initial processes of disintegration and decomposition of the organic matter were brought about by the action of bacteria and other microorganisms. Peat, the first product formed, is altered to form lignite and coal through metamorphism. The pressure of the accumulated layers of

overlying sediments and rock upon the submerged plant matter forced out much of the water and caused some of the volatile substances to escape and the nonvolatile carbon material to form a more compact mass. The greater the stress exerted in the process of metamorphism, the higher was the grade of coal produced. Cannel coal was probably formed in ponds, rather than in lagoons or swamps, as it occurs in lenticular masses and is frequently found to contain fossil fish. Coal was formed chiefly in the CARBONIFEROUS PERIOD of geologic time, but valuable deposits date also from the Permian, Triassic, Jurassic, Cretaceous, and Tertiary periods. The chief coal fields of the United States are the Appalachian (from N Pennsylvania into Alabama), the Eastern Interior (Illinois, Kentucky, and Indiana), the Northern Interior (Michigan), the Western Interior (Iowa, Kansas, Missouri, Oklahoma, and Arkansas), the Rocky Mountain (Colorado, Wyoming, Utah, New Mexico, Montana, and North Dakota), the Pacific (Washington), and the Gulf Coast (Texas, Arkansas, and Louisiana). In Europe the chief coal-producing countries are Germany, Great Britain, Russia, Poland, France, and Belgium. There are valuable coal fields in China, India, South Africa, and Australia, but few in South America. See Wilfrid Francis, *Coal* (1954), D. W. van Krevelen, *Coal* (2d ed. 1962), I. A. Williamson, *Coal Mining Geology* (1967).

coalfish: see COD.

coal gas, gas obtained in the destructive distillation of soft coal, as a by-product in the preparation of COKE. Its composition varies, but in general it is made up largely of hydrogen and methane with small amounts of other hydrocarbons, carbon monoxide (a poisonous gas), carbon dioxide, and nitrogen. It is used as a fuel and illuminant.

coal mining, physical extraction of coal resources to yield coal, also, the business of exploring for, developing, mining, and transporting coal in any form. Strip mining is the process in which the overburden (earth and rock material overlying the coal) is removed to expose a coal seam or coal bed. Excavators either dispose of the overburden or store the waste material for replacement after the coal has been extracted. Once exposed, the coal is usually removed in a separate operation. Surface soil is often stripped separately and spread back onto the reclaimed surface. The environment can also be protected by seeding or planting grass or trees on the fertilized restored surface of a strip mine. The term *strip mining* is most often used in reference to coal mining, although the process may also be used to extract certain metallic ores as well. Sometimes the terms *open-pit*, *open-cast*, or *surface mining* are used in the same sense, although they usually refer to metalliferous mining or the mining of other minerals. Underground coal mining is the extraction of coal from below the surface of the earth. The coal is worked through tunnels, passages, and openings that are connected to the surface for the purpose of the removal of the coal. Mechanical equipment breaks the coal to a size suitable for haulage. Alternatively, the coal is drilled, and the resultant holes are loaded with explosives and blasted in order to break the coal to the desired size. In order to protect the miners and equipment in an underground coal mine, much attention is paid to maintaining and supporting a safe roof or overhead ceiling for the extraction openings. Long-wall mining is a method of underground mining believed to have been developed in Shropshire, England, near the end of the 17th cent. A long face, or working section, of coal, some 600 ft (180 m) in length, is operated at one time. The miners and machinery at the working face are usually protected by hydraulic jacks or mechanical props which are advanced as the coal is extracted. The excavated, or gob, area is either allowed to cave in, or is filled in by waste material called stowing. The Anderton shear is a widely used coal cutter and loader for long-wall mining. It shears coal from the face as it moves in one direction and loads coal onto an armored conveyor as it travels back in the opposite direction. It is ordinarily used for coal seams greater than 3.5 ft (91 cm) in thickness.

Coalsack: see MILKY WAY.

coal tar, product of the destructive distillation of bituminous coal. Coal tar can be distilled into many fractions to yield a number of useful organic products, including benzene, toluene, xylene, naphthalene, anthracene, and phenanthrene. These substances, called the coal-tar crudes, form the starting point for the synthesis of numerous products—notably dyes, drugs, explosives, flavorings, perfumes, preservatives, synthetic resins, and paints and stains. The residual pitch left from the fractional distillation

is used for paving, roofing, waterproofing, and insulation

Coalville, urban district (1971 pop 28,334), Leicestershire, central England Coalville is a modern town in the center of the Leicestershire coal field Besides coal mining, there are hosiery, footwear, and plastics industries

Coamo (kwa'mō), town (1970 pop 12,077), S central Puerto Rico, on the Coamo River It is the trade center of a sugar and tobacco region and has garment factories The town was founded in the 16th cent

coast, land bordering an ocean or other large body of water The line of contact between the land and water surfaces is called the shoreline It fluctuates with the waves and tides Sometimes the terms *coast* and *shore* are used synonymously, but often *shore* is interpreted to mean only the zone between the shorelines at high tide and low tide, and *coast* indicates a strip of land of indefinite width landward of the shore Classically, coasts have been designated as submergent if they resulted from a rise in the relative sea level and emergent if they resulted from a decline Young submergent coasts usually are irregular and have deep water offshore and many good harbors, either bays or estuaries Much of the coast of New England and most of the Atlantic coast of Europe are young submergent coasts according to this classification scheme Gradually the submergent coast, subjected to erosive attacks of the ocean and other agents, becomes mature Headlands are worn back to form cliffs, at the base of which deposits of eroded material accumulate as fringing beaches, spits and bars also grow up from material that is carried by currents and deposited in deeper water The shoreline is called mature when it is smooth, the headlands having been cut away and the bays either filled up or closed off by spits Emergent shorelines usually have shallow water for some distance offshore Such shorelines are found along the Atlantic coast of the SE United States and along part of the coast of Argentina, near the Rio de la Plata This classification system does not adequately describe many coasts, partly because many of them exhibit features of both submergence and emergence Because of these and other problems a classification system that is based on the most recent and predominant geologic agent forming the coast has become popular Under this scheme, there are essentially two major types of coasts Primary coasts are youthful coasts formed where the sea rests against a land mass whose topography was formed by terrestrial agents These coasts include land erosion coasts (Maine), volcanic coasts (Hawaii), deposition coasts (Nile Delta coast), and fault coasts (Red Sea) Secondary coasts are formed chiefly and most recently by marine agents, and may even be primary coasts that have been severely modified by wave action These coasts include wave erosion coasts, marine deposition coasts, and coasts built by organisms (reefs and mangrove coasts) The nature of the coastline of a country or a state is an important factor in its economic development because it relates to defense, fishing, recreation, and overseas commerce See C A M King, *Beaches and Coasts* (2d ed 1972)

coast guard, special naval force assigned to seaboard duties Its primary responsibilities usually consist in suppressing contraband trade and aiding vessels in distress The British coast guard was established just after the Napoleonic Wars for the purpose of preventing smuggling When the Coast Guard Act of 1856 put this task under the direction of the admiralty, the British coast guard was reorganized to perform coast-watching and lifesaving duties In the United States a coast guard was formed in 1915 when an act of Congress combined the Revenue Cutter Service with the Life Saving Service The cutter service had been established by Congress in 1790, at the suggestion of Alexander Hamilton, to prevent smuggling, until the creation of the navy it was the only U.S. armed service afloat The Life Saving Service developed some years later (see LIFESAVING) The U.S. coast guard subsequently absorbed the Lighthouse Service (1939) and the Bureau of Marine Inspection and Navigation (1942) In peacetime the coast guard is under the jurisdiction of the Dept of Transportation, in wartime, and for such other periods as the President may direct, it is under the control of the navy In addition to its rescue and antismuggling activities, the service enforces navigation rules and maintains jurisdiction over the regulations concerning the construction and equipment of merchant ships and over the licensing of merchant marine officers and seamen It also operates and maintains weather ships, an ice patrol in

the N Atlantic, and various navigational aids, including lighthouses, lightships, buoys, and loran stations The Coast Guard Academy, for the training of officers, is located in New London, Conn See studies by M F Willoughby (1957), H R Kaplan (1972), and Gene Gurney (1973)

Coast Mountains, range, W British Columbia and SE Alaska, extending c 1,000 mi (1,610 km) parallel to the Pacific coast, from the mountains of Alaska near the Yukon border to the Cascade Range near the Fraser River Mt Waddington (13,260 ft/4,042 m) is the highest peak The geologically complex range, composed mainly of metamorphic rocks, slopes steeply to the Pacific Ocean, where the shoreline is deeply indented by fjords The Coast Mts have been heavily eroded by mountain glaciers, numerous rivers, including the Fraser, the Skeena, and the Stikine, have cut deep gorges across the range The average annual precipitation of c 90 in (230 cm) makes the region one of the wettest parts of Canada Its slopes are heavily forested, and lumbering is important In the Coast Mts is Kemanu, one of Canada's largest hydroelectric plants The Coast Mts are sometimes confused with the geologically distinct COAST RANGES

coast protection, methods used to protect coastal lands from erosion Beaches can exist only where a delicate dynamic equilibrium exists between the amount of sand supplied to the beach and the inevitable losses caused by wave erosion Various activities of man have upset this equilibrium, decidedly increasing the rate of erosion of the shorelines For example, the plethora of dams constructed across major drainage systems has served to entrap sediment that would normally reach the coastal zone, imperiling the existence of beaches by cutting off their natural sand supply Mining of beach sand has removed millions of tons of sand from coasts and drastically upset the balance between natural supply and losses Historically, man has considered coast protection a local problem, and has attacked the problem by building structures to inhibit the transportation of sand from his local area However, it has been learned that building structures to solve a local erosion problem may extend and intensify the erosion problem along nearby beaches, requiring the construction of structures along an entire coast For example, many structures block littoral drift, which is a movement of sand parallel to the coast, both on the beach and offshore, caused by waves The blockage results in a depletion of sand downcurrent from the structure Several different kinds of structures are built Sea walls are constructed at the edge of the shore facing the ocean waves Designed to protect only the beach areas behind them, they cause an increased loss of sediment in front of and beneath them BREAKWATERS are long piers built offshore parallel to the shoreline, they are designed to provide calm anchorages in an area behind them called a wave shadow At the breakwater off Santa Monica, Calif., the wave shadow impeded the littoral drift, producing a deposition of sand behind the breakwater and extensive erosion of the beach downcurrent Groins are lines of rock or pilings constructed perpendicular to the shoreline They act as a partial barrier to littoral drift, trapping sand on the updrift side and causing erosion on the downdrift side Jetties are often built at river mouths and harbor entrances, projecting out into the ocean to direct and confine littoral currents and to prevent silting of the harbor entrance Jetties cause the same problems of downdrift erosion as groins In some instances it has been necessary to pump the sand trapped by the structure to adjacent beaches downdrift Efforts have also been made to prevent erosion using the natural materials at hand Artificial dunes have been built by bulldozing sand back from the beach or by placing snow fences to trap windblown sand Since beaches themselves are effective in dissipating wave energy, one remedy to the lack of a sand supply is to pump sand directly onto the beach from interior or offshore zones Unlike other man-made structures, artificial beaches do not harm the shore downdrift

Coast Ranges, series of mountain ranges along the Pacific coast of North America, extending from SE Alaska to Baja California, from 2,000 to 20,000 ft (610-6,100 m) high The ranges include the St Elias Mts in SE Alaska and SW Yukon, which have the highest elevations, a partially submerged portion that forms the islands off the coast of SE Alaska and British Columbia, the Olympic Mts in Washington, the Coast Ranges in Oregon, the Klamath Mts, Coast Ranges, and Los Angeles Ranges in California, and the Peninsular Range in Baja California The

Coast Ranges are rugged, geologically young mountains, formed by faulting and folding and are composed mainly of granitic rock, the northern third is glaciated N of San Francisco the ranges are humid and thickly forested, the southern parts are dry and covered with brush and grass Lumbering, mining, and tourism are important

Coatbridge, burgh (1971 pop 52,131), Lanarkshire, S central Scotland In Coatbridge a variety of iron and steel products are manufactured In 1975, Coatbridge became part of the Strathclyde region

Coates, Albert, 1882-1953, Russian-English conductor and composer, b St Petersburg, studied at the Leipzig Conservatory under Nikisch After conducting in Germany (1906-10), he returned to Russia and conducted at St Petersburg until 1917 In 1919 he settled in England where, except for brief teaching assignments in the United States, he remained until 1946, when he moved to the Union of South Africa Although he was a prolific composer, his works have seldom been performed Among them are the operas *Samuel Pepys* (1929), *Pickwick* (1936), and *Van Hunks and the Devil* (1952)

Coatesville, city (1970 pop 12,331), Chester co., SE Pa, on Brandywine Creek, in a farm area, settled c 1717, inc as a city 1916 It is a steel center Joseph Hergesheimer wrote about this region in *The Three Black Pennys* A U.S. veterans hospital is there The Revolutionary battle of BRANDYWINE (Sept 11, 1777) was fought to the south of the city, the area is now a state park

coatimundi (kō'a'tēmūn'dē) or **coatí**, omnivore of North and South America related to the RACCOON The coatimundi has a long snout, an elongated body, and a long bushy tail banded with dark rings The coat color varies from yellowish brown or reddish brown to black The males are significantly larger than the females and may be more than 50 in (127 cm) long and may weigh up to 25 lb (11 kg) Active both day and night, the coatimundi is a forest dweller and an agile tree climber It eats lizards, birds, and fruit and uses its long mobile snout to grub for insects and roots On the ground, its short forelegs give it a bearlike gait as it lumbers along with its tail erect Females and their young travel in bands, but males are solitary and join the band only in the mating season The young, typically four to six in number, are born following a gestation period of about seventy-seven days The species *Nasua narica* is native to SW United States *N. rufa*, the ring-tailed coatimundi, is a related species that ranges from Mexico to Peru Coatimundis are often raised as pets in Mexico They are classified in the phylum CHORDATA, subphylum Vertebrata, class Mammalia, order Carnivora, family Procyonidae

coat of arms: see BLAZONRY and HERALDRY

Coatzacoalcas (kwātsakwal'kōs), city (1970 pop 73,563), Veracruz state, E central Mexico, at the mouth of the Coatzacoalcas River It is a port on the Gulf of Campeche, as well as the northern terminus of rail traffic across the Isthmus of Tehuantepec Highway communications are also good The city is an important commercial center Oil, sulfur, and timber are exported, and the port facilities have been enlarged to enable Coatzacoalcas to handle foreign trade

coaxial cable: see CABLE

cobalamin: see COENZYME, VITAMIN

Cobalt (kō'bōlt), town (1971 pop 2,197), E Ont., Canada, NE of Sudbury, near Lake Timiskaming Cobalt deposits were discovered in 1903 The town is also the center of one of the world's richest silver districts The town has a mining museum

cobalt, metallic chemical element, symbol Co, at no 27, at wt 58.9332, m.p. 1495°C, b.p. about 2870°C, sp. gr. 8.9 at 20°C, valence +2 or +3 Cobalt is a silver-white, lustrous, hard, brittle metal It is a member of group VIII of the PERIODIC TABLE Like iron, it can be magnetized It is similar to iron and nickel in its physical properties The element is active chemically, forming many compounds, e.g., the series of cobaltous and cobaltic salts and the complex cobalt amines derived from cobaltic salts and ammonia Cobalt yellow, green, and blue are pigments of high quality that contain cobalt, another blue pigment, smalt, is made by powdering a fused mixture of cobalt oxide, potassium carbonate, and sand, these pigments are often used for coloring glass and ceramics Cobalt chloride, used as an invisible ink, is almost colorless in dilute solution when applied to paper Upon heating it undergoes dehydration and turns blue, becoming colorless again when the heat is removed and water is taken up The element rarely occurs uncombined in nature but is often found in meteoric metal It is a

constituent of the minerals COBALTITE and SMALTITE and of other ores, usually in association with other metals. Pure cobalt metal is prepared by reduction of its compounds by aluminum (the Goldschmidt process), by carbon, or by hydrogen. It is a component of several alloys, including the high-speed steels carboloy and stellite, from which very hard cutting tools are made. It is a component of some stainless steels, and of high-temperature alloys for use in jet engines. Alnico, an alloy of cobalt, aluminum, nickel, and other metals, is used to make high-strength permanent magnets. As an element in the diet of sheep, cobalt prevents a disease called sway-back and improves the quality of the wool. A radioactive isotope, cobalt-60 (with gamma ray emission 25 times that of radium), is prepared by neutron bombardment. It is used for cancer therapy and in industry for detecting flaws in metal parts. See HYDROGEN BOMB. Cobalt was discovered in 1735 by Georg Brandt, a Swedish chemist.

cobalt bomb: see HYDROGEN BOMB

cobaltite (kō'bōltīt, kō'bōlt'īt), opaque, silver-white, sometimes reddish or grayish mineral of the pyrite group, a compound of cobalt, arsenic, and sulfur, CoAsS. It occurs in crystals of the cubic system, also in compact to granular masses. It is an important ore of cobalt, found chiefly in Sweden, Norway, Zaire, and Ontario (Canada).

Cobb, Howell, 1815-68, American politician, b. Jefferson co., Ga. In 1837 he became solicitor general of the western judicial circuit of Georgia, a district populated largely by small farmers of Unionist sentiments. He championed their cause and from 1843 to 1851 represented them in the House of Representatives. He was elected floor leader of the Democrats in 1848 and speaker in 1849. Cobb united with the Whigs in Georgia to win approval of the Compromise of 1850. His followers and the Whigs formed the short-lived Constitutional Union party, which elected him to the governorship (1851-53). Cobb was returned to Congress in 1855, and in 1857 President Buchanan appointed him Secretary of the Treasury. After Lincoln's election he resigned, advocated secession, and was chairman of the convention in Montgomery, Ala., that organized the Confederacy. In the Civil War he rose to the rank of major general (1863) but saw little active fighting. See Horace Montgomery, *Howell Cobb's Confederate Career* (1959).

Cobb, Irvin Shrewsbury, 1876-1944, American author, b. Paducah, Ky. He was a noted New York humorist and columnist. Although he wrote over 60 books, Cobb is best known for his humorous stories of Kentucky local color, first collected in *Old Judge Priest* (1915). Among his other books of humor are *Speaking of Operations* (1916) and *Red Likker* (1929). See his autobiography, *Exit Laughing* (1942), study by F. G. Neuman (1934, repr. 1974).

Cobb, Lee J., 1911-, American actor, b. New York City. He first performed with the Pasadena (Calif.) Playhouse in 1929 and made his Broadway debut in *Crime and Punishment* (1935). Cobb created the role of Willy Loman in Arthur Miller's *Death of a Salesman* (1948-49, repeated for television in 1965). He performed Shakespeare in New York, including *The Merchant of Venice* and *King Lear*. His films include *On the Waterfront* (1954), *Twelve Angry Men* (1957), and *The Brothers Karamazov* (1958).

Cobb, Thomas Reade Rootes, 1823-62, American lawyer, b. Jefferson co., Ga., brother of Howell Cobb. Admitted to the bar in 1842, he edited 20 volumes of the Georgia supreme court reports (1849-57), prepared *A Digest of the Statute Laws of the State of Georgia* (1851), and compiled (1858-61) a new state criminal code. Cobb was a militant secessionist. In the Georgia secession convention he was chairman of the committee that wrote a new state constitution (1861) and helped write the Confederate Constitution. In the Civil War he organized and led Cobb's Legion. Promoted to brigadier general in Nov., 1862, he was killed at Fredericksburg the following month.

Cobb, Ty (Tyrus Raymond Cobb), 1886-1961, American baseball player, b. Narrows, Ga. In 1905 he joined the Detroit Tigers as center fielder and in his 24 years in the American League was one of the most spectacular and brilliant players of the game. Cobb, called the "Georgia Peach" by his admirers, had a 367 lifetime batting average, made 4,191 major-league hits, stole 892 bases, and won 12 batting championships. He was (1921-26) manager of the Detroit team, played (1927-28) with the Philadelphia Athletics, and then retired from baseball. He was the first elected (1936) member of the National Baseball Hall of Fame. See his autobiography (1961).

Cobbett, William (kōb'īt), 1763?-1835, British journalist and reformer. The son of a farm laborer, he ran away from home at 14 and later joined the British army. He resigned in order to expose abuses in the military forces, but, unable to prove his accusations, he fled to France to escape suit and thence went to the United States. In America, in his *Observations on Priestley's Emigration* (1794), *Porcupine's Gazette* (1797-99), and other pamphlets and periodicals, Cobbett defended the British monarchy and praised aristocratic government in preference to democracy. His outspoken and skillful disparagement of French Jacobinism and of the pro-French party in the United States made him a major target of the Jeffersonian Republicans. Dr. Benjamin RUSH secured a \$5,000 verdict against him for libel in 1799, and shortly afterward Cobbett returned to England. As the threat of French Jacobinism dwindled, Cobbett's Tory patriotism gave way to a deep concern for the condition of the working classes, especially rural workers, in the rapidly industrializing English society, and by 1807 he had become a Radical. His *Political Register*, begun in 1802 and published intermittently throughout the remainder of his life, was one of the greatest reform journals of the period and achieved an unparalleled influence among the working classes. For his attacks on the use of flogging as military punishment he was fined and imprisoned (1810-12). Severe financial difficulties forced him to sell his *Parliamentary Debates* to Hansard's printing firm, (see HANSARD). After the passage (1817) of the Gagging Acts to suppress radicalism and to hinder the circulation of reform literature, Cobbett fled once again to the United States. He settled on a farm on Long Island and wrote his famous *Grammar of the English Language* (1818). Returning to England in 1819, he became a central figure in the agitation for parliamentary reform, but he also found time to write many books, the most important of which, *Rural Rides* (1830), comprises a classic portrayal of the situation of the rural worker. After the Reform Bill was passed in 1832, Cobbett was elected to Parliament, where he became a member of the Radical minority. See biographies by G. D. H. Cole (3d ed. 1947, repr. 1971), G. K. Chesterton (1926), J. W. Osborne (1966), and James Sambrook (1973).

Cobden, Richard (kōb'dən), 1804-65, British politician, a leading spokesman for the MANCHESTER SCHOOL. He made a fortune as a calico printer in Manchester. A firm believer in free trade, after 1838 he devoted himself to the formation and work of the ANTI-CORN-LAW LEAGUE. Campaigning both inside and outside Parliament (to which he was elected in 1841), he finally won over Sir Robert PEEL, and the corn laws were repealed in 1846. After 1849, Cobden concerned himself chiefly with foreign policy, advocating nonintervention in Europe and an end to imperial expansion. He became unpopular for his opposition to the Crimean War (1854-56) and lost his parliamentary seat in 1857. Re-elected in 1859, he negotiated (1859-60) the "Cobden Treaty" for reciprocal tariffs with France. Like his close associate John BRIGHT, he favored the North in the Civil War in the United States (which he had twice visited). His many speeches, letters, and pamphlets have been published. See biographies by John Morley (1882) and J. A. Hobson (1919, new ed. 1968), study by D. Read (1967).

Cōbh (kōv) [Irish, =cove], urban district (1971 pop. 6,049), Co. Cork, S. Republic of Ireland, on the south shore of Great Island in Cork Harbour. Originally called Cove of Cork, the town was renamed Queenstown upon being visited by Queen Victoria in 1849. The name Cōbh was resumed in 1922. There are large docks and stations of naval stores. Situated on slopes above the harbor and having a fine climate, Cōbh has become a seaside resort. It is the headquarters of the Royal Cork Yacht Club, the oldest yacht club in the world (founded in the early 18th cent.), and there is an annual regatta. Steel is manufactured nearby at Haubowline Island.

Cobham, John Oldcastle, Lord see OLDCASTLE, SIR JOHN

Coblentz, William Weber (kō'blēnts), 1873-1962, American physicist, b. North Lima, Ohio, grad. Case School of Applied Science (B.S., 1900) and Cornell (Ph.D., 1903). From 1905 to 1945 he was physicist with the National Bureau of Standards. He was the first to verify Planck's law, and he conducted valuable researches on infrared and ultraviolet radiation, the measurement of stellar radiation and planetary temperatures, and the optical properties of iodine.

Coblentz, West Germany see KOBLENZ

COBOL [from COmmon BUssiness-ORiented Language], symbolic language used for programming a COMPUTER for business applications.

Cobourg Peninsula, c. 50 mi (80 km) long and 25 mi (40 km) wide, N. Northern Territory, Australia, E. of Melville Island. It is a reserve for native flora and fauna.

cobra, name for African and Asian snakes of the family Elapidae that are equipped with inflatable neck hoods. The family also includes the African MAMBAS, the Asian kraits, the New World CORAL SNAKES and a large number of Australian snakes. All members of the family are poisonous and have short, rigid fangs attached at the front of the mouth. Cobras are found in most of Africa and in S. Asia. They are nocturnal hunters, and most feed on small mammals, birds, and frogs. Females of all but one species lay eggs. The hood, which serves as a warning device, consists of loose skin around the neck, when the snake is excited it spreads the hood by extending the underlying long, movable ribs, and inflating it with air from the lungs. The king cobra (*Ophiophagus hannah*), or hamadryad, largest of all venomous snakes, is found in S. Asia, it may reach a length of 18 ft (5.5 m) and feeds chiefly on other snakes. The Indian cobra (*Naja naja*), a common snake of the same region, is usually 4 to 5 ft (1.2-1.6 m) long, its large hood is marked on the back by a pattern of figures resembling eyes. It preys on rats and is therefore often found in houses. The Indian cobra and the Egyptian cobra (*Naja haje*) are often displayed by snake charmers. The cobras appear to respond to the music played by the charmer, but, like all snakes, they are deaf, and only follow the movements of the charmer. As cobras do not strike accurately during the day, charmers are seldom bitten. Most cases of snakebite from cobras occur when humans walking barefoot at night disturb the animal. Cobra venom is not as toxic as that of some other members of the family, the fatality rate among human victims is thought to be about 10%. Some African cobras can eject a spray of venom through the openings of the fangs, aiming accurately to a distance of at least 6 ft (1.8 m). Among these is the ringhals (*Hemachatus hemachatus*) of S. Africa, which aims the spray at the eyes of the victim, causing great pain and sometimes blindness. The ringhals is the only cobra that bears live young. Cobras are classified in the phylum CHORDATA, subphylum Vertebrata, class Reptilia, order Squamata, family Elapidae.

Cobre, El (ēl kō'brā), town (1970 pop. 3,952), SE Cuba, in a high valley of the Sierra Maestra. Once famous for rich copper mines (hence the name El Cobre), it is now chiefly noted for a shrine to Our Lady of Charity (La Virgen de la Caridad del Cobre). Cuba's patron saint. Guerrilla warfare raged in the neighboring mountains during Fidel Castro's revolution.

Coburg (kō'bōrk), city (1970 pop. 42,619), Bavaria, E. central West Germany, on the Itz River. It has metal, glass, and ceramics industries and is known for its toys and Christmas ornaments. Mentioned in the 11th cent., Coburg in 1353 passed to the house of WETTIN. It was the alternate capital (with Gotha) of Saxe-Coburg-Gotha from 1826 to 1918 and joined Bavaria in 1920. The large ducal castle (16th cent.) was the residence of Martin Luther in 1530. The city has a modern convention hall (1962).

Coburg Peninsula, Australia see COBOURG PENINSULA

Coburn, Alvin Langdon, 1882-, American photographer, b. Boston. Coburn began making photographs at eight and by 1905 had become renowned for his thoughtful, perceptive portraits of European literary and artistic celebrities. Living and working in England most of his life, he produced superb photographs of urban and marine scenes and landscapes that were widely published and exhibited. See his autobiography (1966).

coca (kō'kə), common name for shrubs of the genus *Erythroxylon*, particularly *E. coca*, of the family Erythroxylaceae, and found abundantly in upland regions and on mountain slopes of South America, as well as in Australia, India, and Africa. Certain South American Indians chew the leaves mixed with an alkali, lime, which acts with saliva to release the drug COCAINE from the leaves. In the low doses used by the Indians, the drug acts as a stimulant and an appetite depressant with physiological effects similar to those of TOBACCO. Until the time of the Spanish conquest, only the Inca aristocracy was privileged to chew the coca leaves, but afterwards, the Spanish encouraged the enslaved Indians all to use coca in order to get them to endure long periods of

heavy labor and physical hardships. A cocaine-free extract of coca leaves is used in some soft drinks. Coca, a different plant than the cocoa plant CACAO, is grown commercially in Sri Lanka (Ceylon), Java, and Taiwan. Coca is classified in the division MAGNOLIOPHYTES, class Magnoliopsida, order Linales, family Erythroxylaceae.

cocaine (kōk'ān, kō'kān), alkaloid drug derived from the leaves of the COCA shrub. Cocaine acts as an anesthetic, depressing nerve endings and nerve trunks, however, it also stimulates the central NERVOUS SYSTEM, producing, in humans, euphoric effects, hallucinatory experiences, and temporary increases in physical energy. The drug's stimulatory effects make it psychologically habit-forming, but the body does not develop tolerance to the drug, i.e., does not need increasing doses to achieve the original effect. Withdrawal from habitual use of cocaine is characterized by severe depression, which acts to encourage return to use of the drug. Long-term use can result in digestive disorders, weight loss, general physical deterioration, and marked deterioration of the nervous system. Cocaine has been found to induce nervous system aberrations, including a PSYCHOSIS that is characterized by the common delusion that ants or other insects are crawling along or under the skin. Habitual injection of cocaine frequently results in skin abscesses. A combination of cocaine and MORPHINE or HEROIN, known as a speedball, is used by some drug addicts (see DRUG ADDICTION AND DRUG ABUSE).

Cocceius, Johannes (kōksē'ās), 1603–69, German theologian, whose surname was originally Koch or Koken. Born in Bremen, he went to Holland, where he was professor at Francken and Leiden. He produced many learned writings, among them his great dictionary of the Hebrew language (1669), often reprinted. Cocceius held a theory of life based upon the Bible. He made the biblical COVENANT between God and man the central idea of his theology. In his examination of the Old Testament he found Jesus Christ prefigured throughout. His followers, Cocceians, perpetuated and emphasized his teachings.

coccidioidomycosis (kōksīd'ēoi'dōmīkō'sīs), systemic fungal disease (see FUNGUS INFECTION) endemic to arid regions of the Americas. Its original site is in the respiratory tract, from which it can spread to the skin, bones, and central nervous system. Manifestations of the disease range from complete absence of symptoms to systemic infection and death. Coccidioidomycosis is contracted by inhaling dust infected with the fungal spores. The soil that supports *Coccidioides* spores is indigenous to dry, hot geographical areas, SW United States, Argentina, and Paraguay are areas of high incidence of infection. In 60% of the cases no clinical evidence of the disease is present and the only recognizable sign is a positive skin test, in 15% symptoms resembling those of influenza occur, and in 25% more serious signs such as swelling of the knees, weakness, pleural pain, and prostration occur. Diagnosis is made upon positive cultural identification of the virus. Although an antifungal drug is effective in some cases, there is no specific treatment except for bed rest.

coccyx (kōk'sīks) see SPINAL COLUMN

Cochabamba (kōchabāmb'a), city (1971 est. pop. 180,000), alt. c. 8,400 ft (2,560 m), capital of Cochabamba dept., W central Bolivia, the second largest city in Bolivia. It is a commercial center in an agricultural region that ships grains, fruits, and cattle. Industries produce goods mainly for local consumption. Founded in 1574, the city was called Villa de Oropeza and was renamed in 1786. Cochabamba has many historical buildings, including a convent, with five paintings by the Spanish artist GOYA, and a monument to the women of the city who fought and died in the Bolivian war of independence (1815). Cochabamba also has a university.

Cochin, Charles Nicolas (sharl nēkōla' kōshān'), 1715–90, French engraver, designer, writer on art, and painter to the French court. His works, more than 1,500 in number, include historical subjects, such as the *Marriage of the Dauphin*, vignettes and frontispieces, book illustrations, and pencil and crayon portraits.

Cochin (kō'chīn'), former princely state, 1,493 sq mi (3,867 sq km), SW India, on the Arabian Sea. Now part of Kerala state, the region of Cochin has one of the highest population densities in India. Agriculture is the chief economic activity, rice, coconuts, tapioca, pepper, and vegetable oils are produced. Ernakulam was the former capital and Cochin (1971 pop. 438,420) the chief port. The finest port S of Bombay, Cochin has a naval base and shipbuilding industry. Tires, paper, chemicals, and tiles are manu-

factured. After Vasco da Gama visited Cochin (1502), the Portuguese established a settlement there. The Dutch captured it in 1663 and the British in 1795. In adjoining Mattancheri there is a community of descendants of Jews expelled from Portugal in the 16th cent.

Cochin China (kō'chīn, kō'—), Fr. *Cochinchine*, historic region (c. 26,500 sq mi/68,600 sq km) of South Vietnam, SE Asia. The capital and chief city was SAIGON. Cochin China was bounded by Cambodia on the northwest and north, by the historic region of ANNAM on the northeast, by the South China Sea on the east and south, and by the Gulf of Siam on the west. It included the rich MEKONG delta, one of the world's great rice-growing regions, and, in the northeast, the southern spurs of the Annamese Cordillera, where rubber, coffee, tea, oil palm, and sugarcane plantations were established. Only the Plaine des Joncs [reed plain] and the mangrove-covered Ca Mau peninsula were not cultivated. Cochin China was originally part of the KHMER EMPIRE. In the 17th cent. the Annamese (later called Vietnamese) gradually infiltrated through the mouths of the Mekong, increasing their commercial influence until in the middle of the 18th cent. they became masters of the region. After the French occupied Saigon (1859), Annam ceded to France both E Cochin China (1862) and W Cochin China (1867). Unlike the other sections of Indochina, which were French protectorates under native rulers, Cochin China was administered by the French as a colony, thus, French influence was strongest there. After World War II the status of Cochin China became a major issue in the relations between France and Vietnam. Constituted (1946) as an independent republic within the Federation of Indochina, Cochin China was later (1949) permitted by the French to join with Annam and Tonkin in Vietnam. After 1954, when Vietnam was partitioned, Cochin China became the heartland of South Vietnam, it was later divided into several provinces.

cochineal (kōchīnēl', kōch'īnēl'), natural dye obtained from an extract of the bodies of the females of a scale insect (*Coccus cacti*) found on certain species of cactus, especially *Nopalea coccinellifera*, native to Mexico and Central America. The insects' bodies contain the pigment called carminic acid, which is obtained by subjecting a mass of the crushed insects to steam or dry heat, such large numbers of the insects are needed to produce a small amount of dye that the cost is high. Once commonly used as a scarlet-red mordant dye for wool and as a food color, cochineal has been largely replaced by synthetic products. It is used chiefly now as a biological stain.

Cochise (kōchēs', kōchē'sā), c. 1815–1874, chief of the Chiricahua group of APACHE INDIANS in Arizona. He was friendly with the whites until 1861, when some of his relatives were hanged by U.S. soldiers for a crime they did not commit. Afterward he waged relentless war against the U.S. army and became noted for his courage, integrity, and military skill. His friendship with Thomas JEFFORDS became the key to peace. In 1872, Gen. Oliver OTIS HOWARD, the Indian commissioner, requested Jeffords to accompany him to Cochise's mountain stronghold. As a result of the peace talks, Cochise agreed to live on the reservation that Howard promised would be created from the chief's native territory. After the death of Cochise, however, his people were removed to another reservation. The southeastern-most county of Arizona is named for him.

cochlea (kōk'lēā) see EAR

Cochrane, Thomas: see DUNDONALD, THOMAS COCHRANE, 10TH EARL OF

Cock or Kock, Hieronymus (both hē'ərō'nīmās kōk), 1510–70, Flemish painter and engraver. In Antwerp he was the first great publisher of prints and made numerous plates after Bruegel, Bosch, and Floris.

Cockaigne or Cockayne, Land of (both kōk'ān'), legendary country described in medieval tales, where delicacies of food and drink were to be had for the taking. *The Land of Cockayne* is a 13th-century English poem satirizing monastic life.

cockatoo see PARROT

Cockburn, Sir Alexander James Edmund, 1802–80, British jurist. He was called to the bar in 1829, and a volume of reports on election cases (1832) brought him into national prominence as a trial lawyer. He was made recorder for Southampton (1841) and was elected to Parliament from there (1847). He was noted particularly for his defense advocacy, one of his most famous successes being the acquittal (1843) of Daniel McNaghten, who had killed Sir

Robert Peel's secretary, on grounds of insanity, the "McNaghten rules" became the basic definition of criminal responsibility in most English-speaking jurisdictions. In Parliament, Cockburn successfully defended Lord Palmerston's handling of the "Don Pacifico" dispute (1850). He served as attorney general (1851–56) and was chief justice of common pleas (1856–59) and lord chief justice (1859–80), presiding over the famous TICHBORNE CASE.

Cockburn, Sir George, 1772–1853, British admiral. He served in the Mediterranean, and in the War of 1812 he participated in the Chesapeake Bay expeditions and in the burning of Washington. He conveyed Napoleon I in the *Northumberland* to St. Helena, remaining there as governor (1815–16).

Cockburn Island: see MANITOULIN ISLANDS

cockchafer: see JUNE BEETLE

Cockcroft, Sir John Douglas, 1897–1967, English physicist, educated at the Univ. of Manchester and at St. John's College, Cambridge. He was a fellow of St. John's College (1928–46) and professor of natural philosophy at Cambridge (1939–46). After serving (1941–44) as chief superintendent of the Air Defence Research and Development Establishment, he directed (1944–46) the atomic energy division of the National Research Council of Canada and became (1946) the director of the British Atomic Energy Research Establishment. The 1951 Nobel Prize in Physics was awarded jointly to Cockcroft and E. T. S. Walton for their pioneer work in transmuting atomic nuclei by bombarding elements with artificially accelerated atomic particles. He was knighted in 1948.

Cockerell, Charles Robert (kōk'əral), 1788–1863, English architect, archaeologist, and writer. While excavating at Bassae, Aegina, and other sites in Italy, Greece, and Asia Minor, he studied the remains of ancient architecture and designed restorations for the temple of Zeus at Agrigento, Sicily. In 1819 he was appointed surveyor of St. Paul's Cathedral, London, and in 1833 he became chief architect of the Bank of England, designing the buildings at Bristol, Liverpool, and Manchester and making alterations in the London branch. From 1840 to 1857 he served as professor of architecture in the Royal Academy and during 1860–61 was president of the Royal Institute of British Architects. His works include the Taylor buildings, Oxford, Hanover Chapel, London, and the National Monument, Edinburgh. He completed the interior of St. George's Hall, Liverpool. Most of Cockerell's works bear the stamp of the CLASSIC REVIVAL, of which he was a notable exponent.

cocker spaniel, breed of small SPORTING DOG developed from English cocker spaniels brought to the United States in the 1880s. It stands from 14 to 15 in (35.6–38.1 cm) high at the shoulder and weighs about 25 lb (11.3 kg). Its silky, flat, or wavy coat is moderately long and forms fringes, or feathers, on the underside of the body and on the legs, chest, and ears. The coat may be of any solid color or a combination of two or more colors (parti-colored), such as white with red or tan markings or black and tan. The tail is docked. The smallest of the sporting-dog breeds, cockers can be trained to flush game and retrieve. According to some authorities their name derives from their proficiency at hunting woodcocks. They have also been exceptionally popular as house pets. See DOG.

cockfighting, sport of pitting gamecocks against each other. Popular in Asia, in Latin America, and in some areas of the United States, it is an ancient form of amusement, having been practiced in Persia, Greece, and Rome. It has long been opposed by the clergy and by humane groups. Massachusetts passed (1836) the first law in the United States forbidding cockfighting, most other states have since taken similar action. Great Britain prohibited cockfighting by law in 1849. There are several forms of cockfighting, including the single battle and the round-robin tournament. The jousts are usually held in a small circular pit into which the gamecocks—specially bred and trained for fighting—are placed beak to beak by their handlers and then released. Local rules prevail, and a combatant is defeated when he refuses to fight, is unable to fight, or is killed. Metal spurs sometimes are attached to the fowl's natural spurs to make action deadlier.

cockle, common name applied to the heart-shaped, jumping or leaping marine BIVALVE mollusks, belonging to the order Eulamellibranchia. The brittle shells are of uniform size, are obliquely spherical, and possess distinct radiating ridges, or ribs, which aid the animal in gripping the sand. The mantle has three distinct apertures (inhalant, exhalant, and pedal) through which the inhalant and exhalant si-

phons and the foot protrude. The cockle lives in sand and mud in shallow water, often in brackish inlets. It burrows until only the siphons project, pulling in water from which the animal strains the minute planktonic organisms on which it feeds. All cockles are hermaphroditic. In order to accomplish the characteristic jumping form of forward locomotion, the large, powerful, muscular foot is bent backward beneath the shell and then straightened. In most adults, the foot is about as long as the greatest length of the shell. Several species of cockles are considered by man to be good, edible clams. In the British Isles, great numbers of cockles are taken annually for food from densely populated beds. These beds have been known to migrate in units, probably in response to changes in currents. *Protothaca staminea*, the rock cockle, is among the best known and most widely used for food. It usually does not exceed 3 in (7.5 cm) in length. Rock cockles are poor diggers and inhabit packed mud, or gravel mixed with sand, usually 8 in (20 cm) below the surface. They are found on the Pacific Coast near the rocky shores of bays and estuaries. Those inhabiting the open coast during the summer months should not be eaten because they may be infected with toxin-producing organisms. *P. semidecussata*, the Japanese littleneck clam, is smaller but considered to be better-flavored than the rock cockle. The shell is more elongated, with a brownish to bluish banding on one end. It inhabits an environment similar to that of *P. staminea* and is widespread in Puget Sound, Wash., British Columbia, and San Francisco and Tomales Bay, Calif. Unlike the genus *Protothaca*, the basket cockles (*Clinocardium nuttalli*, or *Cardium corbis*) are good diggers and have a large foot. Lacking siphon tubes, basket cockles burrow only slightly beneath the surface and inhabit sand flats, particularly along the Pacific Coast. They are considered good eating clams but are too few in number to be widely marketed. They are most abundant in British Columbia and in Puget Sound, Wash., with fewer found south as far as Baja California and north as far as the Bering Sea. The hard shell cockles, genus *Chione*, are found from San Pedro, Calif., S into Mexico. The giant Atlantic cockle, *Di-nocardium robustum* (*Cardium magnum*), reaches 5 in (12.5 cm) in diameter and is found along the Atlantic Coast from Virginia to Brazil. It has shells with toothed margins, strikingly colored in yellowish brown with spots and transverse stripes of chestnut or purple. Cockles are classified in the phylum MOLLUSCA, class Pelecypoda, order Eulamellibranchia.

cocklebur or **clotbur**, any species of the genus *Xanthium*, widely distributed coarse annual plants of the family Compositae (COMPOSITE family). They are often persistent weeds, the two-seeded oval burrs are particularly troublesome to sheep growers and the very young plants are poisonous to livestock. Cockleburs are often confused with burdock. Cockleburs are classified in the division MAGNOLIOPHYTA, class Magnoliopsida, order Asterales, family Compositae.

cock of the plains: see GROUSE

cock-of-the-rock: see CONINGA

Cockpit Country, hilly region on the plateau of Jamaica, c 200 sq mi (520 sq km), W central Jamaica. Composed of limestone rock, the region has many sink holes, caverns, and subterranean streams.

Cockran, William Bourke, 1854–1923, American political leader, b. Co. Sligo, Ireland. He emigrated to New York City at the age of 17 and in 1876 was admitted to the bar. At first opposed to Tammany Hall, W. Bourke Cockran later joined (1883) the organization, although he subsequently remained independent in action. He supported the gold standard and William McKinley in 1896, anti-imperialism and William Jennings Bryan in 1900, and Theodore Roosevelt's Bull Moose ticket in 1912. As a member (1887–89, 1891–95, 1904–9, and 1921–23) of the U.S. House of Representatives, Cockran was a supporter of organized labor and an opponent of restrictions on immigration. He defended Thomas J. Mooney in 1918. See biography by James McGurran (1948, repr. 1972).

Cockrell, Francis Marion, 1834–1915, Confederate general and U.S. Senator, b. Johnson Co., Mo. Enlisting as a private with Confederate forces in the Civil War, he became a brigadier general in 1863. Cockrell's Brigade was a famous unit in the Western fighting. After the war Cockrell entered Democratic politics, and in 1874, Missouri elected him to the U.S. Senate, where he served until 1905. See biography by Francis Marion Cockrell II (1962).

cockroach or **roach**, name applied to approximately 3,500 species of flat-bodied, oval INSECTS forming the suborder Blattaria of the order Orthoptera. Cockroaches have long antennae, long legs adapted to running, and a flat extension of the upper body wall that conceals the head. They range from ¼ in to 3 in (6–7.6 cm) in length. Some cockroaches have two pairs of well-developed wings, the front pair covering the hind pair when at rest, others have reduced wings or none at all. In some species only the wings of the female are reduced or absent. Many species are able to fly well, although the familiar household species do not fly. Most cockroaches are shiny brown or black, but bright yellows, reds, and greens occur in some tropical species. Cockroaches are night-active insects and most live in damp places, most are omnivorous scavengers. They are worldwide in distribution but are most numerous in the tropics. Most species live in the wild in their native regions, e.g., the wood cockroaches, species of the genus *Parcoblatta*, found under forest litter in the NE United States. A few tropical and subtropical species that have been introduced into the temperate zone have become residents in human homes, where they multiply rapidly and are serious pests. They invade food supplies and emit foul-smelling glandular secretions. Their shape enables them to use tiny cracks as hiding places. They are popularly believed to be carriers of human diseases, although this has not been proved. The large, dark Oriental cockroach, *Blatta orientalis*, is a cosmopolitan household species. The smaller German cockroach, or Croton bug, *Blattella germanica*, native to Europe, is the common urban cockroach of the NE United States. The American cockroach, *Periplaneta americana*, is a large light-reddish species that invades houses in the S United States. Cockroaches reproduce sexually. Their eggs are encased in capsules called oothecae, which in some species remain attached to the abdomen of the female until the eggs hatch. In a few species the ootheca is retained within the body of the female and the young are born live. Young resemble the adults except in size. The group as a whole is extremely old, fossil evidence indicates its extreme abundance during the Carboniferous period, about 350 million years ago. These ancient cockroaches were able to fly and were probably the first flying animals. Cockroaches are classified in five families of the phylum ARTHROPODA, class Insecta, order Orthoptera, suborder Blattaria.

cockscomb: see AMARANTH

cocksfoot: see ORCHARD GRASS

cocktail, short mixed drink originating in the United States and served as an appetizer. It generally has a basis of gin, whisky, rum, or brandy combined with vermouth or fruit juices and often flavored with bitters or grenadine. It is blended by stirring or shaking in a vessel containing cracked ice. The term is also applied to nonalcoholic beverages served as appetizers, e.g., tomato juice cocktail, and also to mixed, cut-up fruits and to shellfish and oysters served with a sharp sauce.

Cocoa, city (1970 pop. 16,110), Brevard co., E Fla., on the Indian River (a lagoon), a segment of the Intra-coastal Waterway, inc. 1895. It is a tourist center in a region where citrus fruits are grown. An 8-mi (12.9 km) causeway leads from the city over Indian River to Merritt Island, Cocoa Beach, and Cape Canaveral. Brevard Community College is in Cocoa. Patrick Air Force Base is nearby.

COCOA: see CACAO

coconut, fruit of the coco PALM (*Cocos nucifera*), a tree widely distributed through tropical regions. The seed is peculiarly adapted to dispersal by water since the large pod holding the nut is buoyant and impervious to moisture. The trees therefore establish themselves naturally on small islands and low shores bordering the tropic seas. The tree grows to a height of from 60 to 100 ft (18–30 m), with a smooth cylindrical stem marked by the nonglacial scars of former leaves. It bears at the top a crown of frondlike leaves and yellow or white blossoms. The number of nuts varies, a well-cared-for tree may yield 75 to 200 or more annually. The mature fruit as it comes from the tree is encased in a thick, brown fibrous husk. The nut itself has a hard woody shell, with three round scars at one end, the embryo lies against the largest scar and emerges through it as a developing plant. Through this easily punctured spot the milk of the young coconut may be drained. Its constantly growing commercial value has led to extensive cultivation of the coconut, especially in the Malay Archipelago, Sri Lanka, and India. A few are found in the southern extremity of Florida. The coco palm is

one of the most useful trees in existence, every part of it having some value. The fruit, either ripe or unripe, raw or cooked, is a staple food in the tropics, the terminal bud, called palm cabbage, is considered a delicacy, and the inner part of young stems is also eaten. The milk of the young nut is a nutritious drink. A sweet liquid obtained from the flower buds ferments readily and is used as a beverage, both when fresh and when distilled to make arrack, it may be boiled down to make various palm sugars, e.g., jaggery. The leaves are used for making fans, baskets, and thatch. The coir (coarse fibers obtained from the husk) is made into cordage, mats, and stuffing, it becomes more buoyant and elastic than hemp in salt water. The hard shell and the husk are used for fuel. The fibrous center of the old trunk is also used for ropes, and the timber, known as porcupine wood, is hard and fine-grained and takes a high polish. From the nutshells are made containers of various kinds—cups, ladles, and bowls—often highly polished and ornamentally carved. The root is chewed as a narcotic. Commercially the greatest value of the coconut lies in the oil, which is extracted from the dried kernels of the fruit. The nuts when ripe are apt to spoil or become rancid. Therefore when they are gathered they are broken open and the flesh is dried and exported under the name of copra. The oil content of copra ranges from 50% to 70% depending upon the method of drying. The coconut and the olive are the earliest recorded sources of vegetable oil. Coconut oil, the major type of palm oil, has been extracted by mortar and pestle in the Orient since antiquity. Primitive methods of drying and expressing the copra are giving way to modern machinery, such as rotary driers and hydraulic presses. The residue, known as coco cake, makes excellent cattle food, as it usually contains a remnant of from 6% to 10% of oil. Large quantities of shredded or desiccated coconut made from copra and many whole coconuts are exported for use chiefly in the making of cakes, desserts, and confectionery. Coconuts are classified in the division MAGNOLIOPHYTA, class Liliatae, order Arecales, family Palmaeaceae.

COCOON: see PUPA

Cocopa Indians (kōkōpā), North American Indians whose language belongs to the Yuman branch of the Hokan-Siouan linguistic stock (see AMERICAN INDIAN LANGUAGES). They formerly lived near the mouth of the Colorado River and in the mountains of S California. Since there was little wild game in the area, the Cocopa cultivated corn, melons, pumpkins, and beans. Some were moved to a reservation in California, and some to Mexico, where they are known as the Cucupá.

Cocos Islands (kōkōs) or **Keeling Islands**, two separate atolls comprising 27 coral islets (1970 pop. 611), 55 sq mi (14.2 sq km), in the Indian Ocean, c 1,400 mi (2,250 km) SE of Sri Lanka. They are under Australian administration. Discovered in 1609 by Capt. William Keeling of the East India Company, the Cocos were settled in 1826 by Alexander Hare, an Englishman. A second settlement was founded in 1827 by John Clunies-Ross, a Scottish seaman, who landed with a boatload of Malay sailors. In 1857 the islands were annexed to the British crown. Queen Victoria granted the lands to the Clunies-Ross family in 1886 in return for the right to use any land on the island for public purposes. In 1903 the islands were included in the STRAITS SETTLEMENTS, and in 1955 they were placed under Australian administration. Only three of the islands are inhabited. West Island, which has an airport and the largest community of Europeans, Home Island, headquarters of the Clunies-Ross Estate, and Direction Island, which has an aviation-marine base. The economy is based on the production of copra and on aviation and government facilities maintained by the Australian government.

Cocteau, Jean (zhāN kōktō'), 1889–1963, French writer, visual artist, and filmmaker. Cocteau's versatility in the arts is unrivaled in the 20th cent. He experimented audaciously in almost every artistic medium, becoming a leader of the French avant-garde in the 1920s. His first great success was the novel *Les Enfants Terribles* (1929), which he made into a film in 1950. Surrealistic fantasy suffuses his films and many of his novels and plays. Among his best dramatic works are *Orphée* (1926) and *La Machine infernale* (1934, tr. 1936), in which the Orpheus and Oedipus myths are surrealistically adapted to modern circumstances. His films include *The Blood of a Poet* (1933), *Beauty and the Beast* (1946), and *Orphée* (1949). Among other works are ballets, sketches, monologues, whimsical drawings,

and the text (written with Stravinsky) for the opera-
Oedipus Rex (1927) See his autobiography,
 comp from his writings by Robert Phelps (tr 1970),
 biographies by Frederick Brown (1968), Elizabeth
 Sprigge and Jean-Jacques Kihm (1968), and Francis
 Steegmuller (1970), Margaret Crosland, ed., *Coc-
 teau's World* (tr 1972)

Cocx, Gonzales* see COQUES, GONZALES

Cocytus (kōsī'tās) see HADES

cod, member of the large family Gadidae, compris-
 ing extremely important and abundant food fishes.
 The cods include the hake and the haddock, all
 found in the N Atlantic and Pacific. The cod was
 extremely important to the economic and social
 growth of New England; it has been used as a Mas-
 sachusetts state emblem. All cods are bottom-feed-
 ers with soft fins, the large ventral fins are located
 under or in front of the pectorals rather than behind
 them as in other fishes. The Atlantic cod varies in
 color but has two distinct phases, gray-green and
 reddish brown. Its average weight is 10 to 25 lb (4.5-
 11.3 kg), but specimens weighing up to 200 lb (90
 kg) have been recorded. About 30,000 tons of cod
 are caught annually. Cods feed on mollusks, crabs,
 starfish, worms, squid, and small fish. Some migrate
 south in winter to spawn. A large female lays up to
 five million eggs in mid-ocean, a very small number
 of which survive. The Pacific cod is found N of Ore-
 gon. Small cod prepared in strips for cooking is
 called scrod. The tomcod resembles a young Atlan-
 tic cod with long, tapering ventral fins. It rarely ex-
 ceeds 15 in (37.5 cm) in length and lives close to
 shore. There is also a Pacific tomcod. The pollack,
 also called coalfish or green cod, is a plump olive-
 green cod found in cool waters on both sides of the
 Atlantic. Pollacks have forked tails and pale lateral
 lines and grow to 3 ft (90 cm) and 30 lb (13.6 kg),
 10,000 tons are taken yearly. The haddock is the
 most important food fish of Atlantic waters, the an-
 nual catch amounting to 50,000 tons, most of which
 is marketed frozen. It is also found in colder Euro-
 pean waters. Haddocks are also bottom-feeders but
 are found in deeper water (up to 100 fathoms). They
 are smaller than cods, reaching a top weight of 30 lb
 (13.6 kg) and length of 3 ft (90 cm) and have black
 lateral lines and dark side patches. Finnan haddie is
 lightly smoked haddock. The burbot is the only
 freshwater cod, found deep in northern streams and
 lakes. It has a single barbel on its chin. A similar
 burbot is found in Europe and Asia. Lings and hakes,
 closely related to the cod, are fishes of commercial
 importance found in warmer waters. They are slen-
 derer than the cod and have weak tails but are
 strong swimmers, preying on crustaceans and small
 fish. Cods are classified in the phylum CHORDATA,
 subphylum Vertebrata, class Osteichthyes, order
 Gadiformes, family Gadidae. See A. C. Jensen, *The
 Cod* (1972).

Coddington, William, 1601-78, one of the found-
 ers of Rhode Island, probably b. Boston, England.
 He came to America in 1630 as an officer of the Mas-
 sachusetts Bay Company and was its treasurer from
 1634 to 1636. He supported Anne HUTCHINSON in the
 antinomian controversy. With her, JOHN CLARKE, and
 other Puritan exiles, he purchased the island of
 Aquidneck (Rhode Island) from the Narragansett In-
 dians and founded Portsmouth (1638). Deposed
 (1639) as leader of the settlement by Hutchinson
 and Samuel GORTON, Coddington withdrew with
 Clarke and founded NEWPORT. The two towns were
 joined under Coddington's governorship in 1640.
 He opposed, however, the union with the mainland
 settlements of Providence and Warwick, which took
 place in 1647 under a patent received in 1644 by
 Roger WILLIAMS. The commission Coddington re-
 ceived in 1651 to govern for life Aquidneck and
 neighboring Conanicut Island was denounced by
 the island people, and Williams and Clarke suc-
 ceeded in having it revoked in 1652. Coddington
 remained influential in Newport affairs and was
 governor of the united colony of Rhode Island and
 Providence Plantations in 1674, 1675, and 1678.

code, in communications, set of symbols and rules
 for their manipulation by which the symbols can be
 made to carry information. By this extended defini-
 tion all written and spoken languages are codes.
 While these are sufficient and actually quite efficient
 in transmission of information, they are at times am-
 biguous and are highly inefficient for telecommuni-
 cations. For example, a circuit capable of carrying a
 voice message, e.g., a telephone circuit, could carry
 several times as much information if that informa-
 tion were represented as telegraphic code. Special
 codes are also used for representing data inside a
 computer. Generally speaking, INFORMATION THEORY

shows that for any particular application there is an
 optimum code; it does not, unfortunately, tell how
 to devise the code. For use in a COMPUTER, informa-
 tion is encoded as strings of binary digits, for tele-
 graphic work, codes such as the MORSE CODE, con-
 sisting of a series of dots and dashes or marks and
 spaces, are used. Certain arbitrary codes are used to
 ensure secrecy of communication, although the
 eavesdropper may have access to the message, he
 does not know the rules by which the symbols are
 associated and cannot convert the message into a
 form he can understand. See CRYPTOGRAPHY, SIGNAL-
 ING.

code, in law, in its widest sense any body of legal
 rules expressed in fixed and authoritative written
 form. A STATUTE thus may be termed a code. Codes
 contrast with customary law (including COMMON
 LAW), which is susceptible of various nonbinding
 formulations, as in the legal opinions of judges. The
 earliest codes (e.g., the Roman TWELVE TABLES) met
 the popular demand that oral regulations be written
 down so that legal chicanery might be prevented. In
 later Roman law, however, the term code acquired
 its modern meaning of a precisely formulated state-
 ment of the principles underlying some branch of
 law (e.g., contracts) or an entire legal system. One of
 the greatest codes was the Roman CORPUS JURIS CIVILIS.
 In Europe, in the late 18th cent., after the general
 adoption of CIVIL LAW by the continental countries,
 jurists asserted that similar codes were needed, and
 the parent modern European codification, the CODE
 NAPOLÉON, appeared (1804) and was followed by
 many others. The civil law code is an attempt to
 determine in advance what legal exigencies will
 arise and to furnish the means for meeting them.
 Basic legal principles (e.g., that contracts express the
 will of the parties) are worked out in systematic de-
 tail and great attention is given to consistency. The
 movement for codification, however, has been
 largely unsuccessful in countries where common
 law prevails, such as the United States, despite the
 argument that the principles of common law are
 sometimes uncertain and often contradict one an-
 other. Advocates of the common law assert that civil
 law makes possibly futile attempts to predict and
 control the course of developments. In the United
 States the term code is sometimes also applied to
 the statutes of a state or of the Federal government
 edited so as to eliminate duplication and inconsis-
 tencies and arranged under appropriate headings.
Code Civil: see CODE NAPOLÉON.

codeine (kō'dēn), alkaloid found in OPIUM. It is a
 NARCOTIC whose effects, though less potent, resem-
 ble those of MORPHINE. An effective cough suppres-
 sant, it is mainly used in cough medicines. Like oth-
 er narcotics, codeine is addictive. See DRUG
 ADDICTION AND DRUG ABUSE.

Code Napoleon (kōd napōlāōN') or **Code Civil**
 (sēvēl'), first modern CODE of France, promulgated
 by Napoleon I in 1804. The work of J. J. Cambacères
 and a commission of four appointed by Napoleon I
 in 1800 was important in making the final draft. The
 Code Napoleon embodied the private law of France
 (i.e., law regulating relations between individuals)
 and, as modified by amendments, it is still in force
 in that country. It is a revised form of the ROMAN
 LAW, i.e., the CIVIL LAW, which prevailed generally on
 the Continent. It shows, of course, many specific
 French modifications, some based on the GERMANIC
 LAW that had been in effect in N France. The code
 follows the Institutes of the Roman CORPUS JURIS CIVILIS
 in dividing civil law into personal status (e.g.,
 marriage), property (e.g., easements), and the ac-
 quisition of property (e.g., wills), and it may be re-
 garded as the first modern analogue to the Roman
 work. Not only was it applied by Napoleon to the
 territories under his control—N Italy, the Low Coun-
 tries, and some of the German states—but it exerted
 a strong influence on Spain (and ultimately on the
 Latin American countries) and on all European
 countries except England. It was the forerunner, in
 France and elsewhere, of codifications of the other
 branches of law, including civil procedure, com-
 mercial law, and criminal law. Quebec prov. and the
 state of Louisiana owe much of their law to the
 Code Napoleon. In addition to the Code Civil,
 Napoleon was responsible for four other codes: the
 Code of Civil Procedure (1807), Commercial Code
 (1808), Code of Criminal Procedure (1811), and the
 Penal Code (1811).

codling moth (kōd'ling), small moth, *Carpocapsa*
pomonella, whose larva is the destructive apple
 worm. Of European origin, it is now found where-
 ever apples are grown. The adult moth is gray with
 brown markings and has a wingspan of about ¾ in

(18 cm). The ¾-in larva is pinkish, with a brown
 head. There are several generations a year; the early
 eggs are deposited on leaves and the later ones di-
 rectly on the developing fruit. The larvae feed inside
 the fruit and pupate (see INSECT) on the bark of the
 tree. Apple worms also attack pears, quinces, and
 English walnuts. The codling moth is classified in
 the phylum ARTHROPODA, class Insecta, order Lepi-
 doptera, family Olethreutidae.

cod-liver oil, yellowish oil obtained from the liver
 of the codfish. The oil is rich in vitamin A and vi-
 tamin D (calciferol). It was long used as a preventive
 and cure for RICKETS in Baltic and Scandinavian
 countries, where fish is a dietary staple. However, it
 was not until the 1920s that doctors in the U.S. fi-
 nally recognized its therapeutic usefulness. More
 palatable synthetic vitamins have largely replaced
 cod-liver oil as dietary supplements, and almost all
 the milk sold in the United States and Europe now
 contains added vitamins A and D. See VITAMIN.

codon* see NUCLEIC ACID

Codreanu, Corneliu Zelea (kōrnē'lyōō zēl'yā
 kōdrēā'nōō), 1899-1938, Romanian political leader
 and anti-Semitic terrorist. Active in the Romanian
 student movement against leftists and liberals, he
 founded (1927) and led the militant, fascist IRON
 GUARD until his conviction for treason in 1938. He
 shot and killed the prefect of Iași in 1924 and insti-
 gated the murder of Premier Ion Duca in 1933. Both
 times he was acquitted. Shortly after his imprison-
 ment in 1938, he and 13 of his followers were killed,
 allegedly while trying to escape.

Codrington, Sir Edward (kōd'rīngtən), 1770-1851,
 British admiral. He held various commands in the
 French Revolutionary and Napoleonic wars, taking
 part in the battle of Trafalgar (1805) and serving
 (1810-13) in the Mediterranean. He commanded the
 combined British, French, and Russian fleet that in
 1827 destroyed the Turkish and Egyptian fleets in the
 battle of NAVARINO.

Cody, William Frederick: see BUFFALO BILL

Cody (kō'dē), city (1970 pop. 5,161), seat of Park co.,
 NW Wyo., on the Shoshone River in a sheep, cattle,
 and irrigated farm area, founded and inc. 1901 by
 William F. Cody (Buffalo Bill). It is a tourist resort at
 the eastern entrance to Yellowstone National Park,
 with dude ranches and a colorful old frontier town
 flavor. Oil from the Big Horn Basin is refined there.
 Cody is headquarters for the Shoshone National
 Forest. Of interest are the Buffalo Bill Historical
 Center, containing Cody memorabilia, the Whitney
 Gallery of Western Art, housing a notable collection
 of art of the Old West, and an annual rodeo. Sho-
 shone Canyon and the Shoshone project are nearby.

Coe College, at Cedar Rapids, Iowa, United Presby-
 terian, coeducational, founded 1851 as Cedar Rap-
 ids Collegiate Institute, chartered 1881 under its
 present name.

coeducation, instruction of both sexes in the same
 institution. The economic benefits gained from joint
 classes and the increasing participation of women
 in industrial, professional, and political activities
 have influenced the spread of coeducation. There
 were scattered examples of coeducation in the late
 17th cent. in Scotland and in the American Colo-
 nies, but there was no general trend until the great
 expansion of public education between 1830 and
 1845 in the developing W. United States. The dis-
 tance between schools in that region and the small
 number of pupils caused elementary schools to ad-
 mit girls. The movement spread naturally to the se-
 condary schools during the reorganization of public
 education after the Civil War. Oberlin College gave
 degrees to both men and women as early as 1837,
 but it was the development of state universities dur-
 ing the post-Civil War era that standardized col-
 legiate coeducation. During the late 1960s a number
 of formerly all-male and all-female colleges, includ-
 ing in 1969 Yale, Princeton, and Vassar, became co-
 educational. See Thomas Woody, *A History of
 Women's Education in the United States* (4th ed.
 1929, repr. 1966).

Coehorn, Menno van (mē'nō vān kōō'hōrn),
 1641-1704, Dutch military engineer and nobleman.
 He invented a portable bronze siege mortar called
 the cohorn. He was considered in his day a rival of
 Vauban in the construction of fortresses. He served
 (1702-3) in the army of the duke of Marlborough in
 the War of the Spanish Succession. The name also
 appears as Coehorn or Cohorn.

coelacanth: see LOBEFIN FISH

Coelenterata (silēn'tarā'tā), another name for the
 phylum CNIDARIA.

Coele-Syria: see BIQA AL

Coello, Claudio (klou'dyō kōā'lyō), c 1642–1693, Spanish baroque painter. As court painter to Charles II he decorated many churches and public buildings of Madrid. His most famous work is the monumental altarpiece for the sacristy of the Escorial, filled with portraits and allegorical figures.

coelom (sē'lām), fluid-filled body cavity, found in animals, which is lined by cells derived from MESODERM tissue in the EMBRYO, and which provides for free, lubricated motion of the viscera. In animals of the phyla ANNELIDA, MOLLUSCA, and ARTHROPODA, the mesoderm forms as a mass of tissue from special embryonic cells between an outer layer, the ECTODERM, and an inner layer, the ENDODERM. The coelom then forms as a result of the splitting and hollowing out of the mesodermal mass. In animals of the phyla ECHINODERMATA and CHORDATA, the mesoderm arises as the lining of folds developing from the endoderm, and the spaces within these folds form the coelom. The structure of the embryonic coelom is relatively simple, in an adult other organs push into the coelomic cavity, and it is also subdivided into compartments, e.g., the pericardial cavity, in which the heart develops.

coendou (kōēn'dōō) see PORCUPINE

coenzyme, any one of a group of relatively small organic molecules required for the catalytic function of certain ENZYMES. A coenzyme may either be attached by covalent bonds to a particular enzyme, or exist freely in solution, but in either case it participates intimately in the chemical reactions catalyzed by the enzyme. Often a coenzyme is structurally altered in the course of these reactions, but it is always restored to its original form in subsequent reactions catalyzed by other enzyme systems. ADENOSINE TRIPHOSPHATE (ATP) is a coenzyme of vast importance in the transfer of chemical energy derived from biochemical oxidations. Other NUCLEOTIDES (formed from URACIL, CYTOSINE, GUANINE, and INOSINE) have also been found to act as coenzymes. For example, uridine triphosphate—a derivative of uracil—has been demonstrated to be of great importance in the metabolism of carbohydrates, as in the biosynthesis of glycogen and sucrose. Those coenzymes that have been found to be necessary in the diet are vitamins. One such compound, biotin, is a member of the B complex; it was first isolated in 1935 from dried egg yolk, and its structure was established in 1942. Biotin is usually found attached to a lysine residue in certain enzymes, where it participates in reactions involving the transfer of carboxyl ($-COOH$) groups, one such reaction is essential for the synthesis of fatty acids. Another group of coenzymes is the cobalamin family, one member, cyanocobalamin (vitamin B₁₂), is known to be essential in the diet, although its role in metabolism remains obscure. Closely related cobalamins seem to be involved in the biosynthesis of methionine and methane. The complicated cyanocobalamin molecule was reported in 1973 to have been synthesized; it was first isolated from liver some 25 years prior to that date. Coenzyme A has been shown to participate in a variety of biochemical reactions, all involving acyl groups such as the acetyl unit, it is, for instance, associated with the pivotal first step of the Krebs cycle (see CITRIC ACID CYCLE) in which an acetyl unit (the breakdown product of carbohydrates) is introduced into the cycle to be converted eventually into carbon dioxide, water, and chemical energy. Coenzyme A is derived from adenine, ribose, and pantothenic acid (a vitamin of the B complex). The two flavin coenzymes, riboflavin mononucleotide (FMN) and flavin adenine dinucleotide (FAD), occur universally in living organisms and play important roles in biochemical oxidations and reductions. They are usually found tightly bound to certain enzymes (flavoproteins) and are derived from riboflavin (vitamin B₂). Glutathione, a tripeptide consisting of residues of glutamic acid, cysteine, and glycine, is known to act as a coenzyme in a few enzymatic reactions, but its importance may lie in its role as a nonspecific reducing agent within the cell. It is hypothesized that glutathione serves to maintain the biological activity of certain proteins by keeping selected cysteine sidechains in the reduced thiol form, thereby not allowing these residues to oxidize and cross-link with one another to form cystine residues (unnecessary cross-links often result in distortions of protein structure). Heme, a complicated molecule containing iron in the ferrous state, serves as a coenzyme in a variety of biochemical processes. It forms an essential part of the structure of HEMOGLOBIN and participates intimately in the uptake and release of oxygen by this protein. (In this case the use of the word "coenzyme" may be

inappropriate in that often hemoglobin is not considered to be an enzyme, since it does not catalyze a chemical reaction.) Heme is an important part of the CYTOCHROMES, enzymes that catalyze the biochemical oxidations and reductions involved in the production of chemical energy in the form of ATP, and heme is also associated with the various enzymes that catalyze the cleavage of peroxides. Lipoic acid seems to be involved in the removal of carboxyl groups from α -keto acids and in the transfer of the remaining acyl groups to various acceptors. Lipoic acid in fact transfers the acetyl group of pyruvic acid to coenzyme A. Like biotin, lipoic acid is commonly found attached to lysine residues within certain enzymes. It was first reported to have been purified and isolated in crystalline form in 1953. The nicotinamide nucleotides were the first coenzymes to be detected (1904) in extracts of a living organism. Nicotinamide adenine dinucleotide (NAD) and nicotinamide adenine dinucleotide phosphate (NADP) are derived from adenine, ribose, and nicotinic acid, or niacin (a vitamin of the B complex) and are important intermediates in the biochemical oxidations and reductions that provide chemical energy within the cell. Both NAD and NADP can be reduced by accepting a hydride ion (H^- , a proton with two electrons) from an appropriate donor, the resulting NADH and NADPH can then be oxidized back to their original states by transferring their hydride ions to various acceptors. In this fashion electron pairs (and protons) are shuttled about in the cell from high energy donors to lower energy acceptors. As a general rule, NADPH donates its hydride ions to biosynthetic processes, such as the fixing of carbon dioxide to make carbohydrates during the dark reaction of photosynthesis. NADH, on the other hand, donates its hydride ions to systems such as the cytochromes, which eventually donate them to oxygen to make (with the addition of a proton) water, producing chemical energy in the form of ATP as a by-product, the process is not yet completely understood. Pyridoxal phosphate is a coenzyme that is essential for many enzymatic reactions, almost all of which are associated with amino acid metabolism, it is, for example, involved in the synthesis of tryptophan, a derivative of pyridoxine (another vitamin of the B complex). The coenzyme tetrahydrofolic acid is derived in humans from the B-complex vitamin folic acid. This coenzyme and its close relatives participate in the transfer of various carbon fragments from one molecule to another, they are, for instance, involved in the synthesis of methionine and thymine. Thiamine pyrophosphate is derived from another B-complex vitamin, thiamine. This coenzyme often plays a role in the removal of carboxyl ($-COOH$) groups from organic acids, releasing the carbon and oxygen atoms as carbon dioxide (CO_2). This coenzyme, for example, helps to remove a carboxyl group from pyruvic acid, leaving behind an acetyl group, which it donates to lipoic acid, the lipoic acid then transfers the acetyl group to coenzyme A, which finally inserts it into the beginning of the Krebs cycle. This important three-step enzymatic process requires the participation of three coenzymes, hundreds of other biochemical reactions require coenzymes as well, and this serves to explain the great significance of those molecules in the functioning of living organisms. In the case of human beings, it also serves to explain the importance of proper dietary intake of vitamins, which provide the only source of certain "building blocks" for several of these coenzymes. See VITAMIN.

coercion, in law, the unlawful act of compelling a person to do, or to abstain from doing, something by depriving him of the exercise of his free will, particularly by use or threat of physical or moral force. In many states of the United States, statutes declare a person guilty of a misdemeanor if he, by violence or injury to another's person, family, or property, or by depriving him of his clothing or any tool or implement, or by intimidating him with THREAT of force, compels that other to perform some act that the other is not legally bound to perform. Coercion may involve other crimes, such as ASSAULT. In the law of contracts, the use of unfair persuasion to procure an agreement is known as DURESS, such a contract is void unless later ratified. At common law, one who commits a crime under coercion may be excused if he can show that the danger of death or great bodily harm was present and imminent. However, coercion is not a defense for the murder or attempted murder of an innocent third party.

Cœur, Jacques (zhak kōr), c 1395–1456, French merchant prince and adviser of King Charles VII, who

made him chief of finances and sent him on important diplomatic missions. His reforms restored order to the confused financial situation brought about by the Hundred Years War. Cœur established French trade in the Levant, employed agents throughout the Orient, owned factories and mines in France and abroad, and rivaled the great Italian merchant republics. Through his monopolies he amassed a fabulous fortune, but he spent a large part of it to finance the campaigns that ultimately drove the English from France. In 1451 he was arrested on the charge, concocted by his debtors and enemies, of having poisoned Agnes SORÉL. He was sentenced (1453), after an unfair trial, to imprisonment and a fine of several million francs. In 1454–55 he escaped to Rome. He died in Chios while leading a papal fleet against the Turks. His house in Bourges, which still stands, is one of the finest examples of secular medieval architecture. See A. B. Kerr, *Jacques Cœur* (1927).

Cœur d'Alene (kūrdālān'), city (1970 pop. 16,228), seat of Kootenai co., N Idaho, near the Wash. line, inc. 1907. It is a tourist and lumbering center situated on Cœur d'Alene Lake W of the Cœur d'Alene Mts.—the gateway to a beautiful summer and winter resort area. The city has numerous lumber mills, grass seed farms, and plants making electronic items and prefabricated homes. Fort Cœur d'Alene (later Fort Sherman) was established there in 1876. The city (named after a tribe of Indians that inhabited the area) grew around the fort after the discovery (1883) of the fabulously rich silver, lead, and zinc lodes and after the mining boom of 1884. For the tumultuous early history of the city, see WESTERN FEDERATION OF MINERS. The city is the headquarters of Cœur d'Alene National Forest and the seat of a junior college.

Cœur d'Alene Indians, North American Indians whose language belongs to the Salishan branch of the Algonquian-Wakashan linguistic stock (see AMERICAN INDIAN LANGUAGES). They occupied N Idaho and were also called the Skitswish. Long known as a peaceful group, the Cœur d'Alene were placed on reservations after an encounter with U.S. forces in 1858; they now number some 500 on a reservation in Idaho.

Cœur de Lion see RICHARD I, king of England

coffee, a tree, its seeds, and the beverage made from them. The Arabian coffee tree (*Coffea arabica*) is an evergreen shrub or small tree of the family Rubiaceae (Madder family). It is believed to be native to Ethiopia but was introduced into Arabia, probably during the 15th cent. Borne in the axils of the smooth, ovate leaves are clusters of fragrant white flowers that mature into deep red fruits about $\frac{1}{2}$ in (1.27 cm) long. The fruit, sometimes called a cherry, is a drupe, and usually contains two seeds, the coffee beans. Sometimes only one seed develops, the fruit is then called a peaberry. Varieties of Arabian coffee have long provided the bulk of the world's supply. Coffee requires a hot, moist climate with a rainfall of at least 50 in (127 cm) and a rich soil; it thrives on well-drained slopes, particularly where the soil is of volcanic origin. It can be grown from sea level to c. 6,000 ft (1,830 m). The better grades are generally produced above 1,500 ft (460 m). Frost is injurious. The plants are propagated from seed. Other taller vegetation is usually planted to control the amount of sunlight reaching the coffee trees and to protect them from the elements. A coffee tree produces its maximum yield sometime between the 5th and the 10th year and continues to bear for about the next 30 years. Other species of some commercial importance are Liberian coffee (*C. liberica*) and Congo coffee (*C. robusta*). Wide variations in production and demand have caused frequent surpluses disastrous to planters, laborers, and the national economy of producing countries. Experiments designed to employ the surplus for industrial purposes have shown the possibility of making such coffee derivatives as cattle fodder, alcohol, fusel oil, caffeine, and glycerin. A coffee quota agreement (1940), administered by the Inter-American Coffee Board (1941), attempts to stabilize the market by allocating the U.S. importation of coffee from Latin America. A considerable quantity of coffee is exported as parchment coffee (seeds within the husk-like covering, from which the outer pulp has been removed) to be finally cleaned and roasted at points of distribution. Heat acts upon the essential oils, developing the aroma and flavor. Roasts range from light brown to the very dark, almost charred, Italian roast. A wide variety of machines and theories for making coffee all aim to preserve the aroma. Whatever the method used, the prime requirements are

properly roasted, freshly ground coffee, freshly boiling water, and absolute cleanliness of utensils, as coffee is easily contaminated by foreign odors "Turkish" coffee, finely powdered and heavily sweetened, is drunk unfiltered by most Eastern peoples. Westerners favor clear coffee. The French use for breakfast café au lait, coffee combined with scalded milk. The unique mocha from the Yemen region of Arabia and some Sumatra, Java, and Colombian coffees are prized by connoisseurs. Various adulterants, including CHICORY, carrots, parsnips, iris root, beans, rice, and cereals, roasted and ground, may usually be detected by soaking in cold water, which is not discolored by genuine coffee beans. Opinion has differed as to the value of coffee. It has become a popular beverage because of its aroma and the exhilarating and fatigue-allaying properties of its CAFFEINE constituent, to which is attributed a medicinal value in cases of shock, pneumonia, and poisoning. Taken in excess it may cause irritability, depression, and indigestion. The early history of coffee is shrouded in legend. Known in Ethiopia before A.D. 1000, it is believed to have been used first as a food, a ball of the crushed fruit molded with fat was a day's ration for certain African nomads. Later, wine was made from the fermented husks and pulps. Coffee made from the ground and roasted beans was used in Arabia by the 15th cent and spread to Egypt and Turkey. Despite early suppression on religious and political grounds, it rapidly became a universal beverage of Arabs. At first opposed by Italian churchmen as an infidel drink, it was Christianized by Pope Clement VIII and by the mid-17th cent it had reached most of Europe. Although introduced in North America c. 1668, coffee took first place as the staple American beverage only after tea had met with popular disapproval following the Boston Tea Party. The production of instant coffee, experimented with as early as 1838, was started (1867) by Gail Borden in Illinois. It became increasingly popular after World War II. Coffee is classified in the division MAGNOLIOPHYTES, class Magnoliopsida, order Rubiales, family Rubiaceae. See W. H. Ukers, *All about Coffee* (2d ed. 1938). Coffeehouses dispensed coffee before it was made in the home in Arab countries and in Europe and America and were known as centers for gossip, gambling, and literary and political discussions. Periodically government restrictions were imposed in the belief that coffeehouses were meeting places of political malcontents. Will's Coffee House in London was famous as a resort of wits and poets. Johnson, Addison, Steele, Sheridan, Dryden, Swift, Goldsmith, Hogarth, and other notables were the centers of coteries in the houses they frequented. In France also the spread of the coffeehouse was rapid and influenced the development of literature and of the stage.

coffee tree, *Kentucky*, common name for the plant species *Gymnocladus dioica*, a tree of the family Leguminosae (PUSE family). The seeds of the woody pods have been used as a substitute for coffee.

cofferdam, temporary barrier for excluding water from an area that is normally submerged. Made commonly of wood, steel, or concrete sheet piling (see PILE), cofferdams are used in constructing the foundations of dams, bridges, and similar subaqueous structures and for temporary drydocks. If double sheeting is utilized, the space between the sheets is usually filled with clay and gravel. When great strain or pressure is likely to be encountered, as in deep water, the pneumatic CAISSON is preferred to the cofferdam. See Lazarus White and E. A. Prentiss, *Cofferdams* (2d ed. 1956).

Coffeyville, city (1970 pop. 15,116), Montgomery co., SE Kansas, on the Verdigris River near the Oklahoma line, in a farm and oil area, inc. 1872. It is a trading and distributing center, with oil refineries and plants producing foundry and machine-shop products, inorganic chemicals, power transmission equipment, and milk and dairy items. With the coming of the railroad (1870), Coffeyville grew as a cattle-shipping point. Oil and natural gas were discovered in the area in 1902. The city was the scene (1892) of a famous shoot-out with the notorious Dalton gang during an attempted bank robbery. Of interest are the Dalton graves and the Dalton Museum. A junior college is there.

Coffin, Henry Sloane, 1877-1954, American Presbyterian clergyman, b. New York City. He was pastor of the Madison Ave. Presbyterian Church in New York City (1905-26), lecturer (1904-9), associate professor of pastoral theology (1909-26), and president (1926-45) of Union Theological Seminary. He was moderator (1943-44) of the General Assembly of the

Presbyterian Church in the U.S.A. His works include *The Meaning of the Cross* (1931), *God's Turn* (1934), *Religion Yesterday and Today* (1940), *God Confronts Man in History* (1947), and *Communion through Preaching* (1952). See biography by M. P. Noyes (1964).

Coffin, Levi, 1798-1877, American abolitionist, b. North Carolina. In 1826 he moved to the Quaker settlement of Newport (now Fountain City), Ind., where he kept a store until 1847. His home became a leading station of the UNDERGROUND RAILROAD, of which he was styled "president." See his *Reminiscences* (3d ed. 1898, repr. 1968).

coffin, closed receptacle for a corpse. Its purpose is usually to protect and to aid preservation of the body, although in the past some have believed that it may confine the spirit of the deceased. Bark, skins, and mats were commonly used in primitive societies to wrap the body prior to burial. Peoples living near rivers or oceans often buried their dead in canoes, and hollowed oak coffins have been found in the Bronze Age BARROW. The Chaldeans and the early Greeks enclosed a corpse in clay, sealing the coffin by firing it. The largest known stone coffins (see SARCOPHAGUS) are Egyptian. Wood and papier-mâché were also used in Egypt for mummy chests. Coffins lined with metal, usually lead, came into use in the Middle Ages. Most coffins used in the Western world today are made of elm or oak and are lined with bronze, copper, lead, or zinc.

Coggan, Donald (Frederick Donald Coggan), 1909-, English Protestant clergyman. Educated at Cambridge and ordained in 1934, Coggan began his ministerial career as curate of a London working-class church. He held academic posts in Toronto and London before becoming bishop of Bradford (1956) and archbishop of York (1961). A critic of apartheid and advocate of greater official tolerance for homosexuals, Coggan was appointed in 1974 to succeed Michael Ramsey as archbishop of Canterbury.

Cognac (kōnyāk'), city (1968 pop. 22,062), Charente dept., W France, in Angoumois, on the Charente River. The French brandy to which Cognac gives its name has been manufactured and exported from the city since the 18th cent. The city was the birthplace of Francis I and was a Huguenot stronghold in the 16th cent.

Cogswell, Joseph Green, 1786-1871, American librarian and bibliographer, b. Ipswich, Mass. After studying abroad, Cogswell taught mineralogy and geology at Harvard and became librarian in 1821. In 1823 he helped to found the Round Hill School at Northampton, Mass. He superintended the Astor Library in New York City (now part of the New York Public Library) and was librarian from 1848 to 1861 and trustee to 1864. He prepared an alphabetical and analytic catalog for the library, which was printed at his own expense and was the basis for the later card catalog.

Cohan, George Michael (kōhān', kō'hān, kō'ān), 1878-1942, American showman, b. Providence, R.I. As a child he appeared in vaudeville as one of "The Four Cohans" with his father, mother, and sister, Josephine. He eventually wrote the act and was the business manager. *The Governor's Son* (1901) was his first attempt at Broadway. *Little Johnny Jones* (1904) was his first success. Cohan wrote the book, music, and lyrics for 20 musicals; he was the producer, director, and most often the star. His inimitable style set the pattern of fast-moving, flippant and gay musicals, his characters were often modeled after real persons. Such shows as *Forty-five Minutes from Broadway* (1906), *Broadway Jones* (1912), *Hello, Broadway* (1914), and *The Song and Dance Man* (1923), and such songs as "The Yankee Doodle Boy," "Give My Regards to Broadway," and "You're a Grand Old Flag" show his preoccupation with flag-waving patriotism. Through his long career he had only one partner, Sam H. HARRIS. In 1913, Cohan revolutionized the mystery farce with his dramatization of Earl Derr Biggers' novel *Seven Keys to Baldpate*. He was an excellent adapter and play doctor; he described his adaptations as "Cohanized." His song "Over There," written during World War I, is now a classic. As an actor he was noted for his debonair characterizations, his performances in *O'Neill's Ah, Wilderness!* (1934) and as the President in *I'd Rather Be Right* (1937) were particularly notable. He made his last public appearance in his own play *Return of the Vagabond* (1940). See his *Twenty Years on Broadway* (1925, repr. 1971), biography by Ward Morehouse (1943).

Cohen, Hermann, 1842-1918, German philosopher. He was a founder of the Neo-Kantian Marburg

school and was known for his commentaries on Kant. His own works include *Logik der reinen Erkenntnis* (1902), *Ethik des reinen Willens* (1904), and *Aesthetik des Gefühls* (1912). See *Reason and Hope: Selections from the Jewish Writings of Hermann Cohen* (tr. Eva Jospe, 1971).

Cohen, Morris Raphael, 1880-1947, American philosopher, b. Minsk, Russia, grad. College of the City of New York, 1900, Ph.D. Harvard, 1906. He emigrated to the United States in 1892. At first an instructor in mathematics at the College of the City of New York, Cohen transferred to the department of philosophy, where he taught from 1912 until 1938, becoming famous for his use of Socratic irony. He then taught at the Univ. of Chicago until 1942. His influence, through his students and his books, has been far-reaching, and he is considered one of the most important American philosophers since William James. Cohen's most important books are *Reason and Nature* (1931, rev. ed. 1953) and *Law and the Social Order* (1933). Other works include *A Preface to Logic* (1944), *The Faith of a Liberal* (1945), and *American Thought: A Critical Sketch* (1954). See his autobiography, *A Dreamer's Journey* (1949), biography by L. C. Rosenfield (1962), study by C. F. Delaney (1969).

cohesion: see ADHESION AND COHESION

Cohn, Ferdinand (fēr'dēnānt kōn), 1828-98, German botanist. He is considered a founder of the science of bacteriology. From his early studies of microscopic life he developed theories of the bacterial causes of infectious disease and recognized bacteria as plants. He aided Robert Koch in preparing Koch's famous work on anthrax. Cohn's writings cover such diverse subjects as fungi, algae, insect epidemics, and plant diseases.

Cohnheim, Julius (yōō'lyōōs kōn'hīm), 1839-1884, German experimental histologist and pathologist. In a relatively brief life Cohnheim made a series of remarkable contributions to the rapidly developing science of pathology. In 1863 he completed important studies on the sugar-forming ferments of the salivary glands and pancreas. Subsequently, he joined Rudolf Virchow at the Pathological Institute in Berlin. Perhaps his most impressive study resulted in the final clarification of the mechanisms of inflammation and suppuration; he demonstrated the migration of leukocytes through blood-vessel walls, thus destroying Virchow's contention that no such passage, or diapedesis, takes place. He also studied venous thrombosis, the embryonic-rest theory of neoplasm formation, atypical leukemias, and experimental tuberculosis.

Cohoes (kəhōz'), city (1970 pop. 18,613), Albany co., N.Y., near Albany, at the confluence of the Mohawk and Hudson rivers, settled by the Dutch 1665, inc. 1869. Its manufactures include textiles (made there since 1840), knitted goods, paper products, boats, and electrical appliances. The world's first power-operated knitting mill was opened there in 1832. The Van Schaick Mansion (1735), built by the son of Cohoes's first settler, was used as headquarters by Gen. Horatio Gates during the Revolutionary War.

cohosh (kōhōsh'), name for several plants, among them BANEERRY and a species of BUGBANE, both of the family Ranunculaceae (BUTTERCUP family), and blue cohosh, a member of the family Berberidaceae (BARBERRY family). Both families are classified in the division MAGNOLIOPHYTES, class Magnoliopsida, order Ranunculales.

coiffure: see HAIRDRESSING

coil: see INDUCTOR, SOLENOID

Coimbatore (kwīm'bātōr'), town (1971 pop. 353,469), Tamil Nadu state, SE India. Commanding the approach to the Palghat Gap, the major pass through the Western Ghats, it was important in the wars of Haidar Ali and Tipu Sultan. The British obtained undisputed possession of Coimbatore in 1799. The town is now a district administrative center and a junction of rail lines linking the east and west coasts of India. Glassware, fertilizer, electrical goods, cement, and synthetic gems are produced. Coimbatore is also a market for tea, cotton, cardamom, cinchona, and teak.

Coimbra (kōēm'brā), city (1970 municipal pop. 108,046), capital of Coimbra dist., W central Portugal, on the Mondego River, in Beira Litoral. The old capital of Beira, it is a market center with small industries but is known chiefly for its history and for the famous university, which was founded (1292) by King Diniz in Lisbon but was moved temporarily to Coimbra in 1308 and permanently in 1540. Coimbra, then known as Conimbriga, was an important town

in Roman days It continued to flourish down through Moorish times and after its Christian recovery (1047) by Ferdinand I of Leon It became the capital of Alfonso I, first king of Portugal, and continued as an important royal residence after the capital was transferred to Lisbon in the 13th cent There is a fine 12th-century cathedral Ines de Castro was murdered there (1355)

coin, piece of metal, usually a disk of gold, silver, nickel, bronze, copper, or a combination of such metals, stamped by authority of a government as a guarantee of its value and used as MONEY Coinage was probably invented independently in Lydia or in the Aegean Islands and in China before 700 B C and in India in the 4th cent B C The earliest known example is an electrum coin (c 700 B C) of Lydia Roman coinage dates from about the 4th cent B C The first coins struck in the American colonies were issued by the Massachusetts Bay colony The first U S MINT was established in 1792 Mottoes used on many U S coins are "E Pluribus Unum" (1795) and "In God We Trust" (1864) Early coins were die-struck by hand and showed many individual variations Standardized coins date from the use (in the 17th cent) of a mill and screw machine (invented c 1561) Coins are usually stamped from rolled metal blanks, are milled, and have a design impressed upon them between the upper and lower dies of a coining press Milled or lettered edges have been used since the 17th cent to discourage the removal of slivers of metal, especially from gold or silver coins No American gold coins have circulated since 1934, when the United States abandoned the domestic gold standard Starting in 1965, the U S Treasury ceased to put silver in all newly minted dimes and quarters Previously, both coins had contained large amounts of silver At the same time, the silver content of the half-dollar was reduced from 90% to 40% See also NUMISMATICS

Cointreau: see CURAÇAO, liqueur

Cojutepeque (kōhōōtāpā'kā), city (1968 est pop 13,000), central El Salvador It is north of a volcano of the same name and is on the Inter-American Highway The city is a commercial and processing center for agricultural produce

Coke, Sir Edward (kōōk), 1552-1634, English jurist, one of the most eminent in the history of English law He entered Parliament in 1589 and rose rapidly, becoming solicitor general and speaker of the House of Commons In 1593 he was made attorney general His rival for that office was Sir Francis Bacon, thereafter one of Coke's bitterest enemies He earned a reputation as a severe prosecutor, notably at the trial of Sir Walter Raleigh, and held a favorable position at the court of King James I In 1606 he became chief justice of the common pleas In this position (after 1613), and as chief justice of the king's bench, Coke became the champion of common law against the encroachments of the royal prerogative and declared null and void royal proclamations that were contrary to law Although his historical arguments were frequently based on false interpretations of early documents, as in the case of the Magna Carta, his reasoning was brilliant and his conclusions impressive His constant collisions with the king and the numerous enemies he developed—especially that with Thomas Egerton, Baron ELLESMERE, the chancellor—brought about his fall Bacon was one of the foremost figures in engineering his dismissal in 1616 By personal and political influence, Coke got himself back on the privy council and was elected (1620) to Parliament, where he became a leader of the popular faction in opposition to James I and Charles I He was prominent in the drafting of the Petition of Right (1628) His most important writings are the Reports, a series of detailed commentaries on cases in common law, and the Institutes, which includes his commentary on Littleton's Tenures See W H Lyon and Herman Block, *Edward Coke* (1929), C D Bowen, *The Lion and the Throne* (1957)

Coke, Thomas (kōōk, kōk), 1747-1814, English clergyman and early bishop of the Methodist Episcopal Church in America After taking orders (1777) in the Church of England, he openly allied himself with the Methodists He was president of the Irish conference in 1782 and two years later was ordained as superintendent for America by John WESLEY When Coke was styled bishop shortly after the American conference of 1784, the change was not approved by Wesley Coke visited America nine times, the last time in 1803 Always deeply interested in Methodist missionary work, he sought (1813) an appointment by the government as bishop of India, agreeing to return to the Established Church As the request was

not granted, he himself secured funds for a Methodist mission, but died on the way to Ceylon See biographies by W A Candler (1923) and J A Vickers (1969)

Coke, Thomas William (kōōk), 1754-1842, English agricultural reformer, known as Coke of Holkham He improved breeds of cattle, sheep, and hogs on his country estate and greatly promoted improved methods of breeding and husbandry He was a member of Parliament for more than 50 years and in 1837 was made earl of Leicester

coke, hard, gray, massive, porous fuel prepared by the destructive DISTILLATION of bituminous COAL, much used when a porous fuel with few impurities and high carbon content is desired, as in the BLAST FURNACE Coke bears the same relation to coal as does charcoal to wood The preparation of coke in beehive ovens results in the loss of volatile by-products Only a small amount is still made by this method For industrial purposes, coke is prepared in retorts or furnaces of silica brick, and the by-products (chiefly ammonia, coal tar, and gaseous compounds) are saved Petroleum coke is the solid residue left by the cracking process of oil refining Natural coke, or carbonite, is formed by METAMORPHISM from bituminous coal when intrusive igneous rock cuts across a vein of coal

cola or **kola**, tropical tree (genus *Cola*) of the family Sterculiaceae (STERCULIA family), native to Africa but now grown in other tropical regions The fruit is a pod containing seeds from which is obtained CAFFEINE, an essential oil Cola nuts are chewed as a stimulant by the native population and are exported for commercial use in soft drinks and medicines Colas are classified in the division MAGNOLIOPHYTES, class Magnoliopsida, family Sterculiaceae

Colatina (kōōlatē'na), city (1970 pop 105,157), Espírito Santo state, E central Brazil, on the Doce River The state's chief agricultural center, Colatina is one of the leading coffee producers of Brazil

Colbert, Charles: see CROISSY CHARLES COLBERT, MARQUIS DE

Colbert, Claudette (klōdēt' kōlbēr'), 1905-, American movie actress, b Paris, France, her original name was Claudette Chauchoin Distinguished by her rosy cheeks, hearty laugh, and curly bangs, Colbert is particularly adept at sophisticated comedy Her films include *It Happened One Night* (1934), *Private Worlds* (1935), *Since You Went Away* (1944), and *Parrish* (1961) She has often appeared on the stage

Colbert, Jean Baptiste (zhaN batēst'), 1619-83, French statesman The son of a draper, he was trained in business and was hired by Cardinal MAZARIN to look after his financial affairs On his deathbed, Mazarin recommended Colbert to King Louis XIV, who made him comptroller general of finances (1665) Colbert helped to procure the downfall of the superintendent of finances, Nicolas FOUQUET, for mismanagement As Louis XIV's minister, Colbert scaled down the public debt by repudiating some obligations and reducing the value of others and set up a system of accounts in order to keep the government within its income His efforts to make taxes more equal had little success in the face of localism and tradition Colbert's aim was to make France economically self-sufficient One of the most successful practitioners of MERCANTILISM, he encouraged the growth of industry through subsidies and tariff protection, rigidly regulated the qualities and prices of manufactured and agricultural products, tried to break down trade barriers within France, initiated a vigorous road-building program, and restricted the use of natural resources In 1669 he was made secretary of state for naval affairs He constructed shipyards, arsenals, and harbors, among them Brest and Rochefort, and began the construction of a large navy as a first step in the development of commerce and colonization Colbert contributed significantly to the splendor of Louis XIV's reign by patronizing the arts and sciences He founded the Academy of Sciences and the Paris Observatory and promoted the French Academy His efforts at economy were soon menaced by the extravagance of the king, and the opening of Louis XIV's wars began the decline of Colbert's power and the ascendancy of the marquis de LOUVOIS It was Colbert's commercial policy, however, that, by challenging Dutch commercial strength, contributed to the DUTCH WAR of 1672-78 To meet military expenses, Colbert was obliged to resort to increased taxation, the sale of offices, borrowing, and the anticipation of future revenues His new taxes caused serious disturbances Despite his unpopularity at the time of his death, Colbert was

later ranked among the greatest of French statesmen See E C Lodge, *Sully, Colbert and Turgot* (1931, repr 1970), C W Cole, *Colbert and a Century of French Mercantilism* (1939)

Colborne, John: see SEATON, JOHN COLBORNE, 1ST BARON

Colby, Bainbridge, 1869-1950, U S lawyer and public official, b St Louis Upon graduation (1891) from Columbia law school, he began law practice in New York City and became active in Republican politics He left the party with Theodore Roosevelt (1912) to found the National Progressive party During World War I he served on the U S Shipping Board and he became (March, 1920) Secretary of State in President Wilson's cabinet He became a close confidant of Wilson, with whom he practiced law (1921-22) after Wilson's term of office ended See his *Close of the Wilson Administration and the Final Years* (1930)

Colby College, at Waterville, Maine, coeducational, est 1813, opened 1818 The school, principally a liberal arts college, adopted its present name in 1899 Its library includes the papers of Edwin Arlington Robinson

Colchester (kōl'chēstər, -chēs'tər), municipal borough (1971 pop 76,145), Essex, SE England, on the Colne River It is a grain and cattle market The oyster fisheries of the Colne are important, an annual event is the October oyster feast Other industries are flour milling, malting, and the making of boilers, gas engines, shoes, and farm machinery Colchester was one of the great cities of pre-Roman Britain, the capital of the ruler Cunobelin (Shakespeare's Cymbeline) It became an important Roman colony and was the particular object of attack (A D 61) by Boadicea To the Anglo-Saxons the place was known as Colneceaster The WITENAGEMOT met there in 931 During the ENGLISH CIVIL WAR the town was taken (1648) after a long siege by parliamentarians under Baron Fairfax of Cameron Of interest are the Roman walls (more completely preserved than elsewhere in England) and the massive Norman castle, part of which houses a museum of Roman antiquities Colchester has a military base

colchicine (kōl'chēsēn'), alkaloid extracted from plants of the genus *Colchicum* and especially from the corms of the autumn crocus, *Colchicum autumnale* (see MEADOW SAFFRON) The metabolic effect of colchicine is not known, but it is thought that it may decrease production of lactic acid and prevent accumulation of uric acid crystals in the body, making it useful in the treatment of gout Colchicine and derivatives such as demecolcine inhibit MITOSIS, or cell division As a mitotic poison, it inhibits rapidly proliferating cells and has been used in cancer therapy and as an IMMUNOSUPPRESSIVE DRUG Colchicine has also been used to visualize chromosomes photomicrographically and to induce mutations experimentally

Colchis (kōl'kīs), ancient country on the eastern shore of the Black Sea and in the Caucasus region Centered about the fertile valley of the Phasis River (the modern Rion), Colchis corresponds to the present-day region of Mingrelia in the Georgian SSR In Greek legend it was the home of Aeetes and Medea, the land where the Golden Fleece was sought by JASON and the Argonauts Greek trading posts were established in Colchis, but the land remained independent until conquered (c 100 B C) and held briefly by Mithradates VI of Pontus After the time of Trajan to the end of the Roman Empire, Rome exerted considerable influence on the region

cold, common, catarrhal infection of the upper respiratory tract sometimes confined to the mucous membrane of the nose, at other times involving that of the throat and larynx as well The cold is the most common human ailment, most Americans suffer from one to three colds per year, children from the ages of one to five being the most susceptible group Although the incidence of colds is higher in winter, exposure to chilling or dampness is considered to be of little significance Colds are frequently accompanied by fever and usually general discomfort The causative agent may be one of 50 to 60 viruses, called rhinoviruses, to which, it seems, almost no one is immune The congested and discharging mucous membrane may become a fertile ground for a secondary bacterial invasion that may spread to the bronchi and lungs or to the ears, sinuses, or mastoid processes There is as yet no known cure or preventive for the common cold, although some are of the opinion that large doses of VITAMINS, especially vitamin C, may be helpful preventives Treatment involves adequate intake of fluids to prevent dehydration and aspirin to relieve pain and fever When necessary, nasal sprays are

used to shrink swollen membranes and syrups to treat severe coughs. Antibiotics are used only in treatment and prevention of secondary bacterial infection. Uncomplicated infections usually last from three to ten days.

Colden, Cadwallader (kōl'dən), 1688–1776, colonial scholar and political leader of New York, b. Ireland, of Scottish parents. After studying medicine in London, Colden arrived (1710) in Philadelphia to practice. He moved (1718) to New York, where he was appointed (1720) surveyor general. He was named (1721) to the governor's council and became increasingly influential during the administration of George Clinton (1686–1761), the colonial governor, whose official papers and addresses Colden in large part prepared. After 1761 he was lieutenant governor of New York, and he became more and more unpopular among the radicals opposed to the British measures. In his 55 years of active public life, Colden was able to make himself one of the most learned men in the colonies. He studied Newton's principles and wrote his own critique, *The Principles of Action in Matter* (1751). He became a botanist of the new Linnaean system of classifying flora (as did his daughter, Jane Colden) and made significant contributions to the medical literature of the colonies. He also published his *History of the Five Indian Nations* (1727), a valuable source on the Iroquois tribes. His letter books (1877–78) and letters and papers (7 vol., 1918–23) were published by the New-York Historical Society. See biography by A. M. Keys (1906, repr. 1971).

cold frame, in horticulture, sun-heated board frame covered with a removable top of glass or other transparent material and sunk into the ground. The top may be solid or slatted or screened for shade. The cold frame is used to start seedlings in early spring (four to six weeks before the average frost-free date), to harden seedlings or plants removed from greenhouses or hotbeds, and to protect plants during the winter. A **HOTBED** is an artificially or naturally heated cold frame.

cold sore* see **HERPES SIMPLEX**

cold storage* see **REFRIGERATION**

Coldstream, burgh (1971 pop. 1,270), Berwickshire, SE Scotland, on the English border. General Monck raised troops there in 1660 for his march into England that resulted in the restoration of Charles II to the throne. The regiment became known as the Coldstream Guards, one of the regiments of guards of the royal household. Coldstream, like Gretna Green, was a marriage resort from 1754 to 1856. In 1975, Coldstream became part of the Borders region.

cold type, any method of preparing matter for PRINTING that employs a typewriter, a special keyboard machine, or photocomposition rather than the metal (hot type) used in letterpress composition. Reproduction is usually by a photographic process.

cold war, term used to describe the shifting struggle for power and prestige between the Western powers and the Communist bloc from the end of World War II until the early 1960s. Of worldwide proportions, the conflict was tacit in the ideological differences between COMMUNISM and capitalist DEMOCRACY. Mutual suspicion had long existed between the West and the USSR, and friction was sometimes manifest in the Grand Alliance during World War II. After the war the West felt threatened by the continued expansionist policy of the Soviet Union, and the traditional Russian fear of incursion from the West continued. Communists seized power in Eastern Europe with the support of the Red Army, the Russian occupation zones in Germany and Austria were sealed off by army patrols, and threats were directed against Turkey and Greece. Conflict sometimes grew intense in the UNITED NATIONS, which was at times incapacitated by the ramifications of the cold war, at others effective in dealing with immediate issues. In a famous speech (1946) at Fulton, Mo., Sir Winston Churchill warned of an implacable threat that lay behind a Communist "iron curtain." The United States, taking the lead against the expansion of Soviet influence, rallied the West with the Truman Doctrine, under which immediate aid was given to Turkey and Greece. Also fearing the rise of Communism in war-torn Western Europe, the United States inaugurated the European Recovery Program, known as the MARSHALL PLAN, which helped to restore prosperity and influenced the subsequent growth of the European Community. During the cold war the general policy of the West toward the Communist states was to contain them (i.e., keep them within their current borders) with the hope that internal division, failure, or evolution might end their threat. In 1948 the Soviet Union directly

challenged the West by instituting a blockade of the western sectors of Berlin, but the United States airlifted supplies into the city until the blockade was withdrawn (see **BERLIN AIRLIFT**). The challenges in Europe influenced the United States to reverse its traditional policy of avoiding permanent alliances, in 1949 the United States and 11 other nations signed the North Atlantic Treaty (NATO, see **NORTH ATLANTIC TREATY ORGANIZATION**). The Communist bloc subsequently formed (1955) the **WARSAW TREATY ORGANIZATION** as a counterbalance to NATO. Meanwhile, in Asia, the Communist cause gained great impetus when the Communists under MAO TSE-TUNG gained control of mainland China in 1949. The United States continued to support Nationalist China, with its headquarters on Taiwan. President Truman, fearing the appeal of Communism to the peoples of Asia, Africa, and Latin America, created the Point Four program, which was intended to help underdeveloped areas. Strife continued, however, and in 1950 Communist forces from North Korea attacked South Korea, precipitating the **KOREAN WAR**. Chinese Communist troops entered the conflict in large numbers, but were checked by UN forces, especially those of the United States. The focus of the cold war in Asia soon shifted to the southeast. China supported insurgent guerrillas in Vietnam, Laos, and Cambodia, the United States, on the other side, played a leading role in the formation of the **SOUTHEAST ASIA TREATY ORGANIZATION** and provided large-scale military aid, but guerrilla warfare continued. The newly emerging nations of Asia and Africa (see **AFRO-ASIAN BLOC**) soon became the scene of cold-war skirmishes, and the United States and the Soviet Union (and later China) competed for their allegiance, often through economic aid, however, many of these nations succeeded in remaining neutral. Hopes for rapprochement between the Soviet Union and the West had been raised by a relaxation in Soviet policy after the death (1953) of Joseph STALIN. Conferences held in that period seemed more amiable, and hopes were high for a permanent ban on nuclear weapons. However, the success of the Soviet artificial satellite Sputnik in 1957, attesting to Soviet technological know-how, introduced new international competition in space exploration and missile capability. Moreover, both Soviet Premier Nikita KHRUSHCHEV and U.S. Secretary of State John Foster Dulles grimly threatened "massive retaliation" for any aggression, and the Soviet Union's resumption (1961) of nuclear tests temporarily dashed disarmament hopes. While Khrushchev spoke of peaceful victory, extremists in both camps agitated for a more warlike course, even at the risk of nuclear catastrophe. China began to accuse the USSR of conciliatory policies toward the West, and by the early 1960s ideological differences between the two countries had become increasingly evident. The cold-war struggle continued in Southeast Asia, in the Middle East (see **CENTRAL TREATY ORGANIZATION**), in Africa (see **ZAIRE**), in Latin America (where the United States supported the **ALLIANCE FOR PROGRESS** to counter leftist appeal), and in Europe, where the East German government erected the **BERLIN WALL** in late 1961 to check the embarrassing flow of East Germans to the West. In 1962 a tense confrontation occurred between the United States and the Soviet Union after U.S. intelligence discovered the presence of Soviet missile installations in Cuba. Direct conflict was avoided, however, when Premier Khrushchev ordered ships carrying rockets to Cuba to turn around rather than meet U.S. vessels sent to intercept them (see **CUBAN MISSILE CRISIS**). It was obvious from this and other confrontations that neither major power would risk nuclear war. Meanwhile, during the late 1950s and early 60s both European alliance systems began to weaken somewhat, in the Western bloc, France began to explore closer relations with Eastern Europe and the possibility of withdrawing its forces from NATO. In the Soviet bloc, Rumania took the lead in departing from Soviet policy. U.S. involvement in the Vietnam War in Southeast Asia led to additional conflict with some of its European allies and diverted its attention from the cold war in Europe. All these factors combined to loosen the rigid pattern of international relationships that was responsible for the cold war, and it appeared to have ended. See D. F. Fleming, *The Cold War and Its Origins, 1917–1960* (1961), J. A. Lukacs, *A New History of the Cold War* (3d ed. 1966), T. W. Wilson, Jr., *Cold War and Common Sense* (1962), Gabriel Kolko, *The Politics of War* (1968), J. L. Gaddis, *The United States and the Origins of the Cold War, 1941–1947* (1972).

Coldwell, Major James William, 1888–1974, Canadian political leader, b. England. He went to Canada

in 1910 and became a school administrator in Regina, Sask. He was a leader of the province's Farmer-Labour party (1932–35) and helped to found the Co-operative Commonwealth Federation (CCF, see **NEW DEMOCRATIC PARTY**), a leftist party. As the CCF candidate, Major (his given name) Coldwell was elected (1935) to the Canadian House of Commons. He was a Canadian delegate to the San Francisco conference in 1945 and to the UN General Assembly in 1946. He became parliamentary leader of his party in 1940 and national president in 1942, holding both posts until 1960. When the New Democratic party was formed in 1961, he became its honorary president. His *Left Turn, Canada* (1945) discusses the CCF's objectives.

Cole, George Douglas Howard, 1889–1959, English economist, labor historian, and socialist. Educated at Oxford, he was long associated with the university and held a professorship from 1944 to 1957. For many years a leading exponent of **GUILD SOCIALISM**, he later returned to his original Fabianism, acting as chairman of the Fabian Society from 1939 to 1946 and becoming its president in 1952. His many books, mainly on labor and socialism, range from popular works to scholarly studies. Among his original works of enduring value are *A Short History of the British Working Class Movement* (3 vol., 1927, rev. ed. 1948), *The British Common People* (with Raymond W. Postgate, 1939, rev. ed. *The British People*, 1947), and *A History of Socialist Thought* (5 vol. in 7, 1953–60). See biography by L. P. Carpenter (1973). With his wife, Margaret Isabel (Postgate) Cole, 1893–, he wrote over 30 detective stories as well as works on economics and politics. Her works include *Beatrice Webb* (1945), *The Story of Fabian Socialism* (1961), and a biography of her husband (1971). She edited Beatrice Webb's important diaries.

Cole, Margaret Isabel (Postgate)* see **COLE, GEORGE DOUGLAS HOWARD**

Cole, Thomas, 1801–48, American landscape painter, b. England. He arrived in the United States in 1818 and moved to Ohio, where he was impressed by the beauty of the countryside. In 1825 he went to New York, where his landscape paintings began to be appreciated. Largely self-taught, he depicted the scenery of the Hudson River valley and the Catskills, which he discovered on long walking trips, becoming a leader of the **HUDSON RIVER SCHOOL**. In 1829 he went to Europe, where he spent some time sketching in England and Italy. In Paris he greatly admired the landscapes of Claude Lorrain. After he returned to New York, he was commissioned (1832) to paint his five famous allegorical scenes, farfetched and neoclassical in style, known as the *Course of Empire* (N.-Y. Historical Soc., New York City). This series and the *Expulsion from the Garden of Eden* (Mus. of Fine Arts, Boston) reflect his strong moralizing tendencies, combined with elements of fantasy, they are far less successful than his landscapes. Other works, such as *Oxbow* (Metropolitan Mus.) and *Catskill Mountains* (Mus. of Art, Cleveland), reveal his joy in the grandeur of nature. See biography by L. L. Noble (1964).

Cole, Timothy, 1852–1931, American wood engraver, b. London. He came to the United States as a child. Cole learned his trade in Chicago and later moved to New York, where in 1873 he began his 40-year association with the *Century Magazine* (then *Scribner's*). He was a pioneer and consummate craftsman in the white line technique of wood engraving, which allowed a more faithful reproduction of the works of European masters and popular contemporary painters. *Dutch and Flemish Masters* (1901) is one of the books that he engraved.

Coleraine (kōl'rān'), municipal borough (1971 pop. 14,871), Co. Londonderry, N. Northern Ireland, near the mouth of the Bann River. Coleraine is a port. Its industries include distilling, linen milling, the curing of ham and bacon, bog iron mining, and salmon fishing. There is also a large chemical fiber plant. In 1613, James I gave the site of the town to the corporations of the City of London for development.

Coleridge, Hartley (kōl'rīj), 1796–1849, English author, eldest son of Samuel Taylor Coleridge. Reared in the household of the poet Southey after the estrangement of his parents, Hartley Coleridge went to Oxford and gained a fellowship at Oriel. His shy and melancholy nature, however, curtailed a very promising university career. He was dismissed from Oriel for intemperance and went to London. There he wrote and tutored private pupils. His *Biographia Literaria*, a series of very sound critical biographies, appeared in 1833. The same year he published a small volume of poems, including some beautiful

sonnets, which established his literary reputation. Shortly thereafter, he retired to the Lake District, where he remained until his death. In 1840 he edited the dramatic works of Massinger and Ford. His brother Derwent published the remainder of his literary works in 1851. See his letters (ed. by E. L. Griggs and G. E. Griggs, 1936), biography by Lawrence Hanson (1939, repr. 1962).

Coleridge, Samuel Taylor, 1772–1834, English poet and man of letters, b. Ottery St. Mary, Devonshire, one of the most brilliant, versatile, and influential figures in the English romantic movement. Son of a clergyman, he was a precocious, dreamy child. He attended Christ's Hospital school in London and was already formidably erudite upon entering Cambridge in 1791. His erratic university career was interrupted by his impulsive enlistment in the dragoons, from which his brothers managed to extricate him. In 1794 he met the poet Robert Southey, who shared his political and social idealism, and together they planned to establish a small utopian community, which they called a pantisocracy, on the banks of the Susquehanna River in the United States. The plan failed to materialize for practical reasons. In 1795, Coleridge married Sarah Fricker, the sister of Southey's fiancée, with whom he was never happy. They settled in Nether Stowey in 1797, and shortly thereafter William Wordsworth and his sister Dorothy moved into a house nearby. Although Coleridge had been busy and productive, publishing both poetry and much topical prose, it was not until his friendship with Wordsworth that he wrote his best poems. In 1798, Coleridge and Wordsworth jointly published the volume *Lyrical Ballads*, whose poems and preface made it a seminal work and manifesto of the romantic movement in English literature. Coleridge's main contribution to the volume was the haunting, dreamlike ballad "The Rime of the Ancient Mariner." This long poem, as well as "Kubla Khan" and "Christabel," written during the same period, are Coleridge's best-known works. All three poems make use of exotic images and supernatural themes. "Dejection: An Ode," published in 1802, was the last of Coleridge's great poems. It shows the influence of (or affinity to) some poetic ideas of Wordsworth, notably the meditation upon self and nature and upon the relationships among emotion, sense experience, and understanding. While an undergraduate Coleridge had begun to take laudanum (an opium derivative then legal and widely used) for his ailments, and he was addicted by about 1800. That year, after having traveled with Wordsworth in Germany, Coleridge moved with his family to Keswick in the Lake District. He continued his studies and writings on philosophy, religion, contemporary affairs, and literature. In 1808 he separated from his wife permanently, and from 1816 until his death he lived in London at the home of Dr. James Gilman, who brought his opium habit under control. Coleridge worked for many years on his *Biographia Literaria* (1817), containing accounts of his literary life and critical essays on philosophical and literary subjects. It presents Coleridge's theories of the creative imagination, but its debt to other writers, notably the German idealist philosophers, is often so heavy that the line between legitimate borrowing and plagiarism becomes blurred. This borrowing tendency, evident also in some of his poetry, together with Coleridge's notorious inability to finish projects—and his proposal of impractical ones—made him a problematic figure. His lifelong friend Charles Lamb called him a "damaged archangel." Indeed, 20th-century editorial scholarship has unearthed additional evidence of plagiarism, thus, Coleridge is still a controversial figure. However, the originality and beauty of his best poetry and his enormous influence on the intellectual and aesthetic life of his time is unquestioned. He was reputedly a brilliant conversationalist, and his lectures on Shakespeare remain among the most important statements in literary criticism. His *Confessions of an Enquiring Spirit* (ed. by his nephew H. N. Coleridge) was published posthumously in 1840. See his collected letters, ed. by E. L. Griggs (6 vol., 1956–71), *Notebooks 1794–1808*, ed. by Kathleen Coburn (4 vol., 1957–61), collected works, ed. by Kathleen Coburn (5 vol., 1969–72), biographies by E. K. Chambers (1938), Lawrence Hanson (1938, repr. 1962), and W. J. Bate (1968), studies by I. D. Campbell (1894), Carl Woodring (1961), Marshall Suther (1965), and Norman Fruman (1972), J. L. Lowes, *The Road to Xanadu* (rev. ed. 1964), R. L. Brett, ed., *Coleridge* (1973). His daughter, Sara Coleridge, 1802–52, has literary standing in her own right. Her translation of *An Account of the Abipones* (1822) shows a great facility in both Latin and

English. Her best work is *Phantasmion* (1837), a fairy tale. See her *Memoir and Letters* (1873, repr. 1974), biography by E. L. Griggs (1941, repr. 1973).

Coleridge-Taylor, Samuel, 1875–1912, English composer, son of a Negro physician of Sierra Leone and an Englishwoman. He studied violin and composition at the Royal College of Music in London. He wrote many songs, orchestral works, piano pieces, and some chamber music but is best known for his cantatas, particularly the *Hiawatha* trilogy (1898–1900) and *A Tale of Old Japan* (1911). See J. F. Coleridge-Taylor, *Genius and Musician* (1943).

Colet, John (kō'let), 1467?–1519, English humanist and theologian. While studying on the Continent (1493–96), Colet became interested in classical scholarship and in theories of education. After his residency at Oxford as a lecturer, in 1505 he became dean of St. Paul's Cathedral, London. He planned the new St. Paul's School (1509) and endowed it from his private fortune. With William Lily, the school's first headmaster, and Erasmus, he collaborated on a Latin grammar that was later called the Eton grammar and used by generations of schoolboys. Colet did not, himself, break with the Roman Church, but his ideas on church reform were influential later. Most of his writings were unpublished until the late 19th cent. See biography by J. H. Lupton (2d ed. 1961), Frederic Seebohm, *The Oxford Reformers* (1913, repr. 1971).

Colette (Sidonie Gabrielle Colette) (sēdōnē' gābrēēl' kōlēt'), 1873–1954, French novelist. Colette gained wide fame with her numerous novels, characterized by their sensitive observations—particularly of women—and their intimate, semiautobiographical style. Her early series of novels, published in collaboration with her first husband, Willy (pseud. of Henry Gauthier-Villars), include *Claudine at School* (1900, tr. 1930) and *The Innocent Wife* (1903, tr. 1934). Among many later novels written on her own are *The Vagant* (1910, tr. 1912), *Chéri* (1920, tr. 1929), *The Cat* (1933, tr. 1936), and *Gigi* (1945). After being divorced in 1906, Colette worked on the music-hall stage until 1914. Her marriage to Henri de Jouvenel also ended in divorce, but her last years were enriched by the companionship of her third husband, Maurice Goudekot. Colette was the first woman to be president of the Goncourt Academy and the second to be made a grand officer of the French Legion of Honor. See *Earthly Paradise*, a collection of her autobiographical writings, ed. by Robert Phelps (1966), biographies by Maria Le Hardouin (tr. 1958), Margaret Davies (1961), and Margaret Crosland (1973), studies by Elaine Marks (1960) and R. D. Cottrell (1974).

coleus, common name for a genus of plants with large colorful leaves native to tropical Asia and Africa. Several species are grown as houseplants. Plants of the genus *Coleus* are in the family Labiatae (MINT family).

Colfax, Schuyler (skī'lər kōl'fäks), 1823–85, Vice President of the United States (1869–73), b. New York City. He moved in boyhood to Indiana. First a Whig editor, he later helped to organize the Republican party in Indiana. He served in the U.S. House of Representatives (1855–69), being speaker from 1863 to 1869. In 1868 he was elected Vice President under Ulysses S. Grant. Colfax was involved in the CREDIT MOBILIER OF AMERICA scandal, which ended his political career. See biography by W. H. Smith (1952).

Colgate, William (kōl'gāt), 1783–1857, American manufacturer and philanthropist, b. England. Arriving as a youth in the United States in 1795, Colgate learned candlemaking in Baltimore and New York. In 1806 he set up a tallow factory in New York and later engaged in soapmaking. In 1847 he moved his factory to Jersey City and by 1850 began producing fancy soaps and toilet preparations. He helped organize several Bible societies, including the American Bible Society (1816), and contributed amply to the institution later called Colgate Univ.

Colgate University, at Hamilton, N.Y., primarily for men, chartered 1819, opened 1820 as Hamilton Literary and Theological Institution, a Baptist seminary, renamed Madison Univ. 1846, assumed present name 1890. Colgate is principally a liberal arts college.

Col-hozeh (kōl-hō'zē), Judahite of Nehemiah's time. Neh. 3:15, 11:5.

colic, intense pain caused by spasmodic contractions of one of the hollow organs, e.g., the stomach, intestine, gall bladder, ureter, or oviduct. The cause of colic is irritation, and the irritant may be a stone (as in the gall bladder or ureter), an irritant food or gas (in the stomach and intestines), appendicitis, or

implantation of an embryo in an oviduct. Intestinal colic in infancy is sometimes attributed to gas formed by excessive swallowing of air or inadequate digestion of milk. Treatment of colic is relative to the cause.

Coligny, Gaspard de Châtillon, comte de (gāspar' də shātēyōn' kōnt də kōlēnyē'), 1519–72, French Protestant leader. A nephew of Anne, duc de MONTMORENCY, he came to the French court at an early age. He distinguished himself at Ceresole (1544) in the Italian Wars, was promoted colonel general of infantry, and in 1552 became admiral of France. He organized two unsuccessful colonies (1555, 1562) in the New World (see RIO DE JANEIRO, RIBAUT, JEAN). In 1557 he defended Saint-Quentin against the Spaniards, but he was taken prisoner and was not released until 1559. In the same year he made public profession of his conversion to Protestantism. He argued for the Protestant cause with CATHERINE DE' MEDICI at the time of the conspiracy of Amboise (1560, see AMBOISE CONSPIRACY OF). With Louis I de CONDÉ he commanded the Huguenots (French Protestants) after the murder of Protestants at Vassy (1562) and also in the second of the Wars of Religion (1567–68). An unsuccessful attempt to capture Coligny and Condé at Noyers (1568) brought on the third war, in which Coligny became sole leader nominally as adviser to the young Henry of Navarre (later King HENRY IV of France). Defeated at Moncontour, he was victor at Arnay-le-Duc (1570) and negotiated the Treaty of Saint-Germain (1570). Reconciled with Catherine and King CHARLES IX (1571), he became the king's favorite adviser. To weaken Catholic Spain he proposed that France aid the Low Countries, which were in rebellion against Spanish rule. Catherine, alarmed at the possibility of war with Spain, also feared that Coligny's increasing influence would weaken her own hold on the king. On Aug. 22, 1572, Coligny escaped the assassination ordered by Catherine and by Henri de GUISE, two days later, however, he was murdered in the massacre of Huguenots instigated by Catherine (see SAINT BARTHOLOMEW'S DAY, MASSACRE OF). See Sir Walter Besant, *Gaspard de Coligny* (1879), Eugene Bersier, *Coligny: The Earlier Life of the Great Huguenot* (1884).

Colima (kōlē'ma), state (1970 pop. 240,235), 2,010 sq mi (5,206 sq km), SW Mexico, on the Pacific Ocean. The capital is COLIMA, the port is MANZANILLO. The smallest in population and one of the smallest in area of the Mexican states, Colima is wedged between Jalisco, which nearly surrounds it, and Michoacán. It includes the islands of Revilla Gígedo off the coast. Most of the state lies within the cool highlands of the Sierra Madre Occidental. The smoking volcano, Colima (12,631 ft/3,850 m high), and the neighboring peak, Nevado de Colima (14,235 ft/4,339 m high), are just across the border in Jalisco. Cotton, sugarcane, and rice grow on tropical plains along Colima's coast, and some of Mexico's finest coffee is cultivated on the mountain slopes. Livestock raising is an important occupation. Iron, copper, and some gold are mined in Colima. The state's economic development has been hindered by inadequate communications. Once part of the ancient Aztec kingdom of Colima, the region was conquered by the Spanish in the 16th cent. Wars between conservative and liberal forces during the 19th cent. brought much fighting to the state.

Colima, city (1970 pop. 64,851), capital of Colima state, SW Mexico. It is a marketing and processing center for the surrounding agricultural region. The city was founded in 1523 by the Spanish explorer Gonzalo de Sandoval.

Colin, Alexander: see COLINS, ALEXANDER.

Colines, Simon de (sēmōn' də kōlēn'), d. 1546, Parisian printer. He was associated with the elder Henri ESTIENNE and continued his work. Colines used elegant roman and italic types and a Greek type, with accents, that was superior to its predecessors. He is believed to have designed some of his types, some were designed by Geoffroy TORRY. His books, often small in format, are superbly crafted.

Colins, Colin, or Colyn, Alexander (alēksa'n'drə kōlān'), c. 1527–1612, Flemish sculptor. He brought European court mannerism to Germany, where he directed the sculpture on the Ottheinrichsbau (1562) in Heidelberg. He designed the sculpture for the tomb of Ferdinand II and executed most of the reliefs in marble on the tomb of Maximilian I, both at Innsbruck.

Coliseum: see COLOSSEUM.

collage (kalāzh', kō-), [Fr., =pasting], technique in art consisting of cutting and pasting natural or manufactured materials to a painted or unpainted

surface—hence, a work of art in this medium. The art of collage was initiated in 1912 when Picasso pasted a section of commercially printed oldcloth to his cubist painting, *Still Life with Chair Caning* (Mus. of Modern Art, New York City). Collage elements appear in works by Gris, Braque, Malevich, Dove, and the futurist artists. A basic means of Dada and surrealist art, it was used by Arp, Schwitters, and Ernst. Collage is related to the newer art of assemblage, in which the traditional painted canvas has been abandoned in favor of the assembling of bits of material, which are sometimes additionally painted or carved. See studies by Harriet Janis and Rudi Blesh (rev. ed. 1967), Herta Wescher (1968, tr. 1971), and Norman Laliberté (1972).

collagen (kōl'ajən), any of a group of proteins found in skin, ligaments, tendons, bone and cartilage, and other CONNECTIVE TISSUE. Collagen is composed of groups of white inelastic fibers with great tensile strength. These fibers are made up of fine fibrils, which are in turn composed of even finer filaments, visible through the electron microscope. Collagen protein contains an unusually high percentage of the amino acids PROLINE and hydroxyproline. X-ray diffraction studies provide evidence that the protein is a coiled chain with periodic, i.e., repeating, arrangement of its amino acids. Cartilage is composed of fibrous collagen in an amorphous gel. The organic (nonmineral) content of bone is made up largely of collagen fibers with calcium salt crystals lying adjacent to each segment of the fiber, the fibers and salt crystals combined form a structure with compressional and tensile strength comparable to that of reinforced concrete. A group of diseases, often termed collagen, or connective tissue, diseases, involve a variety of alterations in the connective tissue fibers, rheumatoid arthritis, rheumatic fever, lupus, and scleroderma are included in this group. Some of these diseases may involve an autoimmune response, in which the immune mechanism injures or destroys the individual's own tissues (see IMMUNITY). Collagen dissolved in boiling water becomes denatured to form GELATIN.

collagen disease: see AUTOIMMUNE DISEASE, COLLAGEN.

collar, decorative strip on the neckline of a garment, modified necklace. Metal circlets, usually twisted, known as torques date from the Bronze Age and are worn by many primitive peoples. The Egyptians fashioned beaded yokes to wear as collars. In the 14th cent. neck chains called livery collars were worn as badges of alliance or fealty, neck chains were also worn as insignia of European orders of knighthood. The medieval gorget, or chin band, circled the neck and enveloped the throat, the habit of conservative orders of nuns retains this feature. Small ruffles began to appear at the neck and wrists c. 1530. The ruff, a circular fluted collar of starched linen, made its first appearance in Spain c. 1540. It later became a heart- or fan-shaped winglike extension that covered the back and shoulders and rose above the coiffure, it was made of fine linen or lace with matching cuffs and was often embroidered. The standing ruff gave way (c. 1635) to broad, falling collars of lace and later of linen. In the late 17th cent. neckcloths and cravats led the way to the stiff wing collar of the 1890s, to the clerical collar, and to the present-day fashion in ascots and neckties for men. Women's collars have varied widely from softly draped fichus and wide berthas to the high, tight collars of the 1890s. Modern collars are generally formed as inseparable parts of dresses and shirts.

collards: see KALE.

collateral, something of value given or pledged as security for payment of a loan. Collateral consists usually of financial instruments, such as stocks, bonds, and negotiable paper, rather than physical goods, although the latter may also be accepted as such. In case of default, the creditor may sell the collateral and apply the money thus acquired to payment of the debt, charging the debtor with any deficiency or crediting him with any surplus. The borrower may usually substitute other collateral for that held by the lender if it is acceptable to the latter. Such a privilege is particularly useful to borrowers who buy and sell securities. Merchandise collateral—such as negotiable warehouse receipts, bills of lading, and trust receipts—is also used, as is personal collateral, including deeds, mortgages, leases, and other rights in real estate. Other collateral may include bills of sale of movable goods, such as crops, machinery, furniture, and livestock, and savings-bank passbooks.

collect (kōl'ekt) [Lat. *lat*, = meeting], in Western liturgies, short prayer proper to an occasion, often

asking a particular favor. In the Roman Catholic Church the collect is said, typically, at Mass just before the epistle and at vespers. It occurs correspondingly in the Anglican and Lutheran liturgies. Many collects are very ancient, especially those of the Sundays and major feasts. Their language is terse. **collective bargaining**, in labor relations, procedure whereby an employer or employers agree to discuss the conditions of work by bargaining with representatives of the employees, usually a labor union. Its purpose may be either a discussion of the terms and conditions of employment (wages, work hours, job safety, or job security) or a consideration of the collective relations between both sides (the right to organize workers, recognition of a union, or a guarantee of no reprisals against the workers if a strike has occurred). The merits of collective bargaining have been argued by both opponents and proponents of the process, the former maintain that it deprives the worker of his individual liberty to dispose of his service, while the latter point out that without the union's protection the worker is subject to the dictation of the employer. As an essential process in labor relations, collective bargaining was first developed in Great Britain in the 19th cent. It has since become an accepted practice in most Western countries with a high level of industrialization. See Guy Farmer, *Collective Bargaining in Transition* (2 vol., 1967), M. S. Rukeyser, *Collective Bargaining* (1968), Russell A. Smith, *Collective Bargaining and Labor Arbitration* (1970), W. H. Hutt, *The Strike-Threat System* (1973).

collective farm, an agricultural producer's cooperative. No one definition fits all collective farms. They vary from nation to nation and also within nations. In the Soviet Union, Stalin in 1929 initiated widespread forced collectivization of agriculture. During that year agricultural land was ruthlessly confiscated, and small landowners were forced on pain of death or deportation to go into a kolkhoz [Rus., = collective farm]. By Feb., 1930, one half of the peasant farms had been collectivized. Widespread resentment of collectivization brought about some modification of the system under the Collective Farm Charter (1935). A mixed system of private and socialized enterprise was put into effect, and members of the collectives were permitted some individual property, including a plot of land and a few farm animals. By 1938 collectivization in the Soviet Union was almost complete, there were 240,000 kolkhozy holding 99.3% of formerly private land under cultivation. Prices paid for the agricultural products of the kolkhozy were set by the state, which also decreed what was to be grown. Collectivization had been instituted by Stalin to modernize agriculture, to secure a reliable food supply, to free capital for industrial production, and to release labor for heavy industry. The program was partly successful, although agricultural production is a continuing problem in the Soviet Union. In 1950, to tighten control over the collectives, a program of amalgamating them into larger units was begun. By 1972 the number of kolkhozy had been reduced from 254,000 to 32,300. The size of collective farms roughly tripled, and in 1972 the average collective had approximately 7,500 acres (3,000 hectares) under cultivation. In 1958 new agricultural measures, designed to woo the farmer-worker, abolished the system of requisition and substituted direct state purchases at higher prices. In 1969 the Collective Farmers' Congress met for the first time in 34 years. It approved new collective farm measures including the increase of the size of private plots, guaranteed income and a unified system of social insurance. In the '70s collective farmers were insured profits on various agricultural commodities as incentive for increased farm production. In the early 1970s, about half of the cultivated land in the U.S.S.R. was in collective farms, most of the rest was held by state farms. The commune of Communist China is similar to the collective farm in the Soviet Union. It is more strictly organized, embracing a wider range of activities, putting greater emphasis on collective living, and including nonagricultural workers. Collectivization of agriculture in Communist China began in 1955 and met little resistance. By 1956, 96% of all the households engaged in agriculture had been included in cooperatives. The system of cooperatives failed to free the labor and capital needed for industrial expansion, and in 1958 the commune system was established. Twenty to thirty cooperatives comprising over 20,000 members and 40 to 100 villages were merged into each commune. The land and equipment of the former cooperatives and any property and cash that the peasants had been permitted to withhold from the 1955 collectivization

became the property of the commune. An independent economic and administrative unit controlled the labor force and all means of production within each commune and provided central management of industry, commerce, education, agriculture, and military affairs. The workers performed both industrial and agricultural tasks and supported a complete military unit. They lived in communal buildings and took their meals as a community. They used communal nurseries, bathing facilities, barbershops, and similar service facilities. Wages and perquisites were controlled by the state, and all products were marketed through state agencies. By Jan. 1, 1959, 99% of all Chinese farm workers were members of a commune. The larger collective units, however, turned out to be less efficient in terms of management. This inefficiency, coupled with natural disasters and the effects of statistical misstatements made by the government, led in the early '60s to deemphasis in China on collective farming. Communes were decentralized, and in some instances land was broken up into private farms placing an emphasis on private incentive. The collective farms in Israel are of three kinds: the moshav ovdim, a worker's settlement, the kibbutz, a commune, the moshav shitufi, a modified collective. In all, the land, held in the name of the Jewish people by the Jewish National Fund, is rented on long-term lease at nominal fees. In the moshav ovdim each family works its own plot and retains any income from it. To hire labor is forbidden. Produce is marketed collectively, and consumer goods are bought collectively. In the kibbutz, best known of the collectives and most important economically, all property except specified personal possessions is collectively owned, planning and work are collective, and collective living is the rule. Work crews are headed by elected foremen. Work is exacted on the basis of ability, and goods distributed according to need. A biweekly town meeting is the final authority of the kibbutz. Elected officials implement the policy of the kibbutz and administer economic and social affairs. The 300-odd kibbutzim of Israel have combined in a number of federations expressive especially of ideological belief. Although only about 5% of Israel's population hold membership in the kibbutzim, they wield considerable political influence. The moshav shitufi, a late development in collectives in Israel, holds property communally, and its members work collectively. Community living is not required of members. Communal farming efforts have not proved markedly popular in North America, although numerous attempts have been and continue to be undertaken (see COMMUNE, COMMUNISTIC SETTLEMENTS). A noted exception is the agricultural-based colonies of Hutterites, who, as a result of persecution in central Europe, emigrated to South Dakota in 1874. They have increased in population and economic prominence to include some 20,000 members, living in over 200 separate colonies in the Dakotas, Montana, Minnesota, Washington, and the Canadian provinces of Alberta, Manitoba, and Saskatchewan. See Geoffrey Hudson et al., *The Chinese Commune* (1969), Elyahu Kanovsky, *The Economy of the Israeli Kibbutz* (1966), R. C. Stuart, *The Collective Farm in Soviet Agriculture* (1972).

Collège de France (kōlēzh' də frāNs), institution of higher learning founded in Paris, France, in 1529 by FRANCIS I at the instigation of Guillaume BUDÉ. It was founded to encourage humanistic studies and has always been independent of any university and free from supervision. Its lectures are open to the public without matriculation or fee. It gives no examinations and grants no certificates or degrees. Now its range of studies encompasses numerous humanistic and scientific fields. Its faculty includes many distinguished scholars.

College of Arms: see HERALD'S COLLEGE.

College of Physicians and Surgeons: see COLUMBIA UNIV.

College of the City of New York: see CITY COLLEGE, NEW YORK, CITY UNIV. OF.

College Park. 1 City (1970 pop. 18,203), Clayton and Fulton counties, NW Ga., a residential suburb of Atlanta, inc. 1891. Georgia Military Academy (1900) is there. 2 City (1970 pop. 26,156), Prince Georges co., W. central Md., a residential suburb of Washington, D.C., settled 1745, inc. 1945. It is the seat of the Univ. of Maryland, and its economy is centered on the university, research institutions, and electronics plants.

colleges and universities, institutions of higher education. Universities differ from colleges in that they are larger, have wider curricula, are involved in

research activities, and grant graduate and professional as well as undergraduate degrees. Universities generally consist of groups of schools, faculties, or colleges. They arose in the 12th and 13th cent as a means of providing further training in the professions of law, theology, and medicine, and as centers of study for the rediscovered works of Aristotle and the Arab scholars. Of the earliest universities, Salerno (9th cent) and Montpellier (13th cent) specialized in medicine, Bologna (1088) in law, and Paris (12th cent) in theology. Students and faculty were originally organized in guildlike groups. The student groups, known as "nations" and comprising students from particular localities, gradually diminished in power, however, as the faculty, by virtue of its control over teaching and graduation, became more powerful. In the Middle Ages, universities usually originated through royal or ecclesiastical initiative or through migrations of students from other universities. The migrations were sometimes influenced by political events. Oxford Univ., for example, was founded (12th cent) by English students from the Univ. of Paris who were forced to leave that institution as a result of conflicts between England and France; similarly, the university at Leipzig was founded (15th cent) by German scholars who were driven out of Prague by John Huss's Czech national movement. The medieval universities often had many thousands of students and played an important role in public affairs. Among the famous institutions founded were Salamanca (c 1230), Prague (1348), Vienna (1365), Uppsala (1477), Leiden (1575), and Moscow (1755). The oldest universities in the New World, both founded in 1551, are Mexico Univ. and San Marcos of Lima. In the 19th cent many governments reorganized and nationalized universities, as in Italy after unification (1870), in Spain (1876), and in France, where 17 autonomous regional universities were established after 1876. By 1900 many universities were secularized in administration and curriculum, and religious tests had been largely eliminated (in England by act of Parliament in 1871). Women have generally been admitted to universities since about 1870 (see COEDUCATION). In the United States, modern universities developed during the late 19th cent from the expansion of private colleges and the establishment of state tax-supported universities, largely as a result of the Morrill Act (1862), by which public lands were granted to the states for the formation and support of state agricultural and mechanical schools (see LAND GRANT COLLEGES AND UNIVERSITIES). Another important influence at that time was the founding of institutions (e.g., JOHNS HOPKINS UNIV.) devoted to graduate study and research. They were modeled on the German universities, with their separate graduate and professional schools each devoted to a particular area of study. In the 20th cent universities have played an increasingly important role in scientific and technical research, largely as a result of social and governmental demands for these services. The nationalization and bureaucratization of research functions has been especially marked in the United States, where various government agencies dispense large amounts of money to both public and private universities for research purposes. The federal government also provides direct aid to various categories of students, especially veterans. Since World War II there has been worldwide proliferation of new universities, expansion of old ones, and merging of small institutions into larger university systems. Educational reforms in Japan, for example, have decreed that there be at least one national university in each of 46 sections of the country, so that there are now more than 70 such institutions. The 1960s saw the establishment of seven new universities in Great Britain, while the period from 1948 to 1970 saw the State Univ. of New York grow from a small group of teacher training colleges into a multicampus system with more than 135,000 students.

Colleges Like universities, colleges first appeared in the Middle Ages, the earliest were founded in 12th-century Paris. Originally the college served as an endowed residence hall for university scholars, but later it absorbed much of the university's activity. It was in England, at Oxford and Cambridge, that the college became the principal center of learning, with the university serving mainly to examine candidates and confer degrees. The Industrial Revolution brought a demand for scientific and technical education, and separate technical colleges (e.g., Yorkshire Science College in Leeds) were founded. Moreover, extension lectures, sponsored by the universities, created a demand for educational centers in remote areas. Degrees, however, continued to be conferred by the universities with which the col-

leges were affiliated. It was in America that the liberal arts college first appeared extensively as a separate institution. In the 17th and early 18th cent, numerous colleges were established in the colonies, primarily to train young men for the ministry. Notable were Harvard (1636, Puritan), William and Mary (1693, Anglican), Yale (1701, Congregationalist), Princeton (1746, New Lights Presbyterian), Columbia (1754, Anglican), Brown (1765, Baptist), and Rutgers (1766, Dutch Reformed). By 1810 many small colleges had been established in the United States. Later in the same century a number of women's colleges were founded. Notable early women's colleges were Mt. Holyoke (1837), Elmira (1853), Vassar (1861), Wellesley (1871), Smith (1871), and Bryn Mawr (1881). Another development of the 19th cent was the growth of normal schools, which later became teachers colleges (see TEACHER TRAINING). Though the curricula and ideals of American colleges continued to be influenced by English schools, the American colleges, stimulated by the German university system and by the increasing demand for technical instruction, began to expand their facilities to include graduate and professional schools. By the 20th cent many American colleges had become universities, and by the middle of the century universities were giving out twice as many bachelor's degrees as were the traditional liberal arts colleges. In an attempt to reassert the importance of the colleges, many of them have been empowered to grant graduate degrees, especially the master's degree. The COMMUNITY COLLEGE movement has been important in expanding opportunities for higher education. OPEN ENROLLMENT has made college training available to a larger segment of high-school graduates. Still another innovation has been the establishment of cluster colleges, a number of specialized institutions clustered on one campus in order to provide the personalized education that is characteristic of the small college without sacrificing the quality and diversity of the university. The University of California at Santa Cruz (est 1965) has such a cluster-college system.

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Colleges of the Seneca, The. see HOBART COLLEGE
College Station, city (1970 pop 17,676), Brazos co., E central Texas, in a livestock and cotton region, inc 1938. Texas Agricultural and Mechanical Univ. is there.

Colleoni, Bartolomeo (bartolōmē'ō kōl-lāō'nē), 1400-1475, Italian soldier of fortune. A CONDOTTIERE, Colleoni fought in the wars between Venice and Milan, often changing sides and distrusted by both. In 1454 he deserted Milan for the last time and became generalissimo of Venice, a post he held until his death. The beautiful Colleoni Chapel is in his native city, Bergamo, and the celebrated equestrian statue of him by VERROCCHIO is in Venice.

Collett, Camilla (Wergeland) (kamē'la vērg'ələn kōl'ēt), 1813-95, Norwegian novelist, sister of Henrik Wergeland. Her feminist novels include *The Governor's Daughters* (1854-55), the first Norwegian psychological novel, and the charming *In the Long Nights* (1862). She devoted her life and work to the emotional and social emancipation of women.

collie, breed of large, agile WORKING DOG developed in Scotland during the 17th and 18th cent. It stands from 22 to 26 in (55.9-66 cm) high at the shoulder and weighs from 50 to 75 lb (22.7-34 kg). There are two varieties of collie, it is thought that originally the rough-coated or long-haired type herded sheep in the tortuous climate of the northern Scottish hills while the less weatherproof smooth-coated collie drove cattle to market. Both varieties may be sable and white, blue merle, tricolored (black, tan, and white), or white. Although no thoroughly docu-

mented explanation of the origin of the collie's name is ever likely to be set forth, the following is probably the most reasonable. A type of sheep once found in the Scottish Highlands had black markings, either on the face or legs, and was called the "Colley" sheep. The dog that was bred and trained to herd these sheep was known as the "Colley dog," and, later, as the "collie." Today it is one of the most popular farm dogs and pets in the United States. See DOG.

Collier, Jeremy, 1650-1726, English clergyman. Collier was imprisoned as one of the NONJURORS, who refused to pledge allegiance to William III and Mary II. He later was outlawed (1696) for absolving on the scaffold two of those involved in the assassination plot against William. Collier's principal fame comes from his *Short View of the Immorality and Profaneness of the English Stage* (1698) and *Ecclesiastical History of Great Britain* (1708, 1714). In 1713 he was ordained a nonjuring bishop. See Anthony Rose, *The Jeremy Collier Stage Controversy* (1966).

Collier, John, 1884-1968, American social worker, anthropologist, and author, educated at Columbia and the College de France. After holding several positions in community organization and social work training, he became active in American Indian affairs. In 1922 Collier was editor of the magazine *American Indian Life* from 1926 until 1933, when he was appointed commissioner of Indian Affairs, a position he held for 12 years. In addition to works in verse, he wrote *Indians of the Americas* (1947) and *On the Gleaming Way* (1962, orig. pub 1949 as *Patterns and Ceremonials of the Indians of the Southwest*).

Collier, John Payne, 1789-1883, English critic, editor, and forger. The marginal notes and signatures supposedly discovered by him on original documents, especially those concerned with Shakespeare, were later exposed as having been forged by him while in the service of the duke of Devonshire. His authentic work included *A Bibliographical and Critical Account of the Rarest Books in the English Language* (1865) and the reprinting of early English tracts.

colligative properties, properties of a SOLUTION that depend on the number of solute particles present but not on the chemical properties of the solute. Colligative properties of a solution include freezing point (see FREEZING), BOILING POINT, osmotic pressure (see OSMOSIS), and solvent VAPOR PRESSURE. By measuring these properties and comparing them with the corresponding properties of the pure solvent, it is possible to determine the number of particles of solute present in the solution. If the mass of solute present is also known, the number-average MOLECULAR WEIGHT can be calculated by dividing the mass of solute by the number of particles present to obtain the average mass per particle.

Collingdale, borough (1970 pop 10,605), Delaware co., SE Pa., a suburb of Philadelphia, inc 1891.

Collingswood, borough (1970 pop 17,422), Camden co., SW N.J., settled 1682 by Quakers, inc 1888. It has some light industry.

Collingwood, Cuthbert Collingwood, Baron. see TRAFALGAR, BATTLE OF.

Collingwood, Robin George, 1889-1943, English philosopher and historian. From 1908 he was associated with Oxford as student, fellow, lecturer in history, and professor of philosophy. Collingwood believed that philosophy should be rooted in history rather than in formal science, and he attempted to correlate creative endeavor with historical experience rather than to sensation. He was also significant as a historian. In *Roman Britain* (1936) and in some 150 monographs he brilliantly reconstructed that ancient era from his study of coins and inscriptions. For his philosophical thought, see *Speculum Mentis* (1924), *An Essay on Philosophical Method* (1933), *Principles of Art* (1938), and *The Idea of History* (1946). See Alan Donagan, *The Later Philosophy of R. G. Collingwood* (1962), Lionel Rubinfeld, *Collingwood and the Reform of Metaphysics* (1970).

Collingwood, city (1971 pop 20,906), Victoria, SE Australia, a suburb of Melbourne. It has woolen and hosiery mills and footwear industries.

Collingwood, town (1971 pop 9,775), 5 Ont., Canada at the south end of Georgian Bay, an arm of Lake Huron. Collingwood has one of the largest shipbuilding plants and one of the largest dry docks on the Great Lakes.

Collins, Anthony, 1676-1729, English theologian, a friend of John Locke. He set forth the position of the deists and defended the cause of rational theology. His *Discourse of Free Thinking* (1713) was answered

by many clergymen and was satirized by Jonathan Swift. His *Philosophical Inquiry Concerning Human Liberty* (1715) is an excellent presentation of the determinist position, the theory that all events are determined by prior causes. See study by James O'Higgins (1970).

Collins, Edward Trowbridge, 1887–1951, American baseball player, b. Millerton, N.Y., grad. Columbia, 1907. One of the game's great second basemen, he was active in the American League for 25 years, playing with the Philadelphia Athletics (1906–14, 1927–30) and the Chicago White Sox (1915–26). During his major league career he stole 743 bases and made 3,313 base hits for a lifetime batting average of .333. Collins was elected to the National Baseball Hall of Fame in 1939.

Collins, Michael, 1890–1922, Irish revolutionary leader. He spent the years from 1907 to 1916 in England, during which period he joined the Fenian movement. He took part in the Easter Rebellion in Dublin in 1916 and was imprisoned for the rest of the year. One of the SINN FEIN members who set up the DAIL EIREANN in 1919, he led the Irish Republican Army in the guerrilla campaign against British rule that eventually forced the British government to sue for a truce. Although a convinced republican, Collins, with Arthur GRIFFITH, negotiated and signed the treaty (1921) that set up the Irish Free State (see IRELAND) because he felt it the best settlement with England possible at that time. He was finance minister in Griffith's government for a brief time before being assassinated by extremist republicans. See biographies by Frank O'Connor (1937), Rex Taylor (1958), Eoin Neeson (1968), Michael O'Donovan (rev. ed. 1969), and Margery Forester (1971).

Collins, Wilkie (William Wilkie Collins), 1824–89, English novelist. Although trained as a lawyer, he spent most of his life writing, producing some 30 novels. He is best known for two mystery stories, *The Woman in White* (1860) and *The Moonstone* (1868), which are considered the first full-length detective novels in English and among the best of their genre. He was a friend of Dickens, in whose periodical *Household Words* many of Collins's novels first appeared. See biographies by M. P. Davis (1956) and W. H. Marshall (1970).

Collins, William, 1721–59, English poet. He was one of the great lyricists of the 18th cent. While he was still at Oxford he published *Persian Eclogues* (1742), which was written when he was 17. Unstable and weak-willed, he never chose a profession and was constantly in debt until he inherited money from an uncle. He won no popularity during his lifetime, and his career was curtailed by insanity. A precursor of the 19th-century romantics, Collins wrote exquisite verse that emphasized mood and imagination. Among his best odes are "To Evening," "To Simplicity," and the one beginning "How sleep the brave." See biographies by P. L. Carver (1967) and H. W. Garrod (1928, repr. 1973), study by O. Doughty (1964).

Collinsville, city (1970 pop. 17,773), Madison co., SW Ill., settled 1817, inc. 1872. It is a former coal-mining center where food products and women's garments are now manufactured. Nearby are the Cahokia Mounds State Park, with its Indian earthworks, and a campus of Southern Illinois Univ.

Collodi, Carlo (kār'lō kōl-lō'dē), pseud. of Carlo Lorenzini (lōrāntē'nē), 1826–90, Italian author. A prolific journalist, he also wrote didactic tales for children, the most famous of which is *Pinocchio*, the story of a Puppet First written (1880) for the *Giornale dei bambini*, the story appeared in book form in 1883 and soon became one of the most widely read juvenile classics. Collodi, however, received little for it. The first English translation (1892) was followed by others in innumerable editions, perhaps the best is that by M. M. Sweet (1927). An animated film version (1940) of *Pinocchio* was made by Walt Disney.

collodion (kālō'dēən), solution of PYROXYLIN in a mixture of alcohol and ether. Upon exposure to air, the solvents evaporate, leaving a thin, colorless, elastic film on any surface upon which the collodion has been spread. Collodion is the forerunner of the lacquer paints that are now widely used in the automobile industry.

colloid (kōl'oid) [Gr. = glue-like], a mixture in which one substance is divided into minute particles (called colloidal particles) and dispersed throughout a second substance. The mixture is also called a colloidal system, colloidal solution, or colloidal dispersion. Familiar colloids include fog, smoke, homogenized milk, and ruby-colored glass. Colloidal particles are larger than molecules but too small to

be observed directly with a microscope, however, their shape and size can be determined by electron microscopy. In a true solution the particles of dissolved substance are of molecular size and are thus smaller than colloidal particles, in a coarse mixture (e.g., a suspension) the particles are much larger than colloidal particles. Although there are no precise boundaries of size between the particles in mixtures, colloids, or solutions, colloidal particles are usually on the order of 10^{-7} to 10^{-3} cm in size. The presence of colloidal particles has little effect on the COLLAGATIVE PROPERTIES of a solution. One way of classifying colloids is to group them according to the phase (solid, liquid, or gas) of the dispersed substance and of the medium of dispersion. A gas may be dispersed in a liquid to form a foam (e.g., shaving lather or beaten egg white) or in a solid to form a solid foam (e.g., styrofoam or marshmallow). A liquid may be dispersed in a gas to form an aerosol (e.g., fog or aerosol spray), in another liquid to form an emulsion (e.g., homogenized milk or mayonnaise), or in a solid to form a gel (e.g., jellies or cheese). A solid may be dispersed in a gas to form a solid aerosol (e.g., dust or smoke in air), in a liquid to form a sol (e.g., ink or muddy water), or in a solid to form a solid sol (e.g., certain alloys). A further distinction is often made in the case of a dispersed solid. In some cases (e.g., a dispersion of sulfur in water) the colloidal particles have the same internal structure as a bulk of the solid. In other cases (e.g., a dispersion of soap in water) the particles are an aggregate of small molecules and do not correspond to any particular solid structure. In still other cases (e.g., a dispersion of a protein in water) the particles are actually very large single molecules. A different distinction, usually made when the dispersing medium is a liquid, is between lyophilic and lyophobic systems. The particles in a lyophilic system have a great affinity for the solvent, and are readily solvated (combined, chemically or physically, with the solvent) and dispersed, even at high concentrations. In a lyophobic system the particles resist solvation and dispersion in the solvent, and the concentration of particles is usually relatively low. The Scottish chemist Thomas Graham discovered (1860) that certain substances (e.g., glue, gelatin, or starch) could be separated from certain other substances (e.g., sugar or salt) by DIALYSIS. He gave the name *colloid* to substances that do not diffuse through a semipermeable membrane (e.g., parchment or cellophane) and the name *crystalloid* to those which do diffuse and which are therefore in true solution. Another property of colloid systems that distinguishes them from true solutions is that colloidal particles scatter light. If a beam of light, such as that from a flashlight, passes through a colloid, the light is reflected (scattered) by the colloidal particles and the path of the light can therefore be observed. When a beam of light passes through a true solution (e.g., salt in water) there is so little scattering of the light that the path of the light cannot be seen and the small amount of scattered light cannot be detected except by very sensitive instruments. The scattering of light by colloids, known as the Tyndall effect, was first explained by the British physicist John Tyndall. When an ultramicroscope (see MICROSCOPE) is used to examine a colloid, the colloidal particles appear as tiny points of light in constant motion, this motion, called BROWNIAN MOVEMENT, helps keep the particles in suspension. ABSORPTION is another characteristic of colloids, since the finely divided colloidal particles have a large surface area exposed. The particles of a colloid selectively absorb ions and acquire an electric charge. All of the particles of a given colloid take on the same charge (either positive or negative) and thus are repelled by one another. If an electric potential is applied to a colloid, the charged colloidal particles move toward the oppositely charged electrode, this migration is called electrophoresis. If the charge on the particles is neutralized, they may precipitate out of the suspension. A colloid may be precipitated by adding another colloid with oppositely charged particles, the particles are attracted to one another, coagulate, and precipitate out. Addition of soluble ions may precipitate a colloid, the ions in sea water precipitate the colloidal silt dispersed in river water, forming a delta. A method developed by F. G. Cottrell reduces air pollution by removing colloidal particles (e.g., smoke, dust, and fly ash) from exhaust gases with electric precipitators. Particles in a lyophobic system are readily coagulated and precipitated, and the system cannot easily be restored to its colloidal state. A lyophilic colloid does not readily precipitate and can usually be restored by the addition of solvent. Thixotropy is a property exhibited by certain gels. A

thixotropic gel appears to be solid and maintains a shape of its own until it is subjected to a shearing (lateral) force or some other disturbance. It then acts as a sol and flows freely. Common thixotropic gels include oil well drilling mud, certain paints and printing inks, and certain clays. Quick clay, which is thixotropic, has caused landslides in parts of Scandinavia and Canada. There are two basic methods of forming a colloid: reduction of larger particles to colloidal size, and condensation of smaller particles (e.g., molecules) into colloidal particles. Some substances (e.g., gelatin or glue) are easily dispersed (in the proper solvent) to form a colloid, this spontaneous dispersion is called peptization. A metal can be dispersed by evaporating it in an electric arc, if the electrodes are immersed in water, colloidal particles of the metal form as the metal vapor cools. A solid (e.g., paint pigment) can be reduced to colloidal particles in a colloid mill, a mechanical device that uses a shearing force to break apart the larger particles. An emulsion is often prepared by homogenization, usually with the addition of an emulsifying agent. The above methods involve breaking down a larger substance into colloidal particles. Condensation of smaller particles to form a colloid usually involves chemical reactions—typically displacement, hydrolysis, or oxidation and reduction.

Collet d'Herbois, Jean Marie (zhāN mārē' kōlō' dērbvā'), 1750–96, French revolutionary, originally an actor and playwright. At first he favored a constitutional monarchy, his *Almanach du Pere Gerard* (1791) was criticized for its royalist tinge, although its patriotism won a competition sponsored by the Jacobins. He then grew more radical, elected to the Convention, he supported Robespierre, persecuted the Girondists, and suppressed the counterrevolutionary attempts at Lyons in a blood bath. Although he turned against Robespierre on 9 Thermidor (July 27, 1794), he fell in the Thermidorian reaction and was deported to French Guiana.

collotype (kōl'atīp) see PRINTING

collusion, conspiracy to defraud a person of his legal rights or to obtain some illegal objective by misusing the forms of law. In suits for divorce, collusion is a conspiracy between the husband and the wife, or one or both of these and a third party, to obtain a DIVORCE on manufactured testimony, usually on pretense of adultery. Such a conspiracy is a bar to divorce.

Collyer, Robert, 1823–1912, American Unitarian clergyman, b. England. By trade a blacksmith, Collyer became a Methodist preacher in 1849. He emigrated to the United States in 1850 and settled near Philadelphia, where for a time he combined his labors as a blacksmith with preaching. In 1859, Collyer became a Unitarian and founded the Unity Church in Chicago, where he served as pastor (1860–79). In 1879 he became minister of the Church of the Messiah, New York City. He was widely known as a lecturer. *Clear Grit* (1913) contains some of his lectures, addresses, and poems. Among his many other works are *The Life That Now Is* (1871) and *Father Taylor* (1906). See biography by J. H. Holmes (1917).

Colman, Norman Jay, 1827–1911, American agriculturist and lawyer, b. near Richfield Springs, N.Y., grad. Univ. of Louisville law school, 1851. He promoted the passage of the Hatch Act (1887), which authorized the creation of agricultural experiment stations. As commissioner of agriculture (1885–89) he was influential in causing the Dept. of Agriculture to be made an executive department (1889). Represented in the cabinet, he was the first Secretary of Agriculture.

Colman, Ronald, 1891–1958, British stage and film actor. Distinguished in demeanor and voice, Colman created an image of kindness, humor, erudition, and romantic appeal. His films include the silent *Stella Dallas* (1927), and the sound films *Raffles* (1931), *Arrowsmith* (1932), *A Tale of Two Cities* (1936), *Lost Horizon* (1937), *The Prisoner of Zenda* (1937), *Random Harvest* (1943), and *Champagne for Caesar* (1949). Colman and his wife, Benita Hume, starred in the television series of the 1950s, *The Halls of Ivy*.

Colmar or **Kolmar** (both kōlmār'), city (1968 pop. 59,550), capital of Haut-Rhin dept., E France, in Alsace, on the Lauch River and the Logelbach Canal. Colmar has textile and other industries. It became a free city of the Holy Roman Empire in 1226, and Louis XIV made it the capital of Alsace in 1673. The old section of Colmar retains its medieval architecture. St. Martin's Church (13th and 15th cent.) contains the *Madonna of the Rose Arbor* by Martin Schongauer, who lived in Colmar all his life. The Unterlinden Museum, in a convent dating from the

13th-14th cent., is outstanding, it contains the Isenheim altarpiece by Mathias Grunewald and numerous masterpieces of the Rhenish school of the 15th cent.

Cologne (kəlōn'), Ger. *Köln*, city (1970 pop. 848,352), North Rhine-Westphalia, W West Germany, on the Rhine River. It is a commercial and industrial center, a rail and road junction, and a river port. Its manufactures include iron, steel, heavy machinery, chemicals, textiles, printed materials, and eau de Cologne. A Roman garrison in the 1st cent. 8 C., Cologne was made a Roman colony in A.D. 50 by Emperor Claudius, who named it *Colonia Claudia Ara Agrippinensis* for his wife, Agrippina. The city passed under Frankish control in the 5th cent. The episcopal see, established there in the 4th cent., was made an archdiocese under Charlemagne. Its archbishops, who later ruled a strip of land on the west bank of the Rhine as princes of the Holy Roman Empire, acquired great power and ranked third among the ELECTORS. The archbishops' constant feuds with the lay citizenry resulted in the transfer (mid-13th cent.) of their residence to nearby Brühl, then to Bonn. Cologne was self-governing after 1288, became a free imperial city in 1475, and, as a member of the Hanseatic League, flourished as a commercial center until the 16th cent. Its decline was hastened by the expulsion of the Jews (15th cent.) and the restrictions imposed on Protestants (16th cent.). Cologne was seized by the French in 1794, and the archbishopric was officially secularized in 1801. The city passed to Prussia in 1815, and in 1821 the archdiocese was reorganized. In the 19th cent. Cologne prospered again as an industrial center and as the main transit port and depot of NW Germany. The industrial town of Deutz (noted for the manufacture of motors), on the east bank of the Rhine, was united with Old Cologne, on the west bank. Old Cologne, with its numerous historic buildings, was severely damaged by aerial bombardment in World War II. The famous Gothic cathedral, the largest in northern Europe, was closed from the end of the war until 1956. It contains the relics of the WISE MEN OF THE EAST and the paintings of Stephen Lochner. The cathedral was begun in 1248 on the site of an older church, but the nave and the two spires (each spire 515 ft/157 m high) were built according to the original plans between 1248 and 1880. Other historic buildings in the city include the Romanesque churches of St. Maria im Kapitol, of St. Gereon, of the Holy Apostles, and of St. Andreas (where Albertus Magnus, the 13th-century scholastic, is buried), the Gothic and Renaissance city hall, and the *Gürzenich* (1441-44), formerly a meeting place of the city's merchants and now a concert hall. Impressive modern structures include the opera house and the radio and television broadcasting stations. As the center of West German Catholicism, Cologne has long been famous for its impressive religious processions and for its exuberant Mardi Gras celebrations. The city figures prominently in German romantic literature. Cologne is the seat of a university (founded 1388, discontinued 1798, reestablished 1919) and numerous museums, including those of painting, ethnology, and municipal history.

Colomb or Colombe, Michel (both mēshēl' kōlōn'), c. 1430-1512, French sculptor, one of the masters of the French Renaissance. Few of his works survive. His name is associated with the execution of the tomb of Francis II, duke of Brittany (completed 1507, Nantes). A relief by Colomb, *St. George and the Dragon* (Louvre), shows a high degree of imagination and skill.

Colomb-Béchar: see BÉCHAR, Algeria.

Colombes (kōlōnb'), city (1968 pop. 80,616), Hauts-de-Seine dept., N central France, on the Seine River. An industrial suburb of Paris, Colombes has fuel refineries, foundries, and publishing houses. A 16th-century church and a sports arena are in the city.

Colombey-les-deux-Églises (kōlōnbē-lā-dōz-äg-lēz'), town (pop. 391), Haute-Marne dept., NE France. The home and grave site of Charles de Gaulle are there.

Colombia (kālūm'bēə, Span. kōlōm'bīya), republic (1973 est. pop. 22,750,000), 439,735 sq mi (1,138,914 sq km), NW South America. The capital is BOGOTÁ. The only South American country with both a Caribbean and a Pacific coastline, Colombia is bounded on the NW by Panama, on the NE by Venezuela, on the S by Ecuador and Peru, and on the SE by Brazil. Colombia has both torrid jungles and majestic, snow-capped mountains. By far the most prominent physical features are the three great Andean chains that fan north from Ecuador. The An-

dean interior is the heart of the country, where in pre-Columbian days the highly advanced CHIBCHA lived. It has the largest concentration of population



and is the area of large-scale cultivation of coffee, Colombia's major crop. Of the three principal Andean ranges, the Western Cordillera is of the least economic importance. One of Colombia's major cities, CALI, lies just east of the range, in the upper Cauca valley. The Central Cordillera has a towering chain of volcanoes (e.g., Tolima) and is the divide between the valleys of the Magdalena and the Cauca rivers. It was until the 19th cent. a backward region, but with improved transportation, the introduction of coffee culture, the exploitation of high-grade coal reserves, and an enormous increase of the white population, its cities of MEDILLIN and MANIZALES have become the economic and industrial core of the republic. A third major city in the Central Cordillera is ARMENIA. The Eastern Cordillera is the longest chain. Its western slopes yield coffee, and in its intermontane basins grains and cattle are raised. The area is rich in iron, coal, and emeralds. Among the leading cities of the highland basins are TUNJA, BUCARAMANGA, and CUCUTA, in addition to Bogotá. To the E of the Andes lies more than half of Colombia's territory, a vast undeveloped lowland. The plains are crossed by navigable rivers, tributaries of the Orinoco and Amazon systems. The northern section consists of savannas (the LLANOS), which are devoted to a large extent to cattle and sheep grazing. VILLAVICENCIO, at the region's western end, is its major urban center. The dense jungles of the extreme southeast are of negligible economic importance. LETICIA is the country's southernmost town, and its only port on the Amazon River. A fourth mountain chain, the Cordillera del Choco, runs parallel to the Pacific N of BUENAVENTURA. The range's slopes yield dyewoods and hardwoods, rubber, tagua nuts (vegetable ivory) and other forest products, and gold and platinum. On the Pacific are the ports of Buenaventura and TUMACO, terminus of a pipeline from the oil-rich area of Putumayo across the mountains. Colombia's chief ocean ports, however, lie on the Caribbean coast to the north: SANTA MARTA, CARTAGENA, and BARRANQUILLA. At Mompón, adjacent to Cartagena, is the terminus of the pipeline from the Barrancabermeja oil fields. In the north, separating the La Guajira peninsula from the rest of the country, is the magnificent Sierra Nevada de Santa Marta, which contains Colombia's highest peak, Pico Cristóbal (18,947 ft/5,775 m). The difficult terrain in Colombia limits the availability of road and rail transportation and makes air and water travel especially important. Agriculture is the chief source of income in Colombia. An extremely wide variety of crops is grown, depending on altitude, but coffee is by far the major crop and its price on the world market has affected Colombia's economic health. Among the commercial crops, coffee is grown between elevations of 3,000 and 6,000 ft (914 and 1,829 m), bananas, cotton, sugarcane, oil palm, and tobacco are grown at lower elevations. Between

6,000 and 10,000 ft (1,829 and 3,048 m) potatoes, beans, grains, and temperate zone fruit and vegetables are grown. Colombia is rich in minerals, including petroleum, iron, coal, gold, silver, platinum, and emeralds. The saltworks at Zipaquirá, near Bogotá, are world famous. The manufacturing sector of the economy has expanded greatly in recent decades, although it is heavily dependent on imported materials. Beverages and processed foods, textiles, metal products, and chemicals are the chief manufactures. Coffee is the main export, others include petroleum and related products, cotton, bananas, and sugar. Various manufactured goods lead the imports. The United States and West Germany are the chief trade partners. In 1969, Colombia joined the Andean Group, an economic organization of South American nations. About two thirds of Colombia's population are mestizos, less than one fifth are of pure European descent. Indians live in the major cities and the remote areas. The small Negro population is concentrated along the coasts and in the Magdalena and Cauca valleys. Spanish is the official language. The population is overwhelmingly Roman Catholic. There are universities in all the major cities. Colombia is governed under an 1886 constitution. The president serves a four-year term. The legislature, subservient to the president, consists of a senate and chamber of deputies. The members are apportioned among the departments (states) and popularly elected for four-year terms. The supreme court is chosen by the president and the legislature. The Conservative and Liberal parties, formed in the 1800s, dominate political life. To insure stability, the two formed the National Front Coalition in 1957 and agreed to divide the major offices between them and alternate in the presidency. The coalition, which ended in late 1973, was challenged in the 1960s by the Popular National Alliance, formed by the former dictator Rojas Pinilla. After the Spanish conquest the area of present-day Colombia formed the nucleus of New Granada (for colonial history, see NEW GRANADA). The struggle for independence was, as in all Spanish-American possessions, precipitated by the Napoleonic invasion of Spain. The revolution was, however, foreshadowed by the rising of the COMUNEROS. Prominent among the first revolutionary leaders was Antonio NARIÑO, who took part in the uprising at Bogotá on July 20, 1810. The revolution was to last nine years before the victory of SIMÓN BOLÍVAR at BOYACÁ (1819) secured the independence of Greater Colombia (Span., *Gran Colombia*). The new state Bolívar created included what is now Venezuela, Panama, and (after 1822) Ecuador, as well as Colombia. Cúcuta was chosen as capital. While Bolívar, who had been named president, headed campaigns in Ecuador and Peru, the vice president, Francisco de Paula SANTANDER, administered the new nation. Political factions soon crystallized. Santander advocated a union of federal sovereign states, while Bolívar championed a centralized republic. Although Bolívar's authority prevailed by and large in the constitutional assembly (1828), Greater Colombia soon fell apart. In 1830, Venezuela and Ecuador became separate nations. The remaining territory emerged as the republic of New Granada. Through the 19th cent. and into the 20th cent. political unrest and civil strife reappeared constantly. Strong parties developed along conservative and liberal lines, the conservatives favored centralism and participation by the church in government and education, and the liberals supported federalism, anti-clericalism, and some measure of social legislation and fiscal reforms. Civil war frequently erupted between the factions. During the 19th and early 20th cent. three statesmen stand out—Tomas Cipriano de MOSQUERA, Rafael NUÑEZ, and Rafael REYES. While Mosquera was president, a treaty was concluded (1846) granting the United States transit rights across the Isthmus of Panama. A new constitution in 1858 created a confederation of nine states called Granadina. Three years later (1861) under Mosquera, the country's name was changed to the United States of New Granada and in 1863 to the United States of Colombia. The antifederalist revolution of 1885 led one year later, during the presidency of Nuñez, to the formation of the republic of Colombia and enactment of a conservative constitution. In 1899, five years after Nuñez's death, civil war of unprecedented violence broke out and raged for three years. As many as 100,000 people were killed before the Conservatives emerged victorious. Another humiliation occurred when, after the United States had acquired the right to complete the Panama Canal (although the agreement was later rejected by the Colombian congress), the republic of Panama declared and, aided by the United

States, achieved its independence from Colombia (1903). During the semidictatorial administration (1904-9) of Reyes, internal order was restored and the country's trade and productivity were vigorously expanded. Reyes, nevertheless, had to resign because of discontent over his handling of the Panama issue. Soon afterward Colombia recognized (1914) Panama's independence in exchange for rights in the Canal Zone and the payment of an indemnity from the United States. For the next four decades political life remained fairly peaceful, although there was economic and social unrest in the 1920s and 1930s. Colombia settled (1917) its boundary disputes with Ecuador, and in 1934 a border clash with Peru over the town of Leticia was settled by the League of Nations in Colombia's favor. Under the leadership of the liberals Olaya Herrera (1930-34), Alfonso Lopez (1934-38), and Eduardo Santos (1938-42), wide-ranging reforms were enacted. Colombia participated in World War II on the Allied side. During the war years, internal divisions worsened. The Liberals split and in the 1946 elections presented two candidates, enabling the Conservatives to win. In 1948, while an Inter-American Conference was being held in Bogotá, the leftist Liberal leader Jorge Eliecer Gaitan, under whom the party had reunited, was assassinated, precipitating violent riots and acts of vandalism. The death of Gaitan exacerbated the enmity between social groups and plunged the country into a decade of civil strife, martial law, and violent rule that cost hundreds of thousands of lives. Political violence turned into sheer criminality (*la violencia*), particularly in rural areas. An archconservative dictator, Laureano Gomez, took power in 1950, when the Liberals put forward no candidate. In 1953, Gomez was ousted by a coup led by Gustavo Rojas Pinilla, the head of the armed forces. Repressive measures continued, fiscal reforms failed, the country was plunged into debt, and Rojas Pinilla became implicated in scandalously corrupt schemes. A military junta, backed by liberals and conservatives alike, ousted Rojas Pinilla in 1957. The following year Alberto Lleras Camargo became president, elected under the National Front coalition agreement. The National Front presidential candidate of 1970, Misael Pastrana Borrero, won very narrowly over Rojas Pinilla, who returned to politics as the champion of the underprivileged. Colombia's economy began to recover from the setbacks of the early 1970s as economic diversification and incentives to lure foreign capital into the country were initiated. However, a high inflation rate continued to impede economic growth. In 1974 the Liberal party candidate Alfonso Lopez Michelsen won the first presidential election following the end of the National Front. See Gerardo Reichel-Dolmatoff, *Colombia* (1965), J. L. Payne, *Patterns of Conflict in Colombia* (1968), Orlando Fals-Borda, *Subversion and Social Change in Colombia* (rev. ed., tr. 1969), A. E. Havens and W. L. Flinn, *Internal Colonialism and Structural Change in Colombia* (1970), T. E. Weil and others, *Area Handbook for Colombia* (1970), W. P. McGreevey, *An Economic History of Colombia, 1845-1930* (1971), J. M. Henao and Gerardo Arruba, *History of Colombia* (tr. 2 vol., 1938, repr. 1972).

Colombo, Emilio (āmē'lyō kōlōm'bō), 1920-, Italian political leader. He was elected a member of the constituent assembly in 1946 and a parliamentary deputy for the Christian Democratic party in 1948. During a lengthy tenure in associate cabinet posts, he helped initiate some of Italy's basic postwar reforms, including land redistribution, nationalization of electrical utilities, and a program of government aid for the development of the impoverished south. He is credited with having written much of the Treaty of Rome, which established the European Economic Community (Common Market) in 1958. After serving as minister of the treasury from 1963 to 1970, he became premier in Aug. 1970. His coalition government fell in Jan. 1972, but he continued to hold successive cabinet posts.

Colombo (kālūm'bō), largest city (1971 pop. 562,442) and capital of Sri Lanka (Ceylon), a port on the Indian Ocean near the mouth of the Kelani River. The original Sinhalese name, *Kālantotta* ("Kelani ferry"), was corrupted to *Kolambu* by Arab traders and was changed to Colombo by the Portuguese. The city's major sections are the old area of narrow streets and colorful market stalls, the modern commercial, business, and government area around the 16th-century Portuguese fort, and Cinnamon Gardens, a wealthy residential and recreational area. Colombo has one of the world's largest man-made harbors and is a popular port of call for passenger

ships. Most of Sri Lanka's foreign trade passes through the port. There are also modern facilities for containerized cargo. Gem cutting and ivory carving are among Colombo's specialties; other industries include food and tobacco processing, metal fabrication, engineering, and the manufacture of chemicals, textiles, glass, cement, leather goods, clothing, furniture, and jewelry. An oil refinery is on the city's outskirts. Colombo was probably known to Greco-Roman, Arab, and Chinese traders more than 2,000 years ago as an open anchorage for oceangoing ships. Muslims settled there in the 8th cent. A.D. The Portuguese arrived in the 16th cent. and built a fort to protect their spice trade. The Dutch, also coveting this trade, gained control in the 17th cent. In 1796, Colombo passed to the British, who made it the capital of their crown colony of Ceylon in 1802. In the 1880s, Colombo replaced Galle as Ceylon's chief port and became a major refueling and supply center for merchant ships on the Europe-Far East route. Colombo served as an Allied naval base in World War II and was made the capital of independent Ceylon in 1948. The Colombo Plan, an international program to aid the economic development of Asian nations, was launched at a conference there in 1950. Two faculties of the Univ. of Sri Lanka, several colleges and research institutes, an observatory, a national museum, Independence Hall (1948), and numerous churches, mosques, and Buddhist and Hindu temples are in Colombo, on the outskirts are two Buddhist universities. About half the city's population is Sinhalese, there are also Tamils, Moors, and small European and Indian communities.

Colombo Plan: see INTERNATIONAL GOVERNMENTAL ORGANIZATIONS

Colón (kōlōn'), city (1970 pop. 25,986), Matanzas prov., W. central Cuba. It is a rail hub and commercial center for the surrounding agricultural region. Colón's sugar industry reached its heyday in the middle 19th cent. and has since declined. The city was founded in 1818.

Colón, city (1970 pop. 67,695), Panama, at the Caribbean end of the Panama Canal. Colón, the second largest city in Panama, is surrounded by, but not part of, the Canal Zone. Cristobal, within the zone, is a suburb. Colón is an important port and commercial center. It was made a free trade zone in 1953. The city was founded in 1850 by Americans working on the trans-Panama railroad and was named Aspinwall until 1890. The city was often scourged by yellow fever until the sanitary work associated with the construction of the canal was completed under W. C. Gorgas.

colon, in anatomy: see INTESTINE

colon, in writing: see PUNCTUATION

Colonia (kōlō'nyā), city (1963 pop. 12,839), capital of Colonia dept., S Uruguay, on the Rio de la Plata. It is a resort city, a port, and the trade center for a rich agricultural region. The city, founded by the Portuguese in 1680, was bitterly contested before being ultimately secured by the Spanish. Colonia has many fine examples of colonial architecture.

Colonial architecture: see AMERICAN ARCHITECTURE
Colonial Conference, British: see IMPERIAL CONFERENCE

Colonial Heights, city (1970 pop. 15,097), in, but not part of, Chesterfield co., SE Va., inc. as a city 1948. Metal awnings and paint are manufactured, tires are retreaded, and whiskey is bottled in the city. Of particular interest is the Violet Bank Library and Museum and the giant cucumber tree in front of it. In 1864, during the Civil War, Gen. Robert E. Lee made his headquarters under the tree while directing the defense of besieged Petersburg (across the Appomattox River from Colonial Heights).

Colonial National Historical Park, 9,430 acres (3,816 hectares), SE Va., mainly on the peninsula between the York and James rivers, created 1930 as Colonial National Monument, renamed 1936. The park embraces a historic region that includes YORKTOWN, JAMESTOWN, WILLIAMSBURG, and Cape Henry (added 1939, see HENRY CAPE), the Colonial Parkway, part of the park, links the three old towns. Archaeological and historical studies as well as reconstruction of old places of interest have been carried on.

colonial preference: see TARIFF

colonization, extension of political and economic control over an area by a state whose nationals have occupied the area and usually possess organizational or technological superiority over the native population. It may consist simply in a migration of nationals to the territory, or it may be the formal assumption of control over the territory by military

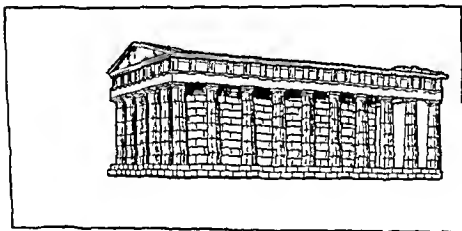
or civil representatives of the dominant power (see COLONY). Overpopulation, economic distress, social unrest, and religious persecution in the home country may be factors that cause colonization, but IMPERIALISM, more or less aggressive humanitarianism, and a desire for adventure or individual improvement are also causes. Colonization may be state policy, or it may be a private project sponsored by chartered corporations or by associations and individuals. Before colonization can be effected, the indigenous population must be subdued and assimilated or converted to the culture of the colonists; otherwise, a *modus vivendi* must be established by the imposition of a treaty or an alliance. As early as the 10th cent. B.C., the Phoenicians founded trading posts throughout the Mediterranean area and later exercised political dominion over these commercial colonies. The Greeks, from a desire for wealth or as a result of the expulsion of a political faction or the defeated inhabitants of a city, established colonies in Asia Minor and Italy, spreading Hellenic culture and stimulating trade. Greek colonies were patterned after the parent state and were at first subject to its jurisdiction. Colonization was an integral part of Roman policy, providing land for the poor, supporting Roman garrisons, and again spreading Roman culture. In their colonization the Romans sought to assimilate the native culture into their own, and in some cases they bestowed Roman citizenship upon natives of the colony. Medieval colonization began with the Crusades and was mainly Italian. The Venetians and Genoese established commercial colonies along trade routes and exercised strict supervision over them. The Portuguese and Spanish became great colonizing nations at the end of the Middle Ages. Portuguese colonization, which received impetus from the development of greatly improved methods of navigation, began with the establishment of trading ports in Africa and the East, while the Spanish concentrated most of their efforts in the Americas. Both the Spanish and the Portuguese exercised strict governmental control over their colonies and used them primarily as a basis for rich commerce with the parent government. They discouraged them from becoming economically self-sufficient. In the late 16th and early 17th cent., the English, Dutch, and French began to undertake colonization through the agency of CHARTERED COMPANIES. The greatest of these private trading companies was the British EAST INDIA COMPANY, which played a vital role in the history of the BRITISH EMPIRE. The French generally adhered to mercantilist theory in establishing their colonies, using them mainly for the economic advantage of France. The English colonists in North America, however, were, in many respects, virtually independent of the parent country, the most serious restriction being the establishment of a trade monopoly by the home government through the NAVIGATION ACTS. Because their territory was suitable for settlement, rather than exploitation, the residence of the British colonists in America tended to be permanent. The increase in overseas trade and colonial consumption helped to stimulate the INDUSTRIAL REVOLUTION, which in turn, because of the increased technological superiority afforded Europe, especially Great Britain, and because of the greater desire for markets and raw materials, gave added impetus to colonization and made it easier to accomplish. Although Great Britain lost most of its North American colonies as a result of the American Revolution, other acquisitions (most notably in India) soon made it the greatest colonial power in the world. The French, stripped of one colonial empire in the colonial wars of the 18th cent., established another in the 19th cent. Germany emerged as an industrial empire in the late 19th cent., but found the colonies of other powers closed to German products and, therefore, embarked upon its own colonial adventures. Japan, also recently industrialized, followed the same path. These ambitions helped to bring on World Wars I and II. Germany was stripped of its colonies after the first conflict, Japan lost its colonies after the second. Modern colonization, frequently preceded by an era in which missionaries and traders were active, has been largely exploitative. Moreover, it has not in the long run proved directly lucrative to the colonial power, because it has involved a heavy drain on the treasury of the home government. Colonization in its classical form is rarely practiced today and is widely considered to be immoral. Most former colonies, especially those in Africa and Asia, have achieved independence from the imperial powers. See MANDATES, TRUSTEESHIP TERRITORY. See D. K. Fieldhouse, *The Colonial*

Empire (1965), C. Verlinden, *The Beginnings of Modern Colonization* (1970), J. H. Parry, *Trade and Dominion* (1971)

Colonna (kölôn'na), noble Roman family that played a leading part in the history of Rome from the 12th to the 16th cent. They were hereditary enemies of the ORSINI family and generally sided with the Ghibellines, or antipapal faction, against the popes. **Sciarra Colonna**, d. 1329, a bitter enemy of Pope BONIFACE VIII, was excommunicated, fled to the court of King Philip IV of France, and led, with Chancellor Nogaret, the French expedition that captured (1303) Boniface. As senator of Rome, Sciarra supported Holy Roman Emperor LOUIS IV during his Italian expedition and bestowed the imperial crown on him in 1328, but he was forced into exile when Louis departed shortly afterwards. Despite its antipapal attitude, the family produced in Pope MARTIN V (Oddone Colonna) one of the most successful advocates of papal authority. **Fabrizio Colonna**, d. 1520, was a general of the HOLY LEAGUE against King Louis XII of France. His daughter was Vittoria Colonna (see separate article). **Prospero Colonna**, 1452-1523, Fabrizio's cousin, also fought the French in the Italian Wars and defeated them (1522) at La Bicocca. **Marcantonio Colonna**, 1535-84, duke of Paliano, commanded the papal forces in the battle of Lepanto (1571) against the Turks. Many other members of the family distinguished themselves in the service of the Holy See and of Spain. Three lines of the family, all of princely rank, are still in existence. The Colonna Palace in Rome was begun by Martin V.

Colonna, Vittoria, marchesa di Pescara (vêtô'rêa kôlôn'na markâ'za dê pâska'ra), 1492-1547, Italian poet, daughter of Fabrizio Colonna. Her love for her husband, Ferrante d'Avalos, is the subject of part of her lamenting verse. After his death (1525) she lived in convents, devoting herself to religious reform. The larger part of her work treats religious themes. In her later years she was a close friend of Michelangelo. For a translation of her verse, see Lorna de' Lucchi, *An Anthology of Italian Poems* (1922).

colonnade (kôlônâd'), a row of columns usually supporting a roof. There are generally two rows of columns or one row and a wall. Colonnades were



Colonnade

popular with the Greeks and Romans, who employed them in the STOA and the PORTICO, they have continued to be used throughout the Middle Ages, the Renaissance, and modern times. See COLUMN.

Colonne, Édouard (âdôâr' kôlôn'), 1838-1910, French conductor and violinist. He appeared as a conductor in Europe and England and was for several years first violinist of the Paris Opera. In 1873 he founded in Paris the Concert national, which later became known as the Colonne Concerts.

Colonsay (kôl'ânzâ), island, 17 sq mi (44 sq km), Argyll, NW Scotland, one of the Inner Hebrides. Crofting and cheese making are the main occupations. Colonsay is separated from Oronsay by a narrow sound.

colony, any nonself-governing territory subject to the jurisdiction of a usually distant country. The term is also applied to a group of nationals who settle in a foreign country or territory but retain political or cultural connections with their parent state. Colonies in the first sense are traditionally classified as either colonies of settlement or colonies of exploitation. A colony of settlement is usually founded in an uninhabited or sparsely inhabited region and one that is climatically congenial to the settlers. There the colonists often recreate the features of the home government, modifying them to suit new conditions. Colonies of exploitation are established for the purpose of exploiting a region rich in resources or with commercial possibilities. Such colonies often have dense native populations. Colonists in a colony of exploitation will consist chiefly of military and administrative officers and commercial and financial representatives. The use of slaves

and forced labor has often been a feature of such colonies. In a colony of exploitation, the government tends to be highly centralized and is frequently upheld by the presence of a strong police force or army, in a colony of settlement, there is generally rapid evolution from a purely military or autocratic government to autonomy or incorporation within the parent state. Since the 18th cent., colonial problems and their settlement have played a central role in European diplomacy and international relations. Strategic considerations, diplomatic rivalries, and the search for markets all led to a dramatic growth in European colonial holdings in the 19th cent. (See COLONIZATION and IMPERIALISM). In the late 19th cent., Great Britain began granting autonomy to some of its colonies, ultimately resulting in the transformation of the BRITISH EMPIRE into the COMMONWEALTH OF NATIONS. In the 20th cent., many colonial areas came under international supervision through the MANDATES system, or its successor, the trusteeship system (see TRUSTEESHIP, TERRITORIAL). The nature of the French empire was changed profoundly with the creation (1946) of the FRENCH UNION and its reorganization (1958) as the FRENCH COMMUNITY. By the early 1970s most of the former colonies of the Western European powers had become independent nations. Of those that had not, most were autonomous in internal affairs and many remained colonies by choice. The most notable exceptions were the Portuguese colonies, which, despite nationalist uprisings, remained under direct Portuguese rule. However, in 1974, following the overthrow of the Caetano regime, Portugal began to divest itself of its colonies. For bibliography, see under COLONIZATION and IMPERIALISM.

colophon (kôl'âfôn') [Gr., =finishing stroke]. Before the use of printing in Western Europe a manuscript often ended with a statement about the author, the scribe, or the illuminator. The first printed book to have a comparable concluding statement was the Mainz Psalter, crediting the printer and giving the date printed (1457) in its last paragraph. After this, a printed book commonly ended with a statement of the kind, now called a colophon. The information came to be given on the title page after c. 1520. The name colophon is applied also to a printer's mark or a publisher's device on a title page or elsewhere.

color, effect produced on the eye and its associated nerves by light waves of different wavelength or frequency. Light transmitted from an object to the eye stimulates the different color cones of the retina, thus making possible perception of various colors in the object. When white light passes through a glass PRISM, it is separated into a band of colors called a SPECTRUM. Since the colors that compose sunlight or white light have different wavelengths, the speed at which they travel through the glass differs. The colors of the visible spectrum, called the elementary colors, are red, orange, yellow, green, blue, indigo, and violet, red light, having the longest wavelength, travels more rapidly through the glass than blue light, which has a shorter wavelength. Color is therefore a property of light that depends on wavelength. When light falls on an object, some of it is absorbed and some is reflected. The apparent color of an object depends on the wavelength of the light that it reflects, e.g., a red object observed in daylight appears red because it reflects only the waves producing red light. The color of a transparent object is determined by the wavelength of the light transmitted by it. An opaque object that reflects all wavelengths appears white, one that absorbs all wavelengths appears black. Black and white are not generally considered true colors, black is said to result from the absence of color, and white from the presence of all colors mixed together. Colors whose beams of light in various combinations can produce any of the color sensations are called primary, or spectral, colors. The process of combining these colors is said to be "additive", i.e., the sensations produced by different wavelengths of light are added together. The additive primaries are red, green, and blue-violet. White can be produced by combining all three primary colors. Any two colors whose light together produces white are called complementary colors, e.g., yellow and blue-violet, or red and blue-green. When pigments are mixed, however, the resulting sensations differ from those of the transmitted primary colors, the process in this case being a "subtractive" one, since the pigments subtract or absorb some of the wavelengths of light. Magenta (red-violet), yellow, and cyan (blue-green) are called subtractive primaries, or primary pigments. A mixture of blue and yellow pigments yields green, the only color not absorbed by one pigment or the

other. A mixture of the three primary pigments produces black. The scientific description of color, or colorimetry, involves the specification of all relevant properties of a color either subjectively or objectively. The subjective description gives the hue, saturation, and lightness or brightness of a color. Hue refers to what is commonly called color, i.e., red, green, blue-green, orange, etc. Saturation refers to the richness of a hue as compared to a gray of the same brightness, in some color notation systems, saturation is also known as chroma. The brightness of a light source or the lightness of an opaque object is measured on a scale ranging from dim to bright for a source or from black to white for an opaque object (or from black to colorless for a transparent object). In some systems, brightness is called value. A subjective color notation system provides comparison samples of colors rated according to these three properties. In an objective system for color description, the corresponding properties are dominant wavelength, purity, and luminance. Much of the research in objective color description has been carried out in cooperation with the Commission Internationale de l'Eclairage (CIE), which has set standards for such measurements. In addition to the description of color according to these physical and psychological standards, a number of color-related physiological and psychological phenomena have been studied. These include color constancy under varying viewing conditions, color contrast, afterimages, and advancing and retreating colors. Color has long been used to represent affiliations and loyalties and as a symbol of various moods and qualities. A well-known use of the symbolism of color is in the liturgical colors of the Western Church, according to which the color of the vestments varies through the ecclesiastical calendar, e.g., purple (i.e., violet) is the color of Advent and Lent, white, of Easter, and red, of the feasts of the martyrs. See also LIGHT, PAINTING, PROTECTIVE COLORATION, VISION. See R. M. Evans, *An Introduction to Color* (1948), Faber Birren, *Creative Color* (1961), Gunter Wyszecki and W. S. Stiles, *Color Science* (1967).

Colorado (kôlôrâd'ô, -râd'ô, -râd'ô), state (1970 pop. 2,207,259) 104,247 sq mi (270,000 sq km), W central United States, one of the Rocky Mt. states, admitted as the 38th state of the Union in 1876 (and therefore known as the "Centennial State"). DENVER is the capital, by far the largest city, and the center of state activity. Other major cities are COLORADO SPRINGS, PUEBLO, LAKEWOOD, AURORA, and BOULDER. Colorado is bounded on the N by Wyoming and Nebraska, on the E by Nebraska and Kansas, on the S by Oklahoma and New Mexico, and on the W by Utah. The plains of Colorado's eastern section are part of the High Plains section of the Great Plains. On their western edge the plains give way to the foothills of the Rocky Mts., which run north-south through central Colorado. The mountains are divided into several ranges that make up two generally parallel belts, with the Front Range and a portion of the Sangre de Cristo Mts. on the east and the Park Range, Sawatch Mts., and San Juan Mts. on the west. Mt. Elbert (14,433 ft/4,399 m) is the highest peak in the U.S. Rocky Mts. The mountain ranges are separated by high valleys and basins called parks. These include North Park, Middle Park, South Park, and San Luis Park. The Continental Divide runs north-south along the Rocky Mts. in Colorado. One of the most scenic states in the country, Colorado's parks include Rocky Mountain National Park, Black Canyon of the Gunnison National Monument with its narrow gorge cut by the Gunnison River, Dinosaur National Monument in NW Colorado, and Great Sand Dunes National Monument in S central Colorado. Mesa Verde National Park, once the home of Indian CLIFF DWELLERS, is located in the southwestern corner of the state, a beautiful but formidable area of mesas and canyons. Most of W Colorado is occupied by the Colorado Plateau, where many canyons have been formed by the action of the Colorado, Gunnison, and other rivers. Colorado has a mean elevation of c. 6,800 ft (2,070 m) and has 51 of the 80 peaks in North America over 14,000 ft (4,267 m) high, thus laying claim to the name "top of the world." Melting snows from the mountains form important river systems that nourish the water-hungry lands of the Southwest. A broad timber belt, largely coniferous and mostly protected as national forest reserves, acts as a huge reservoir. The mighty Colorado River originates in Rocky Mountain National Park, and the headwaters of the North Platte, South Platte, Arkansas, and Rio Grande also gather in Colorado's mountains. The average annual rain-

fall in Colorado is only 166 in (42.2 cm), but by means of irrigation the state has been able to develop otherwise unusable land and ranks high among the states in irrigated acres. The COLORADO-BIG THOMPSON PROJECT and the Fryingpan-Arkansas project are two major water-diversion systems that carry water by tunnel across the Continental Divide to farms on the plains of E Colorado. Agriculture, especially the raising of cattle and sheep, is economically important in the state. Crops, which include wheat, hay, corn, and sugar beets, accounted for less than a quarter of all farm income in 1970. In the 1950s manufacturing displaced agriculture as the major source of income in the state. Food processing is the main industry. Other important industries include the manufacture of nonelectrical equipment, transportation equipment, and electrical equipment, printing and publishing, and the production of stone, clay, and glass products, fabricated metals, chemicals, and lumber. Tourism also plays a vital role in the economy. Colorado's climate, colorful scenery, and extensive recreational facilities attract millions of visitors to the state annually. Besides fine hunting and fishing and skiing there are many special events held in the state, including rodeos and fairs. Gold, the lure to exploration and settlement of Colorado, was the first of many useful minerals to be discovered there. In 1970 molybdenum was the most valuable mineral produced in the state. Colorado has the world's largest known deposit of that mineral. Other leading minerals are petroleum, coal, sand and gravel, and uranium. Gold is no longer mined extensively. Large coal and oil deposits provide considerable resources for the generation of electricity. Hydroelectric power is also used, although on a smaller scale. Colorado's earliest inhabitants were the BASKET MAKERS, Indians who settled in the mesa country before the beginning of the Christian era. Later Indians known as cliff dwellers inhabited the area, building their pueblos in canyon walls. The first white man to enter the region was probably the Spanish conquistador Francisco Vazquez de Coronado in the 16th cent. Spain subsequently claimed (1706) the territory, although no Spanish settlements were established there. The search for gold lured Juan María Rivera into the San Juan valley in 1765, and in 1776 the Franciscan friars Silvestre Velez de Escalante and Francisco Atanasio Dominguez journeyed through part of what is now Colorado. Part of the area was also claimed for France as part of the Louisiana Territory. At the end of the French and Indian Wars (1763), France secretly ceded the Louisiana Territory, including much of Colorado, to Spain. The French regained the whole area in 1800 by the secret Treaty of San Ildefonso concluded with Spain (see SAN ILDEFONSO, TREATY OF). There were still few white men when the United States bought the area N of the Arkansas River and E of the Rocky Mts in the Louisiana Purchase of 1803. The Federal government sent expeditions to Colorado under Zebulon M. Pike (1806), Stephen H. Long (1819-20), and John C. Fremont (1842-43 and 1845). These expeditions generated some public interest in the new territory, and they explored routes opened earlier by the famous MOUNTAIN MEN, trappers, and fur traders who included William H. Ashley, James Bridger, Jedediah S. Smith, Kit Carson, and the Bent brothers. Bent's Fort, in Colorado, was one of the best-known Western trading posts. Settlement in the area did not begin, however, until the United States acquired the remainder of present-day Colorado from Mexico by the Treaty of Guadalupe Hidalgo in 1848. In the early 1800s a small farming settlement had been established in the San Luis valley, but most settlers pushing westward across the Great Plains continued on to the more fertile lands of Oregon, Washington, and California. It was the discovery of gold that first brought large numbers of white men to Colorado. Prospectors led by Green Russell discovered gold in 1858 at Cherry Creek, where the city of Denver now stands. The next year John Gregory made a great strike on the site of present-day Central City, and the lusty, lawless days of the mining boom began. At the time of the gold rush the area in which the gold fields were located was part of the U.S. Kansas Territory. A group of miners organized the gold fields as Arapahoe co. of Kansas Territory. The region was divided into districts, and miners' and people's courts were set up to provide quick justice. The miners sought separate territorial status in 1859 and formed the illegal Territory of Jefferson, which operated until the bill for territorial status was passed by Congress in 1861. William Gilpin, the first territorial governor, chose the name Colorado [Span., =red or colored]. Measures proposing statehood for Colo-

rado were introduced in the U.S. Congress in 1864, and again in 1866 and 1867 when they were vetoed by Andrew Johnson. A bill granting Colorado's state-



hood was finally passed by Congress in 1876. It was also in the 1860s and 1870s that Colorado's settlers achieved peace with the Indians of the area. When the first white settlers came to Colorado, Ute Indians lived in the mountain areas, while Comanche, Cheyenne, Arapaho, and Kiowa Indians roamed the Great Plains. Intertribal warfare between plains and mountain Indians was continuous. The tribes of the plains combined their forces in 1840 to halt the invasion of their homelands and hunting grounds by white settlers, and Indian massacres and lootings were accompanied by the subsequent reprisals carried out by white men. The Federal government tried and failed to achieve peace with the Indians. The warfare finally culminated in the defeat of the Indians after the Indian Wars (1861-69) and the Buffalo War (1873-74). The Ute Indians of the mountains also raided white settlements until a Ute chief, Ouray, brought peace to the tribe in 1873 (there was a brief outbreak of hostilities in 1879) through the cession of Ute territory to the United States. Today, Colorado's Indians live mainly on the Southern Ute reservation and in the Denver area. While Colorado was seeking to establish a government and to deal with the Indian problem, the state's mining boom was in sharp decline. The surface gold had been extracted in the middle 1860s, and mining areas became, and in many cases remain, studded with ghost towns—the machinery abandoned and shacks deserted. Other towns, such as Central City with its famous opera house dating from the city's days of opulence, managed to stay alive. The completion (1870) of a railroad link from Denver to the Union Pacific in Cheyenne, Wyo., and later railroad construction helped to stimulate the extension of farming and the growth of huge cattle ranches as well as to encourage an influx of settlers. In 1870, Nathan C. Meeker, former agricultural editor for the *New York Tribune*, established an agricultural community, Union Colony, at Greeley (named for Horace Greeley). The community constructed Colorado's first large irrigation canal. Between 1870 and 1880 population increased almost five-fold. Denver briefly became the largest receiving market for sheep, and a smelting industry was established. In the 1870s the discovery of silver-bearing lead carbonate ore at Leadville started a new mining boom. Prosperity was short-lived, however, for in the 1890s, despite a rich silver strike at Creede and the discovery of the state's richest gold field at Cripple Creek, Colorado suffered a depression. In 1893 the U.S. government stopped buying silver in order to restore confidence in the nation's currency, which had been placed on the gold standard in 1873. The silver market subsequently collapsed, dealing a severe blow to Colorado's economy. Labor conflicts, disputes over railway franchises, and warfare between sheep and cattle interests also plagued the state at the turn of the century. Many of labor's battles in this period were fought in the mines of Colorado, and the lawlessness and ruthlessness that prevailed among both employers and miners were reminiscent of the early days of the mining camps. When the silver market broke, Colorado turned politically to fusion. Populist-Democratic leaders advocating a return to bimetallism. The free-silver movement, however, was unsuccessful, and by 1910, with the improvement of national economic conditions, Colorado settled down to a predominantly agricultural economy. The establishment of large national parks in the early 1900s provided an additional source of revenue in tourism. During World War I the price of silver soared again and the economy prospered. The stock-market crash of 1929 and the droughts of 1935

and 1937 brought hardship to many. The economy recovered again during World War II, when the state produced food and valuable minerals and metal products for the war effort. Since the mid-1960s Colorado has experienced a large influx of new residents and rapid urban growth and development, especially along a strip (c. 150 mi/240 km long) centered on Denver and stretching from Fort Collins and Greeley in the north to Pueblo in the south. Colorado's state government is based on the constitution drawn up in 1876 and since amended. The governor of the state is popularly elected and serves for a term of four years. The legislature is made up of a senate with 35 members elected for four-year terms and a house of representatives with 65 members elected for two-year terms. Colorado is represented in the U.S. Congress by two Senators and five Representatives and has seven votes in the electoral college. Since the decline of populism in the state in the early part of the 20th cent., neither the Republican nor Democratic party has consistently dominated Colorado state politics. In 1974, Richard D. Lamm, a Democrat, was elected governor. Among Colorado's institutions of higher learning are the Univ. of Colorado, at Boulder, the Univ. of Denver, at Denver, Colorado State Univ., at Fort Collins, and the United States Air Force Academy, at Colorado Springs. See Robert Emmitt, *The Last War Trail* (1954), Perry Eberhart, *Guide to the Colorado Ghost Towns and Mining Camps* (1959), Caroline Bancroft, *Colorful Colorado: Its Dramatic History* (1959), Federal Writers' Project, *Colorado: A Guide to the Highest State* (1941, repr. 1970), P. F. Dorset, *The New Eldorado: The Story of Colorado's Gold and Silver Rushes* (1970), Le Roy R. Hafen, *Colorado: The Story of a Western Commonwealth* (1970), C. W. Casewit, *Colorado* (1973).

Colorado (kōlōrā'thō), river, c.550 mi (885 km) long, rising from tributaries in the Andes and flowing SE across S central Argentina to the Atlantic Ocean. It marks the northern limit of Patagonia. It is also a rough boundary between the commercial agriculture to the north and ranching to the south. The Colorado is unnavigable and frequently overflows its banks in the spring.

Colorado (1 kōlārād ə, -rād ō, -rādō 2 kōlārādə, -rādā) Great river of SW United States, 1,450 mi (2,334 km) long, rising in the Rocky Mts of N Colo., and flowing generally SW through Colo., Utah, Ariz., between Nev. and Ariz., and Ariz. and Calif., and then into Mexico, emptying into the Gulf of California, drains c.244,000 sq mi (631,960 sq km). The Gunnison, Green, San Juan, and Little Colorado are the main tributaries of the upper basin of the Colorado, the Gila is the chief tributary of the lower basin. Silt deposited by the Colorado has formed a great delta across the northern part of the Gulf of California, cutting off the head of the gulf, Salton Sea is a remnant of the severed part. The mouth of the river was seen by Francisco de Ulloa in 1539, the lower part was explored by Hernando de Alarcón in 1540. The river flows through c.1,000 mi (1,610 km) of canyons, of which the most spectacular is the Grand Canyon. Many national parks, monuments, and recreational areas are located along the river banks. The Colorado's waters are used for power and irrigation, especially by means of the Colorado River storage project, the Colorado-Big Thompson project, Hoover Dam, Davis Dam, Imperial Dam, the All-American Canal, Parker Dam, and Glen Canyon Dam. Controversies over water rights on the Colorado have long raged between the United States and Mexico and among the bordering states, treaties and compacts now regulate the river's use. 2 River, 894 mi (1,439 km) long, rising in the Llano Estacado, NW Texas, and flowing SE to Matagorda Bay, an inlet of the Gulf of Mexico, drains c.41,500 sq mi (107,485 sq km). Destructive floods, which prevented private development of the river for power, led the Texas legislature to set up the Lower, Central, and Upper Colorado River authorities to undertake projects for flood control, power plants, and irrigation. The Lower Colorado River Authority, with Federal assistance, has been especially active, building five major dams (Buchanan, Roy Inks, Alvin J. Wirtz, Marble Falls, and Mansfield). These projects have benefited a large part of Texas, including the city of Austin. The scenic section of the river above Austin, which includes the lakes formed by the dams, is called Highland Lakes Country. The Central Colorado River Authority has constructed many small irrigation dams and also has jurisdiction over several city reservoirs. The Upper Colorado River Authority regulates the upper Colorado and the several branches of the Concho, a principal tributary.

Colorado, University of, mainly at Boulder, state supported, coeducational, chartered 1861, opened 1877. It has a branch at Colorado Springs and a large general and psychopathic medical center in Denver, it also operates the High Altitude Observatory at Climax. The university museum has a noted collection of materials and specimens relating to the natural history of the Southwest and the Rocky Mountain regions.

Colorado-Big Thompson project, constructed by the U.S. Bureau of Reclamation to divert water from the headstreams of the Colorado River to irrigate c. 720,000 acres (291,400 hectares) of land in NE Colorado and to supply power, built 1938-56. Water is diverted by several dams, notably Granby Dam on the Colorado and Green Mt. Dam on the Blue River. Water is stored in Granby Reservoir, Shadow Mt. Lake, and Grand Lake before it is pumped through the Alva B. Adams Tunnel (13 mi/21 km long), to fall down the eastern slope of the Continental Divide into the Big Thompson River, a tributary of the South Platte. Dams near Fort Collins and Estes Park divert the water for use. Flatiron (71,500-kw capacity), Estes (45,000 kw), Pole Hill (33,250 kw), and Green Mt. (21,600 kw) dams generate power.

Colorado College, at Colorado Springs, Colo., coeducational, chartered and opened 1874.

Colorado National Monument: see NATIONAL PARKS AND MONUMENTS (table).

Colorado Plateau, physiographic region of North America, c. 150,000 sq mi (388,500 sq km), SW United States, in Arizona, Utah, Colorado, and New Mexico. It is characterized by broad plateaus, ancient volcanic mountains at altitudes of c. 5,000 to 13,000 ft (1,520-3,960 m), and deeply dissected great canyons carved into nearly horizontal and often brightly colored sedimentary and volcanic rocks, the GRAND CANYON of the Colorado River is part of the region. Indian reservations occupy about one third of the mostly semiarid and sparsely vegetated area, about one half of the public land is used for grazing. Ancient cliff dwellings at Mesa Verde and Canyon de Chelly are of archaeological interest. The region has a number of U.S. national parks and monuments.

Colorado potato beetle: see POTATO BEETLE.

Colorado River storage project, a multipurpose plan, undertaken by the U.S. Bureau of Reclamation in 1956, to control the flow of the upper Colorado and its tributaries and to aid in the development of the rugged, remote upper Colorado River basin, includes parts of Wyo., Utah, Colo., Ariz., and N. Mex. The Colorado River Compact of 1922 established the division between the upper and lower basins and stipulated that the upper basin's water consumption be contingent on the delivery of a set amount of water to the lower basin. Since the flow of the Colorado is erratic, a storage project was needed to maintain an even flow of water to the lower basin in dry years. A series of dams regulates stream flow, provides storage reservoirs, creates hydroelectric power, and irrigates both new and previously developed acreage. The four major units of the project are GLEN CANYON DAM, on the Colorado River in Arizona, FLAMING GORGE DAM, on the Green River in Utah, NAVAJO DAM, on the San Juan River in New Mexico, and the Curecanti dams on the Gunnison River in Colorado. The three reservoirs of the Curecanti unit are included in the Curecanti National Recreation Area (see NATIONAL PARKS AND MONUMENTS, table). There are 11 authorized participating projects, including the CENTRAL UTAH PROJECT.

Colorado School of Mines, at Golden, state supported, coeducational, chartered 1874. It was one of the first mineral engineering schools in the United States. It owns extensive experimental and research facilities, field laboratories, and an experimental mine at Idaho Springs. See J. R. Morgan, *A World School: The Colorado School of Mines* (1955).

Colorado Springs, city (1970 pop. 135,060), seat of El Paso co., central Colo., on Monument and Fountain creeks, at the foot of Pikes Peak, inc. 1886. It is a beautiful residential and year-round vacation and health resort city, with thriving industries producing a wide variety of products. The town of El Dorado (later Colorado City) was founded on Fountain Creek by gold miners in 1859. In 1871, Gen. William Palmer and the Denver and Rio Grande RR established the modern city of Fountain Colony nearby, the name was changed to Colorado Springs because of the many mineral springs in the area. The city grew as a summer and health resort, absorbing the earlier community of Colorado City in 1917. Today it is the seat of Colorado College and the headquarters

of Pike National Forest. The United States Air Force Academy is nearby, and to the south are U.S. Fort Carson (est. 1942) and Ent Air Force Base, headquarters of the North American air defense command.

Colorado State University, at Fort Collins, land-grant with state and federal support, chartered 1870, opened 1879 as an agricultural college, assumed present name in 1957. The Rocky Mt. Forest and Range Experiment Station and the headquarters of the Colorado State Forest Service are there.

coloration, protective: see PROTECTIVE COLORATION.

coloratura: see SOPRANO.

color blindness, visual defect resulting in the inability to distinguish colors. About 8% of men and 0.5% of women experience some difficulty in color perception. Color blindness is usually an inherited sex-linked characteristic, transmitted through, but recessive in, females. Acquired color blindness results from certain degenerative diseases of the eyes. Most of those with defective color vision are only partially color-blind to red and green, i.e., they have a limited ability to distinguish reddish and greenish shades. Those who are completely color-blind to red and green see both colors as a shade of yellow. Completely color-blind individuals can recognize only black, white, and shades of gray. Color blindness is usually not related to visual acuity, it is significant, therefore, only when persons who suffer from it seek employment in occupations where color recognition is important, such as airline pilots, railroad engineers, and others who must recognize red and green traffic signals. Tests for color blindness include identifying partially concealed figures or patterns from a mass of colored dots and matching skeins of wool or enameled chips of various colors.

color field painting: see POST-PAINTERLY ABSTRACTION.

color index, in astronomy, difference between a star's apparent photographic MAGNITUDE (B) and apparent visual magnitude (V), as measured with standardized photographic plates. Color index is defined as zero for a white star (SPECTRAL CLASS A0). The color index is positive for stars redder than a white star and negative for stars bluer than a white star. In effect, measuring the color index is equivalent to measuring the difference between the amount of blue light and red light that the star radiates.

Colossae (kālōs'ē), ancient city of SW Phrygia, Asia Minor, S of the Maeander (modern Menderes) River, in W Turkey, 4 mi (6.4 km) E of Denizli. It flourished as a trading town until eclipsed by neighboring Laodicea. The area around Colossae was famous for fantastic theological theories in early Christian times. Although Paul himself never went there, he addressed his epistle to the COLOSSIANS through his fellow worker, Epaphras, who lived at Colossae.

Colosseum or **Coliseum** (both kōlāsē'əm), Ital. Colosseo, common name of the Flavian Amphitheater in Rome, near the southeast end of the Forum, between the Palatine and Esquiline hills. Begun by Vespasian, A.D. c. 75, and completed by his son Titus in A.D. 80, it is the most imposing of Roman antiquities. The vast four-storied oval is 617 ft (188 m) by 512 ft (156 m), much of which is still standing, it had tier on tier of marble seats accommodating c. 45,000 spectators. It encloses an arena measuring 250 ft (76 m) by 151 ft (46 m) where gladiatorial combats were held (see GLADIATORS) until 404. According to tradition, persecuted Christians were thrown there to beasts. The Colosseum has been damaged several times by earthquakes. See John Pearson, *Arena: The Story of the Colosseum* (1974).

Colossians (kālōsh'ānz), epistle of the New Testament, the 12th book in the usual order. It was written to the Christians of Colossae and Laodicea (12, 416) by St. PAUL when he was a prisoner, probably in Rome (A.D. c. 60). The writing was provoked, apparently, by the appearance in the churches addressed of some sort of gnostic doctrine involving angels (2:18). Colossians is like EPHESIANS in tone, especially in the emphasis on the doctrine of the mystical body of Christ (1:15-20, 1:24-25, 2:9-10). This book contains several well-known passages, on the apostleship of St. Paul (1:24-29), on baptism (2:12-15), and on death and resurrection "with Christ" (2:20-3:4).

colossus (kālōs'ās), name given, in antiquity, to a statue of very great size. In Egypt were many colossuses, 50 to 60 ft (15.2 to 18.3 m) high. The Athena Parthenos on the Acropolis at Athens and the Zeus in the temple at Olympia in Greece were other examples. The Colossus of Rhodes, one of the seven

wonders of the ancient world, was a large bronze statue, destroyed in antiquity, of the sun god, Helios, in the harbor of Rhodes. It was built at least in part by Chares of Lindus (Rhodes) between 292 and 280 B.C. Its height probably was something over 100 ft (30.5 m). The bronze had been taken from the machines and tools left behind by DEMETRIUS I after his unsuccessful siege of Rhodes. According to popular but erroneous legend it stood astride the harbor with the ships passing between its legs. Its actual location was on a promontory overlooking the harbor, and the representational type is well known from images on coins of the same period. Among colossuses of later times the Great Buddha at Kamakura, Japan, and the Bartholdi Statue of Liberty in New York harbor are notable. Of two colossal figures of Christ in South America, one is at Rio de Janeiro, and the other, the CHRIST OF THE ANDES, on the boundary between Argentina and Chile.

Colquhoun, Patrick (kōhōon'), 1745-1820, British economist and statistician, b. Scotland. Active in civic affairs in Glasgow (where he founded the chamber of commerce) and London, he became known for his *Treatise on the Police of the Metropolis* (1795, 7th ed. 1806), written from his experience as a police magistrate. The most noted of his works is the *Treatise on the Population, Wealth, and Resources of the British Empire* (1814), in which he set forth statistical estimates of the distribution of national income. His figures, demonstrating the exploitation of the working classes, long influenced social and economic reformers.

Colt, Samuel, 1814-62, American inventor, b. Hartford, Conn. In 1835-36, he patented a revolving-breech pistol and founded at Paterson, N.J., the Patent Arms Company, which failed in 1842. An order for 1,000 revolvers from the U.S. government in 1847 in the Mexican War made possible the reestablishment of his business. He later built the Colt's Patent Fire-Arms Manufacturing Company factory at Hartford. Colt also invented a submarine battery used in harbor defense and a submarine telegraph cable. His revolving-breech pistol became so popular that today the word Colt is sometimes used as a generic term for the revolver. See biography by W. B. Edwards (1953).

Colter, John (kōl'tər), c. 1775-1813, American trapper and guide, b. Virginia. In 1803 he enlisted in the Lewis and Clark expedition and in 1806, on the return trip, was granted a discharge to join a party of trappers. The following year, on his way to St. Louis, he met the expedition of Manuel Lisa and was engaged to guide the party to the mouth of the Big Horn, where a post was built. Lisa sent Colter on a mission to the Crow Indians. His exact route is not certain, but he is believed to have crossed, alone and on foot, the Wind River Mts. and the Teton range, and he may have been the first white man to see the region that he traversed (now included in Yellowstone National Park). He was severely wounded in a battle between the Crow and Blackfoot Indians, but he escaped and made his way back to the post. In 1809 he guided an expedition of the St. Louis Missouri Fur Company to the Three Forks of the Missouri, returning to St. Louis in 1810. He furnished very valuable data to Clark, who was compiling maps for the report of the Lewis and Clark expedition. See biographies by Stallo Vinton (1926) and Burton Harris (1952).

colter, see PLOW.

Colton, Walter (kōl'tən), 1797-1851, American editor, writer, and clergyman, b. Rutland co., Vt. He became a naval chaplain in 1831. His books *Ship and Shore* (1835), *A Visit to Constantinople and Athens* (1836), and *Deck and Port* (1850) are based upon his naval experiences. In 1846 he was appointed chief judge of Monterey, Calif. and founded the *Californian*, California's first newspaper. Colton's book *Three Years in California* (1850) is an excellent historical account of this period.

Colton, city (1970 pop. 19,974), San Bernardino co., S. Calif., a suburb of San Bernardino, in a rich citrus and farm area, inc. 1887.

Coltrane, John, 1926-67, American jazz musician, b. Hamlet, N.C. He began playing tenor saxophone as an adolescent. Coltrane worked with numerous big bands before emerging in the mid-1950s as a major stylist while playing with Miles Davis. Originally influenced by Lester Young, Coltrane displayed dazzling technical brilliance coupled with ardent emotion in his playing. His style was at once sonorous and spare. From the late 1950s until his death he was considered the outstanding tenor and soprano saxophonist of the jazz avant-garde.

coltsfoot, Eurasian perennial herb (*Tussilago farfara*) of the family Compositae (COMPOSITE family), now a widespread weed in most northern lands. The scaly flower stalk bears a yellow flower head and downy, somewhat dandelionlike fruits. The leaves—appearing after the flowers—are large and vaguely heart shaped. Coltsfoot was long a popular cough remedy. Other plants are sometimes called coltsfoot, e.g., the related winter heliotrope, or sweet coltsfoot (*Petastites fragrans*), an ornamental. Coltsfoot is classified in the division MAGNOLIOPHYTA, class Magnoliopsida, order Asterales, family Compositae.

colugo (kalōō'gō) see FLYING LEMUR

Colum, Padraic (pă'drīk kōl'am), 1881–1972, Irish-American author, b. Longford, Ireland. He was active in the IRISH LITERARY RENAISSANCE and helped to found the Abbey Theatre. His verse includes *Wild Earth* (1907), *The Story of Lowry Maen* (1937), and *Collected Poems* (1953). He also wrote children's stories based on Irish folklore. His wife was Mary (Maguire) Colum, 1880–1957, Irish-American critic, b. Sligo, Ireland. Her autobiography, *Life and the Dream* (1947), vividly describes various literary circles.

Columbia, Saint, or Saint Columcille (kōl'amkīl) [Irish, =dove of the church], 521–97, Irish missionary to Scotland, called the Apostle of Caledonia. A prince of the O'Donnells of Donegal, he was educated at Moville and Clonard. In Ireland he founded the monastery schools of Derry (545), Durrow (553), and Kells (c. 554). In 563, Columbia and several companions sailed to evangelize Scotland. They landed at IONA, where they established their center. Thence they went about the Highlands and the northern Lowlands spreading the gospel. Before Columbia's death N. Scotland was entirely Christian. St. Columba ranks with St. Patrick and St. Bridget as one of the three patron saints of the Irish, he is supposed to be buried with them at Downpatrick. Feast: June 9. See Hugh De Blacam, *The Saints of Ireland* (1942).

Columban, Saint (kalūm'ban), c.540–615, Irish missionary to the continent of Europe, also called Columbanus. He was trained in the abbey at Bangor. He and 12 companions, including St. Gall, sailed to France (c.585), where they set out to eradicate the general impiety that had grown up under the successors of Clovis. He went into seclusion in the Vosges, and c.590 he founded the abbey at Luxeuil. His Celtic practices and austerities eventually alienated both ecclesiastical and civil powers. Involved in the hostility between Queen Brunhilda and the Frankish bishops, he was generally feared by them all and was exiled. He went (610) to Switzerland and to Brengenz, seeking to reestablish Christianity there. Hostile reaction caused him to go (612) to Milan. At Bobbio he set up an abbey. There he died and lies buried. St. Columban was a considerable scholar, and all his foundations became known for their learning. He composed a rule for monks, which was later completely replaced by the longer and less austere rule of St. Benedict. Feast: Nov. 21 and, in Ireland, Nov. 23. See the classic work of Montalembert, *The Monks of the West* (1861), Francis MacManus, *Saint Columban* (1962), Brendon Lehan, *The Quest of Three Abbots* (1968).

Columbia 1. City (1970 pop. 58,804), seat of Boone co., central Mo.; inc. 1826. The trade center of a farm and coal area, it is best known as the seat of the Univ. of Missouri and Stephens College. The Missouri School of Religion and a junior college are also there. The city is a medical center, with the university hospital, a state cancer hospital, and a state regional mental health clinic. There are houses dating from c.1820. 2. Industrial borough (1970 pop. 11,237), Lancaster co., SE Pa., on the Susquehanna River, settled by Quakers c.1730, inc. 1814. The borough was originally called Wright's Ferry, its name was changed in 1789 when it narrowly missed Congressional selection as the permanent U.S. capital. One of the world's largest concrete arch bridges spans the Susquehanna there. 3. City (1970 pop. 113,542), state capital, and seat of Richland co., central S.C., at the head of navigation on the Congaree River, inc. 1805. It is the largest city in the state and an important trade and commercial point in the heart of a rich farm region. Its industries include printing and the manufacture of textiles, clothing, plastics, electronic equipment, office machinery, and glass and stone products. A trading post flourished nearby in the early 18th cent. In 1786 the site was chosen for the new state capital because of its central location, the legislature first met in its new quarters in 1790. During the Civil War, Sherman's army entered Columbia on Feb. 17, 1865. That night most of the city was burned by drunken Union sol-

diers and was almost totally destroyed. An educational center, Columbia is the seat of the Univ. of South Carolina, Benedict College, Columbia College, a Lutheran theological seminary, and a Bible college. Also in the city are the state penitentiary, a state hospital, and a U.S. veterans hospital. Notable buildings include the statehouse (begun 1855, damaged in 1865, completed 1901), Woodrow Wilson's boyhood home (1870), and several antebellum houses. Also of interest are the South Carolina Archives Building, the Columbia Museum of Art and Science, and the Midlands Exposition Park, with historical exhibits. Adjacent to the city is U.S. Fort Jackson, a major infantry training center. Lake Murray (formed by the dammed Saluda River) is nearby. 4. City (1970 pop. 21,471), seat of Maury co., central Tenn., on the Duck River, inc. 1817. Once a noted mule market and racing horse center, it is now the trade and processing hub of a fertile area producing beef cattle and burley tobacco and a shipping point for the region's limestone and phosphate deposits. Columbia's many fine antebellum homes include the James K. Polk House (1816). A junior college and a state vocational training center are there. A national jubilee for Tennessee walking horses is held in the city every June.

Columbia, river, c.1,210 mi (1,950 km) long, rising in Columbia Lake, SE British Columbia, Canada. It flows first NW in the Rocky Mt. Trench, then hooks sharply about the Selkirk Mts. to flow S through Upper Arrow Lake and Lower Arrow Lake and receive the Kootenai River (spelled Kootenay in Canada) before entering the United States after a course of 465 mi (748 km). It continues S through Washington and just below the mouth of the Spokane River is forced by lava beds to make a great bend westward before veering south again, running the while entrenched in a narrow valley through the Columbia Plateau. Its chief tributary, the Snake River, joins it just before it turns west again. The Columbia then forms part of the Washington-Oregon border before entering the Pacific Ocean through a wide estuary W of Portland, Oregon. The Columbia River has created regal gorges by cutting through the Cascades and the Coast Ranges, it is fed by the Cowlitz and Willamette rivers, which drain the Puget trough between those ranges. Grand Coulee, now a reservoir in the COLUMBIA BASIN PROJECT, was a former stream channel of the Columbia River. It was created during the Ice Age when the Columbia's course was blocked by ice, forcing it to cut a new channel through the Columbia Plateau. When the ice receded the river resumed its former channel. The Columbia River, commanding one of the great drainage basins of North America (c. 259,000 sq mi/670,800 sq km), was discovered by Robert Gray, an American explorer, in 1792 and is named for his vessel, the *Columbia*. It was first actually entered by a British naval officer, William R. Broughton, later the same year. Long before this time the Indians were fishing salmon from the river, today fish are still caught there, but heavy settlement along the river and its tributaries, the construction of dams, and human use have reduced the salmon runs. The first whites to arrive overland were the members of the Lewis and Clark expedition and the fur traders (notably David Thompson of the North West Company and the founders of Astoria). The river was the focus of the American settlement that created Oregon, and the river was itself sometimes called the Oregon River or the River of the West. Irrigation was begun early, and some tributaries were used to water cropland and orchards, as in, e.g., the valleys of the Wenatchee and Yakima rivers. After 1932 plans gradually developed to use the Columbia River to its ultimate possibility and the Columbia basin project was established. Its purpose is to establish flood control, which would alleviate the destruction seen in the Columbia's greatest flood, that of 1894, and somewhat lesser but damaging floods, such as that of 1948, to improve navigation, to extend irrigation in order to make optimum use of the water of the Columbia and its tributaries, and to produce hydroelectric power to supply the Pacific Northwest. There are six Federal and five non-Federal dams on the Columbia River. Grand Coulee (the key unit of the Columbia basin project) and Chief Joseph Dam, on the river's upper course, provide power, flood control, and irrigation. Priest Rapids, Wanapum, Rock Island, Rocky Reach, and Wells dams are on the middle course, all are among the largest non-Federal hydroelectric facilities in the United States. Bonneville, The Dalles, John Day, and McNary dams, on the lower course, were designed as power, flood control, and navigation projects, these dams

provide a 328-mi (528-km) slack-water navigation channel up the Columbia River from the Pacific Ocean to the Snake River. With these Federal projects and non-Federal dams on the Columbia, hydroelectric plants on the river have a potential generating capacity of about 21 million kw. The development of hydroelectric power has had a significant effect on the economic pattern of the Pacific Northwest. See U.S. Dept. of the Interior, Bureau of Reclamation, *The Columbia River* (1947), J. V. Krutilla, *The Columbia River Treaty, The Economics of an International River Basin Development* (1967).

Columbia, District of: see WASHINGTON, D.C.

Columbia basin project, central Wash., a multi-purpose development of the U.S. Bureau of Reclamation providing irrigation, hydroelectric power, and flood control. Its key unit, the GRAND COULEE DAM, provides the project with power and pumps the waters of the Columbia River into an irrigation system comprising a series of lakes, reservoirs, and numerous canals. Irrigation was begun in 1948 and will eventually cover more than 1,000,000 acres (404,700 hectares) on the Columbia plateau S of Grand Coulee Dam. In 1969 the project had an installed hydroelectric power generation capacity of 2,333,000 kw. O'Sullivan Dam (200 ft/61 m high, 19,000 ft/5,791 m long, completed 1949) on Crab Creek, the project's southernmost dam, is one of the largest earthfill dams in the United States and impounds Potholes Reservoir.

Columbia College: see COLUMBIA UNIV.

Columbia Heights, city (1970 pop. 23,997), Anoka co., SE Minn., a residential suburb adjoining Minneapolis, on the Mississippi River, inc. 1921. It has many varied manufactures.

Columbian Exposition: see WORLD'S COLUMBIAN EXPOSITION.

Columbia Plateau, physiographic region of North America, c.100,000 sq mi (259,000 sq km), NW United States, between the Rocky Mts. and the Cascade Range in Washington, Oregon, and Idaho. Most of the plateau is underlain by deposits, more than 10,000 ft (3,048 m) thick in places, of lava (mainly basalt) interbedded with sedimentary rock, older rocks outcrop in the Blue and Wallowa mts. Young lavas, scattered cinder cones, volcanic ash, and barren landscapes (including CRATERS OF THE MOON NATIONAL MONUMENT) are features of the Snake River plain in the south. Older, decayed lavas, much modified by accumulations of loess, occur in the north in the Columbia basin section, coulees (dry river canyons) and scablands (extensively eroded basalt surfaces), both carved by glacial meltwaters, are features of the region. The Columbia Plateau is an important agricultural and grazing area and is a major source of hydroelectric power.

Columbia sheep, medium-wool breed developed in the United States using Lincoln and Rambouillet sheep crosses. The breed was developed primarily for the Western ranges but is also used successfully in farm flocks. Columbias are white-faced, hornless, and relatively large in size and are prolific breeders.

Columbia University, mainly in New York City, founded 1754 as King's College by grant of King George II. Its first president was Samuel JOHNSON (1696–1772), a clergyman, who held classes in the schoolhouse of Trinity Church. The administration of his successor, Myles COOPER, was interrupted by the American Revolution, the college was closed but was reopened as Columbia College (1784). Title was first vested in the regents of the Univ. of the State of New York but in 1787 it was transferred to the trustees of the college, who elected William Samuel JOHNSON president. In 1857, under Charles King (1789–1867), the college moved to a site at Madison Ave. and 49th St., in 1897, under Seth Low, the move was made to Morningside Heights. The gradual addition of professional and graduate schools resulted in the assumption of the name Columbia Univ. in 1896, in 1912 the name became Columbia Univ. in the City of New York. Columbia College remained the undergraduate school. The school of medicine (est. 1767) was absorbed into the independent College of Physicians and Surgeons (chartered 1807), which in turn was absorbed into the university in 1891. Also included in the university are the schools of law (1858), architecture (1896), and engineering (1896), the school of mines (founded 1864 now included in the school of engineering), and the three graduate faculties—political science (1880), philosophy (1890), and pure science (1892). The university system includes Teachers College (founded 1888, chartered 1889), Barnard College for women (est. 1889), the College of Pharmacy

(est 1892), and the Columbia School of Social Work (formerly the New York School of Social Work, est 1898 as a summer school, affiliated with Columbia in 1940 and included within the university in 1959). The school of journalism was established in 1912 and that of business in 1916. In addition there are schools of public health, library service, international affairs, and the School of General Studies (est 1947, adult undergraduate college, formerly the university extension, est 1904). Much of Columbia's work in the fields of political science and international relations is carried on through a large group of research institutes (e.g., the East Asian, the European, and the Russian institutes). At Irvington-on-Hudson, N.Y., are the university's botanical and biological field stations. At Palisades, N.Y., the university operates the Lamont Geological Laboratory, which has extensive facilities for research in geophysics, geochemistry, and oceanography. The university library system, among the nation's largest, has many important manuscripts and rare book collections. Columbia is affiliated with the Marine Biological Laboratory at Woods Hole, Mass. Notable presidents of Columbia include F. A. P. BARNARD, Nicholas Murray BUTLER, and Dwight D. Eisenhower. Grayson Kirk was president from 1953 to 1969 and was succeeded by Andrew Cordier. In 1970, William J. McGill was appointed president. Columbia Univ. Press was founded in 1893. For histories of the various schools, see the volumes published in the Bicentennial series of Columbia Univ. See J. L. Avorn, et al., *Up Against the Ivy Wall* (1969), *University on the Heights*, ed. by Wesley First (1969).

Columbine. see COMMEDIA DELL'ARTE

columbine (köl'ambīn), any plant of the genus *Aquilegia*, perennials of the family Ranunculaceae (BUTTERCUP family), popular both as wild flowers and as garden flowers. Columbines have delicate and attractive foliage and flower petals with long spurs that secrete nectar. The common Eastern red-and-yellow-flowered wild columbine (*A. canadensis*), frequenting rocky places, is also called rockbell, it is a favorite of hummingbirds, and the Indians made an infusion of the seeds for headache and fever. The blue-and-white-flowered *A. coerulea* of the Rockies is the state flower of Colorado. The common European columbine (*A. vulgaris*), blue, white, or purple flowered and escaped from gardens in the United States, has been the source of many of the garden kinds—some double and of various soft colors. Columbine is classified in the division MAGNOLIOPHYTES, class Magnoliopsida, order Ranunculales, family Ranunculaceae.

columbium, former name of the chemical element NIOBIUM.

Columbus, Christopher, Ital. *Cristoforo Colombo* (krēstō'fōrō kölōm'bō), Span. *Cristóbal Colon* (krēstō'bāl kölōn'), 1451-1506, discoverer of America, b. Genoa, Italy. He spent some of his early years at his father's trade of weaving and later became a seaman on the Mediterranean. Shipwrecked near the Portuguese coast in 1476, he made his way to Lisbon, where his younger brother, Bartholomew, an expert chart maker, lived. Columbus, too, became a chart maker for a brief time in that great maritime center during the golden era of Portuguese exploration and discovery. Engaged as a sugar buyer in the Portuguese islands off Africa (the Azores, Cape Verde, and Madeira) by a Genoese mercantile firm, he met pilots and navigators who believed in the existence of islands farther west. It was at this time that he made his last visit to his native city, but he always remained a Genoese, never becoming a naturalized citizen of any other country. Returning to Lisbon, he married (1479?) the wellborn Dona Filipa Perestrelo e Moniz. By the time he was 31 or 32, Columbus had become a master mariner in the Portuguese merchant service. It is thought by some that he was greatly influenced by his brother, Bartholomew, who may have accompanied Bartholomew Diaz on his voyage to the Cape of Good Hope, and by Martin Alonso Pinzon, the pilot who commanded the *Pinta* on the first voyage. Columbus was but one among many who believed one could reach land by sailing west. His uniqueness lay rather in the persistence of his dream and his determination to realize this "Enterprise of the Indies," as he called his plan. Seeking support for it, he was repeatedly rebuffed, first at the court of John II of Portugal and then at the court of Ferdinand and Isabella of Spain. Finally, after eight years of supplication by Columbus, the Spanish monarchs, having conquered Granada, decided to risk the enterprise. On Aug. 3, 1492, Columbus sailed from Palos, Spain, with three small ships, the *Santa Maria*, commanded by Co-

lumbus himself, the *Pinta* under Martin Pinzón, and the *Niña* under Vicente Yáñez Pinzón. After halting at the Canary Islands, he sailed due west from Sept. 6 until Oct. 7, when he changed his course to the southwest. On Oct. 10 a small mutiny was quelled, and on Oct. 12 he landed on a small island (Watling Island, see SAN SALVADOR) in the Bahama Group. He took possession for Spain and, with impressed natives aboard, discovered other islands in the neighborhood. On Oct. 27 he sighted Cuba and on Dec. 5 reached Hispaniola. On Christmas Eve the *Santa Maria* was wrecked on the north coast of Hispaniola, and Columbus, leaving men there to found a colony, hurried back to Spain on the *Niña*. His reception was all he could wish, according to his contract with the Spanish sovereigns: he was made "admiral of the ocean sea" and governor general of all new lands he had discovered or should discover. Fitted out with a large fleet of 17 ships, with 1,500 colonists aboard, he sailed from Cadiz in Oct., 1493. His landfall this time was made in the Lesser Antilles, and his new discoveries included the Leeward Islands and Puerto Rico. The admiral arrived at Hispaniola to find the first colony destroyed by Indians. He founded a new colony nearby, then sailed off in the summer of 1494 to explore the southern coast of Cuba. After discovering Jamaica he returned to Hispaniola and found the colonists, interested only in finding gold, completely disorderly, his attempts to enforce strict discipline led some to seize vessels and return to Spain to complain of his administration. Leaving his brother Bartholomew in charge at Hispaniola, Columbus also returned to Spain in 1496. On his third expedition, in 1498, he was forced to transport convicts as colonists, because of the bad reports on conditions in Hispaniola and because the novelty of the New World was wearing off. He sailed still farther south and made his landfall on Trinidad. He sailed across the mouth of the Orinoco River (in present Venezuela) and realized that he saw a continent, but without further exploration he hurried back to Hispaniola to administer his colony. In 1500 an independent governor arrived, sent by Isabella and Ferdinand as the result of reports on the wretched conditions in the colony, and he sent Columbus back to Spain in chains. The admiral was immediately released, but his favor was on the wane, other navigators, including Amerigo VESPUCCI, had been in the New World and established much of the coast line of NE South America. It was 1502 before Columbus finally gathered together four ships for a fourth expedition by which he hoped to reestablish his reputation. If he could sail past the islands and far enough west he hoped he might still find lands answering to the description of Asia or Japan. He struck the coast of Honduras in Central America and coasted southward along an inhospitable shore, suffering terrible hardships, until he reached the Gulf of Darien. Attempting to return to Hispaniola, he was marooned on Jamaica. After his rescue, he was forced to abandon his hopes and return to Spain. It is true the Vikings (see LEIF ERICSSON and THORFINN KARLSEFNI) had previously discovered America (c. 1000), but their knowledge had been converted into saga, never acted upon by navigators, so that Columbus was no less a discoverer. Although his voyage was of great importance and marked the beginning of American history, Columbus died in neglect, almost forgotten. Historians have disputed for centuries his skill as a navigator, but it has been recently proved that with only dead reckoning Columbus was unsurpassed in charting and finding his way about unknown seas. See J. M. Cohen, comp., *The Four Voyages of Christopher Columbus* (1969), biographies by S. E. Morison (1942), Salvador de Madariaga (1967), and E. D. S. Bradford (1973).

Columbus 1 City (1970 pop. 155,028), seat of Muscogee co., W. Ga., at the head of navigation on the Chattahoochee River, settled and inc. 1828 on the site of a Creek Indian village. The second largest city in the state, Columbus is a port of entry situated at the foot of a series of falls that extend more than 30 mi (48 km) and provide extensive water power. An important industrial and shipping center with many giant textile mills (the first was built in 1838), it also has iron works, food-processing plants, and factories producing lumber, chemicals, crushed granite, furniture, hospital equipment, concrete, wood and rubber products, and beverages. Columbus, carved out of the wilderness, was built according to plan and remained a busy river port until the arrival of the railroads in the 1850s. Its river traffic has been revitalized with the completion of a series of locks and dams providing access to the Gulf of Mexico.

During the Civil War, Columbus was an important Confederate industrial center. It was captured by Federal troops one week after Lee's surrender at Appomattox. Its industrial growth received added impetus in the early 20th cent. with the development of hydroelectric power plants. There are many antebellum homes in the city, and its oldest section has been marked for restoration and preservation. Columbus College is there, and just south of the city is Fort Benning. 2 City (1970 pop. 26,457), seat of Bartholomew co., S. central Ind., on the East Fork of the White River, inc. 1821. Its many manufactures include automotive parts, diesel engines, castings, metal furniture, electric controls, and plastic components. In the Civil War, Columbus served as a depot for Union armies. Both the railroads and the war brought industries, which remain to this day. The city is known for its outstanding architecture, including buildings designed by world famous architects from the late 1930s onward. 3 City (1970 pop. 25,795), seat of Lowndes co., NE Miss., on the Tombigbee River, inc. 1821. The trade, processing, and shipping center of a large cotton, livestock, dairy, and timber area, it also has marble works and garment factories. Franklin Academy, the first free school in the state, now part of the public school system, was opened in 1821. Mississippi State College for Women and Columbus Air Force Base are there. A pilgrimage for tourists to the city's many beautiful antebellum homes is conducted each year. 4 City (1970 pop. 15,471), seat of Platte co., E. central Nebr., in a prairie region, at the confluence of the Loup and Platte rivers, inc. 1857. It is a railroad, manufacturing, and trade center for a livestock, dairy, and grain area and is the headquarters for the Loup River power project. A junior college is there. 5 City (1970 pop. 540,025), state capital and seat of Franklin co., central Ohio, on the Scioto River, inc. as a city 1834. It is a port of entry, a rail, highway, and air focal point, and a major industrial and trade center in a rich farm region. Its many manufactures include household appliances, aircraft and missiles, automatic controls, foundry and machine-shop products, glass items, processing equipment, and coated fabrics. Columbus was laid out as state capital in 1812, but did not take over the government from Chillicothe until 1816. Its growth was stimulated by the development of transportation facilities—a feeder canal to the Ohio and Erie Canal, which was opened in 1831, the National Road, which reached the city in 1833, and the railroad, which arrived in 1850. Today the city is the seat of Ohio State Univ., Capital Univ., Ohio Dominican College, a business university, state schools for the deaf and blind, and Battelle Memorial Institute (for industrial research in metallurgy, the graphic arts, ceramics, and other fields). Landmarks include the state capital, the state office building, with the state library, the Columbus Gallery of Fine Arts, the library and museum of the state archaeological and historical society, the headquarters of the American Rose Society, with one of the world's largest rose gardens, Camp Chase Confederate cemetery, with the graves of soldiers who died in the Civil War prison camp there, and the vast state fair grounds. Also in the city are U.S. Fort Hayes (est. 1863) and a state penitentiary. Columbus has an international airport. See H. S. Hunker, *Industrial Evolution of Columbus, Ohio* (1958), R. D. McKenzie, *The Neighborhood: A Study of Local Life in the City of Columbus, Ohio* (1923, repr. 1970).

Columbus Day, holiday commemorating Christopher Columbus's discovery of America. It has been traditionally celebrated on Oct. 12 throughout most of the United States, parts of Canada, and in several of the Latin American republics. In the United States, however, since the observation in 1971 of the Uniform Holiday Act, it is celebrated on the Monday nearest to Oct. 12.

Columella, Saint. see COLUMBA, SAINT

Columella (Lucius Junius Moderatus Columella), fl. 1st cent. A.D., Latin writer on agriculture, b. Gades (now Cadiz), Spain. Of his work there remains the 12-volume *De re rustica*, treating general husbandry, the care of domestic animals, and farm management. The 10th book, modeled on Vergil, is in hexameters. A short essay on trees also survives. Columella's Latin is facile and elegant, and his information is surprisingly practical and accurate.

column, vertical architectural support, circular or polygonal in plan. A column is generally at least four or five times as high as its diameter or width, sturdier freestanding masses of masonry are usually called piers or pillars. The shape, proportions, and materials of columns vary widely. Columns arranged

in a row form a colonnade. Early forms of masonry columns can be seen in the rock-cut tombs at Beni Hassan in Egypt, with their polygonal shafts and block capitals. In fully developed Egyptian architecture the columns were of gigantic size, spaced very closely together, and were reserved for inner courtyards and halls. In the Aegean area, in pre-Hellenic times, the column type known to have been used is one with a cushionlike cap and with its shaft tapering downward. Subsequent types were the archaic forms of Doric, developed by the Dorians after their coming (before 1000 B.C.) into the region. By the 7th cent. B.C. this Greek Doric had been established in its design. The columns of classical architecture represent the attempt to design proportionings and details that would create maximum structural harmony. It is in the Greek temples of the Periclean Age (5th cent. B.C.), notably in the Parthenon, that the ideal was obtained. In Greek, Roman, and Renaissance architecture the various column types, taken together with the entablatures that they support, form the classical **ORDERS OF ARCHITECTURE**. The classical column has the three fundamental elements of base, shaft, and capital. The shaft has a gradual upward tapering (entasis), and the capital that crowns it provides a decorative and structural transition between the circular column and the rectangular entablature. The Doric, Ionic, and Corinthian column types advanced toward perfect proportions and details and formed the basis for the columnar architecture of the Romans. Although Greek columns always had vertical channels or flutes cut in their shafts, those of the Romans were often without them. In Greek buildings the columns were usually structurally indispensable, but the Romans and later the Renaissance and modern architects used them often also as a decorative feature, mostly following fixed rules of proportions. The columns of Romanesque, Byzantine, and Gothic buildings were usually structural elements and were without canons of proportioning. The capitals of the Romanesque and Gothic were often variously decorated with plant and animal forms. The columns of Chinese and Japanese architecture are circular or polygonal wood posts, with bases but without capitals, having instead an ornamented projecting bracket. In Indian architecture columns exhibit great variety of detail shafts, bases, and capitals are often intricately ornamented. In modern construction most columns are of either steel or reinforced concrete. See **DORIC ORDER**, **IONIC ORDER**, **CORINTHIAN ORDER**, **CAPITAL**.

columnist, newspaper, the writer of a department appearing regularly in the press, usually under a constant heading. Although originally humorous, the column in many cases has supplanted the editorial for authoritative opinions on world problems. Usually independent of the policy of his paper, the columnist is allowed to criticize political and social institutions as well as persons. Well-known American columnists include Eugene Field, George Ade, Bert Leston Taylor (8 L T.), Finley Peter Dunne, Don Marquis, Heywood Brown, Ernie Pyle, F. P. Adams (F. P. A.), Drew Pearson, Dorothy Thompson, Arthur Krock, David Lawrence, Westbrook Pegler, Walter Lippmann, James Reston, Joseph and Stewart Alsop, Russell Baker, Mary McGroarty, William F. Buckley, Tom Wicker, and Art Buchwald. Noted columnists in other newspaper departments include the gossip columnists Walter Winchell, Louella Parsons, and Suzy Knickerbocker, advice-to-the-lovelorn columnists Dorothy Dix, Ann Landers, and Abigail Van Buren, economic columnists Paul Samuelson and Sylvia Porter, and sports columnists Grantland Rice, Paul Gallico, and Red Smith.

Colville, river, c. 375 mi (600 km) long, rising in the De Long Mts. of the Brooks Range, NW Alaska, and flowing across the tundra, east then north, to the Arctic Ocean. All of its major tributaries rise on the north slope of the Brooks Range. The river, frozen for most of the year, floods each spring as ice on its upper course melts. Umiat is the chief village along its banks. Coal, oil, and natural gas are found in the valley.

Colville Indians, North American Indians whose language belongs to the Salishan branch of the Algonquian-Wakashan linguistic stock (see **AMERICAN INDIAN LANGUAGES**). Reduced to a few hundred by 1872, they were placed on a reservation in NE Washington, since that time their numbers have markedly increased, so that by the 1970s they numbered some 3,000.

Colvin, Sir Sidney (kôl'vin), 1845-1927, English man of letters. Slade professor of fine arts at Cambridge and keeper of prints at the British Museum, he was a friend of Robert Louis Stevenson, whose works and

letters he edited. Colvin wrote several studies on literature and art, including *Early Engraving and Engravers in England* (with A. M. Hind, 1905) and *John Keats: His Life and Poetry* (1917). See his *Memories and Notes of Persons and Places* (1921), E. V. Lucas, *The Colvins and Their Friends* (1928, repr. 1971).

Colwyn Bay (kôl'win), municipal borough (1971 pop. 25,535), Denbighshire, N Wales. It is a popular seaside resort. In 1974, it became part of the new nonmetropolitan county of Clwyd.

coly: see **MOUSEBIRD**.

Colyn, Alexander: see **COLINS, ALEXANDER**.

coma, deep state of unconsciousness from which a person cannot be aroused even with the most painful stimuli. It may be caused by severe head or brain injury, **APOPLEXY**, **DIABETES**, poisoning with morphine or barbiturates, **SHOCK**, or **HEMORRHAGE**. It occurs just before death in many diseases. It is dangerous to force food, fluids, or any medication by mouth on a comatose patient. It is important to keep air passages open. Treatment is directed to the cause of the condition.

coma, in astronomy see **ABERRATION OF STARLIGHT**, **COMET**.

Comanche Indians, North American Indians belonging to the Shoshonean group of the Uto-Aztecan branch of the Aztec-Tanoan linguistic stock (see **AMERICAN INDIAN LANGUAGES**). They originated from a Basin-type culture and eventually adopted a Plains culture. They separated from the Shoshone Indians and migrated southward in the late 1600s, appearing in New Mexico around 1705. In the late 18th cent. and early 19th cent. their range included SE Colorado, SW Kansas, W Oklahoma, and N Texas. The Comanche were excellent horsemen and inveterate raiders, often pushing far S into Mexico. They were extremely warlike and effectively prevented white settlers from passing safely through their territory for more than a century. They are said to have killed more whites in proportion to their own numbers than any other Indian tribe. They were associated with the Kiowa, the Cheyenne, and the Arapaho in a loose confederacy. The Comanche, however, considered themselves superior to their associates, and their language served as the trade language for the area. The sun dance, a common feature among Plains Indians, was not an important part of Comanche culture; they probably introduced the peyote ritual to the Plains tribes. Never a large group despite their wide range, they were greatly reduced by warfare and disease. They now number approximately 3,000 on individually owned land in Oklahoma. See Ernest Wallace and E. A. Hoebel, *Comanches: The Lords of the South Plains* (1952), J. E. Harston, *Comanche Land* (1963), A. C. Greene, *The Last Captive* (1972), T. R. Fehrenbach, *Comanches: The Destruction of a People* (1974).

Comayagua (kômayä'wä), town (1961 pop. 8,473), W central Honduras. Founded in 1537, Comayagua was the most important city of colonial Honduras. In the political struggle following independence from Spain (1821), Comayagua, the Conservative stronghold, rivalled TEGUCIGALPA, seat of the Liberal faction. The cities alternated as capital of the republic, but in 1880 Tegucigalpa became the permanent capital. Today Comayagua is the center of an agricultural and mining region. It has a fine colonial cathedral and other colonial landmarks.

comb, toothed implement for arranging, confining, or ornamenting the hair. Specimens made of ebony, boxwood, bone, ivory, or metal have been found among the relics of ancient Egypt, Greece, and Rome. In the Middle Ages combs were not used by the mass of the people. The Renaissance saw the increased popularity of the comb for ornamental as well as for practical use. Still made by hand at that time, combs were delicately carved and jeweled. It was at that time also that tortoise shell was first used. With the coming of the perwig (c. 1660), combs became fashionable for men, as did the practice of combing one's hair in public. The first factory in the United States to manufacture combs was established (1759) at Newberry, Mass.; horn was the most popular material used. In modern methods of combmaking, a plate of a size sufficient for two combs is cut (usually with a die) so that the teeth of one comb are formed by the interstices of the other. The name also refers to tools for graining painted work, for pressing home the web in a primitive loom, and for carding or combing fibers in preparation for spinning.

Combe, William, 1741-1823, English satirist and miscellaneous writer, b. Bristol. His writing was mainly hack work, issued anonymously to avoid sei-

zure of the proceeds by his many creditors. He is chiefly remembered for the "Dr Syntax" series (3 vol., 1812-21), for which he wrote doggerel verse to accompany the illustrations of Thomas Rowlandson. See biography by H. W. Hamilton (1968).

Combes, Émile (ämêl' kôNb), 1835-1921, French statesman. An able politician of the left democratic group, he was minister of education under Leon Bourgeois (1895-96) and, succeeding René Waldeck-Rousseau, was (1902-5) premier and minister of interior and religion. Anticlericalism, growing out of the DREYFUS AFFAIR, was rampant, and Combes rigorously enforced the law of 1901 requiring religious associations to seek government authorization. He abolished religious education and initiated the separation of church and state in France; abrogation of the CONCORDAT OF 1801 was formalized in 1905 in a law introduced by Aristide BRIAND. Combes was a member of the Briand cabinet in World War I.

Combin, Grand (graN kôNbân'), peak, 14,164 ft (4,317 m) high, Valais canton, S Switzerland, in the Pennine Alps, near the Italian border.

combination, in business see **TRUST**.

combinations, in mathematics see **PROBABILITY**.

combine, harvesting machine that "combines" the operations of harvesting and **THRASHING** grain. Although its widespread use did not occur until the 1930s, the combine was in existence as early as 1830. The original combines were traction-powered and were drawn by horses, or later, driven by steam and internal-combustion engines. Self-propelled units appeared in the 1940s and are rapidly being adopted worldwide. Modern units feature dust-free, air-conditioned cabs and can handle up to 100 acres (41 hectares) of grain per day. Originally developed for cereal grains, the combine is now used for legumes, forage grasses, sorghum, and corn. The basic operations of a combine include cutting the standing crop, gathering it up, threshing the seed from the stem, separating out the chaff, collecting the seed in a hopper for delivery to a truck, and returning the straw to the ground. The combine has replaced the farm machines known as the **REAPER**, the binder, which cut and bound a harvested crop into bundles ready for threshing, and the **thresher**. See O. H. Friesen, *Combines Operation and Adjustment* (1972).

combing, process that follows **CARDING** in the preparation of fibers for spinning, lays the fibers parallel, and removes neps (short fibers). The modern combing machine is a specialized carding machine. Combing produces a fine sliver suitable for drawing out and spinning into strong, smooth yarn. The process used for long staple cottons and worsted yarn, is expensive, since up to 25% of the card sliver is eliminated. Hackling is a form of combing, often by hand, used for linen.

combining weight, the proportion (by weight) in which a chemical element combines with other elements to form compounds. The determination of combining weights was a very important part of early chemical endeavor. The atomic theory of John DALTON (see **ATOM**) was based in part on his determinations of combining weights, which he called atomic weights. Combining weights were usually measured by early chemists on a scale in which hydrogen had a combining weight of 1. See **EQUIVALENT WEIGHT**.

comb jelly, common name for oval transparent organisms of the phylum **CTENOPHORA**, especially of the genus *Pleurobrachia*.

combustion, rapid chemical reaction of two or more substances with a characteristic liberation of heat and light, it is commonly called burning. The burning of a fuel (e.g., wood, coal, oil, or natural gas) in air is a familiar example of combustion. Combustion need not involve oxygen, e.g., hydrogen burns in chlorine to form hydrogen chloride with the liberation of heat and light characteristic of combustion. Combustion reactions involve **OXIDATION AND REDUCTION**. Before a substance will burn, it must be heated to its ignition point, or kindling temperature. Pure substances have characteristic ignition points. Although the ignition point of a substance is essentially constant, the time needed for burning to begin depends on such factors as the form of the substance and the amount of oxygen in the air. A finely divided substance is more readily ignited than a massive one, e.g., sawdust ignites more rapidly than does a log. The vapors of a volatile fuel such as gasoline are more readily ignited than is the fuel itself. The rate of combustion is also affected by these factors, particularly by the amount of oxygen in the air. The nature of combustion was not always clearly understood. The ancient Greeks

The key to pronunciation appears on page xi

believed fire to be a basic element of the universe. It was not until 1774 that the French chemist A. L. LAVOISIER performed experiments that led to the modern understanding of the nature of combustion. See SPONTANEOUS COMBUSTION, HEAT OF COMBUSTION. See C. J. Hilado, *Smoke and Products of Combustion* (1973).

Comecon. see COUNCIL FOR MUTUAL ECONOMIC ASSISTANCE

Comédie Française (kōmādē' fraŋsēz') or **Theâtre Français** (tāā'trā fraŋsā'), state theater of France, on the Rue de Richelieu, Paris. It is sometimes known as La Maison de Molière. The Comédie Française was officially established by Louis XIV (1680), his decree merging the two French companies of comedians at Paris, the troupe of the Hôtel Guenegaud (see MOLIERE and BÉJART) and the troupe of the HÔTEL DE BOURGOGNE. The following year an annual grant of 12,000 livres was allotted from the royal treasury, and a new theater was built for the company. In the Revolution its actors were scattered and the theater closed. By decree of Napoleon in 1803 the institution was revived, and the company was organized along lines that have been continued into the present. The system has no stars, all the permanent members, called *sociétaires* or associates, enjoy the same status, roles being apportioned by common agreement. The company continues to perform the finest works of French drama in a varied, yet sometimes heavily traditional repertory. In 1900 fire destroyed the historic building, but most of the works of art and all the archives were saved, and the theater was rebuilt.

comedy, literary work that aims primarily at amusement. Unlike TRAGEDY, which seeks to engage profound emotions and sympathies, comedy strives to entertain chiefly through criticism and ridicule of man's customs and institutions. Although usually used in reference to the drama (see DRAMA, WESTERN, ORIENTAL DRAMA), the term is also applied to such non-dramatic works as Dante's religious poem, *The Divine Comedy*. Dramatic comedy grew out of the boisterous choruses and dialogue of the fertility rites of the feasts of the Greek god Dionysus. What became known to theater historians as Old Comedy in ancient Greece was a series of loosely connected scenes (using a chorus and individual characters) in which a particular situation was thoroughly exploited through FARCE, fantasy, satire, parody, and political propaganda, the series ending in a lyrical celebration of unity. Reaching its height in the brilliantly scathing plays of Aristophanes, Old Comedy gradually declined in favor of a less vital and imaginative drama. Middle Comedy, of which no plays are extant, emphasized social themes. In New Comedy, generally considered to have begun in the mid-4th cent. B.C., the plays were more consciously literary, often romantic in tone, and decidedly less satirical and critical. Menander was the most famous writer of New Comedy and was closely imitated by the Latin dramatists Plautus and Terence. During the Middle Ages the Church strove to keep the joyous and critical aspects of the drama to a minimum, but comic drama survived in medieval folk plays and festivals, in the Italian *COMMEDIA DELL'ARTE*, in mock liturgical dramas, and in the farcical elements of miracle and morality plays. With the advent of the Renaissance, a new and vital drama emerged. In England in the 16th cent. the tradition of the INTERLUDE, developed by John Heywood and others, blended with that of Latin classic comedy, eventually producing the great Elizabethan comedy. Finding its early expression in the work of Nicholas Udall and John Lyly, Elizabethan comedy reached its highest expression in the plays of Shakespeare and Ben Jonson. Shakespeare, whose comedies ranged from the farcical to the tragicomic, was the master of the romantic comedy, while Jonson, whose drama was strongly influenced by the classical tenets, wrote caustic, rich satire. In France, after the Middle Ages, the classical influence was combined with that of the *commedia dell'arte* in the drama of Molière, one of the greatest comic and satiric writers in the history of the theater. This combination is also present in the plays of the Italian Carlo Goldoni. After a period of suppression during the Puritan Revolution, the English comic drama reemerged with the witty, frequently licentious, consciously artificial comedy of manners of Etherege, Wycherley, Congreve, and others. At the close of the 17th cent., however, such stern reaction had set in against the bawdiness and frivolity of the Restoration stage that English comedy descended into what has become known as sentimental comedy. This drama, which sought more to evoke tears than laughter, had its

counterpart in France in the *comédie larmoyante*. In the later 18th cent. a resurgence of the satirical and witty character comedies was found in the plays of Sheridan and Goldsmith. After an almost complete lapse in the 19th cent., good comedy was again brought to the stage in the comedies of manners by Oscar Wilde and in the comedies of ideas by George Bernard Shaw. In the late 1880s the great Russian dramatist Anton Chekhov began writing his subtle and delicate comedies of the dying Russian aristocracy. The 20th cent. has witnessed several distinct trends in comedy: the sophisticated and witty comedy of manners, initiated by Wilde and carried on by Noel Coward, S. N. Behrman, Philip Barry and others, the romantic comic fantasy of such playwrights as James M. Barrie and Jean Giraudoux, the native Irish comedy of J. M. Synge, Lady Gregory, Sean O'Casey, Brendan Behan, and Brian Friel, the musical comedy, descending from 18th-century ballad operas and the comic operas of W. S. Gilbert and A. S. Sullivan (see MUSICALS), the slick, satirical, and professional comedy of George S. Kaufman, Moss Hart, and Neil Simon, the nihilistic, highly unconventional comedy, containing both comic and tragic elements, of dramatists of the theater of the absurd such as Eugene Ionesco and Samuel Beckett, and the so-called "black comedy," often concerning topics like racism, sexual perversion, and murder, of playwrights such as Joe Orton, Bruce Jay Friedman, and Jules Feiffer. For further information see separate entries on the dramatists mentioned in this article. See Elmer Blistein, *Comedy in Action* (1964), B. N. Schilling, *The Comic Spirit* (1965), J. W. Krutch, *Comedy and Conscience after the Restoration* (rev. ed. 1949, repr. 1967), H. T. E. Perry, *Masters of Dramatic Comedy* (1939, repr. 1968), Walter Sorell, *Facets of Comedy* (1972).

Comenius, John Amos (kōmē'nēās), Czech Jan Amos Komenský, 1592-1670, Moravian churchman and educator, last bishop of the Moravian Church. Comenius advocated relating education to everyday life by emphasizing contact with objects in the environment and systematizing all knowledge. He did not regard religion and science as incompatible. Teaching was to be in the vernacular rather than in Latin, and languages were to be learned by the conversational method. He worked for a universal system of education offering equal opportunities to women. His *Didactica magna* (1628-32, tr. by M. W. Keatinge, 1896, 2d ed., Pt. I, 1910, Pt. II, 1923, repr. 1967) contains an exposition of these principles. He also wrote *Janua linguarum reserata* (1631, tr. *The Gate of Tongues Unlocked*, 1659) and *Orbis sensualium pictus* (1658, tr. *The Visible World*, 1659), one of the earliest illustrated books for children. His collected works were first published in 1867. See biography by F. H. Hay (1973), S. S. Laurie, *John Amos Comenius* (1892, repr. 1973), W. S. Monroe, *Comenius and the Beginnings of Educational Reform* (1900, repr. 1971).

Comet [Gr., =long haired], celestial body of small mass consisting mainly of gases and moving under the sun's gravitational influence. Comets visible from the earth can be seen for periods ranging from a few days to several months. They were long regarded with awe and even terror and were often taken as omens of unfavorable events. Although the occurrence of many comets had been recorded, it was not until 1705 that the return of one was predicted. In that year Edmund Halley concluded that the comet observed in 1682 was the same one that had been described in 1531 and 1607, and he predicted that it would return again in late 1758 or early 1759. The comet returned in the spring of 1759 and again in 1835 and 1910 (see HALLEY'S COMET). Ordinarily a comet contains a small, bright nucleus surrounded by a nebulous envelope of luminous gases called the coma; this luminosity is caused by the molecules absorbing the ultra-violet radiation of the sun. According to the ice-conglomerate theory proposed by F. L. Whipple in 1949, the nucleus consists of ice and other frozen gases with particles of heavier substances interspersed throughout, thus being in effect a large, dirty snowball. As the comet approaches the sun, particles and gases from the nucleus and coma are driven off, usually forming a tail which can extend as much as 100 million mi (160 million km) in length. The tail, pushed by the solar wind, always streams out in the direction opposite the sun, i.e., it follows the head as the comet approaches the sun and precedes it as the comet passes perihelion (its closest point to the sun) and moves away. Near the sun a comet can change drastically in size and shape, with the head contracting as material flows into the tail, it may even split in

two, as Biela's comet did in 1846. The average size of the comet head is about 80,000 mi (130,000 km) in diameter, while some as small as 10,000 mi (16,000 km) and as large as 1,400,000 mi (2,250,000 km) in diameter have been observed. Whereas the volume of a comet is enormous, its mass is estimated to be no more than one millionth that of the earth. Most of the mass is contained in the nucleus and coma. The nucleus itself is small, ranging from one mile to a few thousand miles in diameter. The origin of comets is still uncertain. They were once thought to have originated outside the solar system, however, modern theories suggest they were formed with the formation of the solar system and are permanent members of it. According to the storage-cloud hypothesis of J. H. Oort, a shell of more than 100 billion comets surrounds the solar system at a distance of as much as 150,000 times the distance from the earth to the sun. While in this huge storage cloud, the comets move very slowly, a passing star, however, may change their orbits enough to force some of them into the inner part of the solar system. Some comets appear to have parabolic orbits (see PARABOLA), these orbits may send them past the sun once and then back to the storage cloud. Of the 130 comets with known periods of revolution, about 60 revolve in highly elongated orbits with periods ranging from a hundred to thousands of years. The others return at shorter intervals. About 45 comets have periods of less than 10 years and reach aphelion (the orbital point farthest from the sun) near the planet Jupiter, these have been captured into their smaller orbits by Jupiter's gravitational attraction. As comets lose material with successive passages near the sun, they fade in brightness. Some may break up, leaving a stream of meteoroids (see METEOR) scattered over their orbital path, when the earth passes through this path, a meteor shower is observed. See B. M. Middlehurst, ed., *The Moon, Meteorites, and Comets* (1963), R. S. Richardson, *Gelting Acquainted with Comets* (1967), Willey Ley, *Visitors from Afar: The Comets* (1969).

comic strip, combination of cartoon with a story line, laid out in a series of pictorial panels across a page and concerning a continuous character or set of characters, whose thoughts and dialogues are indicated by means of "balloons" containing written speech. As a form of communication the comic strip medium goes back to the Middle Ages, with the BAYEUX TAPESTRY retracing the hostilities leading to the Battle of Hastings. In the 18th and early 19th cent., balloons were used regularly in the satirical cartoons of William Hogarth and Thomas ROWLANDSON, continuity was also utilized by Rowlandson in his *Tours of Dr. Syntax* (1812-21). The comic strip form can be employed to convey a variety of messages (e.g., advertisements). However, the term "comic strip" in its strictest sense refers to syndicated newspaper features that appear daily in single rows of three or four panels, printed in black and white, and weekly in two to four consecutive rows of panels, forming a page, and printed in color in the Sunday comic sections. The immediate ancestor of the newspaper comic strip was the CARTOON, popular in the late 19th cent. Although there is evidence of comic strips appearing in newspapers as early as 1892, it is the year 1896 that commonly marks the birth of the genre in the American press, with *The Yellow Kid* as its first true representative. This feature, consisting of the weekly antics of a little boy in a bright yellow nightgown, was created by Richard Felton Outcault for the Sunday supplement of Joseph Pulitzer's New York World. The popularity of *The Yellow Kid* resulted in an immediate increase in the World's circulation. William Randolph Hearst soon succeeded in hiring Outcault for his own New York Journal, while Pulitzer hired another artist, George LUKS, to continue the feature in the World. The resulting rivalry between the two *Yellow Kids* not only produced the phrase "yellow journalism," but also emphasized the powerful influence of the comic strip as a circulation builder for newspapers. Rudolph Dirks, in the *Katzenjammer Kids* (1897), was the first to make consistent use of a sequence of panels to tell his stories. With the creation of such pioneering strips as *Happy Hooligan* (1899), by Frederick Burr OPPER, Charles ("Bunny") SCHULTZ's *Foxy Grandpa* (1900), Outcault's *Buster Brown* (1902), and James SWINNERTON's *Little Jimmy* (1905), all the essential components of the comic strip (e.g., regularity of cast, use of sequence of panels and speech-balloons) were refined and securely established. During their early days, comic strips appeared exclusively as weekly features in the Sunday supplement. In 1907, Bud Fisher created the first successful daily

strip with his *Mutt and Jeff*. Because syndicates distributed plates of their comic features to many newspapers, the characters acquired national readership. The enormous influence of comic strips on the public was first demonstrated by "Buster Brown" fashions early in the 20th cent., and it is still evidenced today by the proliferation of "Peanuts" products. Until the mid-1920s comic strips were true to their name, since they were all intended to raise a laugh in the reader. In 1924, Roy Crane, with *Wash Tubbs* (later retitled *Captain Easy*), added an important new dimension to the comic strip: adventure and suspense—which had previously existed, but in burlesque form, in Charles W. Kahles's popular strip, *Hairbreadth Harry* (1906). Some of the earliest examples of this new genre—invariably drawn in a more realistic style than the early "funnies"—were *Tim Tyler's Luck* (1928), by Lyman Young, *Tarzan* (1929), first drawn by Harold Foster, and *Buck Rogers* (1929), by Phil Nowlan and Dick Calkins. These led to such enduring classics as Chester Gould's *Dick Tracy* (1931), Milton Caniff's *Terry and the Pirates* (1934), and Alex Raymond's *Flash Gordon* (1934), and culminated in the most consciously artistic strip of all, Harold Foster's *Prince Valiant* (1937). Some comic strips have proved effective vehicles for political messages. *Little Orphan Annie* (1924), by Harold Gray, extolled free enterprise and conservatism, while the satirical *Pogo* (1949), by Walt Kelly, aimed barbs at the enemies of liberalism. Social satire and intellectual humor have made some strips favorites with adults and university students. *Little Nemo in Slumberland* (1906), by Winslow McCay and *Krazy Kat* (1911), by George Herriman were forerunners of these, and they led to Al Capp's *L'il Abner* (1934), *Pogo*, *Peanuts* (1950), by Charles SCHULZ, Johnny Hart's *B.C.* (1958), Brant Parker's and Johnny Hart's *Wizard of Id* (1964), and Russell Myer's *Broom Hilda* (1970). Experiments with book-length strips led, in the 1930s, to the comic book, a magazine aimed primarily at a juvenile audience—unlike comic strips, which are intended for the entire family—that at first reprinted entire episodes of newspaper strips but eventually evolved its own characters, e.g., *Superman* (1938), by Jerry Siegel and Joe Shuster, *Batman* (1939), by Bob Kane, and *Captain America* (1941), by Joe Simon and Jack Kirby. Adventure, crime, and war comics eventually elicited complaints from parents, teachers, and clergymen about the portrayal of violence and crime in a product intended for children. In 1954 publishers formed a Comics Code Authority to administer self-censorship standards, thus averting government action. One of the most significant developments of the 1960s was the emergence of comic strip clubs and associations, in the United States and in Europe, whose members collect vintage strips, write critical studies about them, and publish the results of their research in specialized journals. They hold conventions where classic comic material is bought, sold, and traded, and where panel discussions, slide shows, and lectures are given on the subject of comic strips. See Coulton Waugh, *The Comics* (1947), S. D. Becker, *Comic Art in America* (1959), George Perry and Alan Aldridge, *The Penguin Book of Comics* (1967), Pierre Couperie and M. C. Horn, *A History of the Comic Strip* (1968), Walter Herdeg and David Pascal, ed., *The Art of the Comic Strip* (1972).

Comilla (kōmīl'ā), town (1961 est. pop. 54,500), Bangladesh, on the Gumti River. An administrative center on the main railroad and highway linking Chittagong with Dacca, it is a collection point for hides and skins and has a noted cottage industry in cane and bamboo basketry. Comilla has three colleges affiliated with the Univ. of Dacca.

Commines, Philippe de (fēlēp' də kōmēn'), c. 1447–c. 1511, French historian, courtier, and diplomat. In 1472 he left the service of Charles the Bold of Burgundy to enter that of Louis XI of France, who rewarded him richly. After Louis's death he plotted against Charles VIII and was banished from court. He later regained favor, accompanied Charles to Italy, and was briefly ambassador to Venice. His *Memoires sur les regnes de Louis XI et de Charles VIII* (available in many editions and translations) is a historical and literary work of the highest rank. It contains striking portraits of Charles the Bold, Louis XI, and Charles VIII and is penetrating in its analysis of men, motives, and institutions. His name is also spelled Commines and Comynnes. See his memoirs, ed. by Samuel Kiser (2 vol., tr. 1968 and 1973).

Cominform (kōm'infōrm) [acronym for Communist Information Bureau], information agency organized in 1947 and dissolved in 1956. Its members were the Communist parties of Bulgaria, Czechoslovakia,

France, Hungary, Italy, Poland, Rumania, the Soviet Union, and Yugoslavia. The Cominform attempted to reestablish information exchanges among the European Communist parties that had lapsed since the dissolution (1943) of the COMINTERN. Its decisions were not binding, nor was membership obligatory for Communist parties. It was not a reconstitution of the Comintern, only a setting up of information contacts. Its chief function was the publication of materials designed to demonstrate the unity of its members. In 1948 the Cominform expelled the Yugoslav Communist party because of the defiance by Marshal TITO of Soviet supremacy. In 1956, as a gesture of reconciliation with Tito, the Cominform was dissolved.

Comintern (kōm'īntərn) [acronym for Communist International], name given to the Third INTERNATIONAL, founded at Moscow in 1919. Vladimir Ilyich Lenin feared a resurgence of the Second, or Socialist, International under non-Communist leadership. The Comintern was established to claim Communist leadership of the world socialist movement. The delegates to the first congress were mainly Russians, with some members of left-wing socialist splinter groups who happened to be in the Soviet Union and one German (who abstained on the crucial vote of establishing the organization). Gregory ZINOVIEV was the first president of the Comintern. The second congress laid down (1920) the "Twenty-one Conditions" for membership, firmly establishing a differentiation between the socialist parties of the center and the Communist parties of the left. The Comintern gained strength during the 1920s, but its efforts to foment revolution, notably in Germany, were unsuccessful. In 1935 the Comintern abandoned the membership policies established under the "Twenty-one Conditions" and began to form coalitions, or popular fronts, with bourgeois parties. In 1936, Germany and Japan concluded the so-called Anti-Comintern Pact, ostensibly to protect the world from the Third International. The pact was renewed in 1941 with 11 other countries as signatories. In order to allay the misgivings of its allies in World War II, the Soviet Union dissolved the Comintern in 1943. See K. E. McKenzie, *The Comintern and World Revolution, 1928-1943* (1964), M. M. Drachkovitch, ed., *The Comintern* (1966), Branko Lazitch and M. M. Drachkovitch, *Biographical Dictionary of the Comintern* (1973).

comma: see PUNCTUATION

Commack (kō'māk), uninc. town (1970 pop. 22,507), Suffolk co., SE N.Y., on central Long Island. It is chiefly residential.

Commagene (kōmājē'nē), ancient district of N. Syria, on the Euphrates River and S of the Taurus range, now in SE Asiatic Turkey. Its metropolis, Samosata, was founded by Samos, the king of Commagene, c. 150 B.C. The fertile agricultural district was made part of the Assyrian Empire and later of the Persian Empire. In the period after Alexander the Great, it gradually assumed independence under the Seleucid kings of Syria, and its governor, Ptolemy, revolted in 162 B.C., declaring absolute independence. The ruling dynasty of independent Commagene was related to the Seleucids. In 64 B.C., King Antiochus I, a Roman ally, had his territory enlarged with the addition of Commagene by Pompey, but when he aided the Parthians he was deposed in 38 B.C. by Antony. Commagene was annexed by Tiberius (A.D. 17) but a new king, Antiochus IV, was instated by Caligula (A.D. 38), was soon deposed, and then reinstated (A.D. 41) by Claudius. Finally Vespasian permanently annexed Commagene (A.D. 72). The territory was invaded by KHOSRU I of Persia in 542, but he withdrew the same year when his campaign was checked by BELISARIUS.

Commager, Henry Steele (kōm'ijər), 1902–, American historian, b. Pittsburgh, Pa. He received his Ph.D. from the Univ. of Chicago in 1928 and taught history at New York Univ. (1926–38) and Columbia (1938–56), where he was made adjunct professor in 1956, that same year he was appointed professor at Amherst. His writings, often in collaboration with other historians, are extensive. Among them are *The Growth of the American Republic* (with Samuel E. Morison, 1930, 6th ed., rev. and enl., 2 vol. 1969), *Theodore Parker* (1936, 2d ed. 1947, reissue 1960), *Our Nation* (with Eugene C. Barker, 1941), *Majority Rule and Minority Rights* (1943), *The American Mind* (1950), *Freedom, Loyalty, and Dissent* (1954), and *The Era of Reform* (1960). He edited *Documents of American History* (1934, 8th ed. 1968), *The Heritage of America* (with Allan Nevins, 1939, rev. and enl. ed., 1949), *Readings in American History* (with Allan Nevins, 1939), *America in Perspective*. The

United States through Foreign Eyes (1947), *The St. Nicholas Anthology* (1948), *The Spirit of 'Seventy-six* (with R. B. Morris, 1958), and *The Atlas of the Civil War* (1950). Commager is also editor of the multivolume "Rise of the American Nation" series. See the biographical essays in *Freedom and Reform*, ed. by H. M. Hyman and L. W. Levy (1967).

Commander Islands: see KOMANDORSKI ISLANDS, USSR

Commandments, Ten: see TEN COMMANDMENTS

commando, small military raiding and assault unit, first employed by the Boers in the South African War (1899–1902). However, it was not until 1940, when the British organized a number of such units, that the term came into wide use. Made up of hand-picked volunteers, specifically trained for dangerous work, these units were employed in missions throughout World War II. Some of the most celebrated of the commando operations were the raids on Field Marshal Rommel's headquarters (1941) and on St. Nazaire (1942) and the capture (1944) of the Dutch island of Walcheren. The U.S. army's ranger battalions were somewhat similar and were also popularly called commandos. After World War II, the American rangers and the British army's commandos were disbanded, but the British Royal Marine Commandos remained active and were employed in the Korean war and the Suez operation. During the Arab-Israeli conflicts, commando raids were common on both sides. See GUERRILLA WARFARE.

commedia dell' arte (kōm-mā'dēā dēl-lār'tā), popular form of comedy employing improvised dialogue and masked characters that flourished in Italy from the 16th to the 18th cent. Its influence on European drama is inestimable and can be seen especially in French pantomime and in the English harlequinade. Probable roots are found in the *Fabulae Atellanae* of the Oscans and Romans and in the Byzantine mimes of the Eastern Roman Empire. Little remains to evaluate the original performances, although *scenarii* (synopses of plot), *conceitti* (stock rhetorical speeches for every emotion), and *lazzi* (stock comic business that could be employed) are recorded. The ensemble companies generally performed in Italy, although a company called the *comédie-italienne* was established in Paris in 1661. The characters or "masks," in spite of changes over the years, retained much of their original flavor. Often the actor became so associated with his part that he used the name of his character in everyday life. Most important were the *zanni*, or servant types. They were the plot weavers, and their job was to arouse laughter. *Arlecchino*, or Harlequin, was the most famous of this type. An acrobat and a wit, he was always childlike and amorous. He wore a black, cat-like mask and motley colored clothes, which were later patterned with red, blue, and green diamonds. He carried a bat or wooden sword, the ancestor of the slapstick. His crony, *Brighella*, was more roguish and sophisticated. A cowardly villain, he would do anything for money. *Figaro* and *Molière's* *Scapino* are descendants of this type. *Pedrolino*, the martyr type, was a white-faced, moon-struck dreamer. The French *PIERROT* is his descendant. *Pagliaccio*, the forerunner of today's clown, was closely akin to *Pedrolino*. *Pulcinella*, as seen in the English *PUNCH AND JUDY* shows, was dwarfish and cruel, a humpback with a crooked nose, the deformed bachelor who chased pretty girls. *Pantalone* or *Pantaloon* was a caricature of the Venetian merchant, rich and retired, mean and miserly, with a young wife or an adventurous daughter. Wearing baggy trousers, he had a pointed beard, and his chin was thrust forward. *Il Dottore* (the doctor), his only friend, was a walking caricature of learning, pompous and fraudulent. He was dressed in black. He survives in the works of Molière. *Il Capitano* (the captain) was a caricature of the professional soldier, usually of the Spanish type, bold and swaggering, but cowardly. He was replaced by *Scaramuccia* or *Scaramouche*, who was much more agile. Dressed in black and carrying a pointed sword, he was the Robin Hood of his day. *The Inamorato* (the lover) went by many names. The matinee idol of his time, he had to be handsome and eloquent in order to speak the love declamations. He wore no mask. *The Inamorata*, whether she be *prima donna* or *seconda donna*, was his female counterpart. *Isabella Andreini* was the most famous. Her servant, or *soubrette*, usually called *Columbine*, was the beloved of Harlequin. Witty, bright, and given to intrigue, she developed, along with Harlequin, into such characters as Harlequine and *Pierrette*. *La Ruffiana* was an old woman, either the mother or a village gossip, who thwarted the lovers. *Cantarina* and *Ballerina* often took part in the comedy, but for the most part their

job was to add variety to the performance by singing, dancing, or playing a musical instrument. None of the women wore masks. The *Commedia dell'arte* survived the early 18th cent. only by means of its vast influence on written dramatic forms. See Allardyce Nicoll, *Masks, Mimes, and Miracles* (1931), K. M. Lea, *The Italian Popular Comedy* (2 vol., 1934, repr. 1962), Winifred Smith, *Commedia Dell'arte* (rev. ed. 1964), P. L. Duchartre, *The Italian Comedy* (tr. 1928, repr. 1965).

commensalism, relationship between members of two different species of organisms in which one individual is usually only slightly benefited, while the other member is not affected at all by the relationship. For example, some flatworms live attached to the gills of the horseshoe crab, obtaining bits of food from the crab's meals, the crab is apparently unaffected. In many cases commensalism cannot be distinguished from parasitism (see PARASITE). See also COMPETITION, SYMBIOSIS.

Commerce, city (1970 pop. 10,536), Los Angeles co., S. Calif., a suburb of Los Angeles, inc. 1960. An important transportation hub for S. California, Commerce is the home of several large corporations, manufactures range from telephones to chemicals. In 1927, Charles A. Lindbergh landed *The Spirit of St. Louis* at the old Vail Field in Commerce while on a nationwide tour following his transatlantic flight.

commerce, traffic in goods, usually conceived as nondomestic trade. Engaged in by all peoples from the earliest times, it has been carried on in some areas and by some peoples more than others, because of special advantages or aptness. The Egyptians, the Sumerians and later inhabitants of Mesopotamia, the Cretans, the Syrians, the Phoenicians, the Greeks, the Arabs, and the Western Europeans have excelled in commerce, tapping the resources of the East, Oceania, the Americas, and Africa. The center of commerce has shifted from the Mediterranean to the North Sea and the Atlantic. The Crusades did much to widen European trade horizons and prefaced the passing of trade superiority from Constantinople to Venice and other cities of N. Italy. In the 15th and 16th cent. with the sudden expansion of Portugal and Spain the so-called commercial revolution reached a climax. In N. and central Europe, the earlier supremacy of the Hanseatic League, the Rhenish cities, and the cities of N. France and Flanders was eclipsed by the rise of national states. Antwerp began its long career of glory when the Spanish were losing hegemony, and the Dutch briefly triumphed in the race for world commerce in the 17th cent. The Dutch in turn gave way to a British-French rivalry that by 1815 left Great Britain paramount. The Industrial Revolution of the 18th and 19th cent. further aided the development of commerce. The rise of the CHARTERED COMPANY under the auspices of the national state had much to do with the expansion of trade, as did the modern corporation, which later displaced the chartered company. World commerce was also aided materially by the invention of the astrolabe, the mariner's compass, and the sextant, by the development of iron and steel construction, by the application of steam to both land and water transport, and by the more recent development of communication devices such as the telephone, telegraph, cable, and radio and of inventions such as refrigeration, the gasoline engine, the electric motor, and the airplane. The theory of commerce as imposed by the national state has varied from the MERCANTILISM of the 17th and 18th cent. and the protective tariff of the 19th and 20th cent. to the free trade that Britain long upheld. After World War II recognition of the need for commercial expansion led to the creation of regional systems such as the COMMON MARKET. In general there was a twofold development. On the one hand there was a reduction of regional trade barriers. And on the other there was a tendency for the Communist and capitalist countries to bar trade with each other, by the 1970s, however, commerce between the two blocs had been greatly expanded. See Miriam Beard, *A History of Business* (2 vol., 1938, repr. 1962-63), H. L. Adelson, *Medieval Commerce* (1962), C. S. Belshaw, *Traditional Exchange and Modern Markets* (1965), William Culican, *The First Merchant Venturers* (1967), Jan Pen, *A Primer on International Trade* (1967), R. S. Lopez, *The Commercial Revolution of the Middle Ages* (1971).

Commerce, United States Department of, Federal executive department charged with promoting U.S. economic development and technological advancement. In Feb., 1903, the Congress established a Department of Commerce and Labor empowered to investigate and report upon the operations of corporations engaged in interstate commerce (with the

exception of common carriers). The first secretary was G. B. CORTELYOU. In 1913 the Department of Labor was established as a separate executive department, while the functions of the Department of Commerce were expanded, the chief officer of each department, the Secretary, received cabinet rank. Among its tasks are taking of censuses, promotion of American business at home and abroad, establishing standard weights and measures, and issuing patents and registering trademarks. Agencies under control of the Secretary of Commerce include the Economic Development Administration, the Bureau of the Census, the National Oceanic and Atmospheric Administration, the Office of Minority Business Enterprise, the National Bureau of Standards, the Patent Office, the Maritime Administration, and the Bureau of International Commerce.

Commerce City, city (1970 pop. 17,407), Adams co., N. central Colo., an industrial suburb of Denver, inc. 1952.

commercial law, the laws that govern business transactions, except those relating to the transportation of goods (see MARITIME LAW). Commercial law developed as a distinct body of jurisprudence with the beginning of large-scale trade. Formal documents and other evidences of regularized trade practices were known in Egypt and Babylonia. In many parts of the ancient world foreign merchants, through treaty arrangements or other agreements, were allowed to regulate their affairs and adjudicate their own disputes without interference from local authorities. They tended to settle in special sections of commercial cities where they might follow their own religions, laws, and customs. ROMAN LAW incorporated features of the already developed commercial law, which, however, was no longer handled separately in special courts but was treated simply as part of the whole legal system. The barbarian invasions of Europe caused such social disruption that it was not until late in the Middle Ages that long-range commerce again became possible in Europe and merchants were once more able to determine the rules and regulations under which they could safely operate. In the cities of N. Italy and S. France the merchant class frequently dominated the state and could enact the needed rules as legislation. In other parts of Europe associations of merchants bought protection from powerful lords or kings who granted them safe conduct and permitted them to conduct fairs and to establish regulations and methods of enforcement (see HANSEATIC LEAGUE). Both classes of merchants established special courts where summary judgment was granted with little regard for the technicalities of procedure and doctrine in the regular courts and without the use of lawyers. The term "law merchant" was applied to the substantive principles that eventually emerged from this quasi-judicial activity. The law merchant developed later in England than on the Continent, and it was not fully established there until the mid-16th cent., when English trade with the New World began to assume importance. In England the law was administered by special courts having jurisdiction only over those engaged in trade; these were the courts of piepoudre [Fr., *pied poudre*=dusty foot, an allusion to the dusty shoes of merchant judges who perhaps had been trudging the roads]. The royal courts in early days refused to hear merchants' suits, but in the 17th cent. they reversed this position and obtained exclusive jurisdiction. At first, however, the litigants were required to present proof of the law merchant in each case. The uncertainty and delay that resulted from this requirement demanded reform, and in the 18th cent. Lord Chief Justice Mansfield made the law merchant a part of the COMMON LAW and abolished the requirement of special proof. The United States adopted the principles prevailing in England in the late 18th cent. On the continent of Europe commercial law remains a separate subject matter with its special courts. It has been argued that the continental system is superior in that it distinguishes the business affairs of formally established enterprises from those entered into casually by private persons. The Anglo-American system, on the other hand, has been defended as affording no favoritism to any form of business activity. However, in commercial countries of both systems there has been a considerable increase in the extensive use of commercial arbitration that is in many ways comparable to the former private courts of merchants. The American states have adopted almost uniform commercial statutes that considerably facilitate the flow of trade throughout the nation. See F. R. Sanborn, *The Origins of Early English Maritime and Commercial Law* (1930), J. G. Pease, *The*

Law of Markets and Fairs (1958), F. A. Whitney, *The Law of Modern Commercial Practices* (1959).

commercial paper, type of short-term negotiable instrument, usually an unsecured promissory note, that calls for the payment of money at a specified date. Because it is not backed by collateral, commercial paper is usually issued by major firms whose credit-rating is so good that their notes are immediately accepted for trading. The notes are sold at a discount and mature in from three to six months. Commercial paper is an important source of cash for the issuing firm, it supplements bank loans and is usually payable at a lower rate of interest than the prime discount rate. Strictly speaking, it includes only those instruments that are used in commerce in place of money, as distinguished from paper used in investment, personal, estate, speculative, and public transactions. In addition to promissory notes, commercial paper may include drafts, bills of exchange and checks, acceptances, bills of lading, warehouse receipts, orders for delivery of goods, and express orders. See A. O. Greef, *The Commercial Paper House in the United States* (1939), N. D. Baxter, *The Commercial Paper Market* (1969).

commercial revolution, in European history, a fundamental change in the quantity and scope of commerce. In the later Middle Ages steady economic expansion had seen the rise of towns and the advent of private banking, a money economy, and trading organizations such as the HANSEATIC LEAGUE. Under the new national monarchies, most notably those of Portugal, Spain, the Netherlands, and England, markets grew wider and more secure. Commercial expansion was supported by technical improvements in seafaring, and from about 1450 explorations were made, first to Africa, then to the Orient and the New World. By the mid-16th cent. the Oriental carrying trade had been wrested from the Arabs, and Eastern goods poured into Europe. From the New World came gold and silver, which in less than a century more than doubled European prices and greatly stimulated economic activity. The focus of commerce shifted from Mediterranean to Atlantic ports, CHARTERED COMPANIES were organized, and continued improvements in navigation and ship construction speeded long voyages. As a worldwide trade evolved, the principles of MERCANTILISM were adopted, and local trade barriers were abrogated, stimulating internal commerce. Modern credit facilities also appeared, new institutions included the state bank, the bourse, and the futures market, and the promissory note and other new media of exchange were created. Quickened commercial activity brought economic specialization, thus leading to the transformations in production associated with modern capitalism. By 1700 the stage was set for the INDUSTRIAL REVOLUTION. See H. A. Miskimin, *The Economy of Early Renaissance Europe, 1300-1460* (1969), Joseph Gies, *Merchants and Money* (1972), M. M. Postan, *Medieval Trade and Finance* (1973).

Commines, Philippe de: see COMINES, PHILIPPE DE.

commission government: see CITY GOVERNMENT.

committee, one or more persons appointed or elected to consider, report on, or take action on a particular matter. Because of the advantages of a division of labor, legislative committees of various kinds have assumed much of the work of legislatures in many nations. Standing committees are appointed in both houses of the U.S. Congress at the beginning of every session to deal with bills in the different specific classes. Important congressional committees include those on ways and means, appropriations, interstate commerce, and military, naval, and foreign affairs. The number, but not the scope, of the committees was much reduced in 1946. Since then there has been a large increase in the number of subcommittees, which have become steadily more important. Members of committees are in effect elected by caucuses of the two major parties in Congress; the majority party is given the chairmanship and majority on each committee, and chairmanships, as well as membership on important committees, are gained by seniority. The presiding officer of either house may appoint special committees, including those of investigation, which have the power to summon witnesses and compel the submission of evidence. The presiding officers also appoint committees of conference to obtain agreement between the two houses on the content of bills of the same general character. The American legislative committee system conducts most congressional business, through its powers of scrutiny and investigation of government departments. In France the constitution of the Fifth Republic permits each legislative chamber to have no more than

six standing committees. Because these committees are large, unofficial committees have formed that do much of the real work of examining bills. As in the U.S. government, these committees are quite powerful because of their ability to delay legislation. In Great Britain devices such as committees of the whole are used in the consideration of money bills and there are large standing committees of the House of Commons, but legislative committees have not traditionally been very important in the system of government. Recently attempts have been made to form specialized committees. See L. A. Froman, *The Congressional Process* (1967), George Goodwin, Jr., *The Little Legislatures* (1970), Barbara Hinkley, *The Seniority System in Congress* (1971).

Committee for Industrial Organization: see AMERICAN FEDERATION OF LABOR AND CONGRESS OF INDUSTRIAL ORGANIZATIONS

Committee of Public Safety: see REIGN OF TERROR

Commodity Credit Corporation: see AGRICULTURAL SUBSIDIES

commodity market, organized traders' exchange in which standardized, graded products are bought and sold. Commodity markets in the United States are open for trading in about 30 commodities, ranging from wheat and cotton to silver and platinum. Most trading is done in futures contracts, i.e., agreements to deliver goods at a set time in the future for a price established at the time of the agreement. Futures trading allows both HEDGING to protect against serious losses in a declining market and speculation for gain in a rising market. For example, a seller may sign a contract agreeing to deliver grain in two months at a set price. If the grain market declines at the end of two months, the seller will still get the higher price quoted in the futures contract. If the market rises, however, speculators buying grain stand to profit by paying the lower contract price for the grain and reselling it at the higher market price. Spot contracts, a less widely used form of trading, call for immediate delivery of a specified commodity and are often used to obtain the goods necessary to fulfill a futures contract.

Commodus (Lucius Aelius Aurelius Commodus) (kôm'adas), 161-192, Roman emperor (180-192), son and successor of MARCUS AURELIUS. In 180, reversing his father's foreign policy, he concluded peace with the German and the Sarmatian tribes and returned to his licentious pleasures in Rome. There he vaunted his strength in gladiatorial combats and decreed that he should be worshipped as Hercules Romanus. He changed his own name to Marcus Commodus Antoninus and wanted to rename the city of Rome after himself. Many plots to assassinate him failed, but eventually, on the order of his advisers, he was strangled by a wrestler. PERTINAX succeeded him.

Common Cause, U.S. organization that seeks a "re-ordering of national priorities and revitalization of the public process to make our political and governmental institutions more responsive to the needs of the nation and its citizens." It was established in 1970 by John W. Gardner as the successor organization to the Urban Coalition Action Council, which was founded in 1968. Common Cause calls itself the "national citizens lobby." It supports a large number of political reforms, including abolition of the Congressional seniority system, and a limitation on national campaign spending and political contributions. It has sponsored voter registration drives throughout the nation and has worked for a liberalization of registration requirements. Common Cause has been especially effective in employing lawsuits as a weapon of political reform. In the early 1970s its legal actions were an integral part of the mostly successful drive to force disclosure of those individuals and corporations that had anonymously contributed money to the 1972 presidential campaign. Located in Washington, D.C., the group has about 110,000 members.

common-ion effect, decrease in solubility of an ionic salt, i.e., one that dissociates in solution into its ions, caused by the presence in solution of another solute that contains one of the same ions as the salt. The common-ion effect is an example of CHEMICAL EQUILIBRIUM. For example, silver chloride, AgCl, is a slightly soluble salt that in solution dissociates into the ions Ag⁺ and Cl⁻, the equilibrium state being represented by the equation $\text{AgCl}_{(s)} \rightleftharpoons \text{Ag}^+ + \text{Cl}^-$. According to LE CHÂTELIÉ'S PRINCIPLE, when a stress is placed on a system in equilibrium, the system responds by tending to reduce that stress. In the system taken as an example, if another solute containing one of those ions is added, e.g., sodium chloride, NaCl, which supplies Cl⁻ ions, the

solubility equilibrium of the solution will be shifted to remove more Cl⁻ from the solution, so that at the new equilibrium point there will be fewer Ag⁺ and Cl⁻ ions in solution and more AgCl precipitated out as a solid.

common law, system of law that prevails in England and in countries colonized by England. The name is derived from the medieval theory that the law administered by the king's courts represented the common custom of the realm, as opposed to the custom of local jurisdiction that was applied in local or manorial courts. In its early development common law was largely a product of three English courts—King's Bench, Exchequer, and the Court of Common Pleas—which competed successfully against other courts for jurisdiction and developed a distinctive body of doctrine. The term "common law" is also used to mean the traditional element in the law of any common-law jurisdiction, as opposed to its statutory law or legislation (see STATUTE), and to signify that part of the legal system that did not develop out of EQUITY, maritime law, or other special branches of practice. The distinctive feature of common law is that it represents the law of the courts as expressed in judicial decisions. The grounds for deciding cases are found in precedents provided by past decisions, as contrasted to the CIVIL LAW system, based on statutes and prescribed texts. Early common law was somewhat inflexible; it would not adjudicate a case that did not fall precisely under the purview of a particular WRIT and had an unwieldy set of procedural rules. Except for a few types of lawsuit in which the object was to recover real or personal property, the only remedy that it provided was money DAMAGES; equity was created partly to overcome these deficiencies. Until comparatively recent times there was a sharp division between common law (or legal jurisdiction) and equity (or equitable jurisdiction). In 1848 the state of New York enacted a code of civil procedure (drafted by David Dudley FIELD) that merged law and equity into one jurisdiction. Thenceforth, actions at law and suits in equity were to be administered in the same courts and under the same procedure. The Field code reforms were adopted by most states of the United States, by the Federal government, and by the United Kingdom (in the Judicature Act of 1873). Besides the system of judicial precedents, other characteristics of common law are trial by JURY and the doctrine of supremacy of the law. Originally, supremacy of the law meant that not even the king was above the law; today it means that acts of governmental agencies are subject to scrutiny in ordinary legal proceedings. Judicial precedents derive their force from the doctrine of stare decisis [Lat., =stand by the decided matter], i.e., that the previous decisions of the highest court in the jurisdiction are binding on all other courts in the jurisdiction. Changing conditions, however, soon make most decisions inapplicable except as a basis for analogy, and a court must therefore often look to the judicial experience of the rest of the English-speaking world. This gives the system flexibility, while general acceptance of certain authoritative materials provides a degree of stability. Nevertheless, in many instances, the courts have failed to keep pace with social developments and it has become necessary to enact statutes to bring about needed changes; indeed, in recent years statutes have superseded much of common law, notably in the fields of commercial, administrative, and criminal law. Typically, however, in statutory interpretation the courts have recourse to the doctrines of common law. Thus increased legislation has limited but has not ended judicial supremacy. All Canada except Quebec and all of the United States except Louisiana, Puerto Rico, and the Virgin Islands follow common law. U.S. statutes usually provide that the common law, equity, and statutes in effect in England in 1603, the first year of the reign of James I, shall be deemed part of the law of the jurisdiction. Later decisions of English courts have only persuasive authority. See O. W. Holmes, *The Common Law* (1881, new ed. by M. DeWolfe Howe, 1963, repr. 1968), T. F. Plucknett, *Concise History of the Common Law* (5th ed. 1956), Harold Potter, *Historical Introduction to English Law and Its Institutions* (4th ed. 1958), A. R. Hogue, *Origins of the Common Law* (1966), R. C. van Caenegem, *The Birth of the English Common Law* (1973).

Common Market, officially the European Economic Community (EEC), established (1957) by a treaty between Belgium, France, Italy, Luxembourg, the Netherlands, and West Germany (Federal Republic of Germany). It is headquartered in Brussels, Belgium. In 1961, Great Britain, the Republic of Ireland,

Norway, and Denmark began negotiations for membership, but these were ended in 1963 at the insistence of France. Another attempt failed in 1967. By 1972, however, negotiations were successful and the four applicants were invited to join by signing the Treaty of Accession. Great Britain, the Republic of Ireland, and Denmark formally joined in 1973, but Norway's electorate rejected the bid. Greece and Turkey and a number of African countries are associate members. The most important step in the creation of the EUROPEAN COMMUNITY, the Common Market has as its aim the eventual economic union of its member nations, ultimately leading to political union. Steps in this program include the gradual elimination of all internal tariff barriers and establishment of a common tariff system, the free movement of labor and capital, the abolition of trusts and cartels, and the development of joint and reciprocal policies on labor, social welfare, agriculture, transport, and foreign trade. Steps toward economic union have included the following: the establishment, in 1962, of common price levels for agricultural products, the removal, 1968, of customs duties, and the agreement, in 1969, to move toward monetary union. A first step in the direction of political union was the 1970 agreement to meet twice a year for foreign policy consultations. See F. B. Jensen and Ingo Walter, *The Common Market* (1965), Uwe Kitzinger, *The European Common Market and Community* (1967), A. E. Walsh and John Paxton, *The Structure and Development of the Common Market* (1968), R. C. Mowat, *Creating the European Community* (1973), Charles Ransom, *The European Community and Eastern Europe* (1973).

Commons, John Rogers, 1862-1945, American economist, b. Hollansburg, Ohio, grad. Oberlin, 1888. Influenced by the other social sciences, Commons tried to broaden the scope of economics, especially in his noted *Legal Foundations of Capitalism* (1924) and *Institutional Economics* (1934). He was also interested in immediate social problems, chiefly those dealing with labor, and served on many government commissions. Commons was one of the editors of *A Documentary History of American Industrial Society* (10 vol., 1910-11) and *History of Labor in the United States* (4 vol., 1919-35). See his autobiography, *Myself* (1934), biography by L. G. Harter (1962).

Commons, House of: see PARLIAMENT

Commonwealth, form of administration signifying government by the common consent of the people. To Locke and Hobbes and other 17th-century writers the term meant an organized political community similar to what is meant in the 20th cent. by the word state. Certain states of the United States are known as commonwealths (Massachusetts, Pennsylvania, Virginia, and Kentucky), and the federated states of Australia are known collectively as the Commonwealth of Australia. In the same collective sense, the now independent components of the former British Empire and Britain's remaining dependencies are described as the COMMONWEALTH OF NATIONS. The Commonwealth in English history was the government set up by the victorious army power following the English civil war and the execution (1649) of King Charles I. The Commonwealth was dominated from the outset by Oliver CROMWELL, who by the Instrument of Government (1653) was made lord protector of the Commonwealth. The subsequent government is usually known as the PROTECTORATE, though the Commonwealth formally continued until Restoration in 1660.

Commonwealth Fund, foundation established (1918) by Mrs. Stephen V. Harkness "for the welfare of mankind." Its headquarters are in New York City. In 1970 its assets were estimated at over \$113 million. Contributing in its first 20 years to the early development of child guidance clinics and the strengthening of rural hospitals and health departments, the fund later emphasized the broadening and integration of medical education, experimental health services, and medical research. Fellowships are offered to graduate students and civil servants from the British Commonwealth for study in the United States, and fellowships for advanced training in medicine and allied fields are given to aid teaching and research.

Commonwealth games, series of amateur athletic meets held among citizens of countries in the Commonwealth of Nations. Originated (1930) as the British Empire games, the series is held every four years and is patterned after the Olympic games. The meets have been 1930, Hamilton, Canada, 1934, London, 1938, Sydney, Australia, (no games in 1942 and 1946 due to World War II), 1950, Auckland, New

Zealand, 1954, Vancouver, Canada, 1958, Cardiff, Wales, 1962, Perth, Australia, 1966, Kingston, Jamaica, 1970, Edinburgh, Scotland, 1974, Christchurch, New Zealand. Competition is in badminton, boxing, cycling, fencing, shooting, swimming, track and field, weight lifting, and wrestling.

Commonwealth of Australia: see AUSTRALIA

Commonwealth of Nations, voluntary association of Great Britain and its dependencies, certain former British dependencies that are now sovereign states and their dependencies, and the associated states (states with full internal government but whose external relations are governed by Britain). At its foundation under the Statute of Westminster (see WESTMINSTER, STATUTES OF) in 1931, the Commonwealth was composed of Great Britain, the Irish Free State (now the Republic of Ireland), Canada, Newfoundland (since 1949 part of Canada), Australia, New Zealand, and South Africa. As of 1974 the other sovereign members (with date of entry) were India (1947), Sri Lanka (as Ceylon, 1948), Ghana (1957), Malaysia (as Federation of Malaya, 1957), Nigeria (1960), Cyprus (1961), Sierra Leone (1961), Tanzania (as Tanganyika, 1961), Jamaica (1962), Trinidad and Tobago (1962), Uganda (1962), Kenya (1963), Malawi (1964), Zambia (1964), Malta (1964), The Gambia (1965), Singapore (1965), Guyana (1966), Botswana (1966), Lesotho (1966), Barbados (1966), Mauritius (1968), Swaziland (1968), Western Samoa (1970), Tonga (1970), Fiji (1970), Bangladesh (1972), the Bahamas (1973), and Grenada (1974). Ireland, South Africa, and Pakistan withdrew in 1949, 1961, and 1972, respectively. Nauru became a special member in 1968. The associated states in 1974 were Antigua (1967), St. Kitts-Nevis (1967), Dominica (1967), St. Lucia (1967), and St. Vincent (1969). Brunei and (nominally) Rhodesia have statutes similar to those of associated states. The purpose of the Commonwealth is consultation and cooperation. The sovereign members retain full authority in all domestic and foreign affairs, although Britain generally enjoys a traditional position of leadership in certain matters of mutual interest. Members (Canada is the sole exception) are part of the sterling monetary exchange area. There are other economic ties in the fields of trade, investment, and development programs for new nations. A set of trade agreements (begun at the Ottawa Conference in 1932) between Britain and the other members gives preferential tariff treatment to many raw materials and manufactured goods that the Commonwealth nations sell in Britain. There is great concern that Britain's entry (1973) into the European COMMON MARKET may disrupt these economic ties and threaten the viability of the Commonwealth. Periodically there are meetings of Commonwealth heads of government, but no collective decision made at these meetings is considered binding. In 1965 a Commonwealth Secretariat was set up, with headquarters in London. See BRITISH EMPIRE. See W. B. Hamilton, ed., *A Decade of the Commonwealth, 1955-1964* (1965), J. D. B. Miller, *The Commonwealth in the World* (3d ed. 1965), Zelman Cowen, *The British Commonwealth of Nations in a Changing World* (1965), *The Commonwealth Office Yearbook* (annual, from 1967), Nicholas Mansergh, *The Commonwealth Experience* (1969).

commune, in agriculture see COLLECTIVE FARM

commune (kôm'yoon), in medieval history, collective institution that developed in continental Europe after the fall of the Roman Empire. Because of the importance of the commune in municipal government, the term is also used to denote a town itself to which a charter of liberties was granted by the sovereign or feudal overlord. Although in most cases the development of communes was inextricably connected with that of the cities, there were rural communes, notably in France and England, that were formed to protect the common interests of villagers. To build defenses, regulate and improve trade, raise taxes, and maintain order, organization of an urban area was necessary. The earliest attempts at united action of the burghers involved the forming of associations in which the burghers swore an oath binding themselves together in a personal bond of mutual support and defense. The communes grew in power and, as autonomous corporate entities, became extremely influential in organizing city government. By the late 12th cent., when cities were well established, all who chose to live in them had to take an oath acknowledging the authority of the communes. Because the town was located on land belonging to a king or emperor (see FEUDALISM), the town owed allegiance to its lord and paid him tribute and, in wartime, service or money payment. Suzerains often favored the communes as

sources of wealth and confirmed their rights in liberal charters. Disputes, nevertheless, frequently arose between communes and their overlords. In the struggle between kings and nobles, the kings usually strengthened the communes and sought alliances with them. However, in the 16th and 17th cent., when European states (notably France and Spain) became centralized, the privileges of the communes were gradually withdrawn. The extent of their liberties and the details of their organization varied widely. A common feature was the elected council. The magistrates were usually called *consoli*, *podestas*, and *capitols* in Italy and S. France, *échevins* and *jurés* in N. France and the Low Countries, *Senatoren* and *Ratsherren* in Germany. Corporations and guilds gained a prominent share in the government. Militia insured the defense. The earliest communes arose in N. and central Italy. In the struggle between emperors and popes, the communes forming the LOMBARD LEAGUE gained a great deal of independence and became almost synonymous with the cities themselves. In the 14th cent., however, the communes were usurped by local tyrants. The commune of ROME was established by Arnold of Brescia in 1144. In the Low Countries, e.g., in FLANDERS, communes arose very early and enjoyed very wide privileges. In S. France, AVIGNON, ARLES, and TOULOUSE were outstanding examples of self-governed communes, as BARCELONA was in Spain. In Germany, cities such as FRANKFURT, COLOGNE, NUREMBERG, AUGSBURG, and LUBECK became republics immediately subject to the emperor (imperial and free imperial cities). Others, such as MAGDEBURG, held charters that became models for numerous towns in N. Germany, Bohemia, and Moravia. See W. F. T. Butler, *The Lombard Communes* (1906, repr. 1969), Henri Pirenne, *Medieval Cities* (tr. 1925, repr. 1969), M. V. Clarke, *The Medieval City State* (1926, repr. 1966), J. H. Mundy and Peter Riesenberger, *The Medieval Town* (1959).

Commune of Paris, insurrectionary governments in Paris formed during (1792) the FRENCH REVOLUTION and at the end (1871) of the FRANCO-PRUSSIAN WAR. In the French Revolution, the commune represented the will of the urban workers and small tradesmen against that of the upper bourgeoisie and the agrarian provinces. The commune virtually engineered the storming of the Tuileries and the arrest of the king on Aug. 10, 1792, thus precipitating the downfall of the French monarchy. For the next two years the commune, led by Pierre CHAUMETTE and Jacques HÉBERT, was, along with the Committee of Public Safety, a major power in the French state. Through the bloc of deputies known as the MOUNTAIN the commune also dominated the National Convention. During the REIGN OF TERROR, however, many leaders of the commune were executed (1794), and when the moderates gained control of the Convention (1794-95), they broke the commune's power. At the end of the Franco-Prussian War, in 1871, the Parisians opposed the national government, headed by Adolphe THIERS and the National Assembly at Versailles, as too conservative and too ready to accept a humiliating peace with Prussia. Thiers, after failing to disarm the Parisian national guard, fled (March, 1871) to Versailles, and the Parisians elected a municipal council, the commune of 1871. Meanwhile, the victorious Prussians affected neutrality. The Versailles troops began a siege of Paris (the second siege of the city in three months). The *communards*, whose aims included economic reforms, represented many shades of political opinion—followers of Louis BLANQUI, of Pierre PROUDHON, and of the Marxist First International as well as radical republicans of the 1793 Jacobin tradition, such as Louis DELESCLUZE. As the long siege drew to an end, the Versailles troops entered the city despite the desperate defense of the *communards*, who threw up barricades, shot hostages (including the archbishop of Paris), and burned the Tuileries palace, the city hall, and the palace of justice. On May 28 the commune was finally defeated. Severe reprisals followed, with more than 17,000 people executed, including women and children. Numerous persons were deported or imprisoned. Communes were also formed and suppressed in other cities in 1871, notably in Saint-Étienne, Le Creusot, Marseilles, and Toulouse. Memories of the bloody Paris repression embittered political relations between liberals and conservatives for many years afterward. See studies by E. S. Mason (1930, repr. 1967), Frank Jellinek (1937, repr. 1965), Alistair Horne (1965 and 1971), and Stewart Edwards (1971).

communicable diseases, illnesses caused by microorganisms and transmitted from an infected person or animal to another person or animal. Some

diseases are passed on by direct or indirect contact with infected persons or with their excretions. Most diseases are spread through contact or close proximity because the causative bacteria or viruses are airborne, i.e., they can be expelled from the nose and mouth of the infected person and inhaled by anyone in his vicinity. Such diseases include diphtheria, scarlet fever, measles, mumps, whooping cough, influenza, and smallpox. Some infectious diseases can be spread only indirectly, usually through contaminated food or water, e.g., typhoid, cholera, dysentery. Still other infections are introduced into the body by animal or insect carriers, e.g., rabies, malaria, encephalitis, Rocky Mountain spotted fever. The human disease carrier, i.e., the healthy person who may himself be immune to the organisms he harbors, is also a source of transmission. Some infective organisms require rather special circumstances for their transmission, e.g., sexual contact in syphilis and gonorrhea, injury in the presence of infected soil or dirt in tetanus, infected transfusion blood or instruments in serum hepatitis and sometimes in malaria. A disease such as tuberculosis may be transmitted in several ways—by contact (human or animal), through food or eating utensils, and by the air. Control of communicable disease depends upon recognition of the many ways transmission takes place. It must include isolation or even quarantine of persons with certain diseases. Proper antiseptics (see ANTISEPTIC) should be observed in illness and in health. Immunologic measures (see IMMUNITY) should be utilized fully. Education of the population in rules of public health is of great importance both in the matter of personal responsibility (disposal of secretions, proper handling and preparation of food, personal hygiene) and community responsibility (safe water and food supply, garbage and waste disposal). Animal and insect carriers must be controlled, and the activities of human carriers must be limited.

communication, transfer of information, such as thoughts and messages, as contrasted with transportation, the transfer of goods and persons (see INFORMATION THEORY). The basic forms of communication are by signs (sight) and by sounds (hearing, see LANGUAGE). The reduction of communication to writing was a fundamental step in the evolution of society for, in addition to being useful in situations where speech is not possible, writing permits the preservation of communications, or records, from the past. It marks the beginning of recorded history. Whereas the rise of BOOK PUBLISHING and JOURNALISM (see also NEWSPAPER and PERIODICAL) facilitated the widespread dissemination of information, the invention of the TELEGRAPH, the RADIO, the TELEPHONE, and TELEVISION made possible instantaneous communication over long distances. With the installation of the submarine CABLE and improvements in short-wave radio technology, international communication was greatly improved and expanded. In 1962 several types of communications satellites were launched. Three years later, in 1965, Early Bird, or Intelsat I, the first in a series of advanced communications satellites, was launched (see SATELLITE, ARTIFICIAL). The 20th-cent. development of mass media has played a major role in changing social, economic, political, and educational institutions. In the United States, radio and television communication is controlled by the FEDERAL COMMUNICATIONS COMMISSION. The international phases of transport and communications are under the direction of the Office of Transport and Communications of the Dept. of State. The UN maintains its International Telecommunication Union (ITU), which has three functions—to maintain and extend international cooperation for the improvement and rational use of telecommunication, to promote the development and efficient use of technical facilities, and to harmonize the actions of nations. Telecommunication has been defined by international agreement as any emission, transmission, or reception of signs, signals, sounds, and writing. See BROADCASTING. See Colin Cherry, *On Human Communication* (1962), T. H. Crowley and others, *Modern Communications* (1962), H. M. McLuhan, *The Medium is the Message* (1967), B. H. Bagdikian, *The Information Machines* (1971), Hadley Read, *Communication Methods for all Media* (1972), John Tebbel, *The Media in America* (1974).

communications satellite, artificial SATELLITE that functions as part of a global radio-communications network. Echo, the first communications satellite, was launched in Aug., 1960. It was an uninflated inflatable sphere that passively reflected radio signals back to earth. Later satellites carried with them electronic devices for receiving, amplifying,

and rebroadcasting signals to earth. Relay, launched by the National Aeronautics and Space Administration (NASA), was the basis for Telstar, a commercially sponsored experimental satellite. Earth-synchronous orbits were used by NASA's Syncom and its Earlybird, the world's first commercial communications satellite. Such satellites orbit with a period of 24 hr, so that they remain over a single spot on the earth's surface. In 1962, the U.S. Congress passed the Communications Satellite Act, which created the COMMUNICATIONS SATELLITE CORP. (COMSAT). COMSAT participated in an international consortium, which launched four series of Intelsat satellites, beginning with Earlybird in 1965.

Communications Satellite Corporation (COMSAT), organization incorporated (1962) by an act of Congress to establish a commercial system of international communications using artificial satellites. Although government sponsored, it was financed by a public stock issue. The launching in 1965 of its first satellite, Early Bird, inaugurated a trans-Atlantic service, a similar link with Asia was established some 18 months later. Along with representatives of more than 80 other nations, COMSAT is a member of the International Telecommunications Satellite Consortium (INTELSAT). Through member-company satellites and its many earth stations around the world, the consortium provides for international communications via telephone and television. See COMMUNICATIONS SATELLITE.

communio, see EUCHARIST, LORD'S SUPPER

communism, fundamentally, the system of social organization in which property (especially real property and the means of production) is held in common. Thus, the *ejido* system of the Mexican Indians and the property-and-work system of the INCA were both communist, although the former was a matter of more or less independent communities cultivating their own lands in common and the latter a type of community organization within a highly organized empire. In modern usage, the term Communism (written with a capital C) is applied to the movement that aims to overthrow the capitalist order by revolutionary means and to establish a classless society in which all goods will be socially owned. The theories of the movement come from Karl MARX, as modified by Vladimir Ilyich LENIN, leader of the successful Communist revolution in Russia. Communism, in this sense, is to be distinguished from socialism, which (as the term is commonly understood) seeks similar ends but by evolution rather than revolution.

Origins of Communism Communism as a theory of government and social reform may be said, in a limited sense, to have begun with the ancient Greek idea of the Golden Age, a concept of a world of communal bliss and harmony without the institution of private property. Plato, in his *Republic*, outlined a society with communal holding of property, his concept of a hierarchical social system including slavery has by some been called "aristocratic communism." The Neoplatonists revived the idea of common property, which was also strong in some religious groups such as the Jewish ESSENEs and certain early Christian communities. These opponents of private property held that property holding was evil and irreligious and that God had created the world for the use of all mankind. The first of these ideas was particularly strong among Manichaean and Gnostic heretics, such as the Cathari, but these concepts were also found in some orthodox Christian groups (e.g., the Franciscans). The MANORIAL SYSTEM of the Middle Ages included common cultivation of the fields and communal use of the village commons, which might be vigorously defended against the lord. It was partly to uphold these common rights, threatened by early agrarian capitalism, that the participants in the Peasants' Revolt (1381) in England and the insurgents of the Peasants' War in 16th-century Germany advocated common ownership of land and of the means of production. In the 16th and 17th cent. such intellectual works as Sir Thomas More's *Utopia* proposed forms of communal property ownership in reaction to what the authors felt was the selfishness and depredation of growing economic individualism. In addition, some religious groups of the early modern period advocated forms of communism, just as had certain of the early Christians. The Anabaptists under Thomas MUNCER were the real upholders of communism in the Peasants' War, and they were savagely punished for their beliefs. This same mixture of religious enthusiasm and economic reform was shown in 17th-century England by the tiny sect of the DIGGERS, who actually sought to put their theories into practice on common land. Capitalism, reinforced by the INDUS-

TRIAL REVOLUTION, which began in the 18th cent., brought about the conditions that gave rise to modern communism. Wages, hours, and factory conditions for the new industrial class were appalling, and protest grew. Although the French Revolution ended without satisfying radical demands for economic egalitarianism, the voice of François BABEUF was strongly raised against economic inequality and the power of private property. For his class consciousness and his will to revolution he has been considered the first modern communist. Although he was guillotined, his movement (Babouvism) lived on, and the organization of his secret revolutionary society on the "cell" system was to be developed later as a means of militant revolution. In the early 19th cent. ardent opponents of industrial society created a wide variety of protest theories. Already what is generally known as utopian communism had been well launched by the comte de SAINT-SIMON. In this era a number of advocates gathered followers, founded small cults, and attempted to launch COMMUNISTIC SETTLEMENTS, particularly in the United States. Most notable among such men were Robert OWEN, Étienne CABET, and Charles FOURIER. Pierre Joseph PROUDHON, although he did not adopt the principle of common ownership, exercised great influence by his attacks on the evils of private property. A host of critics and idealistic revolutionists arose in Germany. More important was the survival or revival of Babouvism in secret French and Italian revolutionary societies, intent on overthrowing the established governments and on setting up a new, propertyless society. It was among them that the terms *communism* and *socialism* were first used. They were used vaguely and more or less interchangeably, although there was a tendency to use the term *socialist* to denote those who merely stressed a strong state as the owner of all means of production, and the term *communist* for those who stressed the abolition of all private property (except immediate personal goods). Among the chief leaders of such revolutionary groups were the Frenchmen Louis BLANC and (far more radical) Louis Auguste BLANQUI, both of whom played important roles in the February Revolution of 1848. The year 1848 was also marked by the appearance of *The Communist Manifesto* of Karl Marx and Friedrich ENGELS, the primary exposition of the socioeconomic doctrine that came to be known as MARXISM. It postulated the inevitability of a communist society, which would result when economic forces (the determinants of history) caused the class war, in this struggle the exploited industrial proletariat would overthrow the capitalists and establish the new classless order of social ownership. Marxian theories and programs soon came to dominate left-wing thought. Although the German group (founded in 1847) for which *The Communist Manifesto* was written was called the Communist League, the Marxist movement went forward under the name of SOCIALISM, its 19th-century history is treated in the article under that heading and under SOCIALIST PARTIES, in European history.

The Growth of Modern Communism The modern form of Communism (written with a capital C) began to develop with the split (1903) within the Russian Social Democratic Labor party into factions of BOLSHEVISM and MENSHEVISM. The more radical wing, the Bolsheviks, were led by Lenin and advocated immediate and violent revolution to bring about the downfall of capitalism and the establishment of an international socialist state. The triumph of the Bolsheviks in the RUSSIAN REVOLUTION of 1917 gave them the leadership in socialist action. They constituted the Communist party in 1918 (see COMMUNIST PARTY, in the USSR). Meanwhile World War I had shaken the socialist movement as a whole by splitting those who cooperated with the governments in waging the war from those who maintained a stand for revolution against all capitalist governments. Chief among the stalwart revolutionists were the Communist party in Russia and the SPARTACUS PARTY (later the Communist party) in Germany. The establishment of a working socialist state in Russia tended to give that country leadership, and Leninism grew stronger. Communist revolts immediately after the war failed in Germany, and the briefly successful Communist state under Béla KUN in Hungary was also repressed with great bloodshed. The revolutionary socialists now broke completely with the moderate majority of the movement. They withdrew from the Second INTERNATIONAL and formed (1919) the Third INTERNATIONAL, or COMINTERN, in 1919. Henceforth, the term *Communism* was applied to the ideology of the parties founded under the aegis of the Comintern. Their program called for the unit-

ing of all the workers of the world for the coming world revolution, which would be followed by the establishment of a dictatorship of the proletariat and state socialism. Ultimately there would develop a harmonious classless society, and the state would wither away. The Communist parties were organized on a hierarchical basis, with active cells of members as the broad base, they were made up only of the elite—those approved by the higher members of the party as being reliable, active, and subject completely to party rule. Communist parties were formed in countries throughout the world and were particularly active in trying to win control of labor unions and in fomenting labor unrest. Despite the existence of the Comintern, however, the Communist party in the USSR adopted, under Joseph STALIN, the theory of "socialism in one country," which asserted the possibility of building a true Communist system in one country alone. This departure from Marxist internationalism was challenged by Leon TROTSKY, whose theory of "permanent revolution" stressed the necessity of world revolution. After Trotsky was expelled (1929) from the Soviet Union, he founded a Fourth, or Trotskyist, International to rival the Comintern. Stalin's program of building the Soviet Union as the model and base of Communism in the world had the effect of tying Communist and Soviet policy even more closely together, an effect intensified by the "monolithic unity" produced by the party purges of the 1930s. It became clearly evident in that decade that in practice Communism, contrary to the hopes of theorists and intellectuals, had created in the USSR a giant totalitarian state that dominated every aspect of life and denied the ideal of individual liberty. Except for the small Mongolian People's Republic, no other Communist state was created before World War II. The Chinese Communist party was founded in 1921 and began a long struggle for power with the KUOMINTANG. However, it received little aid from the USSR, and it was not to achieve its goal until 1949. In the late 1920s and early 30s the Communist parties followed a policy of total hostility to the socialists, and in Germany this was one factor that facilitated the rise of the Nazis. In 1935, however, the Comintern dictated a change in policy, and the Communists began to work with other leftist and liberal parties for liberal legislation and government, as in the Popular Front government in France. In World War II the USSR became an ally of the Western capitalist nations after Germany attacked it in 1941. As part of its cooperation with the Allies the USSR brought about (1943) the dissolution of the Comintern. Hopes for continued cooperation, intrinsic in the formation of the United Nations, were dashed, however, by a widening rift between the Soviet bloc and the Western democracies, especially the United States, after the war (see COLD WAR). Communism had been vastly strengthened by the winning of many new nations into the zone of Soviet influence and strength in Eastern Europe. Governments strictly modeled on the Soviet Communist plan were installed in the "satellite" states—Albania, Poland, Czechoslovakia, Hungary, Bulgaria, and East Germany. A Communist government was also created under Marshal TITO in Yugoslavia, but Tito's independent policies led to the expulsion of Yugoslavia from the COMINFORM, which had replaced the Comintern, and Titoism was labeled deviationism. By 1950 the Chinese Communists held all of China except Taiwan, thus controlling the most populous nation in the world. A Communist administration was also installed in North Korea, and fighting between the People's Republic of Korea (Communist) and the southern Republic of Korea exploded in the KOREAN WAR (1950-53), fought between Communist and United Nations troops. Other areas where rising Communist strength provoked dissension and in some cases actual fighting include Malaya, Laos, many nations of the Middle East and Africa, and, especially, Vietnam, where the United States intervened to aid the South Vietnamese regime against Communist guerrillas and North Vietnam (see VIETNAM WAR). In many of these poor countries, Communists attempted, with varying degrees of success, to unite with nationalist and socialist forces against Western imperialism. After the death of Stalin in 1953 some relaxation of Soviet Communist strictures seemed to occur, and at the 20th party congress (1956) Premier Nikita Khrushchev denounced the methods of Stalin and called for a return to the principles of Lenin, thus presaging some change in Communist methods, although none in fundamental ideology. A resurgence of nationalist feeling within the Soviet bloc—vividly demonstrated by the bloodily suppressed Hungar-

ian uprising of 1956—ultimately forced some acknowledgment from the USSR. However, while it began to allow some limited freedom of action to the Eastern European countries, the invasion of Czechoslovakia in 1968 demonstrated its determination to prevent serious challenges to its domination. Communist parties in Western countries, on the other hand, especially in Italy, have felt more free to set their own policy. When in 1961 the USSR attacked Albania for Stalinism, China came strongly to Albania's defense. Ideological differences between China and the USSR became increasingly apparent in the 1960s and 70s, with China portraying itself as a leader of the underdeveloped world against the two superpowers, the United States and the Soviet Union. While both the USSR and China sought better relations with the United States in the 1970s, it appeared that the differences between the two major Communist powers would increase rather than decrease. See N. A. Berdyaev, *The Origin of Russian Communism* (tr 1937, repr 1960), Max Beer, *The General History of Socialism and Social Struggles* (2 vol., tr 1957), Donald Zagoria, *The Sino-Soviet Conflict* (1962, repr 1964), Z. K. Brzezinski, *Ideology and Power in Soviet Politics* (rev ed 1967), F. W. Houn, *A Short History of Chinese Communism* (1967), G. F. Hudson, *Fifty Years of Communism: Theory and Practice, 1917-1967* (1968), Helmut Gruber, *International Communism in the Era of Lenin* (1969), Raya Dunajevskaya, *Marxism and Freedom* (3d ed 1971), Leonard Shapiro, *The Communist Party of the Soviet Union* (2d ed 1971), R. C. Goldston, *Communism: A Narrative History* (1972), W. S. Sworakowski, *World Communism: A Handbook* (1973), D. A. Hyde, *Communism Today* (1973).

communistic settlements, communities practicing common ownership of goods. Communistic settlements were known in ancient and medieval times, but the flowering of such groups occurred in the 19th cent. in the United States, where a number of German pietistic sects established such communities as the AMANA CHURCH SOCIETY, Iowa, Harmony, Pa. (see HARMONY SOCIETY), and ZOAR, Ohio. Similar settlements were founded by the Shakers, Mormons, Mennonites, Dukhobors, and Jansenites. Unique religious settlements were the Oneida Community (see under ONEIDA, N.Y.), Hopedale, Mass., and the Brotherhood of the New Life, N.Y. (see HARRIS THOMAS LAKE). Another group were non-Christian, often antireligious and utopian. The leading communities within this group were of two types, those founded by the followers of Robert OWEN (including NEW HARMONY, Ind., and NASHOBA, Tenn.) and the numerous ones (notably BROOK FARM, Mass.) formed on the principles of Charles FOURIER. Belonging to neither of these groups were the Icarian settlements, led by Etienne CABET, and the anarchistic villages of Josiah WARREN. The religious groups, unified by strong faith and authority, tended to prosper and outlive the secular groups, the latter, however, often attracting brilliant and original personalities, provided a ferment of new thought. The chief attempts since the 19th cent. at setting up such colonies have been in Israel, where there are a number of successful agricultural collectives (see COLLECTIVE FARM). See A. F. Tyler, *Freedom's Ferment* (1944, repr 1962), R. M. Kanter, *Commitment and Community* (1972).

Communist party, in China. Founded in 1921 by Chen Tu-hsiu and Li Ta-chao, professors at Peking Univ., the party was under strong COMINTERN influence from its beginnings. The Chinese Communist party became formally allied with the KUOMINTANG in 1923, by 1925 Communists held many top posts in the Kuomintang organization. CHIANG KAI-SHEK forced a reduction in Communist power in March, 1926, but the party maintained the Kuomintang alliance at the insistence of the USSR. In April, 1927, Chiang Kai-shek drove the Communists, led by CHOU EN LAI, from SHANGHAI and executed many of their leaders, in July the party formally resigned from the Kuomintang government at Wuhan and went underground, and the long conflict between the party and the Kuomintang began. In Aug., 1927, MAO TSE-TUNG led the peasants of Hunan prov. in the Autumn Crop Uprising, a popular rebellion that was bloodily suppressed. One branch of the party secretly maintained itself in the cities, a short-lived Communist commune was established at Canton in Dec., 1927. In the rural hinterland Mao Tse-tung and CHU TEH established (1927) a precarious soviet in Kiangsi prov. Several other rural soviets were set up in Hunan, Anhwei, and Hupei provs. By 1931, Mao was in control of the official soviet government at Jui-chin, radical land-reform policies were followed to gain the support of the peasants. A Red Army, under

the leadership of Mao and Chu Teh, was recruited from the peasantry of Kiangsi. Eventually driven from their southern base by Chiang's military campaigns, many thousands of Communists trekked north on the LONG MARCH and set up headquarters at YEN AN in Shensi prov. There the party organization was strengthened, factories were built, and the civil war with Chiang's forces continued. In Sept., 1937, after a two-year effort to promote Chinese unity in the face of further Japanese aggression (see SINO-JAPANESE WAR, SECOND), the Communists obtained a limited truce from Chiang Kai-shek and accepted his nominal authority, although they retained actual military and political control over large areas in the northwest. The truce with the Kuomintang broke down in 1939, but Communist guerrillas remained the only really effective force against the Japanese in N. China. When World War II ended in 1945, the Communists controlled wide rural areas in N. and central China and moved quickly to gain control of Manchuria. From 1945 to 1949 party membership swelled as Communist armies took city after city from the Nationalists. After the People's Republic of China was set up in 1949, the party became the administrative and policymaking center of the government. For the changes wrought by the Communist regime in China, see CHINA. See J. E. Rue, *Mao Tse-tung in Opposition, 1927-1935* (1966), Shanti Swarup, *A Study of the Chinese Communist Movement* (1966), F. W. Houn, *A Short History of Chinese Communism* (1967), K. T. Chang, *The Rise of the Chinese Communist Party, 1921-1927* (1971).

Communist party, in the USSR, officially the Communist party of the Soviet Union. It exercises all effective power within the country, and, as the oldest and for a long time the only ruling Communist party in the world, it wields considerable (and in some cases controlling) influence over the Communist parties of other countries (see COMMUNISM). It presently has about 14,700,000 members (out of a total estimated population of 246,000,000) and more than 375,000 party units throughout the USSR. Marxist socialism (see MARXISM) took root in Russia in the 1880s. Led by Georgi PLEKHANOV, a small group of Marxists formed (1883) the League for the Emancipation of Labor, stressing the revolutionary capabilities of the growing industrial proletariat. Other groups were soon founded, the largest of which was the Jewish *Bund*, and in 1898 they united to form the Russian Social Democratic Labor party. The second party congress (1903) in Brussels and London split into factions of BOLSHEVISM and MENSHEVISM. The Bolsheviks, led by Vladimir Ilyich LENIN, demanded a highly disciplined, centralized, and dedicated revolutionary elite rather than a mass party. These principles guided the Bolsheviks before the 1917 revolution and remain the basis for the present Russian Communist party. When the RUSSIAN REVOLUTION began in March, 1917, the Bolsheviks were unprepared, and under the provisional government they played a minor role. When Lenin returned from exile in April, he called for seizure of power, despite opposition within the party. The Bolsheviks gained strength in key areas, capitalizing on mass discontent, and in November they were able to seize control. With a total party membership of about 200,000, they faced the problem of governing alone or sharing power. Lenin and Leon TROTSKY demanded party dictatorship and destroyed all opposition from Mensheviks and other socialist groups. During the civil war (1918-20) the Bolshevik party—from 1918 the All-Russian Communist party—was at the height of its revolutionary ardor. Despite seemingly impossible tasks, it strengthened the party apparatus on all levels. After the death of Lenin (1924) dissident elements in the party were silenced as Joseph STALIN emerged as Lenin's successor. In the party congresses of the 1920s debates were stormy and some intraparty democracy was still evident, but the 16th party congress in 1929 demonstrated Stalin's virtual supremacy. The party, called from 1925 the All-Union Communist party (Bolsheviks), still had at this time a strongly urban character. One purpose of the massive agricultural collectivization launched in 1929 was to strengthen the party in rural areas. By 1933 there were more than 3,500,000 party members and candidates, many newly recruited from rural areas. Then there began the series of purges that turned the 1930s into a reign of terror. The former leaders of the party—Trotsky, BUKHARIN, ZINOVIEV, KAMENEV, RYKOV, and others—were accused of treason. A series of spectacular show trials were held, almost all the defendants were executed or exiled. As the purges drew to a close by 1938, party membership had declined to 1,920,000. There was an immediate upturn in membership with the

approach of World War II, in the period after the war membership grew more slowly. In the 1960s the tendency was once more to broaden the base of membership. The Stalinist period, from 1930 until 1953, was characterized by a repressive and omnipotent dictatorship over all Soviet citizens, including party members. The party as an organization lost influence, while its leaders gained absolute power. Party congresses were infrequent. In 1952 the party was renamed the Communist party of the Soviet Union. Decisions were made by Stalin alone, and the fortunes of party members depended upon his whims. Unbounded adulation was accorded him. However, at the 20th party congress (1956, three years after Stalin's death) Premier NIKITA KHRUSHCHEV testified that the beliefs long held in the West about Stalin's crimes were true. The subsequent campaign of de-Stalinization reached a climax at the 22d party congress in 1961, and Stalin's body was removed from its place of honor in a mausoleum in Red Square. After the death of Stalin, Georgi MALENKOV at first appeared to hold power, but ultimately Khrushchev emerged as the successor, holding by 1958 the highest posts in both party and government—first secretary of the party and chairman of the council of ministers. The purge (1957-58) of the "antiparty group" of Malenkov, Vyacheslav MOLOTOV, Lazar Kaganovich, and Nikolai BULGANIN strengthened his position. Khrushchev, however, was suddenly removed in 1964 because of dissatisfaction with both his foreign and domestic policies. He was replaced by a so-called collective leadership whose leading members were Leonid BREZHNEV and Alexei KOSYGIN. By the 1970s, Brezhnev, general secretary of the party, had clearly emerged as the dominant figure but with less personal power than Khrushchev had held. The Communist party is organized so that its units parallel the territorial hierarchy of state administration as well as all institutions such as the press, education, armed forces, and agriculture. Through these institutions the party can effectively control the making and implementation of policy. A small core of party members is made up of full-time paid professional workers, the rest hold regular jobs in addition to fulfilling their party obligations. Each party committee has a small ruling body called a bureau or presidium, the leading member of which is the first secretary. The smallest party cell may consist of only three members in a factory, school, or office. The highest body, elected by the party congress, is the central committee, of which the ruling body is the presidium (formerly politburo). Membership in the party is determined in a severe selection process, involving recommendations from party members and a period of trial during which a candidate must prove his ability. A major source of new party members is the Young Communist League (Komsomol), an organization of youths from the ages of 14 to 28. It presently has over 30 million members. Komsomol is patterned after the Communist party and is strictly controlled to realize the goals of indoctrinating Soviet youth with the aims of the party, carrying out specific party tasks, and training future party members. See Herbert Marcuse, *Soviet Marxism* (1958, repr 1968), R. T. Fisher, *Pattern for Soviet Youth: A Study of the Congresses of Komsomol, 1919-1954* (1959), J. S. Reshetar, Jr., *A Concise History of the Communist Party* (rev ed 1964), Merle Fainsod, *How Russia is Ruled* (rev ed 1965), T. H. Rigby, *Communist Party Membership in the U.S.S.R., 1917-67* (1968), D. J. R. Scott, *Russian Political Institutions* (4th ed 1969), Leonard Shapiro, *The Communist Party of the Soviet Union* (2d ed 1971).

Communist party, in the United States, political party that espouses the Marxist-Leninist principles of COMMUNISM. The first Communist parties in the United States were founded in 1919 by dissident factions of the Socialist party. The larger, which called itself the Communist party of America, consisted of many of the former foreign language federations of the Socialist party, in particular the Russian Federation and the former Michigan Socialist party. The other, named the Communist Labor party, was led by Benjamin Gitlow and John REED. The parties immediately became subject to raids by agents of Attorney General A. Mitchell PALMER and local authorities. These raids resulted in a sharp drop in party membership and, in Jan., 1920, forced the Communists to go underground. In May, 1921, under strong pressure from the Third (Communist) International, or Comintern, the Communist groups in the United States were united under the name of the Communist party of America. The Comintern also forced a change in policy from a militant revo-

lutionary one to one stressing the need to work through established labor organizations and to develop a mass following. Accordingly, in Dec., 1921, the Communists organized the Workers party of America, as a legal, acknowledged organization, and by 1923 the underground party had ceased to function. Attempts were made to work through the growing farmer-labor movement of the early 1920s, but they failed in the face of opposition from most farmer-labor leaders and from the Progressive leader, Senator Robert La Follette. Unsuccessful Communist-led strikes among textile workers in Passaic, N.J. (1926), in New Bedford, Mass. (1928), and among New York City garment workers (1926) also lessened Communist influence in trade unions. During this period two factions developed within the party. One, led by Jay LOVestone, was generally socialist in background and concerned with political theory. The other, led by William Z. FOSTER and Earl BROWDER, was more syndicalist in background and interested in union activity. These two groups alternated in party leadership until 1929, when the Comintern ordered that the Foster group be placed in control to carry out the new policy line established at its Sixth World Congress (1928). The party was renamed the Communist party of the United States of America. The new period, called the Third Period, saw the development of the theory of "social fascism," by which labor and socialist leaders were denounced as more dangerous enemies of the workers than the fascists. During this period the American Communists also made a major appeal for Negro support, calling for the creation of a Negro republic in the South, on the grounds that Negroes were a national, not a racial, minority. The adoption of the new party line coincided with the beginning of the depression of 1929, and as the economic crisis grew, Communist membership increased. However, the policies of that time isolated the Communists both in politics and in the unions, so that despite increased membership and some success in organizing the unemployed, the party's influence remained small. In 1935 the Seventh World Congress of the Comintern announced another change of direction. It now stressed the need for a "popular front," a movement to create political coalitions of all anti-fascist groups. In the United States, the Communists abandoned opposition to the New Deal, they reentered the mainstream of the trade union movement and played an important part in organizing new unions for the Congress of Industrial Organizations (CIO), for the first time gaining important positions of power in the union movement. As antifascist activists they attracted the support of many non-Communists during this period. However, the party's attacks on Nazi Germany ended abruptly with the signing of the Hitler-Stalin nonaggression pact in Aug., 1939, and World War II, which immediately followed, was denounced as an "imperialist" war caused by Great Britain and France. American defense preparations and aid to the Western democracies were vigorously opposed as "war-mongering," and Communist-dominated unions were quick to go out on strike. In June, 1941, when Germany attacked Russia, the character of the war, for the Communists, was changed overnight from "imperialist" to "democratic." The party, under the leadership of Earl Browder, now went all out in its support of the war. Strikes were opposed as a hindrance to the war effort, and in 1944 the U.S. Communist party "disbanded" as a political party to become the Communist Political Association. In 1945, however, Browder's policy was attacked as being one of the "right deviationism," and he was replaced by William Z. Foster. This change in line and the beginning of the COLD WAR brought the party, which had achieved relative respectability during the war, under renewed attack. In 1948 the Communists supported the presidential candidacy of Henry A. Wallace on the PROGRESSIVE PARTY ticket, but he obtained only slightly more than a million votes. Communist influence in labor unions came under increasing attack. The Taft-Hartley Act of 1947 denied the facilities of the National Labor Relations Board to unions that failed to file affidavits avowing that their officers were not Communists, and in 1949-50 the CIO expelled unions that were still Communist-dominated. In March, 1947, President Truman barred Communists or those aiding or sympathetic to Communism from employment in the executive branch of the Federal government. The sensational confessions of former Communists, such as Whittaker CHAMBERS, and increasing evidence of Communist espionage led to highly publicized investigations by Congress (especially by the House Un-American Activities

Committee and the Senate Subcommittee on Government Operations), the Federal Bureau of Investigation, and Federal grand juries. In Oct., 1949, 11 top Communist leaders were convicted on charges of conspiring to advocate the overthrow of the U.S. government. In June, 1951, the Supreme Court found the Smith Act of 1940, under which the convictions had been obtained, constitutional, and the government proceeded to bring many lesser Communist officials to trial. In 1950 the McCarran Internal Security Act required that all Communist and Communist-dominated organizations register with the Federal government the names of all members and contributors, and the Communist Control Act of 1954 further strengthened the provisions of the McCarran Act by providing severe penalties for Communists who failed to register, denying collective bargaining power to Communist-dominated unions, and taking away the "rights, privileges and immunities" of the Communist party as a legal organization. At the same time many states passed "little Smith Acts," with such provisions as the requirement of loyalty oaths from state employees and the denial of a place on the ballot to Communist parties. This was also the period of Senator Joseph McCarthy's hysterical search for Communists in all branches of government. In 1956, Nikita Khrushchev's denunciation of Stalin's excesses, along with the Russian suppression of the Hungarian revolt in that same year, created new schisms in the U.S. Communist party, which lost thousands of members. The Supreme Court has upheld many of the provisions of the Smith and McCarran acts as they apply to the leadership of the Communist party, but several decisions of the 1960s substantially voided sanctions against the rank and file except where some active conspiracy against U.S. security is proved. As a result the party resumed open activities in 1966 and ran presidential candidates in the elections of 1968 and 1972. In 1972 it claimed about 17,000 dues-paying members. The material on American Communism is voluminous and is listed in three bibliographies: Fund for the Republic, Inc., *Bibliography on the Communist Problem in the United States* (1955), Robert F. Delaney, *The Literature of Communism in America* (1962), and Joel Seidman, ed., *Communism in the United States* (1969). For two works registering official views of the American Communist party in different periods, see Earl R. Browder, *What is Communism?* (1936) and William Z. Foster, *History of the Communist Party of the United States* (1952, repr. 1968). See James O'Neal and G. A. Werner, *American Communism: A Critical Analysis of Its Origins, Development and Programs* (1947, rev. ed. 1972), Irving Howe and Lewis Coser, *The American Communist Party, A Critical History* (1958, repr. 1962), Theodore Draper, *American Communism and Soviet Russia* (1960), Joseph Starobin, *American Communism in Crisis, 1943-1957* (1972).

community chest, cooperative organization of citizens and social welfare agencies in a city. Also known as a united fund, it has two purposes, to raise funds through an annual campaign for its member agencies and to budget the funds raised. The fund is administered by the community chest or united fund itself, or as a joint endeavor with a community welfare council, to represent the idea of administering, as well as collecting, the funds, the national association in 1927 took the name Community Chests and Councils. Today the organization's official name is the United Way of America. The idea of cooperative collecting for charitable purposes originated in Liverpool, England (1873), and, in the United States, in Denver (1887). In 1900 the Cleveland chamber of commerce went a step further and assumed responsibility for endorsing the agencies seeking funds, 13 years later Cleveland brought almost all its welfare organizations together in the Cleveland Welfare Council. The name *community chest* was coined in Rochester, N.Y., in 1913. See J. R. Sealey et al., *Community Chest: A Case Study in Philanthropy* (1957).

community college, public institution of higher education. Community colleges are characterized by a two-year curriculum that leads to either the associate degree or transfer to a four-year college. The transfer program parallels the first two years of a four-year college. The degree program generally prepares students for direct entrance into an occupation. Because of their low tuition, local setting, and relatively easy entrance requirements, community colleges have been a major force in the post-World War II expansion of educational opportunities in the United States. Their privately owned counterparts are known as junior colleges. See Edmund J. Gleazer, Jr., *This is the Community College*

(1968), C. R. Monroe, *Profile of the Community College* (1972).

commutation of sentence, in criminal law, reduction of a sentence for a criminal act by action of the executive head of the government. Like PARDON, commutation of sentence is a matter of grace, not of right, it is distinguished from pardon, however, in that the conviction of crime is not nullified. The commutation, hence, may be granted on condition that the criminal observe certain restrictions for the balance of his original sentence. Many states have statutes providing for commutation of sentence as a reward for good conduct during imprisonment. Once earned, the commutation becomes a matter of right and may be enforced by court action.

commutative law, in mathematics, law holding that for a given binary operation (combining two quantities) the order of the quantities is arbitrary, e.g., in addition, the numbers 2 and 5 can be combined as $2+5=7$ or as $5+2=7$. More generally, in addition, for any two numbers a and b the commutative law is expressed as $a+b=b+a$. Multiplication of numbers is also commutative, i.e., $a \times b = b \times a$. In general, any binary operation, symbolized by \circ , joining mathematical entities A and B obeys the commutative law if $A \circ B = B \circ A$ for all possible choices of A and B . Not all operations are commutative, e.g., subtraction is not since $2-5 \neq 5-2$, and division is not since $\frac{2}{5} \neq \frac{5}{2}$.

commutator, device used in an electric GENERATOR to convert the alternating current produced in the generator into direct current before the current is sent into an external circuit, it is basically a rotary switching device synchronized with the frequency of the alternating current. Commutators are also used in electric MOTORS to switch currents in order to maintain magnetic polarities necessary to keep the shafts of the motors turning.

Commynes, Philippe de: see COMINES, PHILIPPE DE.
Comnenus (kōmnē'nās), family name of several Byzantine emperors—ISAAC I, ALEXIUS I, JOHN II, MANUEL I, ALEXIUS II, and ANDRONICUS I—who reigned in the 11th and 12th cent., and of the historian, Princess ANNA COMNENA. Though unable to turn back the forces that contributed to the eventual downfall of the BYZANTINE EMPIRE, they were generally able rulers. Hellenism was revived during the family's reign, and contact with the West was increased. A branch of the family founded the empire of Trebizond (see TREBIZOND, EMPIRE OF) after the fall of Constantinople in 1204.

Como (kō'mō), city (1971 pop. 97,395), capital of Como prov., Lombardy, N. Italy, at the southwest end of Lake Como, near the Swiss border. It is primarily a tourist center. Originally a Roman colony, Como became an independent commune in the 11th cent. and was frequently at war with, and ruled by, Milan. It later came under Spanish and Austrian control and was liberated by Garibaldi in 1859. In the Middle Ages and the Renaissance, craftsmen, architects, and sculptors from Como (the *maestri comacini*) were renowned throughout Italy. The city has a remarkable marble cathedral (14th-18th cent.), a 13th-century city hall, and several Romanesque churches.

Como, Lake (kō'mō), Ital. *Lago di Como* or *Lario*, c. 56 sq. mi. (145 sq. km), 30 mi. (48 km) long and from $\frac{1}{2}$ to $2\frac{1}{2}$ mi. (0.8-4 km) wide, in Lombardy, N. Italy. Lake Como is a natural widening of the Adda River, which feeds and drains the lake. Situated in the foothills of the Alps, the lake is one of the most beautiful of Europe. It is a tourist resort, and handsome villas line its shores. Lecco, Como, Varennes, and Bellagio are principal towns.

Comodoro Rivadavia (kōmōthō'rō rēvāthā'vya), town (1970 pop. 78,479), Chubut prov., S. Argentina, on the Gulf of San Jorge, an inlet of the Atlantic Ocean. The major center of oil production in Argentina, it is connected by a 1,100-mi. (1,770-km) pipeline with Buenos Aires. The town is under military administration, and a government-owned corporation runs the oil wells.

Comonfort, Ignacio (ēgna'syō kōmōnfōrt'), 1812-63, Mexican general and president (1855-58). He was one of the leaders in the liberal Revolution of AYUTLA, which in 1855 overthrew SANTA ANNA and installed Juan ÁLVAREZ in the presidency. Comonfort became acting president upon the resignation of ÁLVAREZ, with his cabinet, particularly Benito JUÁREZ and Miguel LERDO DE TEJADA, he continued the anticlerical liberal program and embodied it in the constitution of 1857. In Dec., 1857, Comonfort, elected under the new constitution, took office as president. The reform program created a furor and awoke rebellion. Comonfort, a half-hearted liberal, at-

tempted to make his position more moderate and was deserted by the liberals. He allowed the conservatives to seize power, then turned against them. Unopposed by either party and opposed by public opinion, he resigned and fled (Jan., 1858) to the United States. He returned to fight against the French invaders and was killed in battle.

Comoro Islands (kōm'arō), French overseas territory (1970 est. pop. 267,000), 838 sq mi (2,170 sq km), an archipelago in the Indian Ocean, at the northern end of the Mozambique Channel, between the Malagasy Republic and Mozambique. The capital and largest city is MORONI. The Comoro Islands comprise the four main islands of Grande Comore—on which Moroni is located—Anjouan, Mayotte, and Moheli, and numerous coral reefs and islets. They are volcanic in origin and have a tropical climate. African peoples are most numerous in the population, although there are many Arabs and Indians in the towns; overpopulation is a problem. Most of the people are Muslim. French is the official language, but Arabic and Swahili are widely spoken. The islands' economy is largely agricultural; the main farming areas are held by foreign companies and feudalistic local landowners. Vanilla, copra, cocoa, sisal, cloves, and essential oils are the major crops and exports. Rice, machinery, and petroleum are the main imports. The islands were populated by successive waves of immigrants from Africa, Indonesia, Madagascar, and Arabia. In 1841 the French persuaded the king of Mayotte to cede Grande Comore. The other islands were ceded between 1866 and 1909. All were occupied by the British during World War II. In 1946 the islands were granted administrative autonomy within the French Union. The territorial assembly voted in Dec., 1958, to remain in the French Republic as an overseas territory. By 1968 internal self-government was achieved. In 1973 negotiations with France led to an agreement for the islands' eventual independence. The territory is represented in the French National Assembly by two deputies and in the Senate by one senator.

Compactata: see HUSSITES

compactor, device used to compress garbage to a relatively small volume so as to facilitate its handling and disposal. Essentially the device consists of a mechanical press that acts to reduce the size of garbage in its container. Environmentally it is advantageous in that it may be used as a substitute for the incinerator, which often generates air pollution. However, compacting makes it more difficult to separate waste materials for recycling.

companies, chartered: see CHARTERED COMPANIES

Company, Luis (lōōēs' kōmpa'nēs), 1883-1940, Spanish politician, Catalan nationalist leader. After the Spanish monarchy fell (1931), he proclaimed an autonomous Catalan republic within the Spanish republic and in 1933 was elected president of CATALUNYA. Pressed by extremists, in 1934 he declared Catalonia fully independent, but this separatist revolt failed and Company was jailed. The leftist electoral victory of 1936 brought him back to power, and he headed the Catalan government throughout the civil war. In 1939 he fled to France, but German occupation forces returned him to Spain in 1940, and he was executed.

company union: see UNION, LABOR

comparative anatomy: see ANATOMY

compass. 1 In mathematics, an instrument for making circles and measuring distances. Frequently called a pair of compasses, it consists of two metal legs with one end of each attached to a pivot to form a V-shaped device. The free ends are pointed, a pen or pencil may be substituted for one of the points. 2 In navigation, an instrument for determining direction. The mariner's compass consists of a magnetic needle freely suspended so that in the earth's magnetic field it turns to align itself with the magnetic north and south poles. Declination is the angle between the magnetic needle and the geographical meridian. Use of the compass by the early Chinese is probably legendary. The first known reference in European literature dates from the 12th cent. Another more accurate form of navigational compass is the gyrocompass. It consists essentially of a rapidly spinning, electrically driven rotor, suspended in such a way that its axis automatically points along the geographical meridian. The gyrocompass is unaffected by magnetic influences. This compass came into wide use in warships and aircraft during the Second World War. See GYROSCOPE.

compass plant or **rosinweed**, large, coarse North American perennial plant (*Silphium laciniatum*) of the family Compositae (COMPOSITE family), found chiefly in open grasslands. The deeply cut leaves

tend to point north and south. It has been used medicinally and is sometimes cultivated. Other plants of similar leaf orientation are sometimes called compass plants. Compass plant is classified in the division MAGNOLIOPHYTES, class Magnoliopsida, order Asterales, family Compositae.

compensation, workmen's: see WORKMEN'S COMPENSATION

competition, in biology, relationship between members of the same or different species in which individuals are adversely affected by those seeking the same living requirements, such as food or space. Intraspecific competition, i.e., competition between members of the same species, is illustrated by some species of birds and mammals, the males of which set up territories from which all other males of the same species are excluded. In interspecific competition members of different species compete for the same ecologically limiting factors, such as a food source. Not all relationships between organisms are competitive; for example, the commensal relationship between members of different species is non-competitive (see COMMENSALISM).

competition, in economics, rivalry in supplying or acquiring an economic service or good. Sellers compete with other sellers, and buyers with other buyers. Competition among merchants in foreign trade was common in ancient times, but among local retail dealers and among producers it is largely modern, a characteristic of mercantile and industrial expansion after the Middle Ages. By the 19th cent. classical economic theorists had come to regard competition, at least within the national state, as a natural outgrowth of the operation of SUPPLY AND DEMAND. The price of an item was seen as ultimately fixed by the confluence of the two forces. Early capitalist economists argued that supply and demand pricing worked better without any effort at regulation or control. Their model of perfect competition was marked by absolute freedom of trade, widespread knowledge of market conditions, easy access of buyers to sellers, and the absence of all action restraining trade by agencies of the state. Under such conditions no single buyer or seller could materially affect the market price of an item. After c. 1850, practical limitations to perfect competition became evident as industrial and commercial combinations, cooperatives, and trade unions arose to hamper it. Some governments attempted to impose competition by legislation, e.g., the SHERMAN ANTI-TRUST ACT of 1890, but the litigation involved in enforcing such legislation proved cumbersome and uncertain. A later development was government acceptance of the existence of industrial and commercial combinations, together with an effort to apply regulation, administered either by the state or by the industries themselves. Such a view was inherent in the development of the CARTEL in Germany and in the fact that governments have accepted the existence of practical monopolies in the field of public utilities (see UTILITY, PUBLIC). Copyrights, patents, and FAIR-TRADE LAWS also tend to reduce competition. See A. R. Burns, *Decline of Competition* (1936), John K. Galbraith, *American Capitalism: The Concept of Countervailing Power* (rev. ed. 1956, repr. 1962), M. S. Massell, *Competition and Monopoly* (1962, repr. 1964).

Compiègne (kōNpyē'nyā), city (1968 pop. 29,700), Oise dept., N France, in Île-de-France, on the Oise River. It is an industrial center with varied manufactures, a large glassworks is located in the suburbs. As far back as the Merovingian period (7th cent.), Compiègne had been the site of royal gatherings, from the 17th to 19th cent. French monarchs used it as a summer residence. The forest of Compiègne was a royal hunting ground. Joan of Arc was captured (1430) by the Burgundians at Compiègne. In a railroad car in the forest the armistice ending World War I was signed, in 1940, Hitler forced the French to surrender in the same car (which was later taken to Germany and destroyed). The large 15th-century palace, other old structures, and the place's historic connotations attract many tourists.

complement: see IMMUNITY

complementarity principle, physical principle enunciated by Niels Bohr in 1928 stating that certain physical concepts are complementary. If two concepts are complementary, an experiment that clearly illustrates one concept will obscure the other complementary one. For example, an experiment that illustrates the particle properties of light will not show any of the wave properties of light. This principle also implies that only certain kinds of information can be gained in a particular experiment. Other information that is equally important cannot be measured simultaneously and is lost in rigorous

terms the principle states that it is impossible to give simultaneously a space-time description of atomic entities and also a set of mathematical, causal laws describing such entities. The QUANTUM THEORY shows that these two descriptions are statistically related alternatives, complementary and mutually exclusive. A space-time description is limited by the UNCERTAINTY PRINCIPLE, while a causal description in mathematical form can only be stated in terms of other variables. See Werner Heisenberg, *The Physical Principles of the Quantum Theory* (1930, repr. 1949).

complex, term originated by C. G. Jung to indicate a group of feelings and memories resulting from early highly emotional experiences that occupy a dominant but unconscious position in the mind of an individual. Although repressed from consciousness, a complex nevertheless continues to exert a prevailing influence over mental activity and behavior. To the extent that complexes dominate personality, they indicate a disturbed state of consciousness, or what Jung called splinter psyches. Therapists try to bring the complexes into consciousness and release their energy for productive use. See INFERIORITY COMPLEX, OEDIPUS COMPLEX.

complex ion, charged molecular aggregate (see ION), consisting of a metallic atom or ion to which is attached one or more electron-donating molecules. In some complex ions, such as sulfate, SO_4^{2-} , the atoms are so tightly bound together that they act as a single unit. Many complex ions, however, such as tetrammine zinc (II), $\text{Zn}(\text{NH}_3)_4^{2+}$, are only loosely aggregated and tend to dissociate in a water solution until an equilibrium is established between the complex ion and its components (see CHEMICAL EQUILIBRIUM). Such complex ions, or coordinated complexes as they are also called, generally consist of a positively charged central metal atom or ion, like the zinc in tetrammine zinc, surrounded by electron-donating, or basic, groups called LIGANDS, in the tetrammine zinc complex, the NH_3 groups are the ligands. The number of bonds connecting the ligands to the central atom or ion is its coordination number, or ligancy. Transition metals (see TRANSITION ELEMENTS) are especially suited for forming complex ions because they have filled or partially filled electron orbitals that can participate in bonding the ligands to the metal. The bonding holding the ligands to the central atom or ion is similar to covalent bonding between atoms but is more complex (see CHEMICAL BOND). All the ligands surrounding the central ion need not be the same, and some positions can be occupied by solvent molecules. Because ligands remain in a fixed position around a central atom or ion, in many complexes different ISOMERS, or arrangements, of the ligand groups are possible. When there are four or more ligands around a central atom, different stereoisomers, or spatial configurations, are possible (see STEREOCHEMISTRY). Many complex ions are colored, the specific color of a complex depends on both the central atom or ion and the ligands. For example, when cobaltous chloride is dissolved in water, a pale pink solution, sometimes called invisible ink, results because of the presence of the hydrated cobaltous ion, $\text{Co}(\text{H}_2\text{O})_6^{2+}$; this solution does not show up well on paper, but if the paper is heated to drive the water off, visibility improves because of the formation of a blue tetrachlorocobalt (II)- 2 complex. Some of the more important complex ions are vitamin B_{12} , chlorophyll, and the heme component of hemoglobin, in which the central metal ions are cobalt, magnesium, and iron, respectively, and the ligands are complex organic systems. Many enzymes contain a metal ion about which parts of the protein are coordinated.

complex number. see NUMBER

complex variable analysis, branch of MATHEMATICS that deals with the CALCULUS of functions of a complex variable, i.e., a variable of the form $z = x + iy$, where x and y are real and $i = \sqrt{-1}$ (see NUMBER). A function $w = f(z)$ of a complex variable z is separable into two parts, $w = g_1(x, y) + ig_2(x, y)$, where g_1 and g_2 are functions of the real variables x and y . The theory of functions of a complex variable is concerned mainly with functions that have a derivative at every point of a given domain of values for z ; such functions are called analytic, regular, or holomorphic. If a function is analytic in a given domain, then it also has continuous derivatives of higher order and can be expanded in an infinite SERIES in terms of these derivatives (i.e., a Taylor's series). The function can also be expressed in the infinite series

$$f(z) = a_0 + a_1(z - z_0) + a_2(z - z_0)^2 + \dots + a_n(z - z_0)^n + \dots$$

where z_0 is a point in the domain. Also of interest in complex variable analysis are the points in a domain, called singular points, where a function fails to have a derivative. The theory of functions of a complex variable was developed during the 19th century by A. L. Cauchy, C. F. Gauss, G. F. B. Riemann, K. T. Weierstrass, and others.

composite, common name for the Compositae, by far the largest family of vascular plants, totaling an estimated 950 genera and perhaps 20,000 species. They are distributed over most of the earth and in almost all habitats and climates. North American genera number about 230, of which 20 are believed to be naturalized from Europe. The greatest number of composites are herbaceous, some are shrubs, and a few are small trees or climbing plants, chiefly tropical. In the typical composite flower (e.g., the sunflower), what appears to be a single flower is in reality a head of many small flowers. Petalike flowers of the outer ring are called ray flowers and are often sterile. These constitute the more conspicuous part of the head and are adapted in a variety of ways (e.g., in size and color) to attract insects for pollination and to serve as a landing platform for them. The central portion of the head is composed of disk flowers, minute tubular florets nearly always com-

grouping of forms on a two-dimensional plane in depth. In abstract painting forms are generally composed on planes parallel to the picture surface. In illusionistic works (see ILLUSIONISM) with advanced PERSPECTIVE, forms are arranged to accord with the laws of depth perception. Triangular groupings were favored in Renaissance art both for reasons of symmetry and for symbolic connotations of the Trinity.

composition, in ancient and medieval law, a sum of money paid by a guilty party as satisfaction to the family of the person he injured or killed. Failure to make the payment might justify retaliation in kind against the offender or his family. In earliest times, the payment was made as a result of a mutual agreement between the parties, but later it was imposed by law. In many societies the amount paid varied according to the rank of the person injured or slain. Composition reflected a transition from a system of feuds or blood revenge (see VENDETTA) to one where socially dangerous acts are primarily a concern of the state rather than of private persons and their families alone. The exaction of the payment recognized the outrage to the person and the family as the prime offense, but it tended to discourage disorder by providing a substitute for retributive killing or other violence. When, in addition to composition, a fine had to be paid to the state, the dangerous act approached the modern conception of a crime (see CRIMINAL LAW). This institution was known in all Germanic cultures, including Anglo-Saxon England, and was widespread in many parts of the world. It is still practiced in certain Middle Eastern countries. An example of composition is wergild [Old Eng. = man's price], the payment made by a murderer to the family of a murdered person. Wergild was often paid to the king for loss of a subject and to the lord of the manor for the loss of a vassal as well as to the family of the deceased. The term *composition* is also used to refer to an agreement between an insolvent debtor and his creditor, whereby the creditor for some consideration, such as an immediate payment of a portion of the debt, waives the remainder and considers his claim fully satisfied.

composition board, wood product produced in the form of a board or sheet, formed of cellulose fibers or particles derived from wood or other sources, and used principally as a building material. The oldest type of composition board is a relatively dense material known as hardboard, discovered accidentally in 1924 by the American scientist William Mason. After obtaining wood fibers by using high-pressure steam, Mason attempted to dry a matlike mass of them in a steam press. Because of a faulty valve, the press remained hot longer than had been planned and thus the first piece of hardboard was formed. In other forms of composition board the fibers are not as closely packed, and the density is correspondingly lower. Some of these boards find application as insulating and soundproofing materials. Other similar types are treated with waterproofing material, e.g., asphalt applied under pressure, and are usable as the sheathing of buildings. Such materials typically have a resistance to shearing forces exceeding that of plywood. Particle board, another form of composition board, is made by binding wood particles ranging in size from flakes to sawdust together with a suitable adhesive, such as a plastic resin, and pressing or extruding them to form sheets. Particle board is used as a cheaper substitute for plywood in some applications, but even though it has a higher density, it is less resistant to puncture and the effects of weather. When properly veneered it is suitable for making furniture. In its raw form it makes an excellent subflooring for dry locations.

compost, substance composed mainly of partly decayed organic material that is applied to fertilize the soil and to increase its HUMUS content, it is often used in vegetable farming, home gardens, flower beds, lawns, and greenhouses. Compost usually is made from plant materials (e.g., grass clippings, vegetable tops, garden weeds, hay, tree leaves, sawdust, and peat) together with manure and some soil, lime, SUPERPHOSPHATES, and nitrogen fertilizers are often added with manure to reinforce the compost and hasten its decomposition.

Compostela, Santiago de, Spain see SANTIAGO DE COMPOSTELA

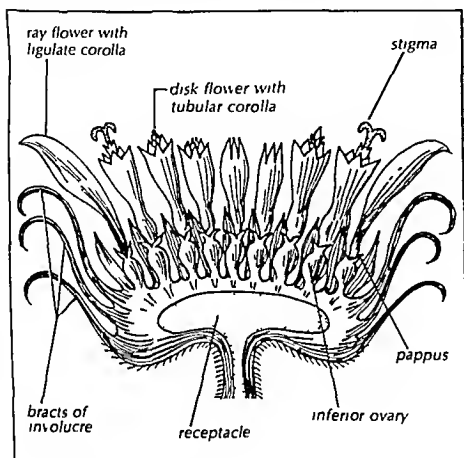
compound, in chemistry, a substance composed of ATOMS of two or more ELEMENTS in chemical combination, occurring in fixed, definite proportion and arranged in a fixed, definite structure. A compound has unique properties that are distinct from the properties of its elemental constituents and of all

other compounds. One familiar chemical compound is water, a liquid that is nonflammable and does not support combustion. It is composed of two elements: hydrogen, an extremely flammable gas, and oxygen, a gas that supports combustion. A compound differs from a mixture in that the components of a mixture retain their own properties and may be present in many different proportions. The components of a mixture are not chemically combined; they can be separated by physical means. A mixture of hydrogen and oxygen gases is still a gas and can be separated by physical methods. If the mixture is ignited, however, the two gases undergo a rapid chemical combination to form water. Although the hydrogen and oxygen can occur in any proportion in a mixture of gases, they are always combined in the exact proportion of two atoms of hydrogen to one atom of oxygen when combined in the compound water. Another familiar compound is sodium chloride (common salt). It is composed of the silvery metal sodium and the greenish poisonous gas chlorine combined in the proportion of one atom of sodium to one atom of chlorine. Water is a molecular compound; it is made up of electrically neutral MOLECULES, each containing a fixed number of atoms. Sodium chloride is an ionic compound; it is made up of electrically charged IONS that are present in fixed proportions and are arranged in a regular, geometric pattern (called crystalline structure) but are not grouped into molecules. The atoms in a compound are held together by chemical bonding (see CHEMICAL BOND). A compound is often represented by its chemical FORMULA. The formula for water is H_2O and for sodium chloride, $NaCl$. The FORMULA WEIGHT of a compound can be determined from its formula. The MOLECULAR WEIGHT of a molecular compound can be determined from its molecular formula. Two or more distinct compounds that have the same molecular formula but different properties are called ISOMERS. Compounds are formed from simpler substances by CHEMICAL REACTION. Some compounds can be formed directly from their constituent elements, e.g., water from hydrogen and oxygen: $2H_2 + O_2 \rightarrow 2H_2O$. Other compounds are formed by reaction of an element with another compound, e.g., sodium hydroxide ($NaOH$) is formed (and hydrogen gas released) by the reaction of sodium metal with water: $2Na + 2H_2O \rightarrow 2NaOH + H_2\uparrow$. Compounds are also made by reaction of other compounds, e.g., sodium hydroxide reacts with hydrogen chloride (HCl) to form sodium chloride and water: $HCl + NaOH \rightarrow NaCl + H_2O$. Complex molecules such as proteins are formed by a series of reactions involving elements and simple compounds. Compounds can be decomposed by chemical means into elements or simpler compounds. Water is broken down into hydrogen and oxygen by electrolysis. Candle wax, a mixture of hydrocarbons, is changed in the candle flame by combustion (with oxygen) to a mixture of the simpler compounds carbon dioxide (CO_2) and water. Life is based on numerous reactions in which energy is stored and released as compounds are produced and decomposed.

compound eye see EYE

compressed air, air whose volume has been decreased by the application of pressure. Air is compressed by various devices, including the simple hand pump and the reciprocating, rotary, centrifugal, and axial-flow compressors. Compressed air exerts an expansive force that can be controlled and used in various devices including tires, air brakes, caissons, and diving suits. As a source of power it is used to operate PNEUMATIC TOOLS, e.g., pneumatic hammers and drills and spraying equipment. It is widely employed for cleaning dust and dirt out of mechanical equipment. It is used also in mining, tunneling, and the manufacture of explosives, since it is not a fire hazard. Compressed air is in readily available supply and is easily stored and transported.

compression, external stress applied to an object or substance, tending to cause a decrease in volume (see PRESSURE). Gases can be compressed easily, solids and liquids to a very small degree if at all. Water, for example, is practically incompressible, thus making it especially useful for HYDRAULIC MACHINES. According to the KINETIC-MOLECULAR THEORY OF GASES, when the molecules of a gas are brought close enough together by compression, the gas (under certain conditions of temperature) undergoes LIQUEFACTION. This principle is applied commercially to several gases, including liquid oxygen and the so-called bottled gas (a mixture of hydrocarbons) used as a fuel. Boyle's law deals with the decrease in the volume of a gas in relation to the increase of pres-



Cross section of a sunflower, a member of the composite family

taining both stamens and pistils. The entire composite head is supported by a series of bracts (modified leaves), which arise from the base of the flower stalk and are collectively termed the involucre. The FRUITS of composites are achenes. Many are remarkably adapted for dispersal by animals—e.g., the many burr plants of the family, such as the burdock and cocklebur—or by wind, e.g., the dandelion and goldenrod. Although numerous individual variations exist among the composites, the general flower plan makes the plants readily identifiable and represents the highest evolutionary specialization of flower structure of all dicotyledonous plants. In effect, the community of flowers in a composite head performs by a division of labor the same functions as a single flower in other plants. As a flower structure it ensures pollination, and the effective dispersal variations have made the family widespread and predominant. Taxonomic distinctions within the family are not always clear; botanists sometimes subdivide the Compositae into several families (e.g., the thistle, chicory, and ragweed families) or, more frequently, into tribes. The composite group includes many common weeds and wild flowers, especially late summer and autumn flowers. The pollen of many species causes hay fever. This large family is of minor economic importance. A few species are used for food, usually as salad plants—e.g., lettuce, endive and chicory, salsify, and dandelion, the artichoke is the only commercial table vegetable. Many composites have been used in medicinal preparations. The family is most valuable for its ornamentals. Among the well-known and numerous cultivated species are the asters, daisies, chrysanthemums, marigolds, and zinnias. The composite family is classified in the division MAGNOLIOPHYTA, class Magnoliopsida.

composite order: see CORINTHIAN ORDER

composition, in art, the organization of forms and colors within the work of art. In traditional sculpture this means the arrangement of masses and planes. In representational painting it means the

sure upon it (see GAS LAWS). The ability or the degree to which an internal-combustion engine reduces the volume of its fuel mixture preparatory to firing is called its compression. Also, a region of high pressure in a fluid is called a compression, thus sound waves are said to propagate at compressions and rarefactions (regions of low pressure) of their medium, such as air.

Compromise of 1850 The annexation of Texas to the United States and the gain of new territory by the Treaty of Guadalupe Hidalgo at the close of the Mexican War (1848) aggravated the hostility between North and South concerning the question of the extension of SLAVERY into the territories. The antislavery forces favored the proposal made in the Wilmot Proviso to exclude slavery from all the lands acquired from Mexico. This, naturally, met with violent Southern opposition. When California sought (1849) admittance to the Union as a free state, a grave crisis threatened. Also causing friction was the conflict over the boundary claims of Texas, which extended far westward into territory claimed by the United States. In addition, the questions of the slave trade and the FUGITIVE SLAVE LAWS had long been vexing. There was some fear that, in the event of strong antislavery legislation, the Southern states might withdraw from the Union altogether. The possibility of the disintegration of the Union was deprecated by many but was alarming to some, among them Henry CLAY, who emerged from retirement to enter the Senate again. President TAYLOR was among those who felt that the Union was not threatened, he favored admission of California as a free state and encouragement of New Mexico to enter as a free state. These sentiments were voiced in Congress by William H. SEWARD, John C. CALHOUN and other Southerners, particularly Jefferson DAVIS, maintained that the South should be given guarantees of equal position in the territories, of the execution of fugitive slave laws, and of protection against the abolitionists. Clay proposed that a series of measures be passed as an omnibus compromise bill. Support for this plan was largely organized by Stephen A. DOUGLASS. The measures were the admission of California as a free state, the organization of New Mexico and Utah territories without mention of slavery, the status of that institution to be determined by the territories themselves when they were ready to be admitted as states (this formula came to be known as POPULAR SOVEREIGNTY), the prohibition of the slave trade in the District of Columbia, a more stringent fugitive slave law, and the settlement of Texas boundary claims by Federal payment of \$10 million on the debt contracted by the republic of Texas. These proposals faced great opposition, but Daniel WEBSTER greatly enhanced the chances for their acceptance by his famous speech on March 7, 1850. Taylor's death and the accession of conservative Millard FILLMORE to the presidency made the compromise more feasible. After long debates and failure to pass the omnibus bill, Congress passed the measures as separate bills in Sept., 1850. Many people, North and South, hailed the compromise as a final solution to the question of slavery in the territories. However, the issue reemerged in 1854 with the KANSAS-NEBRASKA ACT, and seven years later the factions were fighting the Civil War. See E. C. Rozwenc, *The Compromise of 1850* (1957), Holman Hamilton, *Prologue to Conflict* (1964).

Compton, Arthur Holly, 1892-1962, American physicist, b. Wooster, Ohio, grad. College of Wooster (B.S., 1913), Ph.D. Princeton, 1916. He was professor and head of the department of physics at Washington Univ., St. Louis (1920-23), and professor of physics at the Univ. of Chicago (1923-45), where he helped to develop the atomic bomb. He returned to Washington Univ. where he was chancellor (1945-53) and professor (from 1953). For his discovery of the COMPTON EFFECT he shared with C. T. R. Wilson the 1927 Nobel Prize in Physics. In addition to his work on X rays he made valuable studies of cosmic rays. His writings include *X Rays and Electrons* (1926, 2d ed., with S. K. Allison, *X-Rays in Theory and Experiment*, 1935), *The Human Meaning of Science* (1940), and *Atomic Quest* (1956). See his *Cosmos of Arthur Holly Compton*, ed. by Marjorie Johnston (1968) and *Scientific Papers*, ed. and with an intro. by R. S. Shankland (1973).

Compton, Karl Taylor, 1887-1954, American physicist, b. Wooster, Ohio, grad. College of Wooster (Ph.B., 1908), Princeton (Ph.D., 1912), brother of A. H. Compton. He taught at Princeton from 1915 to 1930 (as professor from 1919) and was president of the Massachusetts Institute of Technology from 1930

to 1948. From 1948 to 1949 he was chairman of the research and development board of the National Military Establishment. He did notable research on photoelectricity, radar, ionization of gases, ultraviolet spectroscopy, and electric arcs.

Compton, city (1970 pop. 76,611), Los Angeles co., S. Calif., a residential and industrial suburb between Los Angeles and Long Beach, inc. 1888. It has aircraft, electronic, oil, chemical, and steel industries. A junior college is there.

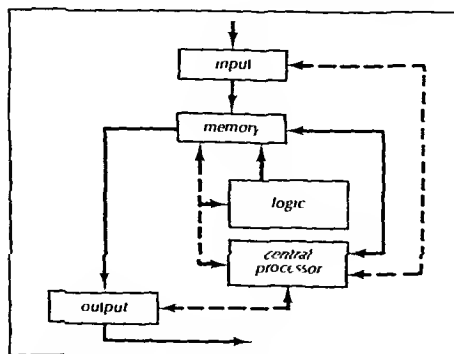
Compton-Burnett, Dame Ivy, 1892-1969, English novelist. Educated at the Univ. of London, she lived quietly in London for most of her life. She was named a Dame Commander of the British Empire in 1967. Ivy Compton-Burnett's unconventional novels of the Edwardian gentry reveal beneath their irony, satire, and wit an embittered, frightful world of hypocrisy and cruelty. Her writings are noted for their lack of plot, their absence of description and characterization, and their almost complete reliance on articulate, highly stylized conversations. Among her most notable works are *Brother and Sister* (1929), *A House and Its Head* (1935), *Manservant and Maid-servant* (1947), *Mother and Son* (1955), *The Mighty and Their Fall* (1961), and *The Last and the First* (1971). See biography by Elizabeth Sprigge (1973), study by Charles Burkhart (1965).

Compton effect [for A. H. Compton], increase in the wavelengths of X rays and gamma rays when they collide with and are scattered from loosely bound electrons in matter. This effect provides strong verification of the quantum theory since the theoretical explanation of the effect requires that one treat the X rays and gamma rays as particles or photons (quanta of energy) rather than as waves. The classical treatment of these rays as waves would predict no such effect. According to the quantum theory a photon can transfer part of its energy to a loosely bound electron in a collision. Since the energy of a photon is proportional to its frequency, after the collision the photon has a lower frequency and thus a longer wavelength. The increase in the wavelength does not depend upon the wavelength of the incident rays or upon the target material. It depends only upon the angle that is formed between the incident and scattered rays. A larger scattering angle will yield a larger increase in wavelength. The effect was discovered in 1923. It is used in the study of electrons in matter and in the production of variable energy gamma-ray beams.

compurgation (kōm'pārgā'shən), in medieval law, a complete defense. A defendant could establish his innocence or nonliability by taking an oath and by getting a required number of persons to swear they believed his oath. Compurgation, also called *wager of law*, was found in early Germanic law and in English ecclesiastical law until the 17th cent. In common law it was substantially abolished as a defense in felonies by the Constitutions of Clarendon (1164). Compurgation was still permitted in civil actions for debt, however, and vestiges of it survived until its final abolition in 1833. It is doubtful whether compurgation ever existed in America.

computer, device capable of performing a series of calculations or logical operations without human intervention. Although such devices as the ABACUS and the desk CALCULATING MACHINE have limited calculating capacities, the computer is characterized by the number and complexity of operations it can perform and by its ability to store, retrieve, and process data. Computers are of two types, analog and

digital. An analog computer is designed to process data in which the variable quantities vary continuously (see ANALOG CIRCUIT); it translates the relationships between the variables of a problem into analogous relationships between electrical quantities, such as current and voltage, and solves the original problem by solving the equivalent problem, or analog, that is set up in its electrical circuits. Because of this feature, analog computers are especially useful in the simulation and evaluation of dynamic situations, such as the flight of a space capsule or the changing weather patterns over a certain area. The key component of the analog computer is the OPERATIONAL AMPLIFIER, and the computer's capacity is determined by the number of amplifiers it contains (often over 100). A digital computer is designed to process data in numerical form (see DIGITAL CIRCUIT); its circuits perform directly the mathematical operations of addition, subtraction, multiplication, and division. The numbers operated on by a digital computer are expressed in the BINARY SYSTEM, binary digits, or bits, are 0 and 1, so that 0, 1, 10, 11, 100, 101, etc. correspond to 0, 1, 2, 3, 4, 5, etc. Binary digits are easily expressed in the computer circuitry by the presence (1) or absence (0) of a current or voltage. A string of such bits is sometimes called a digital word; it may specify not only the magnitude of the number in question, but also its sign (positive or negative), and may also contain redundant bits that allow automatic detection of certain errors (see CODE, INFORMATION THEORY). A digital computer can store the results of its calculations for later use, can compare results with other data, and on the basis of such comparisons can change the series of operations it performs. The operations of a digital computer are carried out by LOGIC CIRCUITS, which are digital circuits whose single output is determined by the conditions of the inputs, usually two or more. The various circuits processing data in the computer's interior must operate in synchronism; this is accomplished by controlling them with a very stable OSCILLATOR, which acts as the computer's "clock." Typical computer clock rates range from several million cycles per second to several hundred million, with some of the fastest computers having clock rates of about a billion cycles per second. Operating at these speeds, digital computers are capable of performing thousands to millions of arithmetic operations per second, thus permitting the rapid solution of problems so long that they would be impossible for a human to solve by hand. In addition to the arithmetic or logic circuitry and a small number of registers that hold intermediate results, the heart of the computer also contains the central processor—circuitry that decodes the set of instructions, or program, and causes it to be executed—and the storage unit, or memory, where results or other data are stored for periods of time ranging from a small fraction of a second to many months. Since the central processor can operate no faster than the rate at which data is fed to it, it is important that access to this internal memory be very rapid. The basic elements of such a memory are usually either magnetic cores, which store one bit of information according to the direction in which the cores are magnetized, or electronic circuits, which store one bit by being switched either on or off. Magnetic cores have the advantage of not needing power to maintain stored data, but they operate more slowly than electronic circuits. Both are costly and require means for regenerating stored data that would otherwise be lost at various times. For this reason most computers are also equipped with bulk storage systems using equipment such as magnetic tape, magnetic disks, magnetic drums, punched paper tape, or punched paper cards. In a system using magnetic tape the information is stored by a specially designed TAPE RECORDER somewhat similar to one used for recording sound. In disk and drum systems the principle is the same except that the magnetic medium lies in a closed path, or track, on the surface of a disk or cylinder, with a separate magnetic head serving each track. Of these systems disks are the fastest and most efficient. Drum systems operate about as fast but are wasteful of space; this defect has rendered them virtually obsolete. Paper tapes and cards suffer from the same problem as magnetic tape, namely that a good deal of search time may be needed to find a particular item of data, and they operate even more slowly than tape. Before a computer can be used to solve a given problem, it must first be programmed, that is, prepared for solving the problem by being given a set of instructions, or program. Each instruction in the program is a simple, single step, telling the computer to perform some arithmetic



Schematic diagram of a computer system. Data flow is indicated by solid lines, control signals are indicated by dashed lines.

tic operation, read the data from some given location in the memory, compare two numbers, or take some other action. The program is entered into the computer's memory exactly as if it were data, and on activation, the machine is directed to treat this material in the memory as instructions. Other data may then be read in and the computer can carry out the program to solve the particular problem. Since computers are designed to operate with binary numbers, all data and instructions must be represented in this form, the machine language, in which the computer operates internally, consists of the various binary codes that define instructions together with the formats in which the instructions are written. Since it is time-consuming and tedious for a programmer to work in actual machine language, an intermediate programming language, or assembly language, designed for the programmer's convenience, is used for the writing of most programs. The computer is programmed to translate a given assembly language into machine language and then solve the original problem for which the program was written. Assembly languages vary from machine to machine. Certain programming languages are universal, varying little from machine to machine. These are usually designed for particular types of problems. For example, FORTRAN is for scientific and mathematical use, COBOL for business use, PL/1 for general use, and ALGOL for mathematical use. The various programs by which a computer controls aspects of its operations, such as those for translating data from one form to another, are known as software, as contrasted with hardware, which is the physical equipment comprising the installation. Once a program has been prepared, it must be fed into the computer through the machine's input facilities. This is accomplished most often by means of written language, either on paper, in which case it is called hard copy, or on the face of a cathode-ray tube, in which case it is called soft copy. Human beings communicate with the computer by means of teletypewriters, machines that punch paper cards and tapes for presentation to the computer, and special devices such as GRAPHIC TERMINALS. Generally, the slowest operations that a computer must perform are those of transferring data, particularly when the data is received from or delivered to a human being. In large installations, this problem is often alleviated by using small computers to handle data input and output for a larger one. In a fairly recent development known as time-sharing, a single fast computer serves a number of remote data terminals. The computer switches from one terminal to another so quickly that many different users at different terminals can use the computer at the same time without any one of them being aware of the others. Human beings may also communicate with the computer directly through its control panel, however, except for initiating and concluding long periods of operation this is very wasteful, as a vast amount of computing time is lost in the time it takes a human being to respond to an output message. In most moderate to large installations the moment-to-moment control of the machine resides in a special software program called an operating system, or supervisor. Other forms of software include assemblers and compilers for programming languages. Software is of great importance, the usefulness of a highly sophisticated array of hardware can be severely compromised by the lack of adequate software. Advances in the technology of INTEGRATED CIRCUITS has spurred the development of smaller computers, sometimes called minicomputers. These, because of their relatively low cost, are increasingly being used in place of analog computers for single-purpose operation. They are also good for general use in small installations. Except for tasks requiring human creativity, the applications of the digital computer are virtually limitless, such limitations as there are being principally related to difficulty in acquiring adequate data for the computer or in reducing the data to numbers. This is an area of continuing research for new applications and improvements in hardware and software. American scientist Vannevar Bush built a mechanically operated device, called a differential analyzer, in 1930. It was the first general-purpose analog computer. In the 19th cent. British mathematician Charles Babbage designed, but did not build, a mechanical digital device capable of processing information as a modern computer does. The first information-processing digital computer actually built was the Automatic Sequence Controlled Calculator, or Mark I computer. Completed in 1944, this electro-mechanical device was designed by American engineer Howard Aiken. In 1946 the Electronic Numerical

cal Integrator and Computer, or ENIAC, was put into operation. Using thousands of electron tubes, it was the first electronic digital computer. In the late 1950s transistors replaced electron tubes in computers, allowing a reduction in the size and power consumption of computer components. During this period FORTRAN and ALGOL, and later COBOL, were introduced. In the 1960s hybrid computers were formed by connecting analog computers to digital ones. Later integrated circuits were developed that allowed further reduction in component size and increase in reliability. See John Pfeiffer, *The Thinking Machine* (1962), Jeremy Bernstein, *The Analytic Engine: Computers—Past, Present and Future* (1963), D. G. Fink, *Computers and the Human Mind* (1966), R. R. Fenichel and J. Weizenbaum, ed., *Computers and Computation: Readings from Scientific American* (1971), Irving Adler, *Thinking Machines* (rev. ed. 1973), Craig Fields, *About Computers* (1973), J. M. Adams, *Computers* (1973), R. C. Dorf, *Computers and Man* (1974).

computer music, music composed or performed with the aid of a computer. For composition, the computer is programmed to select or reject elements from a pre-established, digitally represented sound domain. The result is either transcribed into conventional musical notation or electrically synthesized. Sound production consists of a digital program effecting filters and/or oscillators to generate electrical signals whose parameters—amplitude, frequency—can be heard as sound events when they are transcribed onto magnetic tape, amplified, and played through loudspeakers. The Columbia-Princeton Electronic Music Studio is a major center for the production of computer music.

Comstock, Anthony, 1844-1915, American morals crusader, b. New Canaan, Conn. He served with the Union army in the Civil War and was later active in advocating the suppression of obscene literature. He was the author of the comprehensive New York state statute (1868) forbidding immoral works, and in 1873 he secured stricter Federal postal legislation against obscene matter. That same year he organized the New York Society for the Suppression of Vice. As secretary of the society until his death, Comstock was responsible for the destruction of 160 tons of literature and pictures. For his liberal enemies he became the symbol of licensed bigotry and for his supporters the symbol of stalwart defense of conventional morals. Comstock also inspired the Watch and Ward Society of Boston. See biographies by Heywood Brown and Margaret Leech (1927) and De Robinge Bennett (repr. 1971).

Comstock, Henry Tompkins Paige: see COMSTOCK LODGE

Comstock Lode, richest known U.S. silver deposit, W. Nevada, on Mt. Davidson in the Virginia Range. It is said to have been discovered in 1857 by Ethan Allen Grosh and Hosea Ballou Grosh, sons of a Pennsylvania minister and veterans of the California gold fields who died under tragic circumstances before their claims were recorded. Henry T. P. Comstock, known as Old Pancake, was a sheepherder and prospector who took possession of the brothers' cabin and tried to find their old sites. He and others searching for gold laid claim to sections of the Comstock (1859) but soon sold them for insignificant sums. The lode did not become really profitable until its bluish sand was assayed as silver. News of the discovery then spread rapidly, attracting promoters and traders as well as miners, and the lode was the scene of feverish activity. Among early arrivals was William Morris Stewart, who later became one of Nevada's first senators. Camps and trading posts in the area became important supply centers, and Virginia City, a mining camp on the mountain, was for several decades the "capital" of the lode and a center of fabulous luxury. Great fortunes were made by the "silver kings," John W. Mackay, James Graham Fair, James C. Flood, and William S. O'Brien, and by Adolph Sutro, George Hearst, and Elley Orrum Bowers. Silver determined the economy and development of Nevada until exhaustion of the mines by wasteful methods of mining and the demonetization of silver started a decline in the 1870s. By 1898 the Comstock was virtually abandoned. See Grant Smith, *History of the Comstock Lode* (1943), George Lyman, *The Saga of the Comstock Lode* (1934, repr. 1971), Lucius Beebe and Charles Clegg, *Legends of the Comstock Lode* (4th ed. 1956).

Comtat Venaissin (kəNtā' vənəNsāN') or **Comtat**, region of SE France, Vaucluse dept., comprising the territory around AVIGNON. Well-irrigated, it is a truck-farming and fruit-growing area. Comtat Ven-

assin was given by King Philip III to Pope Gregory X in 1274. Succeeding French kings sought to regain the region, but it remained in papal hands until 1791, when a plebiscite was held and the inhabitants voted to reunite with France. The region's historic capital was CARPENTRAS.

Comte, Auguste (ōgust' kōNt), 1798-1857, French philosopher, founder of the school of philosophy known as POSITIVISM, educated in Paris. From 1818 to 1824 he contributed to the publications of Saint-Simon, and the direction of much of Comte's future work may be attributed to this association. Comte was primarily a social reformer. His goal was a society in which individuals and nations could live in harmony and comfort. His system for achieving such a society is presented in his *Cours de philosophie positive* (1830-42, tr. *The Course of Positive Philosophy*, 1896 ed.). In this work Comte analyzes the relation of social evolution and the stages of science. He sees the intellectual development of man covered by what is called the Law of the Three Stages—theological, in which events were largely attributed to supernatural forces, metaphysical, in which natural phenomena are thought to result from fundamental energies or ideas, positive, in which phenomena are explained by observation, hypotheses, and experimentation. The sciences themselves are classified on the basis of increasing complexity and decreasing generality of application in the ascending order: mathematics, astronomy, physics, chemistry, biology, and sociology. Each science depends at least in part on the science preceding it, hence all contribute to sociology (a term that Comte himself originated). A sociology developed by the methods of positivism could achieve the ends of harmony and well-being which Comte desired. Another work, *Le Système de politique positive* (1851-54, tr. *System of Positive Polity*, 1875-77), placed religion above sociology as the highest science, it was, however, a religion shorn of metaphysical implications, with humanity as the object of worship. For a modern edition of part of this work see *A General View of Positivism* (1957). Important among his other writings are *Catechisme positiviste* (1852, tr. 1858) and *Synthese subjective* (1856). Published posthumously were his *Testament* (1884) and his letters (1902-05). See R. L. Hawkins, *Auguste Comte and the United States, 1816-1853* (1936) and *Positivism in the United States, 1853-1861* (1938), F. S. Marvin, *Comte, the Founder of Sociology* (1937, repr. 1965).

comuneros (kōmōnā'rōs), in Spain and Spanish America, citizens of a city or cities when organized to defend their rights against arbitrary encroachment of government. The first great revolt of comuneros in Spain was the uprising (1520-21) of the *comunidades* (autonomous cities) of Castile against the measures of Emperor CHARLES V. In Spanish America, the revolt of the comuneros of Paraguay, led by ANTEQUERA Y CASTRO against Gov. Diego de los Reyes Balmaseda and continuing against viceregal and Jesuit opposition from 1723 to 1735, was one of the first considerable democratic uprisings of Latin America. In the comunero insurrection of New Granada (1780-81), 60 cabildos rejected new taxes and sought reforms.

Comus (kō'mas), in late Roman legend, god of mirth and revelry. A follower of Dionysus, he was represented as a drunken youth bearing a torch. In Milton's poetic masque, *Comus*, he is the mischievous son of Bacchus and Circe.

Comyn, John (kūm'ĭn), d. c. 1300, Scottish nobleman, known as the Black Comyn. In 1286 he became one of the six regents for MARGARET MAID OF NORWAY and, as such, agreed to the treaty of 1290, by which Margaret was to marry the eldest son of Edward I of England. After her death, he was at first a claimant for the vacant throne but then supported the claim of his brother-in-law, John de BALIOL, who was awarded the crown by Edward I of England in 1292. Comyn joined Baliol in his revolt against Edward but submitted to the English king in 1296. The name also appears as Cumming.

Comyn, John, d. 1306, Scottish nobleman. He was called the Red Comyn, to distinguish him from his father, the Black Comyn. Aiding his uncle, John de BALIOL, in the struggle against Edward I, he was for a time held hostage by the English. After the rout of the Scottish troops at Falkirk (1298), he was appointed one of the guardians of the realm. He renewed the struggle with Edward, but surrendered in 1304 on condition that he could retain his lands. He was murdered at Dumfries by Robert the Bruce (later ROBERT I), probably because Robert feared him as a rival claimant to the throne. The name also appears as Cumming.

Conakry (kōn'āk'rē), city (1972 pop est., with suburbs, 290,000), capital of Guinea and its Conakry region, SW Guinea, a port on the Atlantic Ocean. Located on Tombo island and connected with the mainland by a causeway, Conakry is Guinea's largest city and its administrative, communications, and economic center. Its economy revolves largely around the port, which has modern facilities for handling and storing cargo, and from which Guinea's chief exports, alumina and bananas, are shipped. A railroad connects Conakry with Kankan, E Guinea, and roads run to the Ivory Coast, Senegal, and Mali. The few local manufactures include food products and beverages, iron ore and bauxite were mined nearby until the late 1960s. In 1887, Conakry was occupied by French forces. Its main growth dates from World War II, and today it is a modern city with wide boulevards and fine botanical gardens. The Polytechnical Institute of Conakry (1963) and a school of administration are located there.

Conaniah (kōn'ān'ā), Levite of Josiah's time 2 Chron 35 9

Conant, James Bryant (kō'nənt), 1893-, American educator, b Dorchester, Mass., grad Harvard (B A, 1913, Ph D, 1916). Except for a brief period in the army (1917-19), Conant taught chemistry at Harvard from 1916 until 1933, serving as chairman of the department during the last three years. He was president of Harvard from 1933 until his resignation in 1953. Conant was chairman (1941-46) of the National Defense Research Committee, in 1953 he was appointed U.S. High Commissioner for Germany and later served as ambassador to West Germany (1955-57). He directed a number of extensive investigations of American education and has published widely in the field. Conant's writings include *Education in a Divided World* (1948), *Modern Science and Modern Man* (1952), *Education and Liberty* (1953), *Slums and Suburbs* (1961), *The Comprehensive High School* (1967), *Scientific Principles and Moral Conduct* (1967), and his autobiography, *My Several Lives* (1970).

Conant, Roger, 1592-1679, one of the founders of Massachusetts, b East Sudleigh, Devonshire, England. He was a salter in London before he went to Plymouth in 1623. Conant lived at Nantasket from 1624 to 1625, when he was appointed to manage the Dorchester Company's settlement on Cape Ann. In 1626, with about 20 settlers, he founded Salem (Naumkeag) and later was the leading citizen of Beverly, which was incorporated (1668) largely because of his efforts. See biography by C. K. Shipton (1944).

Conant, Thomas Jefferson, 1802-91, American biblical scholar and editor of many translations of books of the Bible. He aided in the revision of the English Bible completed in 1881.

conceit, in literature, fanciful or unusual image in which apparently dissimilar things are shown to have a relationship. The Elizabethan poets were fond of Petrarchan conceits, which were conventional comparisons, imitated from the love songs of Petrarch, in which the beloved was compared to a flower, a garden, or the like. The device was also used by the METAPHYSICAL POETS, who fashioned conceits that were witty, complex, intellectual, and often startling, e.g., John Donne's comparison of two souls with two bullets in "The Dissolution." Samuel Johnson disapproved of such strained metaphors, declaring that in the conceit "the most heterogeneous ideas are yoked by violence together." Such modern poets as Emily Dickinson and T. S. Eliot have used conceits.

concentration, in chemistry, measure of the relative proportions of two or more quantities in a MIXTURE. Concentration may be expressed in a number of ways. The simplest statement of the concentrations of the components of a mixture is in terms of their percentages by weight or volume. Mixtures of solids or liquids are frequently specified by weight percentage concentrations, such as alloys of metals or mixtures used in cooking, whereas mixtures of gases are usually specified by volume percentages. Very low concentrations may be expressed in parts per million (ppm), as in specifying the relative presence of various substances in the atmosphere. In addition to these means of expressing concentration, several others are defined especially for describing SOLUTIONS: molarity, molality, mole fraction, formality, and normality. Some of these define the concentration of the solute in reference to the amount of solvent, others in reference to the total amount of solution. The molality of a solution is the number of moles of solute per liter of solution, e.g., a solution of glucose in water containing 180.16 grams (1

gram-molecular weight, or mole) of glucose per liter of solution is referred to as one molar (1 M). The molality of a solution is the number of moles of solute per 1,000 grams of solvent, a solution prepared by dissolving 180.16 grams of glucose in 1,000 grams of water is one molal (1 m). The mole fraction of a solution is the ratio of moles of solute to the total number of moles in the solution. Since ionic compounds, such as sodium chloride, NaCl, do not occur as molecules, their concentrations cannot be expressed in terms of molality, molality, or mole fraction. Instead, the concentration of an ionic compound in solution may be given by its formality, the number of gram-formula weights of the compound per liter of solution, e.g., a solution containing 58.44 grams (one gram-formula weight) of NaCl per liter of solution is one formal (1 F). In considering the reactions of certain solutions in combination, for example the NEUTRALIZATION of acids and bases, a useful expression of the concentration is the normality of each solution, the number of gram-equivalent weights of solute per liter of solution (see EQUIVALENT WEIGHT), e.g., a solution containing 49.04 grams (one gram-equivalent weight) of sulfuric acid, H₂SO₄, per liter of solution is one normal (1 N). Concentrations of solutions may also frequently be given in terms of the weight of solute in a given volume of solvent or solution. The concentration of a solute is very important in studying chemical reactions because it determines how often molecules collide in solution and thus indirectly determines the rates of reactions and the conditions at equilibrium (see CHEMICAL EQUILIBRIUM).

concentration camp, prison created outside the normal prison system for particular categories of people, usually for political reasons. After Adolf Hitler's rise to power in 1933, concentration camps were set up throughout Germany for detaining persons, especially Jews and Communists, considered undesirable by the Nazis (see NATIONAL SOCIALISM). No legal procedure was required for commitment. Inmates performed hard labor under the supervision of SS guards notorious for their brutality. During World War II concentration camps mushroomed throughout German-occupied Europe. Of the millions of people of many nationalities detained in them, a large proportion died of mistreatment, malnutrition, and disease. Several camps were extermination camps. In the best known of these—Majdanek, Treblinka, and Oswiecim (Auschwitz), in Poland—more than 6 million men, women, and children (mostly Jews and Poles) were killed in gas chambers. Documented proof of these horrors, used in later war-crimes trials, includes unmentionable details of sadism, sometimes perpetrated under the guise of medical experiments. Among the most notorious camps liberated by U.S. and British troops in 1945 were Buchenwald, Dachau, and Belsen. The term concentration camp has also been used to include forced-labor camps in which political prisoners are confined and any camps used to confine minority groups.

Concepcion (kōnsēpsēōn'), city (1970 pop 189,929), capital of Concepcion prov., S central Chile, near the mouth of the Bio-Bio River. It is an industrial and commercial center and one of Chile's major cities. Its port, Talcahuano, just north of the city, ships the products of the surrounding rich agricultural region. Concepcion's industries produce glass, textiles, sugar, hides, and steel. Founded in 1550 by Pedro de Valdivia, the Spanish conqueror of Chile, the city was besieged and destroyed by the Araucanian chief Lautaro in 1554-55. It was completely destroyed by earthquakes in 1570, 1730, 1751, 1835, and 1939, and was severely damaged in 1960. Its numerous rebuildings have given Concepcion a modern appearance. Points of interest include the Plaza Independencia and a university.

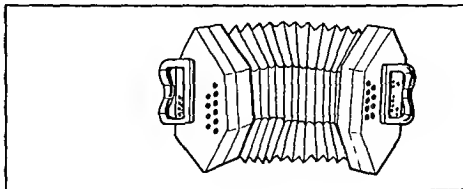
Concepcion del Uruguay (dēl ōrōōgwī'), city (1970 pop 73,720), Entre Rios prov., NE Argentina, a port on the Uruguay River. It ships the grain and beef of the surrounding region. The city was founded in 1778 and was twice the capital of Argentina in the 19th cent. It was the scene of a revolt (1870) that culminated in the assassination of ex-president Justo José de Urquiza.

conceptualism, in philosophy, position taken on the problem of UNIVERSALS, initially by Peter ABELARD in the 12th cent. Like nominalism it denied that universals exist independently of the mind, but it held that universals have an existence in the mind as concept. These concepts are not arbitrary inventions but are reflections of similarities among particular things themselves, e.g., the concept male reflects a similarity between Paul and John. This similarity

shows that universals are also patterns in God's mind according to which he creates particular things. Slightly modified, this view becomes the position of moderate REALISM, the classical medieval solution to the controversy. For a modern statement of conceptualism, see C. I. Lewis, *Analysis of Knowledge and Valuation* (1946, repr 1962).

concert, in music, public performance of a group of musical compositions. Originally the word referred simply to a group of musicians playing together, concerts by a solo performer are properly called recitals. The earliest recorded public concerts were organized by a London violinist, John Banister, in 1672. Many orchestral concerts were given in the 18th cent., and early in the 19th cent., which saw great development of concert life, public concerts of chamber music were given. In the American colonies, the first concert on record took place in Boston in 1731.

concertina (kōnsürtē'nə), musical instrument whose tone is produced by free reeds. It was invented by Sir Charles Wheatstone in 1829. It is a



Concertina

chromatic instrument similar to the ACCORDION, but its bellows are attached to hexagonal blocks having handles and buttons (finger pistons), and it is smaller. It is mainly associated with popular music.

concerto (kanchâr'tō), musical composition usually for an orchestra and a soloist or a group of soloists. In the 16th cent. the term was applied to music for an ensemble, either vocal or instrumental. At the end of the century it referred to music in which two ensembles contested with each other. By 1750 it meant music contrasting a full ensemble with soloists in alternation. The form known as *concerto grosso* is characterized by a small group of solo players contrasted with the full orchestra. Giuseppe Torelli (1658-1709) and VIVALDI established the *concerto grosso* in three movements, while CORELLI used four or more. These three composers were active in the development of all forms of the concerto in the baroque period. J. S. Bach's six Brandenburg concertos and the concertos of Handel represent the fullest development of the baroque type. Toward the end of the 18th cent. the solo concerto displaced the *concerto grosso*. Mozart established the classical concerto in three movements, the first of which is a sonata as in a symphony, for solo instrument and orchestra. Beethoven expanded the dimensions of this form, giving greater importance to the orchestra. In the 19th cent. Liszt unified the concerto by using the same themes in all movements. He was one of numerous composers to use the concerto form as a showcase for virtuoso display in the solo. The concerto repertory is strongest in works for piano and violin as the solo instrument. In the 20th cent. renewed interest in the *concerto grosso* has been manifested by such composers as Hindemith, Bartok, and Bloch. See A. J. B. Hutchings, *The Baroque Concerto* (1961), Abraham Vainus, *The Concerto* (rev ed 1964), D. F. Tovey, *Essays in Musical Analysis: Concertos* (1936, repr 1972).

Concert of Europe, term used in the 19th cent. to designate a loose agreement by the major European powers to act together on European questions of common interest. The concert emerged after the Congress of Vienna (1814-15) and included the QUADRUPLÉ ALLIANCE powers of Great Britain, Austria, Prussia, and Russia, and, as of 1818, France as well. It aimed to preserve peace by concerted diplomatic action reinforced by periodic conferences dealing with problems of mutual concern.

concerto grosso. see CONCERTO

conch, common name for certain marine GASTROPOD mollusks having a heavy, spiral shell, the whorls of which overlap each other. In conchs the characteristic gastropod foot is reduced in size and the operculum, a horny plate located on the foot and used to seal the shell opening in many gastropods, has the appearance and function of a claw. During locomotion, the operculum secures a foothold in the sand, and the conch jumps forward by means of the quick contraction of a retractor muscle called the columella muscle. Thus the conch lacks the

creeping motion of most gastropods. The king conch, *Strombus gigas*, found in the warmer waters of the Atlantic, Caribbean, and Gulf of Mexico, has a shell 10 to 12 in (25–30 cm) long and may weigh up to 5 lb (2.3 kg). Similar in size and distribution is the queen conch, *Cassia cameo*. Its shell has been used in Europe to carve cameos. Conch shells range in color from white to red; they have been used by man to fashion a number of items, such as buttons, ornaments, or the crude trumpets made from the shell of the trumpet conch, *Charonia tritonis*. This conch is similar in shape to the king and queen conchs but is much more slender and reaches a length of 20 in (50 cm). *C. tritonis* is found in the Gulf of Mexico and the Indian Ocean. The largest conch and also one of the largest univalves in the world is the horse conch, *Pleuroploca gigantea*, having a shell length of 24 in (60 cm). It is found along the Atlantic Coast from North Carolina to Brazil. The body can retreat entirely into the shell and remain there for months if unfavorable conditions prevail. An unusual conch shell is that of the spider conch, *Lambis lambis*, which has leglike projections. Spider conchs are voracious carnivores, common on coral reefs. They also feed on algae, as do the king conchs. Most conchs are carnivorous, feeding on bivalve mollusks, some are scavengers as well. They inhabit tropical waters and have been used as a food source for man. The conch is classified in the phylum MOLLUSCA, class Gastropoda, order Mesogastropoda.

Conchos (kōn'chōs), river, c 350 mi (560 km) long, rising in S Chihuahua state, N Mexico, and flowing N and NE to the Rio Grande. Dams along its middle course provide water for extensive cotton oases just south of the city of Chihuahua.

conciliation see MEDIATION

Concini, Concino (kōnchē'nō kōnchē'nē), d 1617, Florentine adventurer, favorite of MARIE DE' MEDICI, queen of France, who made him marshal of France (1613). In 1610 he was made marquis d'Ancre. He exerted great influence after the death of Marie's husband, Henry IV, and succeeded the duke of Sully as minister. His greed and his spy system won him the hatred of all classes. His efforts to weaken the nobility provoked an unsuccessful revolt (1615) led by Henri II de CONDÉ. In 1617, Louis XIII had Concini assassinated. His wife, Leonora Galigai (1571?–1617), lady in waiting and favorite of the queen, was beheaded and burned for sorcery.

Concord (1, 2, 3, kōng'kard, 4 kōn'kōrd") 1 Residential city (1970 pop 85,164), Contra Costa co., W central Calif., in an oil and farm region, settled c 1852, inc 1905. Electronic equipment is made. The city is the eastern terminus for rapid transit to the San Francisco Bay area. A junior college is there, and a U.S. naval ammunition depot is nearby. 2 Town (1970 pop 16,148), Middlesex co., E Mass., on the Concord River, inc 1635. Electronic and wood products are made. The site of the Revolutionary battle of Concord on April 19, 1775 (see LEXINGTON AND CONCORD BATTLES OF), is marked by Daniel Chester French's bronze Minute Man. Concord has many fine old houses, some opened as memorials to noted occupants—Emerson, the Alcotts, Hawthorne, and Thoreau. An antiquarian museum and the Old Manse, built in 1769 by Emerson's grandfather and made famous by Thoreau, and the place where Ephraim Bull developed the Concord grape are there. 3 City (1970 pop 30,022), state capital and seat of Merrimack co., 5 central N.H., on the Merrimack River, settled 1725–27, inc as Rumford, Mass., in 1733 (Count RUMFORD later took his title from this name) and as Concord, N.H., in 1765. Famous for its granite, the city also has a printing industry and plants making leather goods, electrical equipment, furniture, stone and clay products, textiles and apparel, metalware, and food. It became the state capital in 1808, and its growth was further aided by the building of the Middlesex Canal in 1815. St. Paul's school (preparatory) and the house of Franklin Pierce (now a museum) are in Concord. Mary Baker Eddy was born a few miles away, at Bow. 4 City (1970 pop 18,464), seat of Cabarrus co., central N.C., near the edge of the Piedmont, settled 1796, inc 1837. Located in a livestock and grain area, it is also a thriving cotton textile center. In addition to a great variety of cotton goods, its manufactures include foods and metal products. Gold discovered nearby in 1799 started the North Carolina gold rush. Concord is the seat of Barber-Scotia College.

Concord, river, c 15 mi (24 km) long, NE Mass., a short tributary of the Merrimack, which it joins at Lowell. On April 19, 1775, colonial militia fired some of the first shots of the American Revolution at the

British over a bridge across the river at Concord, Mass. Henry David THOREAU's first book, *A Week on the Concord and Merrimack Rivers* (1849), records a boat trip with his brother.

concordat (kōnkōrd'āt), formal agreement, specifically between the pope, in his spiritual capacity, and the temporal authority of a state. Its juridical status is now generally accepted as being a contract between CHURCH AND STATE and as such it is a treaty governed by international laws. The term *concordat* has also been applied to other agreements, thus, in the Swiss Confederation before 1848 federal decisions were called concordats. The fundamental antithesis between church and state found particularly violent expression in the quarrels over INVESTITURE during the Middle Ages and gave rise to the practice of concluding concordats. The earliest agreement to be called a concordat (see WORMS, CONCORDAT OF, 1122) was a dual proclamation rather than a bilateral act. The Concordat of 1516 between Pope Leo X and King Francis I of France, which abolished the Pragmatic Sanction of Bourges (see PRAGMATIC SANCTION), gave the king the right to nominate bishops, abbots, and priors but reserved to the pope the right of confirmation and special rights of appointment. That right was revoked at the States-General of Orléans in 1561, and the struggle between GALLICANISM and ULTRAMONTANISM was resumed, to last until the French Revolution. The CONCORDAT OF 1801, most famous of all concordats, regulated the status of the church in France for a century. In the 19th and 20th cent. numerous concordats were concluded. The appointment of bishops still remained an important issue, but the advance of secularism gave increasing importance to the status of religious education, monastic orders, and church property and to the seemingly conflicting loyalties of Roman Catholics to the state and to the church. In the Catholic countries of Latin America the conflicts and adjustments between church and state gave rise to a number of concordats. The concordat of 1855 with Austria gave vast rights to the church, but it was abrogated by Austria upon the proclamation of papal infallibility. The KULTURKAMPF between Otto von Bismarck and the papacy ended (1887) with a *modus vivendi*, which was a tentative agreement and not called a concordat. The status of the papacy in Italy was regulated in 1929 by the LATERAN TREATY. The threat of National Socialism (Nazism) to the Roman Catholic Church prompted the concordat of 1933 with Adolf Hitler, who violated it from the start. In Spain, where Francisco Franco had abrogated the concordat of 1931, a provisional agreement with the Vatican over the appointment of bishops was reached in 1941. After World War II a number of concordats (notably that with Poland) were abrogated by Communist regimes. A new concordat with Spain was signed in 1953.

Concordat of 1801, agreement between Napoleon Bonaparte and Pope Pius VII that reestablished the Roman Catholic Church in France. Napoleon, wishing to consolidate his position and to end the confusion in church affairs created by the French Revolution, took the initiative in negotiating the agreement. By its terms Roman Catholicism was recognized as the religion of most French citizens. Archbishops and bishops were to be nominated by the government, but the pope was to confer the office. Parish priests were to be appointed by the bishops, subject to government approval. Confiscated church property, most of which had been sold to private persons, was not to be restored, but the government was to provide adequate support for the clergy. To implement the concordat Napoleon issued (1802) the so-called Organic Articles, these restated the traditional liberties of the Gallican church (see GALLICANISM) while increasing Napoleon's control of church activities. The Organic Articles were not agreed to by the pope, and he did not consider them binding. A century later, anticlericalism, intensified by the Dreyfus Affair, led to the imposition of severe restrictions on the church by the government of Émile COMBES. Anticlericalism culminated in 1905 in the formal repudiation of the concordat, thereby separating CHURCH AND STATE. In Alsace and Lorraine, however, the Concordat of 1801 remained in force even after their recovery (1918) from Germany by France.

Concorde, Place de la (plās dā lā kōnkōrd'), large square, Paris, France. It is bounded by the Tuilleries gardens, the Champs Élysées, the Seine River, and a facade of buildings divided by a vista of the Madeleine Church. The Pont de la Concorde, a monumental bridge, leads from the Place to the other side of the Seine. The square was designed by Jacques Gabriel and built between 1755 and 1792. It was

originally planned as a monument to the then ruling Louis XV, whose statue stood in the center, and was called "Place Louis XV." In 1792 the statue was torn down, the square renamed "Place de la Révolution," and a guillotine set up, transforming the area into a site of mass executions. Under the Directory the name "Concorde" was adopted (although during the Bourbon restoration of 1815–30 "Place Louis XV" was revived). The central obelisk, a gift of the Egyptian viceroy, was erected in 1836. The fountains were constructed between 1836 and 1846.

Concordia (kōng-kōr'hyā), city (1970 pop 110,401), Entre Rios prov., NE Argentina, a port on the Uruguay River. One of the chief towns in the Argentine Mesopotamia, it exports preserved meat, mate, quebracho, and grain and is the distributing center of a farm and stock-raising district. Concordia was founded in 1832.

concrete, structural masonry material made by mixing broken stone or gravel with sand, cement (see CEMENT HYDRAULIC), and water and allowing the mixture to harden into a solid mass. The cement is the chemically active element, or matrix, the sand and stone are the inert elements, or aggregate. The use of artificial masonry similar to modern concrete dates from a remote period but did not become a standard technique of construction until the Romans adopted it (after the 2d cent. B.C.) for roads, immense buildings, and engineering works. The concrete of the Romans, formed by combining pozzolana (a volcanic earth) with lime, broken stones, bricks, and tuff, was easily available and had great durability (the Pantheon of Rome and the Baths of Caracalla were built with it). It proved suitable for temples, basilicas, the forum, and baths, enormous spaces could be roofed without lateral thrusts by vaults cast in the rigid homogeneous material. Concrete was unknown for centuries after the fall of Rome. Scientifically proportioned concrete formed with cement is an invention of modern times, the name not being used until c 1830. Modern portland cement has revolutionized the production and potentialities of concrete and has superseded the natural cements, to which it is vastly superior. Concrete used without strengthening is termed mass, or plain, concrete and has the structural properties of stone—great strength under compressive forces and almost none under tensile ones. F. Joseph Monier, a French inventor, found that tensile weakness could be overcome if steel rods were embedded in a concrete member. The new composite material was called reinforced concrete, or ferroconcrete. It was patented in 1857, and a private house in Port Chester, N.Y., first demonstrated (1857) its use in the United States. By the mid-20th cent. it had become a widely used structural material, rivaled only by steel. Reinforced concrete was improved by the development of prestressed concrete—concrete containing cables that are placed under tension before or after the concrete hardens. Another improvement, thin-shell construction, takes advantage of the inherent structural strength of certain geometric shapes, such as hemispherical and elliptical domes, in thin-shell construction great distances are spanned with very little material. The component materials of concrete are mixed in varying proportions, according to the strength required and the function to be fulfilled. The ideal mixture is that which solidifies with the minimum of voids, the mortar and small particles of aggregate filling all interstices. A typical proportioning is 1 2 5, i.e., one part of cement, two parts of sand, and five parts of broken stone or gravel, with the proper amount of water for a pouring consistency. For hardening into the required shape, the mixture is poured into wood or steel molds, called forms. Among the advantages of concrete as a building material are its adaptability to widely varied structural needs, its practically universal availability, its fire resistance, and the ease with which it can be used. The perfecting of reinforced concrete has profoundly influenced structural techniques and architectural forms throughout the world. See E. 5 de Mare, ed., *New Ways of Building* (3d ed 1958), A. A. Raafat, *Reinforced Concrete in Architecture* (1958), Peter Collins, *Concrete: The Vision of a New Architecture* (1959), A. M. Neville, *The Properties of Concrete* (1963), J. J. Waddell, *Concrete Construction Handbook* (1968).

concrete music: see ELECTRONIC MUSIC

concretion, mass or nodule of mineral matter, usually oval or nearly spherical in shape, and occurring in sedimentary rock. It is formed by the accumulation of mineral matter in the pore spaces of the sediment, usually around a fossil or fossil fragment acting as a nucleus. Most concretions are very dense.

and compact, and are usually composed of calcite, silica, or iron oxide. The material making up the concretion is believed to come from the surrounding rock, being redeposited around the nucleus. Concretions range in diameter from a fraction of an inch to many feet, although most are but a few inches in diameter. Perhaps the best known are the flint nodules found in chalk deposits such as those at Dover, England. Concretions having radiating cracks filled with mineral matter are called turtle stones, or septaria.

Condamine, La' see MONACO

Condé (kōNdā'), family name of a cadet branch of the French royal house of BOURBON. The name was first borne by **Louis I de Bourbon, prince de Condé**, 1530-69, Protestant leader and general. He fought the Spanish at Metz (1552) and Saint-Quentin (1557) but won little favor at court. After his conversion to Protestantism he became involved in the Conspiracy of Amboise (1560, see AMBOISE, CONSPIRACY OF) and escaped execution only through King Francis II's premature death. He was restored to favor by the regent, Catherine de' Medici, but took command of the Huguenots in the Wars of Religion (see RELIGION, WARS OF) and was captured at Dreux (1562). Released in 1563, he once more took up arms in 1567 and was killed at the battle of Jarnac. His son, **Henri I de Bourbon, prince de Condé**, 1552-88, was also a Huguenot general. **Henri II de Bourbon, prince de Condé**, 1588-1646, French political leader, son of Henri I, was forced to leave France (1609) because of the attentions paid his wife by King Henry IV. He returned in 1610 and in 1615 formed a conspiracy against Concino Concini, who dominated the government of the regent, MARIE DE' MEDICI, but he was bought off and later imprisoned (1616-19). Afterward he made his peace with the government, fought against the Protestants in the religious wars, and in 1643 became a member of the council of regency for King Louis XIV. His elder son, Louis II (see CONDÉ, LOUIS II DE BOURBON, PRINCE DE) was known as the Great Condé. Another son, Armand, founded the cadet branch of CONTI. Both sons and a daughter, Mme de LONGUEVILLE, were leaders in the FRONDE. Louis II's great-grandson, **Louis Joseph de Bourbon, prince de Condé**, 1736-1818, fought with distinction in the Seven Years War. At the beginning of the French Revolution he emigrated and fomented counterrevolutionary action. He formed a corps known as the army of Condé, which he allied with the Austrians. In 1797 he offered his services to Russia, in 1800 he entered English pay, but he was obliged to dissolve his army in 1801. He returned to France at the Restoration. His son, **Louis Henri Joseph de Bourbon, prince de Condé**, 1756-1830, followed his father into exile, fought in his army, and headed an unsuccessful revolt in the Vendée during the Hundred Days. He died, probably by suicide. His son was the ill-fated Louis Antoine Henri de Bourbon-Condé, duc d'ENGHEN. See H. E. P. L. d'Aumale, *History of the Princes de Condé in the XVIIIth and XVIIIth Centuries* (1863-64, tr. 1872).

Condé, Louis II de Bourbon, prince de, 1621-86, French general, called the Great Condé, son of Henri II de Condé. Among his early victories in the Thirty Years War were those of Rocroi (1643), Freiburg (1644), Nordlingen (1645), and Lens (1648). In the series of outbreaks known as the FRONDE he was at first loyal to the court, but his later intrigues and ambitions caused his arrest in 1650. This precipitated the Fronde of the Princes against Cardinal MAZARIN, chief councillor of state during the regency of ANNE OF AUSTRIA. The nobles forced Mazarin to release Condé (1651), who became leader of the rebellious army of the princes and allied himself with Spain against France. After the disintegration of the Fronde and the return to power of Mazarin, Condé was (1653-58) commander of Spanish forces against France. In the final stage of the war he was defeated (1658) in the Battle of the Dunes (see DUNES, BATTLE OF THE). After the Peace of the Pyrenees (1659) between France and Spain, he was pardoned and returned to court. He fought in the Dutch War for King Louis XIV, defeating William of Orange at Senef (1674) and forcing Raimondo Montecuccoli to retreat from the Rhine (1675). His last years were spent in retirement at Chantilly. See Walter FitzPatrick, *The Great Condé* (1873).

condensation, in physics, change of a substance from the gaseous (vapor) to the liquid state (see STATES OF MATTER). Condensation is the reverse of VAPORIZATION, or change from liquid to gas. It can be brought about by cooling, as in DISTILLATION, or by an increase in pressure due to a decrease in volume. Certain natural phenomena, such as dew, fog,

mist, and clouds, are the result of the condensation of water vapor in the atmosphere, the formation of DEW illustrates well the fundamental principles involved in such phenomena. The explanation of condensation can be found in the KINETIC-MOLECULAR THEORY OF GASES. As heat is removed from a gas, the molecules of the gas move more slowly, and as a result, the INTERMOLECULAR FORCES are strong enough to pull the molecules together to form droplets of liquid. Similarly, reducing the volume of the gas reduces the average distance between molecules and thus favors the intermolecular forces tending to pull them together.

condensed milk: see MILK

condenser, in electricity, obsolete term for CAPACITOR. The part of a DISTILLATION apparatus or other apparatus that causes the CONDENSATION of a gas is also called a condenser.

Condillac, Étienne Bonnot de (ätyēn' bōnō' də kōNdēyak'), 1715-80, French philosopher who developed the theory of sensationalism (i.e., that all knowledge comes from the senses and that there are no innate ideas). He took holy orders, and in 1768 he became a member of the French Academy of Sciences. His major works were *Essai sur l'origine des connaissances humaines* (1746) and *Traité des sensations* (1754). In these he tried to simplify Locke's theory of knowledge by arguing that all conscious experience is simply the result of passive sensations. In spite of this reduction of consciousness to the passive reception of sensation he nevertheless retained the Cartesian dualism of soul and body. He thus attempted to harmonize his deterministic psychology with his religious profession. See Z. Q. Schaupp, *The Naturalism of Condillac* (1926), I. F. Knight, *The Geometric Spirit* (1968).

conditioning: see LEARNING

condor, common name for certain American vultures, found in the high peaks of the Andes of South America and the Coast Range of S. California. Condors are the largest of the living birds, nearly 50 in (125 cm) long with a wingspread of from 9 to 10 ft (274-300 cm). Voracious eaters, they prefer carrion but will attack living animals as large as deer. Two eggs are laid in a sketchy cliff nest of twigs, the young are unable to fly until they are about a year old. The Andean condor, *Vultur gryphus*, has black plumage with white wing patches and a white neck ruff. The lead-colored head and neck are bare, the male has a comb and wattles. The rare California condor, or California vulture, *Gymnogyps californianus*, is all black with white wing bands. Condors, particularly the California species, are extremely rare and on the verge of extinction. The California condor only lays one egg and does not breed until at least six years old. Condors are classified in the phylum CHORDATA, subphylum Vertebrata, class Aves, order Falconiformes, family Cathartidae.

Condorcet, Marie Jean Antoine Nicolas Caritat, marquis de (maré' zhaN' anTwan' nēkōla' karēta' marké' də kōNdōrsā'), 1743-94, French mathematician, philosopher, and political leader, educated at Rheims and Paris. He became a member of the Academy of Sciences in 1769 and of the French Academy in 1782. His work on the theory of probability (1785) was a valuable contribution to mathematics. Condorcet took part in the Revolution, but, opposing the extremes of the Jacobins, he was condemned and died in prison. His best-known work is *Esquisse d'un tableau historique des progrès de l'esprit humain* (1795, tr. *Sketch for a Historical Picture of the Progress of the Human Mind*, 1955). In that work Condorcet traced human development through nine epochs to the French Revolution and predicted in the 10th epoch the ultimate perfection of man. See studies by A. E. Burlingame (1930) and J. S. Schapiro (1934, repr. 1963).

condottiere (kōndōt-tyā'rā) [Ital., = leader], leader of mercenary soldiers in Italy in the 14th and 15th cent., when wars were almost incessant there. The condottieri hired and paid the bands who fought under them. They dealt directly with the cities or states that requested their services and were responsible solely to them. They fought for the highest bidder, passing easily from one lord to another, this game proved dangerous and even fatal to more than one. Some condottieri had small states of their own, either inherited or acquired. The most famous were the Attendolosi (founders of the SFORZA family), COLLEONI, CARMAGNOLA, and Sir John de HAWKWOOD. See studies by J. J. Deiss (1966) and Geoffrey Trease (1971).

conducting, in music, the art of unifying the efforts of a number of musicians simultaneously engaged in musical performance. In the Middle Ages and

Renaissance the conductor was primarily a time beater, maintaining the measure or *tactus* of polyphonic music with his hand or a roll of music paper. During the baroque era the harpsichordist, playing the *basso continuo*, was the conductor. When the *continuo* disappeared, the first violinist, even today called concertmaster, became the leader or shared the function with a keyboard player. A few 18th-century conductors, such as Johann STAMITZ (1717-57) of the Mannheim orchestra, achieved a high standard of performance. The custom of beating time with a stick (baton) on a music stand or table originated in France. This noisy practice was irritating to the listener. It actually caused the death of the composer LULLY who struck his own foot with his baton, resulting in an abscess that killed him. The beating technique was altered and a more subtle manner was used by Beethoven, Mendelssohn, and Spohr. In his classic treatise *Über das Dirigieren* [concerning directing], Wagner laid down the principles of modern conducting, and under his influence Hans von BÜLOW became the first of the virtuoso conductors. A generally conventional set of gestures is used for beating time, a downstroke marking the beginning of a measure. The baton remains popular although a few conductors, notably STOKOWSKI, prefer not to use it. Modern conducting is highly individual and requires great musical understanding, a thorough knowledge of instruments and of the concert repertoire, a clear mastery of the baton and hand gestures, and a human sympathy for the performers. See Hermann Scherchen, *Handbook of Conducting* (tr. 1933), A. C. Boult, *A Handbook on the Technique of Conducting* (7th ed. 1951), Carl Bamberg, *The Conductor's Art* (1965), H. C. Schonberg, *The Great Conductors* (1967).

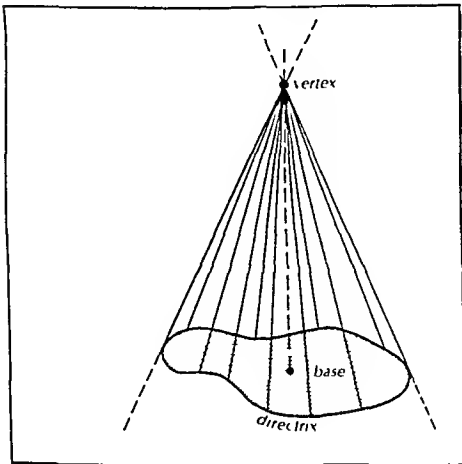
conduction, transfer of HEAT or ELECTRICITY through a substance, resulting from a difference in TEMPERATURE between different parts of the substance, in the case of heat, or from a difference in electric POTENTIAL, in the case of electricity. Since heat is ENERGY associated with the motions of the particles making up the substance, it is transferred by such motions, shifting from regions of higher temperature, where the particles are more energetic, to regions of lower temperature. The rate of heat flow between two regions is proportional to the temperature difference between them and the heat conductivity of the substance. In solids, the molecules themselves are bound and contribute to conduction of heat mainly by vibrating against neighboring molecules, a more important mechanism, however, is the migration of energetic free electrons through the solid. Metals, which have a high free-electron density, are good conductors of heat, while nonmetals, such as wood or glass, have few free electrons and do not conduct as well. Especially poor conductors, such as asbestos, are used as insulators to impede heat flow (see INSULATION). Liquids and gases have their molecules farther apart and are generally poor conductors of heat. Conduction of electricity consists of the flow of CHARGES as a result of an electromotive force, or potential difference. The rate of flow, i.e., the electric current, is proportional to the potential difference and to the electrical conductivity of the substance, which in turn depends on the nature of the substance, its cross-sectional area, and its temperature. In solids, electric current consists of a flow of electrons, as in the case of heat conduction, metals are better conductors of electricity because of their greater free-electron density, while nonmetals, such as rubber, are poor conductors and may be used as electrical insulators, or DIELECTRICS. Increasing the cross-sectional area of a given conductor will increase the current because more electrons will be available for conduction. Increasing the temperature will inhibit conduction in a metal because the increased thermal motions of the electrons will tend to interfere with their regular flow in an electric current, in a nonmetal, however, an increase in temperature improves conduction because it frees more electrons. In liquids and gases, current consists not only in the flow of electrons but also in that of ions. A highly ionized liquid solution, e.g., salt water, is a good conductor. Gases at high temperatures tend to become ionized and thus become good conductors (see PLASMA), although at ordinary temperatures they tend to be poor conductors. See ELECTROCHEMISTRY, ELECTROLYSIS, SUPERCONDUCTIVITY.

conductus: see MOTET

cone or **strobilus** (strōb'ālas), in botany, reproductive organ of the gymnosperms (the conifers, cycads, and ginkgos). Like the flower in the angiosperms (flowering plants), the cone is actually a highly modified branch, unlike the flower, it does

not have sepals or petals. Usually separate male (staminate, or pollen) cones and female (ovulate, or seed) cones are borne on the same plant. Each of the numerous scales, or sporophylls, of the staminate cone bears POLLEN-producing anthers and each female-cone scale bears ovules in which egg cells are produced. In the pine, a typical conifer, the staminate cones are small and short-lived, they are borne in clusters at the top of the tree. At the time of pollination, enormous numbers of pollen grains are released, those that land accidentally on female-cone scales extend pollen tubes part way into the ovule during one growing season but usually do not reach the stage of actual fertilization until the next year. The cones that are commonly observed are the seed cones, which are normally hard and woody although in a few the scales are fleshy at maturity. The terms *strobili* and cones are also applied to the comparable structures of the horsetails and club mosses.

cone or **conical surface**, in mathematics, surface generated by a moving line (the generator) that passes through a given fixed point (the vertex) and continually intersects a given fixed curve (the directrix). The generator creates two conical surfaces—one above and one below the vertex—called nappes. If the directing curve is a CONIC SECTION (e.g., a circle or ellipse) the cone is called a quadric



Cone

cone. The commonest type of cone is the right circular cone, a quadric cone in which the directrix is a circle and the line drawn from the vertex to the center of the circle is perpendicular to the circle. The generator of a cone in any of its positions is called an element. The solid bounded by a conical surface and a plane (the base) whose intersection with the conical surface is a closed curve is also called a cone. The altitude of a cone is the perpendicular distance from its vertex to its base. The lateral area is the area of its conical surface. The volume is equal to one third the product of the altitude and the area of the base. The frustum of a cone is the portion of the cone between the base and a plane parallel to the base of the cone cutting the cone in two parts.

coneflower, name for several American wild flowers of the family Compositae (COMPOSITE family). The purple coneflowers (genus *Echinacea*) are found E of the Rockies. They are sometimes grown as garden plants, as are the similar yellow coneflowers, or rudbeckias (see BLACK-EYED SUSAN). Coneflowers are classified in the division MAGNOLIOPHYTA, class Magnoliopsida, order Asterales, family Compositae.

Conegliano, Cima da see CIMA GIOVANNI BATTISTA

Conemaugh (kōn'əmə'), river c 70 mi (110 km) long, rising in the Allegheny Mts and flowing NW to the Allegheny River, SW Pa. Federal flood-control works on the river and its tributaries include Conemaugh River Dam (160 ft/49 m high, 1,265 ft/386 m long, completed 1952).

Conestoga Indians (kōnəstō'gə), North American Indians of the Iroquoian branch of the Hoka-Siouan linguistic stock (see AMERICAN INDIAN LANGUAGES). In the 17th cent they lived on the lower reaches of the Susquehanna River and about the head of Chesapeake Bay, and they were sometimes called Susquehannocks. From this area they were driven southward and westward by attacks from the Iroquois Confederacy. The few survivors of this warfare were massacred by whites inflamed by accounts of the Indian War then raging (1763) along the Pennsylvania frontier.

Conestoga wagon, heavy freight-carrying vehicle of distinctive type that originated in the Conestoga region of Pennsylvania c 1725. It was used by the farmers to carry heavy loads long distances before there were railroads to convey produce to markets. Later it was used to carry manufactured goods across the Alleghenies to frontier stores and settlements and to bring back the frontier produce. This means of transporting goods by WAGON TRAIN developed into a major business employing thousands of wagons before the railroads crossed the mountains c 1850. The larger Conestoga wagons, usually drawn by six horses, carried loads up to eight tons. The bottom of the wagon box was curved, rising at both ends, so that in going up and down hills the goods would shift less easily and the tailgate would be subjected to less strain. The same curve was carried out in the white hood, at first made of hempen homespun and later of canvas, which rose up and out at each end, covering the front and rear openings with a poke bonnet effect to keep out sun, rain, and dust. The wagons were striking and graceful vehicles as they moved over the hills and were often called "ships of inland commerce." An arch of bells was fastened to the hames of each horse. The drivers usually rode the left wheel horse and are credited with originating the American custom of turning out to the right. The PRAIRIE SCHOONER was a modification of the Conestoga wagon. See study by G. Shumway and H. C. Frey (3d ed. 1968).

coney or **cony** (both kō'nē), name used for the RABBIT (*Oryctolagus*) and for its fur, more often, for the PIKA, a small rodent found at high altitudes in both hemispheres, and for the HYRAX, a small herbivorous, hoofed animal of Africa and SW Asia. The last is probably the coney referred to in the Bible (Ps 104:18, Prov 30:26).

Coney Island (kō'nē), beach resort and amusement center of S Brooklyn borough of New York City, SE NY, on the Atlantic Ocean. The tidal creek that once separated the island from the mainland has been filled in, making the area a peninsula. More than a million persons throng to Coney Island on hot weekends and holidays, attracted by the beach, the 2-mi (3.2-km) boardwalk, the New York Aquarium, and the many other entertainment devices, eating places, and souvenir stands. High-rise apartments have replaced much of the amusement area since the 1950s.

confectionery, delicacies or sweetmeats that have sugar as a principal ingredient, combined with coloring matter and flavoring and often with fruit or nuts. In the United States it is usually called candy, in Great Britain, sweets or boiled sweets. Sweetmeats, long known in the Orient and to the Egyptians, were at first preserved or candied fruits, probably made with honey. One of the earliest functions of candy was to disguise unpleasant medicine, and prior to the 14th cent confections were sold chiefly by physicians. Medieval physicians often used for this purpose sugarplum, a sweetmeat made of gum dragon, white sugar, and rosewater, beaten into a paste. One of the earliest confections still surviving is marzipan, known throughout Europe, it is made of almonds or other nuts, pounded to a paste and blended with sugar and white of egg. In the Middle Ages it was sometimes molded into fancy shapes and stamped with epigrams. Sugarplums made of boiled sugar, were known in England in the 17th cent, but it was not until the 19th cent that candy-making became extensive. The display of British boiled sweets at the national exhibition of 1851 stimulated manufacture in other countries, especially in France. In the United States in the middle of the 19th cent about 380 small factories were making lozenges, jujube paste, and stick candy, but most fine candy was imported. With the development of modern machinery and the increasing abundance of sugar, confectionery making became an important industry. In the early 1970s annual candy sales in the United States had reached around \$2 billion. Candy is roughly divided into two classes, hard and soft, the distinction is based on the fact that sugar when boiled passes through definite stages during the process of crystallization. Fondant, or sugar cooked to the soft stage, is the basis of most fancy candies, such as chocolate creams. See P. P. Gott, *All about Candy and Chocolate* (1958), 8. W. Minifie, *Chocolate, Cocoa and Confectionery* (1970).

Confederacy, name commonly given to the Confederate States of America (1861-65), the government established by the Southern states of the United States after their SECESSION from the Union. (For the events leading up to secession and for the military operations of the Confederacy in the con-

flict between North and South which followed, see CIVIL WAR.) South Carolina, the first Southern state to secede (Dec 20, 1860) after the election of the Republican President Abraham Lincoln, was soon followed out of the Union by six more states—Mississippi, Florida, Alabama, Georgia, Louisiana, and Texas. On Feb 4, 1861, delegates from these states (except the Texans, who were delayed) met at Montgomery, Ala., and organized a provisional government. The Convention passed over the radical secessionists, R. B. Rhett and W. L. Yancey, and elected (Feb 9) Jefferson DAVIS of Mississippi and Alexander H. STEPHENS of Georgia president and vice president respectively. The Convention also drafted a constitution (adopted on March 11) and functioned as a provisional legislature pending regular elections. The constitution closely resembled the Constitution of the United States, even repeating much of its language, but naturally had STATES' RIGHTS provisions. Slavery was "recognized and protected," but the importation of slaves "from any foreign country other than the slave-holding States or Territories of the United States of America" was prohibited. The general welfare clause of the old Constitution was omitted, protective tariffs were forbidden, and for most appropriations a two-thirds vote of congress was required. There were other, less important, departures from the US Constitution, e.g., the president and vice president were to be elected for six years, but the president was not "reeligible", members of the president's cabinet might not be granted seats in either house of the Confederate congress to discuss legislation affecting their departments, and amendment to the constitution (by two thirds of the states, with congress having no voice) was made easier. The new government seized or pressed its claims for US property within its domain, especially forts and arsenals, and, when the Union declined to surrender Fort Sumter, ordered the firing (April 12-13) that formally began the hostilities. Lincoln's immediate call for troops brought four more Southern states—Arkansas, North Carolina, Virginia, and Tennessee—into the Confederacy, which now comprised 11 states. The border slave states of Maryland, Kentucky, and Missouri remained in the Union although they contained many Southern sympathizers. Confederate state governments were established at Neosho, Mo., and Russellville, Ky., in opposition to the official governments. In May it was decided to transfer the capital from Montgomery to Richmond, Va., because of Virginia's prestige, that move, considering Richmond's proximity to the North, has generally been regarded as a serious mistake. The new constitution was ratified (the approval of only five states was needed), general elections for congress and for presidential electors (as under the Federal Constitution) were held in Nov., 1861, and on Washington's birthday in 1862, the "permanent" government was inaugurated at Richmond. Davis and Stephens had been chosen without opposition to head it. Judah P. BENJAMIN, successively attorney general, secretary of war, and secretary of state, was the most important figure in Davis's cabinet. Only two other men remained in the cabinet for its entire brief existence—Stephen R. MALLORY, secretary of the navy, and John H. REAGAN, postmaster general. The story of the Confederacy is essentially the story of the loss of the Civil War. Even with its early military triumphs, the Confederacy experienced trying days. It never won recognition as an independent government, although Southerners had been confident that "king cotton" would bring this about. In 1861 they instituted an embargo on the export of cotton and voluntarily limited cultivation of the staple on the theory that these self-imposed and unofficial restrictions would make a cotton-hungry England eager to acknowledge the new nation that could supply in abundance the most important raw material in Britain's industrial system. The British, however, were well provided with cotton from previous boom years, and when their stocks finally were depleted, other sources of supply became available. Furthermore, Lincoln's EMANCIPATION PROCLAMATION enhanced the Union cause in the eyes of the average Briton, and the British government, no matter how pro-Confederate some of its individual members were, was not disposed to fly in the face of popular opinion. The CONFEDERATE CRUISERS built or bought in England were a scourge to the US merchant marine, and later at the settlement of the ALABAMA CLAIMS, Great Britain was adjudged partly responsible for their depredations, but beyond this the Confederate missions of James M. MASON, John SLIDELL, William L. YANCEY, and others in Europe achieved little. Napoleon III would probably have

followed Britain in recognizing the Confederacy, but not even the Confederate offer to recognize the French-dominated government of Maximilian in Mexico could induce the emperor to go off on this diplomatic venture alone. On the other hand, both the British and French recognized the blockade of the South, which the Union had proclaimed at the beginning of the war. This was particularly galling to Southerners because at first the blockade was not very effective; it is estimated that not more than a tenth of the ships running the blockade in 1861 were captured. But as the war progressed the blockade became more effective, and by 1865 one of every two blockade runners was being taken. When, in Oct., 1863, Davis expelled the British consuls who had remained in the South, the Confederacy had resigned itself to European nonrecognition, which was mostly influenced by the rising tide of Union successes in the war. The Confederate army early found that volunteers alone were insufficient, and the first conscription law was passed in April, 1862. By a later act (Feb., 1864), white men within the ages of 17 and 50 were drafted into military service. Provisions permitting the hiring of substitutes and exempting one owner or overseer for each 20 Negroes were highly unpopular among the yeomanry, who grumbled about "a rich man's war and a poor man's fight." Joseph E. BROWN and Zebulon B. VANCE, the governors of Georgia and North Carolina, led the denunciation of conscription and further berated Davis for the assumption of state troops into the Confederate army, the suspension of the writ of *habeas corpus*, and the Confederate tax program. Their extreme states' rights views represented a logical development of the theory that had led the Southern states to secede, but their insistence on maintaining these views at a time when unity was imperative was an added factor in the Confederate defeat. The fact that Brown, Vance, and others like them were able men and no less set on victory than was Davis only emphasizes this glaring deficiency in the nature of the Confederacy. Moreover, from the very beginning, the Confederacy was in bad financial condition, lacking in both specie and banks. It had difficulty in negotiating loans and was forced to finance its operations through issues of paper money, which by 1864 reached \$1 billion in face value, more than twice that of the greenbacks issued by the Union. The gold value of these notes declined dangerously. Christopher G. MEMMINGER, secretary of the treasury, was forced to resign in 1864, but the situation was beyond the abilities of any man. With the men at war, the women of the Confederacy carried on at home. They did not face wholesale death as did the soldiers in the field, yet they knew war, it was brought to them in the mighty Union invasion of 1864-65. Feeling the pinch of the Union blockade and already lacking the bare necessities of life—shoes, iron goods, paper, clothing—because the South was nonindustrial (the armies were kept supplied with ammunition, but beyond that industry was negligible), they now saw their country devastated by Union forces such as those led by Sherman and Sheridan. Many, both men and women, cried for peace, but the Union price was too great (see HAMPTON ROADS PEACE CONFERENCE) and most Southerners hung on grimly. Benjamin's proposal that Negroes who willingly enlisted in the fight be freed indicates how desperate affairs became before the Confederacy collapsed. That the Confederacy was able to continue the war as long as it did is a tribute to its stout soldiers and a few brilliant commanders, notably Robert E. Lee. For the South, less populous than the North and largely made up of scattered agricultural communities, defeat was inevitable. The heroic aspect of the South's struggle was tarnished by its retention and defense of the institution of slavery, yet it long revered the "lost cause" of the Confederacy as its greatest tradition. See Jefferson Davis, *The Rise and Fall of the Confederate Government* (1881, abr. ed. 1961), F. L. Owsley, *King Cotton Diplomacy* (1931, new ed. 1959), R. S. Henry, *The Story of the Confederacy* (1931, rev. ed. 1957), C. H. Wesley, *The Collapse of the Confederacy* (1937, repr. 1968), J. G. Randall, *The Civil War and Reconstruction* (1937, rev. ed. by David Donald, 1961), E. M. Coulter, *The Confederate States of America, 1861-1865* ("A History of the South" series, Vol. VII, 1950), Clement Eaton, *A History of the Southern Confederacy* (1954), M. W. Wellman, *They Took Their Stand: The Founders of the Confederacy* (1959), W. B. Years, *The Confederate Congress* (1960), C. P. Roland, *The Confederacy* (1960), H. S. Commager, *The Defeat of the Confederacy* (1964), E. M. Thomas, *The Confederacy as a Revolutionary Experience* (1971).

Confederate cruisers, in U.S. history, warships constituting the South's seagoing navy. At the outbreak of the Civil War the United States ranked next to Great Britain in merchant marine. Since almost all of the tonnage belonged to the North, the Confederacy set out to destroy it. Privateering flourished only briefly because the increased effectiveness of the Union blockade forestalled attempts to bring prizes into Southern ports for adjudication. But in the course of the war some 18 cruisers, known as Confederate cruisers, were engaged in this activity. Only eight achieved results of any consequences. Of these, the *Florida*, the *Alabama*, and the *Shenandoah* were outstanding. The *Florida*, built in Liverpool in 1861-62, began her active career in Jan., 1863. Commanded by John N. Maffitt and later by Charles M. Morris, the *Florida*, along with several of her captures that were in turn commissioned Confederate cruisers, took about 60 prizes. She was captured by the U.S.S. *Wachusett* in the harbor of Bahia, Brazil, in Oct., 1864. The most famous of the cruisers was the *Alabama*, also built at Liverpool in 1861-62. Under the command of Raphael Semmes she took almost 70 prizes. Her damage to U.S. shipping was valued at more than \$6 million in the settlement of the ALABAMA CLAIMS. In a famous naval action off Cherbourg, France, on June 19, 1864, the *Alabama* was sunk by the U.S.S. *Kearsarge*. The *Shenandoah*, bought at London in 1864, was commanded by James I. Waddell. Many of her 38 prizes, principally Pacific whalers, were taken after the fall of the Confederacy, of which Waddell was not apprised until Aug., 1865. On returning to England the *Shenandoah* reverted to the United States. The indirect damage inflicted on the U.S. carrying trade by the cruisers had far more effect than the direct losses they caused. Insurance rates rose, and hundreds of ships transferred to foreign flags, especially to Great Britain's. The raiders were in good part responsible for the decline of the nation's merchant marine. See G. W. Dalzell, *The Flight from the Flag* (1940), Murray Morgan, *Dixie Raider* (1948), Edward Boykin, *Ghost Ship of the Confederacy* (1957), W. N. Still, Jr., *Iron Afloat* (1971).

Confederate States of America see CONFEDERACY

Confederation, Articles of, in U.S. history, ratified in 1781 and superseded by the Constitution of the United States in 1789. The imperative need for unity among the new states created by the American Revolution and the necessity of defining the relative powers of the CONTINENTAL CONGRESS and the individual states led Congress to entrust the drafting of a Federal constitution to a committee headed by John Dickinson. In the Articles of Confederation submitted by the committee to the Second Continental Congress, on July 12, 1776, three points provoked much argument—the apportionment of taxes according to population, the granting of one vote to each state, and the right of the federal government to dispose of public lands in the West. After several revisions were made, however, this constitution, with a preamble and 13 articles, was adopted by Congress on Nov. 15, 1777. In their final form, the Articles retained the vote by states, but based the apportionment of taxes on the value of buildings and land, and specified that no state should be deprived of territory for the benefit of the United States. The preamble and Article 1 established a perpetual union of the Thirteen Colonies under the style of the United States of America. Article 2 asserted that each state retained its sovereignty and every right not expressly delegated to the central government, while Article 3 characterized the confederation as a "league of friendship," for common defense. In Article 4, the free inhabitants of each state were granted the privileges of free citizens in all the states, extradition was provided for, and it was stipulated that full faith and credit be given the records, acts, and judicial proceedings of the courts of one state in the courts of every other state. Article 5 provided that each state send annually not less than two nor more than seven delegates to Congress, though each state was to have only one vote. Article 6 left the conduct of war to Congress, and Article 7 empowered the state legislatures to appoint military officers up to and including the rank of colonel. Article 8 provided that the charges of war and other expenses incurred for the common defense should be defrayed out of a common treasury. Besides placing the conduct of foreign affairs in the hands of Congress, Article 9 authorized a system of settling disputes between states, granted Congress partial control over the currency, sanctioned the establishment of post offices by Congress, and established the Committee of the States,

with one delegate from each state, to sit in recess of Congress. The authority of the central government was drastically restricted by this article, which forbade Congress to engage in war, negotiate treaties or alliances, coin money, emit bills of credit, or borrow and appropriate money without obtaining the consent of a majority of the states. Provisions for the functioning of the Committee of the States and for the possible admission of Canada were made in Articles 10 and 11. Article 12 stated that pecuniary obligations of Congress were to be deemed a charge against the United States. Article 13 stipulated that the Articles of Confederation were to be unanimously ratified by the states before going into effect and that no alteration could be made unless agreed to both by Congress and by the legislature of every state. By 1779 all the states had ratified the Articles except Maryland, which refused its assent until states claiming territory NW of the Ohio River relinquished their claims, thus guaranteeing the equitable right of all states to the Western lands. When New York, followed by Virginia and Connecticut, offered to cede to Congress its claims to Western territory, Maryland ratified (March 1, 1781) the articles. While this constitution was a contribution to the techniques of government and a step toward national unity, most American historians hold that the Articles of Confederation proved wholly unsatisfactory because of the subordinate position occupied by the central government. Congress, dependent upon the states for its funds and for the execution of its decrees, became a legislative-executive body attempting to reconcile the policies of the various states. It could not extend its jurisdiction to individuals, command respect abroad by stabilizing credit, unify foreign and domestic policies, pass navigation regulations, or enforce treaty obligations. Because of its inherent weaknesses, the government commanded little respect, and its prestige was further diminished by its inability to cope with internal uprisings such as Shays's Rebellion. Many capable statesmen who held key posts—e.g., Robert Morris, John Jay, and Benjamin Lincoln—were thwarted by this organization of government, while others, equally able, shunned Congress in favor of state politics. The unanimity rule enabled one state to prevent the passage of a measure desired by 12 states. Thus, New York alone blocked the establishment of a vitally important tariff. When it became apparent that government under the Articles of Confederation was, in the words of George Washington, "little more than the shadow without the substance," agitation for a stronger Federal government began. This agitation resulted in the Annapolis Convention of 1786 and the FEDERAL CONSTITUTIONAL CONVENTION of 1787, which drafted the Constitution of the United States. Perhaps the most significant event of the Confederation period was the adoption of the Ordinance of 1787 concerning the Northwest Territory. See Allan Nevins, *The American States during and after the Revolution, 1775-1789* (1924, repr. 1971). A more favorable view of the Articles of Confederation is given in the scholarly studies of Merrill Jensen, *The Articles of Confederation* (1940, repr. 1963) and *The New Nation* (1950, repr. 1962). See also study by S. A. Pleasants III (1968).

Confederation of the Rhine, league of German states formed by Emperor Napoleon I in 1806 after his defeat of the Austrians at AUSTERLITZ. Among its members were the newly created kingdoms of Bavaria and Württemberg (see PRESSBURG, TREATY OF), the grand duchies of Baden, Hesse-Darmstadt, and Berg, and a number of other principalities. Eventually nearly all the German states except Austria and Prussia joined the confederation. The members disavowed their allegiance to the Holy Roman Empire, and Francis II, already styled emperor of Austria, relinquished the title Holy Roman emperor in 1806. Napoleon attempted to influence the internal as well as the foreign affairs of the confederation, but recurring international crises diverted his efforts. After Napoleon's retreat from Russia (1812-13), its members, by changing sides in the war, caused the collapse of the confederation.

Confessing Church, Ger. *Bekennende Kirche*, German Protestant movement. It was founded in 1933 by Martin NIEMÖLLER as the Pastors' Emergency League and was systematically opposed to the Nazi-sponsored German Christian Church. The immediate occasion for the opposition was the attempt by the Nazis soon after their rise to power to purge the German Evangelical Church of converted Jews and to make the church subservient to the state. At the Synod of Barmen (May, 1934) the Confessing Church set up an administration and proclaimed itself the true Protestant Church in Germany. After

the arrest of many of its ministers the church was forced underground. Eventually the more moderate Lutheran Council replaced it as the most effective opponent to the Nazi regime. After the war Niemöller and his followers continued as a separate group within the German Evangelical Church. The group is governed by representatives from each territorial church (the Council of Brethren) and its doctrines are based on the Barmen declaration and the Reformation creeds. See A. C. Cochrane, *The Church's Confession under Hitler* (1962).

confession, in law, formal admission of criminal guilt. It is usually obtained in the course of examination by the police or prosecutor or at the trial. For a confession to be admissible against an accused it must have been procured voluntarily after the person was told of his rights (see *MIRANDA VS ARIZONA*). If a confession is obtained by torture or by a false promise of immunity from prosecution made by a responsible party, it is inadmissible. A signed confession is *prima facie* voluntary, and the accused must introduce proof that it was extorted if he wishes to prevent its introduction at the trial. Usually a person who does not plead guilty may not be convicted solely on the basis of his confession.

confessional literature derives from a central ritual of the Christian faith, confession of one's sins. The *Confessions* of St. Augustine, an autobiographical account of Augustine's struggle against the pagan world view of his times (4th–5th cent. A.D.), and his ultimate conversion to Christianity, is the first important example of confessional literature—"I sinned when as a boy I preferred those empty to those more profitable studies 'One and one, two, two and two, four,' this was to me a hateful song 'the wooden horse lined with armed men' and 'the burning of Troy' were the choice spectacle of my vanity." Probably the best modern example of religious confessions is Thomas Merton's *The Seven Storey Mountain* (1948). Not all confessional literature is religious. Jean-Jacques Rousseau's *Confessions* (1781) reveal the author as he is, not as he ought to be. "Two almost incompatible things are united in me, how I don't know, a very ardent temperament and ideas slow to burn. It might be said that my heart and my mind do not belong to the same individual." Thomas De Quincey's *Confessions of an English Opium Eater* (1822) and F. Scott Fitzgerald's *The Crack-Up* (1936) follow this tradition. The intimate, autobiographical poetry of poets like Robert Lowell, Sylvia Plath, and Anne Sexton has been termed "confessional poetry." Confessional literature is not always autobiographical. Such novels as Chateaubriand's *Memoirs d'outre-tombe* (1849), Dostoyevsky's *Notes From The Underground* (1864), André Gide's *L'immoraliste* (1930), Saul Bellow's *Herzog* (1964), and Philip Roth's *Portnoy's Complaint* (1969) are the confessions of fictional narrators whose sins may or may not resemble those of their creators.

Confession of Augsburg: see CREED 4.

confessions of faith, Protestant: see CREED 4, 5, 6.

confirmation, Christian rite in which the initiation into the church that takes place by BAPTISM is confirmed. In the Roman Catholic and Orthodox Eastern churches, it is a SACRAMENT by which a Christian is strengthened in his faith. In the Lutheran and Anglican churches it is universally used, but it is not a sacrament (except among High Anglicans). In the East it is conferred by the priest on the newly baptized person of whatever age. In the West it is ordinarily an episcopal function, and the recipient has reached a canonical age of discretion. Confirmation consists of the laying on of hands and anointing with chrism, a mixture of oil and balm. Anglicans and Lutherans have abandoned the anointing. Some other Protestant churches use the term confirmation for the ceremony of admitting baptized persons into full church membership. Scriptural passages cited as authority for confirmation include Acts 8:14–17, 19.

conflict of laws, that part of the law in each state, country, or other jurisdiction that determines whether, in dealing with a particular legal situation, the law of some other jurisdiction will be recognized or given effect. An alternative term, widely used in Europe, is "private international law." An example of a situation that might involve the different laws of two places is that of a contract signed in one state and mailed to another. Complications may arise if one of the states provides that a contract so delivered is effective once mailed, while the other state provides that it is not effective until received. The rules of conflicts of law that a court applies in these disputed situations are commonly designed to

decide the case by the law of the territory having the closest connection with the transaction. An often expressed ideal is that of making the decision the same regardless of where the case is decided. In the United States the existence of many states with legal rules often at variance makes the subject of conflict of laws especially urgent. The Supreme Court ruled in 1938 that each Federal court must apply the conflict of laws rules of the state in which it sits. Certain provisions of the U.S. Constitution deprive the states of complete freedom to determine how they will decide cases in this field. Most important is Article 4, Section 1, which provides, in part, "Full Faith and Credit shall be given in each State to the Public Acts, Records, and judicial Proceedings of every other State." The U.S. Supreme Court has interpreted this provision as requiring each state to treat as valid any judgment rendered by another state that had jurisdiction and to lend its powers of enforcement to the judgment, the sole exception is that the courts of one state do not enforce claims arising under the penal law of another (see EXTRADITION). Jurisdiction in this context is defined as the capacity of the state to interpose its authority in a transaction because of intimate connection with it. There are especially difficult jurisdictional problems in the field of divorce. The chief problem occurs when only one of the parties appears and the other is merely notified of the action. In such cases the Supreme Court has ruled that the state had jurisdiction to divorce if the party appearing was domiciled there. The court has defined DOMICILE as the place where a person is living with the ultimate intention of making it his home. A person who obtains a divorce under these circumstances may claim alimony in any state and is immune from the charge of bigamy if there is a remarriage. The most important attempt in antiquity to deal with the problem of conflict of laws was the *jus gentium* [law of nations] of the Romans: a system of laws applied to all free foreigners. The founder of the modern study of conflict of laws was the medieval jurist, Bartolus of Sassoferrato (1314–57). See W. W. Cook, *The Logical and Legal Basis of the Conflict of Laws* (1942), P. C. Jessup, *Transnational Law* (1956), S. A. Bayart, *Conflict of Laws* (1968).

Confraternity of Christian Doctrine: see BIBLE.

Confucianism (kənfyōō'shənizəm), moral and religious system of China. Its origins go back to the *Analects* (see CHINESE LITERATURE), the sayings attributed to CONFUCIUS, and to ancient commentaries, including that of MENCIUS. In its early form (before the 3d cent. B.C.) Confucianism was entirely a system of ethical precepts for the proper management of society. It envisaged man as essentially a social creature who is bound to his fellows by *jen*, a term often rendered as "sympathy," or "human-heartedness." *Jen* is expressed through the five relations—sovereign and subject, parent and child, elder and younger brother, husband and wife, and friend and friend. Of these, the filial relation is usually stressed. The relations are made to function smoothly by an exact adherence to *li*, a term denoting a combination of etiquette and ritual. In at least some of these relations a person may be superior to some and inferior to others. If in his subordinate status he wishes to be properly treated he must—applying a principle similar to the Golden Rule—treat his own inferiors with propriety. Correct conduct, however, proceeds not through compulsion, but through a sense of virtue inculcated by observing suitable models of deportment. The ruler, as the moral exemplar of the whole state, must be irreproachable, but a strong obligation to be virtuous rests upon all men. It was recognized by the early philosophers that the millennial "great commonwealth," the union of mankind under ethical rule, would take a long time to achieve. It might be constantly advanced, however, by practicing the "rectification of names." This is a critical examination of the degree to which the behavior of a functionary or an institution corresponds to its name, thus, the title of king should not be applied to one who exacts excessive taxes, and the criticism of the undeserving claimant should force him to reform. In the 1st cent. A.D. began the practice of offering sacrifices and other veneration to Confucius in special shrines, it continued into the 20th cent. Confucianism had often to contend with supernatural religious systems, notably TAOISM and BUDDHISM, and at times, especially from the 3d to the 7th cent., it suffered a virtual eclipse. Under the T'ang dynasty (618–906) it enjoyed a renaissance and was the state religion. In the Sung dynasty (960–1279) occurred the development of neo-Confucianism. Neo-Confucian thinkers for-

mulated a system of metaphysics (which was not a part of older Confucianism), drawing on Taoist and Buddhist ideas, they were particularly influenced by ZEN BUDDHISM. Nevertheless they did not accept the Taoist search for immortality or the otherworldly ideals of Buddhism, remaining faithful to the practical and socially concerned Confucian spirit. The neo-Confucian eclecticism was unified and established as an orthodoxy by Chu Hsi (1130–1200), and his system dominated subsequent Chinese intellectual life. His metaphysics is based on the concepts of *li*, or principle of form in manifold things, and the totality of these, called the "supreme ultimate" (*t'ai chi*). During the Ming dynasty, the idealist school of Wang Yang-ming (1472–1529) put a stress on meditation and intuitive knowledge. The overthrow (1911–12) of the monarchy, with which Confucianism had been closely identified, led to the disintegration of Confucian institutions and a decline in Confucian traditions, a process accelerated after the Communist revolution (1949). See Richard Wilhelm, *Confucius and Confucianism* (tr. 1931, repr. 1970), J. C. Shryock, *The Origin and Development of the State Cult of Confucius* (1932, repr. 1966), Lin Yutang, *The Wisdom of Confucius* (1943), H. G. Creel, *Confucius The Man and the Myth* (1949, repr. 1972), Liu Wu-chi, *Confucius His Life and Time* (1955, repr. 1972), Shigeki Kaizuka, *Confucius* (tr. 1956), F. C. Hsu, *Confucianism* (1966), D. H. Smith, *Confucius* (1973).

Confucius (kənfyōō'shās), Chinese K'ung Fu-tse, c. 551–479? B.C., Chinese sage. Positive evidence concerning the life of Confucius is scanty. Modern scholars base their accounts largely on the *Analects*, a collection of sayings and short dialogues apparently collected by Confucius's disciples, and discard most of the later legends. Confucius was born in the feudal state of Lu, in modern Shantung prov. Distressed by the constant warfare between the Chinese states and by the venality and tyranny of the rulers, he urged a system of morality and statecraft that would preserve peace and afford the people the stable, just government they required. He gathered about him a number of disciples, some of whom occupied high positions, although Confucius himself, possibly because of his extremely outspoken manner toward his superiors, was at most granted an insignificant sinecure. From about his 55th to his 65th year he toured several neighboring states, but he was still unable to induce any ruler to grant him high office so that he might introduce his reforms. Later tradition depicts Confucius as a man who, seeking to restore an older social order, made special study of ancient books. It was said that he was a minister of state and the author (or at least the editor) of the *Wu Ching* [five classics] (see CHINESE LITERATURE). His supposed doctrines are embodied in Confucianism. For bibliography, see CONFUCIANISM.

congenital heart disease, any defect in the HEART present at birth. There is evidence that some congenital heart defects are inherited. However, most commonly, the defect is caused by environmental conditions in the uterus like the presence of certain drugs or viruses that reach the fetus via the maternal circulation, e.g., infection of the mother with rubella (German measles) virus during the first trimester of pregnancy causes a high rate of congenital heart lesions and other malformations. Among the most common congenital heart disorders are malformations in the valves and the persistence of structures that are normally closed off at birth, i.e., the ductus arteriosus (fetal blood vessel that shunts blood from the pulmonary vein to the aorta, bypassing the heart) and the foramen ovale (opening between the left and right atria of the fetal heart). If the malformation is severe, it will produce various symptoms of insufficient heart function, such as cyanosis (bluish tinge to the skin), dyspnea (difficulty in breathing), fatigue, and abnormal heartbeat, valvular deformities predispose the patient to bacterial infection of the endocardium (see ENDOCARDITIS). Less severe malformations may not produce noticeable symptoms until later in life, and some may not require any medical attention. Many congenital heart defects that are debilitating can now be corrected surgically. Other congenital anomalies, such as mongolism, are present in about 20% of cases of congenital heart disease.

congestive heart failure, inability of the heart to expel sufficient blood to keep pace with the metabolic demands of the body. In the healthy individual the heart can tolerate large increases of workload for a considerable length of time. Cardiac failure results from conditions, e.g., coronary, hypertensive, and rheumatic heart disease, that interfere with the nutrition and oxygenation of the heart.

muscle itself. Congestive heart failure develops in 50% to 60% of patients with such disorders, and it can be either acute or chronic. If the heart has time to compensate the heart muscle may become hypertrophic (enlarged). Eventually the great demand for oxygen by the heart muscle cells cannot be met, and cell death results. Either the left or right ventricle alone may fail first, although combined failure is most common and almost always eventually occurs. Left ventricular failure is marked by shortness of breath (dyspnea), often accompanied by cough, pulmonary congestion and edema are evident. Failure of the right ventricle produces systemic edema, reflecting hepatic and visceral engorgement. Treatment of cardiac failure usually includes long-term restrictions on diet and activity. Digitalis is often prescribed to increase the speed and force of cardiac contractions. Diuretics are used to remove excess sodium and water from the body.

conglomerate, corporation whose asset growth, often very rapid, comes largely through the acquisition of, or merger with, other firms whose products are largely unrelated to each other or to that of the parent company. Merger to gain monopoly ("horizontal integration") was notable at the turn of the century, somewhat later, acquisition of suppliers or buyers ("vertical integration") became fairly common. Conglomerates did not emerge until the 1960s, when they quickly became popular among investors. Their stock prices often rose spectacularly, sometimes, however, they fell just as spectacularly. Economic advantages attributed to the conglomerate include protection against overspecialization, availability of management expertise, and reduced cost due to greater productive capacity.

conglomerate, in geology, sedimentary ROCK composed largely of pebbles or other rounded particles whose diameter is larger than 2 mm (0.08 in.). Essentially a cemented gravel, conglomerates are formed along beaches, as glacial drift, and in river deposits. Conglomerates formed of angular shaped pebbles are called breccias.

Congo (kɒŋɡoʊ), or **Zaire** (zɑɪər), great river of equatorial Africa, c 2,720 mi (4,380 km) long, formed by the waters of the Lualaba River and its tributary, the Luvua River, and flowing generally N and W through Zaire to the Atlantic Ocean. The second longest river of Africa and one of the longest in the world, the Congo River drains c 1,425,000 sq mi (3,690,750 sq km) including all of Zaire and parts of the Congo Republic, Cameroon, Central African Republic, Burundi, Tanzania, Zambia, and Angola. The Lualaba River, considered to be the upper Congo River, rises in SE Zaire, flows north over rapids and falls to Bukama, and thence across a vast plain and through a series of marshy lakes (Kabwe, Kabele, Upemba) to receive the Luvua River at Ankoro. The Luvua River has its most remote source in the Chambeshi River, which rises in N Zambia and flows southwest into swamps around Lake Bangweulu, it emerges from the swamps as the Luapula River, continues N along the Zaire-Zambia border into Lake Mweru, exits from there as the Luvua River, and continues NW to the Lualaba River. A third major headstream is the Lukuga River, which drains from Lake Tanganyika and joins the Lualaba River near Kabalo. From Kabalo, the Lualaba River flows N to Kisangani in a varied course marked by a deep and narrow gorge (the Gates of Hell) below Kongolo, a navigable stretch from Kasongo to Kibombo, a section of rapids and falls from Kibombo to Kindu, a shallow but navigable section from Kindu to Ubundu, and a section of seven cataracts—known as Stanley Falls—between Ubundu and Kisangani that marks the end of the Lualaba and the beginning of the Congo River proper. Below Kisangani, the Congo flows west and southwest, in a great curve unbroken by falls or rapids for about 1,090 mi (1,750 km) to Kinshasa. For most of its middle section the Congo is from 4 to 10 mi (6.4–16.1 km) wide, with many islands and sandbars. Because its many large tributaries (including the Lomami, Kasai, Lulunga, Ubangi, Aruvimi, Itimbiri and Mongala rivers) drain areas with alternating rainy seasons on either side of the equator, the Congo has a fairly constant flow throughout the year. Between Bolobo and Kwamouth the Congo narrows in width to between 1 mi and 1½ mi (1.6–2.4 km) but, c 350 mi (560 km) from its mouth, widens to form lakelike Stanley Pool (Mabele Pool), on which Kinshasa and Brazzaville are located. From the western end of Stanley Pool, the Congo descends 876 ft (267 m) in a series of 32 rapids, known as Livingstone Falls, to the port of Matadi. Below Matadi (83 mi/134 km inland) the Congo is navigable by ocean-going vessels and, despite such hazards as the whirlpools of the Devil's Caul-

dron, shifting sandbars, and sharp bends in the river, forms one of the largest natural harbors in Africa. The river is tidal to Boma, c 60 mi (100 km) upstream. The Congo River enters the Atlantic Ocean between Banana Point, Zaire, and Sharks Point, Angola, and dredging is required to keep a navigable channel open. The river is continued offshore by a c 500 mi (800 km) long submarine canyon that is c 4,000 ft (1,220 m) deep. With railroads to bypass major falls (Matadi-Kinshasa, Kisangani-Ubundu, Kindu-Kongolo), the Congo River and its tributaries form a system of navigable waterways c 9,000 mi (14,480 km) long, along which move much of central Africa's copper, palm oil kernels, cotton, sugar, and coffee. The chief ocean port is Matadi, with its associated oil port, Ango Ango, the chief river ports are Kinshasa and Kisangani. River steamers operate throughout the year between Kinshasa and Kisangani. The Congo River is Africa's largest potential source of hydroelectric power, the most valuable site is along Livingstone Falls, where the first phase of the Inga Power Project was begun in 1972. The mouth of the Congo River was visited (1482) by Diogo Cão, the Portuguese navigator. It became known as the Zaire River (a corruption of the local name *Mzadi* meaning "great water") and was later referred to as the Congo River (for the Kongo kingdom located near its mouth), it was renamed Zaire River by the government of Zaire in 1971. The Congo's lower course was traced upstream as far as Isangila by a British force under Capt J. K. Tuckey in 1816, and its upper headwaters by the missionary David Livingstone, who followed the Lualaba River to Nyangwe in 1871. The journalist Henry Stanley traveled from Nyangwe to Isangila and on to Boma during his great transcontinental journey (1874–77), thus proving the headwaters to be tributaries of the Congo River and not sources of the Nile as hypothesized by Livingstone. See W. H. Bentley, *Pioneering on the Congo* (2 vol 1900, repr 1970), Sir Harry Hamilton Johnston, *The River Congo, From its Mouth to Bolobo* (3d ed 1884, repr 1970).

Congo, Belgian: see ZAIRE

Congo, kingdom of the: see KONGO, KINGDOM OF THE

Congo, People's Republic of the, republic (1973 est pop 1,130,000), 132,046 sq mi (342,000 sq km), W central Africa. BRAZZAVILLE is the capital. The Congo is bordered on the W by Gabon, on the N by Cameroon and the Central African Republic, on the E and SE by Zaire, and on the SW by Cabinda, a Portuguese exclave, and by the Atlantic Ocean. The



terrain is covered mainly by dense tropical rain forest, with stretches of wooded savanna. Tributaries of the Congo and Ubangi rivers, which separate the Congo from Zaire, flow through the country. The climate is hot and rainfall is heavy. The Congo serves as the transport and commercial hub of central Africa, with economically important road, river, and rail systems connecting inland areas with the Atlantic. The country's internal road network is inadequate, however, and has hampered economic development. Agriculture and forestry are the chief economic activities in the Congo. The major subsistence crops are cassava and yams. Sugarcane and tobacco, raised primarily on plantations, are the leading export crops, followed by coffee, cocoa, palm products, and groundnuts. Timber is also a major export. Diseases restrict cattle raising, and

fishing is not well developed. Industry is limited mainly to the processing of agricultural and forest products, and is concentrated in Brazzaville and Pointe-Noire (both port cities) and in the Niari valley. Mining is increasingly important, with potash and oil the principal exports, petroleum resources are being rapidly depleted, however. The Bakongo, the major ethnic group in the Congo, are mostly farmers or traders, they are Bantu-speaking, as are the other principal tribes, the Bateke, the Mbochi, and the Sanga. Pygmies live in the north, and Vili people dwell along the coast. A majority of the Congolese people practice traditional animist religions, the rest are primarily Christian. French is the country's official language. Pygmies, migrating from the Zaire region, were probably the first inhabitants of what is now the Congo. They were followed by the Bakongo, the Bateke, and the Sanga, who arrived in the 15th cent. After the coastal areas were explored by the Portuguese navigator Diogo Cão in 1482, commerce developed between the Europeans and the coastal African states, which raided the interior for slaves to trade. Portuguese traders predominated throughout the 17th cent, although French trade centers were established (mainly at Loanga), and English and Dutch merchants sought commercial opportunities. Europeans penetrated inland in the late 19th cent, with Pierre Savorgnan de Brazza leading major expeditions in 1875 and 1883. In 1880 he negotiated an agreement with the Bateke to establish a French protectorate over the north bank of the Congo River. Between 1889 and 1910, the Congo (called the French Congo and later the Middle Congo) was administered primarily by French companies that held concessions to exploit the area's rubber and ivory resources. Scandals over the decimation of the African population through forced labor and portage broke out in 1905 and 1906. France restricted the role of the concessionaires in 1907, and in 1910 the Congo became a colony in French Equatorial Africa. Renewed forced labor and other abuses sparked an African revolt in 1928. The Free French forces made the Congo a bastion of their struggle against the Germans and the Vichy regime during World War II. In 1946, the region was granted a territorial assembly and representation in the French parliament. In the French constitutional referendum of 1958, the Congo opted for autonomy within the French Community. Full independence was achieved on Aug 15, 1960, with Fulbert Youlou as the first president. Forced to resign after a revolt in 1963, he was succeeded by Alphonse Massamba-Debat. In 1964 the new president founded a Marxist-Leninist party and proclaimed a noncapitalist path of economic development. A Five-Year Plan was initiated, and the state sector of the economy in agriculture and industry was expanded. Tensions between the government and the army grew, and in 1968, Marien Ngouabi, an army commander, seized power. He followed his predecessor's socialist policies, but created his own Marxist-Leninist type of party, the Congolese Workers party. An attempted coup in Feb, 1972, provided Ngouabi with a reason to purge opponents. In June, 1973, a new constitution was approved by referendum, it provided for popularly elected national, regional, and local assemblies. Despite radical rhetoric and close links with Communist countries, the Congo has retained close ties with France, it remains in the French franc zone and is an associate member of the European Common Market. The Congo is a member of a customs union with Gabon, the Central African Republic, Chad, and Cameroon, all of which share a central bank and a common currency. See Andre Gide, *Travels in the Congo* (tr 1927), Samir Amin and Catherine Coquery-Vidrovitch, *Histoire économique du Congo, 1880-1968* (1969), G. C. McDonald, *Area Handbook for People's Republic of the Congo* (1971).

Congo, Republic of the. see ZAIRE

Congo eel. see SALAMANDER

Congo Republic. see CONGO, PEOPLE'S REPUBLIC OF THE

Congregationalism, type of Protestant church organization in which each congregation, or local church, has free control of its own affairs. The underlying principle is that each local congregation has as its head Jesus Christ alone and that the relations of the various congregations are those of fellow members in one common family of God. Congregationalism eliminated bishops and presbyteries. The movement to which the name came to be applied began in the 16th and 17th cent in England, in a revolt against the formalized worship, unregenerate membership, and state control of the Established Church. Those holding such views found them-

selves unable to remain within the Church of England Robert BROWNE published in 1582 the first theoretical exposition of Congregational principles and expressed the position of some of those SEPARATISTS Churches established on such lines were started very early in the 17th cent in Gainsborough and Scrooby, but government opposition drove them into exile in Holland Not until the Protectorate did the Congregationalists make much progress About that time the name INDEPENDENTS was first introduced, a term long common in Great Britain (it is still used in Wales) but seldom used in America In 1658, when the Savoy Synod met in London, over 100 churches were represented With the Restoration came repression for the Independents, partly relieved by the Toleration Act of 1689 A marked tendency among English Congregationalists in the 19th cent was toward combination in larger fellowship Churches of this denomination formed a union in Scotland in 1812, in Ireland in 1829, in 1831 the Congregational Union of England and Wales was established The Congregational Union and the Evangelical Union were united in 1896 Membership in Congregational churches in Great Britain has declined in the 20th cent They have been active in ecumenical activities, and in 1972 most British Congregationalists and Presbyterians merged to form the United Reform Church Congregationalism was carried to America in 1620 by the Pilgrims, who were members of John Robinson's congregation in Holland, originally of Scrooby, England In America, Congregationalism reached its greatest public influence and largest membership In New England numerous communities were established based on Congregational-type religious principles In 1648 in the CAMBRIDGE PLATFORM a summary of principles of church government and discipline was drawn up Congregationalists took a leading part in the GREAT AWAKENING that, in New England, was started in 1734 by the preaching of Jonathan EDWARDS As the country expanded, Congregational churches were established in the newly opened frontier regions In 1810 the American Board of Commissioners for Foreign Missions began its work, in 1826 the American Home Missionary Society was formed These were followed, in 1846, by the American Missionary Association, primarily devoted to missionary work among blacks and Indians The early part of the 19th cent brought the Unitarian secession, when over 100 churches left the main Congregational body Congregational churches began to meet in local and then in statewide conferences, out of which developed (1871) the National Council of the Congregational Churches of the United States But each local church remained free to make its own declaration of faith and free to decide its own form of worship, in the conduct of the local church each member was granted an equal voice The principal assistants of the pastor are the deacons In education Congregationalists were always prominent, but the institutions of their founding—Harvard (1636), Yale (1701), Williams, Amherst, Oberlin, and many others—have been free from sectarianism The trend toward broader fellowship and larger cooperation was notably indicated in the merging in 1931 of the National Council of the Congregational Churches of the United States and the General Convention of the Christian Church (see DISCIPLES OF CHRIST) to form the General Council of the Congregational and Christian Churches of the United States The National Association of Congregational Christian Churches was formed in 1955 and had about 85,000 members in the early 1970s A move to unite the Congregational Christian Churches with the Evangelical and Reformed Church was approved by the councils of the two denominations in 1957, forming the UNITED CHURCH OF CHRIST See Williston Walker, *The Creeds and Platforms of Congregationalism* (1907, repr 1960), G G Atkins and F L Fagley, *History of American Congregationalism* (1942), D T Jenkins, *Congregationalism* (1954), A A Rounser, Jr, *The Congregational Way of Life* (1960), Horton Davies, *The English Free Churches* (2d ed 1963), M L Starkey, *The Congregational Way* (1966)

Congress, Library of: see LIBRARY OF CONGRESS

Congress of Industrial Organizations: see AMERICAN FEDERATION OF LABOR AND CONGRESS OF INDUSTRIAL ORGANIZATIONS

Congress of Racial Equality (CORE), civil rights organization founded (1942) in Chicago by James Farmer Dedicated to the use of nonviolent direct action, CORE seeks to promote better race relations and to end all discriminatory policies in the United States Its earliest activities were directed toward the desegregation of restaurants and other public accommodations in Chicago It later expanded its pro-

gram of nonviolent sit-ins to public accommodations in the South CORE first gained national recognition through its sponsorship (1961) of the Freedom Rides, a series of confrontatory bus rides throughout the South by interracial groups of CORE members and supporters The program, ultimately successful, was designed to end segregation on interstate bus routes CORE was one of the sponsors of the massive 1963 civil rights march on Washington In 1966, James Farmer resigned as national director of CORE and the organization's program became somewhat more separatist, concentrating on black voter registration in the South and on community problems, including slum housing and police mistreatment, in the North See study by August Meier and Elliot Rudwick (1973)

Congress of the United States, the legislative branch of the federal government, instituted (1789) by Article 1 of the CONSTITUTION OF THE UNITED STATES, which prescribes its membership and defines its powers Congress is composed of two houses—the Senate and the House of Representatives

The Senate The Senators, two from each state, have six-year terms and were chosen by the state legislatures until 1913, when the Seventeenth Amendment, providing for their direct popular election, went into effect Actually, many states, especially in the West, had already in effect adopted this reform through the use of the direct PRIMARY The terms of one third of the Senators expire every two years A Senator must be at least 30 years old, a US citizen of not less than nine years standing, and a resident of the state in which he is elected The Senate is presided over by the Vice President of the United States, who has no part in its deliberations and may vote only in case of a tie, in his absence his duties are assumed by a president pro tempore, elected by the Senate

The House of Representatives Members of the House of Representatives are apportioned among the states according to their populations in the federal census Every state is entitled to at least one Representative States that are entitled only to one (Alaska, Delaware, Nevada, North Dakota, Vermont, and Wyoming, by the 1970 census) have a Representative at large, i.e., one elected by the whole state The legislatures of those states entitled to more than one Representative have been required since 1842 to divide their states into congressional districts When a reapportionment is made and until a new districting is carried out, a state whose quota is changed may also elect Representatives at large Representatives are chosen for two-year terms, and the entire body comes up for reelection every two years A Representative must be 25 or older, a US citizen of at least seven years standing, and a resident of the state in which he is elected Although without a vote, one resident commissioner from Puerto Rico and one delegate from the District of Columbia sit in the House The presiding officer of the House, the speaker, is elected by the members of the House and may designate any member of the House to act in his absence In 1910 a revolt against the powerful speaker, Joseph Gurney CANNON, resulted in the transfer of much of the power and influence of that office to the House committees

Joint Activities In both houses the work of preparing and considering legislation is done by standing committees, and in addition there are special committees in each house as well as joint committees with bicameral membership The two houses have an equal voice in legislation, but revenue bills must originate in the House of Representatives Bills, after having been passed by each house separately, must be signed by the President within 10 days of their submission, or they become law automatically, unless Congress is not in session If vetoed by the President, a bill may become law only by its repassage by a two-thirds majority in each house The Constitution requires a regular annual meeting of Congress, which, since the passage of the Twentieth Amendment in 1933, begins on Jan 3 each year The President may call an extra session of Congress or of either house Only the House of Representatives may impeach the President or other federal officers and the Senate alone has the authority to try impeachments, but each house is the judge of the qualifications of its own members The Senate must ratify all treaties by a two-thirds vote and confirm important presidential appointments to office, including cabinet members, judges of federal courts, and high-ranking officers of the armed forces Because of this and because it is the smaller body and its members enjoy longer terms of office and virtually unlimited debate, the Senate is regarded as the more powerful of the two houses Congress, as a

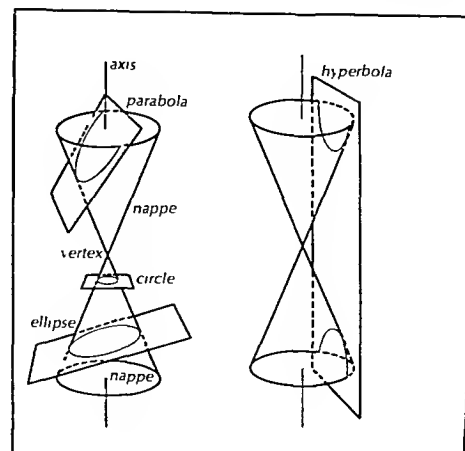
whole, reached the zenith of its power during RECONSTRUCTION The proceedings of each house are recorded in the *Congressional Record* Throughout its history many critics have charged that Congress operates under antiquated machinery and processes that are inadequate Procedural reforms proposed include the adoption of a rule of relevancy in Senate debate, electric voting in the House, joint hearings on similar bills, liberalizing the methods by which a bill may be discharged from committee for consideration, and abolishing seniority as the basis for committee chairmanships See E S Griffith, *Congress Its Contemporary Role* (4th ed 1967), S C Patterson, comp., *American Legislative Behavior* (1968), Roger Davidson, *The Role of the Congressman* (1969), N W Polsby, *Congress and the Presidency* (2d ed 1971), Louis Fisher, *President and Congress* (1972), Aage Clausen, *How Congressmen Decide* (1973), John Kingdon, *Congressmen's Voting Decisions* (1973)

Congreve, William, 1670–1729, English dramatist, b near Leeds, educated at Trinity College, Dublin, and studied law in the Middle Temple After publishing a novel of intrigue, *Incognita* (1692), and translations of Juvenal and Persius (1693), he turned to writing for the stage His first comedy, *The Old Bachelor* (1693), produced when he was only 23, was extremely successful and was followed by *The Double Dealer* (1693) and *Love for Love* (1695) In 1697 his only tragedy, *The Mourning Bride*, was produced About this time Congreve replied to the attack on his plays made by Jeremy COLLIER, who in a famous essay attacked the English stage for its immorality and profaneness Congreve reached his peak with his last play, *The Way of the World* (1700), which has come to be regarded as one of the great comedies in the English language The leading female roles in Congreve's plays were written for Anne BRACEGIRDLE, who was probably his mistress He never married After 1700, Congreve did little literary work, perhaps because of the cool reception accorded his last play or because of his failing health—he suffered from gout He subsequently held various minor political positions and enjoyed the friendships of Swift, Steele, Pope, Voltaire, and Sarah, duchess of Marlborough The plays of Congreve are considered the greatest achievement of Restoration comedy They are comedies of manners, depicting an artificial and narrow world peopled by characters of nobility and fashion, to whom manners, especially gallantry, are more important than morals Congreve's view of mankind is amused and cynical His characters are constantly engaged in complicated intrigues, usually centering around money, which involve mistaken identities, the signing or not signing of legal documents, weddings in masquerade, etc His plays are particularly famous for their brilliance of language, for verbal mastery and wit they have perhaps been equalled only by the comedies of Oscar Wilde See his works (ed by F W Bateson, 1930), biographies by D C Taylor (1931), J C Hodges (1941), M E Novak (1971), and E W Fosse (1888, repr 1973), David Mann, ed., *A Concordance to the Plays of William Congreve* (1973)

Coniah (kōn'ā) see JEHOIACHIN

conical surface* see CONE

conic section or **conic** (kōn'ik), curve formed by the intersection of a plane and a right circular CONE (conical surface) The ordinary conic sections are the CIRCLE, the ELLIPSE, the PARABOLA, and the HYPER-



Conic sections

BOLA When the plane passes through the vertex of the cone, the result is a point, a straight line, or a pair of intersecting straight lines, these are called degenerate conic sections. There are many examples of the conic sections, both in nature and in technology. The orbits of planets and satellites are elliptical, and parallel reflectors (e.g., in telescopes) are parabolic in shape.

conifer (kōn'ifūr) [Lat., = cone-bearing], tree or shrub of the order Coniferales, e.g., the PINE, MONKEY-PUZZLE TREE, CYPRESS, and SEQUOIA. Most conifers bear cones and most are evergreens, though a few, such as the LARCH, are deciduous. Some have globular fruits, e.g., the YEW. Conifers are widely distributed over the world but are mostly found in the highlands of temperate regions. The conifers, the ginkgos, and the cycads comprise the three most important classes of gymnosperms, i.e., plants without true flowers. Conifers are classified in the division PINOPHYTA, class Pinopsida.

Coningh, Philips de see KONINCK, PHILIPS DE

Coningham, Sir Arthur (kūn'ing-am), 1895–1948, British air marshal, b. Australia. During World War I, he served first in the New Zealand army and then joined (1916) the Royal Flying Corps, a forerunner of the Royal Air Force. He remained in the air force and became air vice marshal after the outbreak of World War II. He commanded the tactical air support forces in North Africa (1941–43), during the invasion of Sicily and S. Italy (1943–44), and during the Normandy landings (1944–45). He became air marshal in 1946 and retired in 1947.

Coninxloo or Koninxloo, Gillis van (both gīl'is van kōn'ingkslō), 1544–1607, Flemish landscape painter. His *Judgment of Midas* (Dresden), *Latona* (Hermitage, Leningrad), and above all the *Landscape with Figures* (Liechtenstein Gall., Vienna) are fine examples of his art. Coninxloo's paintings, characterized by fantasy, warm tones, and refined realism, were important for the transmission of a Venetian type of landscape to the North.

conimeter see KONIMETER

Conjeeveram, India see KANCHIPURAM

conjugation see INFLECTION

conjugation, in genetics see RECOMBINATION

conjunction, in astronomy, alignment of two celestial bodies as seen from the earth. Conjunction of the moon and the planets is often determined by reference to the sun. When a body is in conjunction with the sun, it rises with the sun, and thus cannot be seen, its ELONGATION is 0°. The moon is in conjunction with the sun when it is new, if the conjunction is perfect, an ECLIPSE of the sun will occur. Mercury and Venus, the two inferior planets, have two positions of conjunction. When either lies directly between the earth and the sun, it is in inferior conjunction, when either lies on the far side of the sun from the earth, it is in superior conjunction.

conjunction, in English, PART OF SPEECH serving to connect words or constructions, e.g., *and*, *but*, and *or*. Most languages have connective particles similar to English conjunctions.

conjunctivitis (kən'jŭktiv'itēs), catarrhal inflammation of the membrane that covers the eyeball and lines the eyelid, usually acute, caused by a bacillus or virus. Commonly called pink eye, mild conjunctivitis usually causes redness, discharge, and itching of the membrane. If left untreated it usually clears up in 8 to 10 days. Conjunctivitis may also be associated with upper respiratory infection or with childhood diseases such as measles. The disorder, whether chronic or acute, is treated successfully with antibiotics, sometimes combined with cortisone. TRACHOMA, though rare in the United States, is a severe conjunctivitis that can cause loss of vision. Another severe form of conjunctivitis is caused by the gonococcus bacterium and is usually associated with a genital infection. Conjunctivitis in newborn infants, called ophthalmia neonatorum, was a problem at one time, however, routine instillation of silver nitrate solution into the eyes of newborn infants has materially reduced the incidence of blindness.

Conklin, Edwin Grant, 1863–1952, American zoologist, b. Waldo, Ohio, B.S. Ohio Wesleyan Univ., 1886, Ph.D. Johns Hopkins Univ., 1891. From 1903 he taught and conducted research at Princeton, principally in cytology (particularly cell division), embryology, and heredity. His chief interest was evolution. He wrote *Heredity and Environment* (1915) and many other works, and he was influential in organizing the marine biology laboratory at Woods Hole, Mass.

Conkling, Roscoe, 1829–88, American politician, b. Albany, N.Y. On his admission to the bar in 1850, he

was immediately appointed district attorney of Albany. The son of Alfred Conkling, Congressman and Federal judge, he became a U.S. Representative (1859–63, 1865–67) and Senator (1867–81) and undisputed leader of the Republican party in New York. Conkling's machine was built upon Federal patronage, which was entirely his during the Grant administrations. But in 1878, President Hayes, an advocate of civil service reform, removed two Conkling lieutenants, Chester A. ARTHUR and Alonzo B. CORNELL, from the management of the New York customhouse in defiance of Conkling, who claimed that a Senator had the right to control Federal patronage in his state. Conkling was reelected, and another lieutenant, Thomas C. PLATT, became his colleague in the Senate, while Cornell won the governorship. Conkling headed the third-term movement for Grant in 1880 and placed him in nomination at the Republican national convention. Although his Old Guard or "Stalwarts" faction was unsuccessful, he prevented the nomination of James G. BLAINE, his bitter personal enemy. The deadlocked convention chose James A. GARFIELD as a compromise candidate, and Chester A. Arthur was named for Vice President as a sop to the "Stalwarts." Conkling gave Garfield only lukewarm support but claimed afterwards that the President-elect had promised him the patronage in return. Garfield denied this and further antagonized Conkling by making Blaine Secretary of State. When an anti-Conkling man was appointed collector of the port of New York, Conkling resigned from the Senate in protest. Platt soon followed his leader, earning for himself the nickname "Me Too." The two expected vindication through reelection by the state legislature, but both were defeated. Conkling then retired to the private practice of law, in which he was highly successful. See biography by his nephew, A. R. Conkling (1889), study by David M. Jordan (1971).

Connacht see CONNAUGHT, Ireland

Connally, John Bowden (kōn'ālē), 1917–, U.S. public official, b. Floresville, Texas. A lawyer, he became associated with Lyndon B. Johnson, managed the latter's successful senatorial campaign in 1948, and later served as Johnson's administrative assistant. He was named Secretary of the Navy in 1961, but he resigned (1962) to campaign for the governorship of Texas and was elected. When President John F. Kennedy was assassinated in Dallas, Connally was accompanying him and was wounded. He was twice reelected governor, serving until 1968. A conservative Democrat, he was chosen (1971) by President Richard M. Nixon as Secretary of the Treasury and was instrumental in bringing about the institution of a 90-day wage-price freeze in Aug., 1971. In May, 1972, Connally resigned from the cabinet to aid the President's reelection. The following year Connally joined the Republican party and served as a special adviser to the President after the resignation of key aides as a result of the WATERGATE AFFAIR. He left the White House shortly after that, however, and in July, 1974, was himself indicted for accepting a bribe from milk producers before the 1972 election. See studies by Charles Ashman (1974) and A. F. Crawford and Jack Keever (1974).

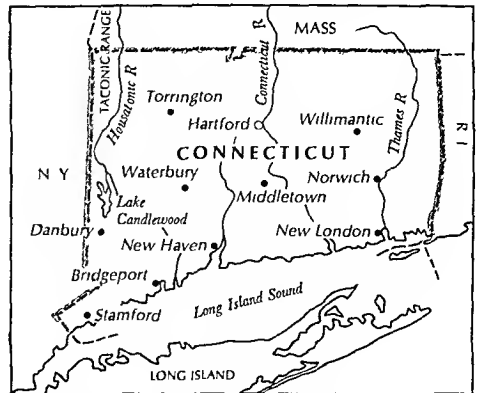
Connaught, Arthur William Patrick Albert, duke of (kōn'ōt), 1850–1942, English prince, son of Queen Victoria and Prince Albert, brother of Edward VII. Trained for a military career, he served in Egypt (1882) and India (1886–90) and as commander in chief in the Mediterranean (1907–9). He was (1911–16) governor general of Canada. His son, Prince Arthur of Connaught, 1883–1938, was (1920–23) governor general of South Africa.

Connaught or Connacht (both kōn'ōt, kōn'ākht), province (1971 pop. 389,763), 6,611 sq mi (17,122 km), W. Republic of Ireland, comprising the counties of MAYO, SLEIGO, LEITRIM, ROSCOMMON, and GALWAY. It was one of the ancient kingdoms of Ireland, whose rulers, the O'Connors, were supplanted by the Anglo-Norman De Burghs in the 13th cent.

Conneaut (kōn'ēōt'), city (1970 pop. 14,552), Ashtabula co., extreme NE Ohio, on Lake Erie, near the Pa. line, settled 1799, inc. 1834. It is a port of entry—an important ore-receiving port and a limestone and coal loading center—and a vacation resort. Conneaut has a railroad museum, with antiques of the steam era.

Connecticut (kənēt'ikət), state (1970 pop. 3,031,709), 5,009 sq mi (12,973 sq km), NE United States, southernmost of the New England states, one of the Thirteen Colonies. HARTFORD is the capital and the largest city, with BRIDGEPORT and NEW HAVEN next in size. Rectangular in outline, the state extends c. 90 mi (145 km) from east to west and c. 55 mi (90 km) from

north to south, it is bounded on the N by Massachusetts, on the E by Rhode Island, on the S by Long Island Sound, and on the W by New York. Connecti-



cut is divided into two roughly equal sections, usually called the eastern highland and the western highland. These sections are separated by the Connecticut valley lowland. The Connecticut River, which flows through only the northern half of the valley, veers off to the southeast at Middletown in central Connecticut. Along the Long Island Sound there is a low, rolling coastal plain. The western highland, with the Taconic Mts. and the Litchfield Hills, is more rugged than the eastern highland. A few isolated peaks in the west are more than 2,000 ft (610 m) high. The Thames and the rivers emptying into it drain the eastern highland, and the Housatonic, with its chief tributary, the Naugatuck, drains the western highland. Though famed for its rural loveliness, Connecticut is heavily industrialized and derives most of its economic wealth from its industries. Textiles, typewriters, silverware, sewing machines, clocks, and watches are among Connecticut's many industrial products. The state's principal industries produce transportation equipment, non-electrical and electrical machinery, fabricated metals, primary metals, and chemicals. Firearms and ammunition, first produced in Connecticut at the time of the American Revolution, are still manufactured in the state. Groton is an important center for submarine building. Agriculture accounts for only a small share of income in the state, dairy products, eggs, and tobacco are the leading farm items. High grade broadleaf tobacco, used in making cigar wrappers, has been a specialty of Connecticut agriculture since the 1830s. Largely shade-grown in the fertile Connecticut valley, it remains a valuable crop although production has been adversely affected by new methods of cigar production. Many varieties of fish, as well as oysters, lobsters, and other shellfish, are caught in Long Island Sound, but the fishing industry is small. Few minerals are produced, stone, sand, and gravel account for most income derived from mining. Insurance is an important industry in Connecticut, and Hartford is one of the world's largest insurance centers, with the home offices of many insurance companies located in the city. In 1614, Adriaen Block, a Dutchman, sailed through Long Island Sound and discovered the Connecticut River. The Dutch built a small fort in 1633 on the site of present-day Hartford, but they abandoned it in 1654 as English settlers moved into the area in increasing numbers. Edward Winslow of Plymouth Colony was apparently the first Englishman to visit (1632) Connecticut, and in 1633 members of the Plymouth Colony established a trading post on the site of WINDSOR. This small Pilgrim enterprise was soon absorbed by Puritan settlers from the Massachusetts Bay Company. These settlers had been attracted to the area by the excellent reports brought back by one of their members, John Oldham, in 1633. Oldham returned to the Connecticut area in 1634 and established still another trading post, which became WETHERSFIELD. The following year Puritans flocked in great numbers to the Connecticut valley. In 1636, Thomas Hooker and his congregation left Newtown (present-day Cambridge, Mass.) and settled near the Dutch trading post that had been established on the site of present-day Hartford. Although some of the migrants, like Hooker, had chafed under the restrictive laws of the Massachusetts Bay colony, it was the desire for more and better land rather than religious differences that prompted the Puritan migration. Their departure was without bitterness, and the Connecticut venture had the official blessing of the Massachusetts Bay colony. Land was purchased

from the natives, who were on the whole friendly. The PEQUOT INDIANS resisted white settlement, but they were defeated by the English under John Mason (c 1600–1672) and John Underhill (c 1597–1672) in the short Pequot War of 1637. Not until King Philip's War in 1675–76 was there further serious trouble with the Indians. In 1638–39 representatives of the three Connecticut River towns—Hartford, Windsor, and Wethersfield—met at Hartford and formed the colony of Connecticut. They also adopted the FUNDAMENTAL ORDERS, which established a government for the colony. Under these statutes any householder who had taken a Trinitarian oath of fidelity to the commonwealth was admitted to the town meeting, which acted on local affairs and voted for deputies to the colony's General Court. However, "admitted inhabitants" could not themselves be deputies unless the General Court or a magistrate considered them worthy to be "freemen," and probably less than a third achieved that distinction. Those freemen elected to the General Court, which met at Hartford, chose the magistrates, one of whom was selected to be governor (John Haynes was the first). The governor had to be a member of some approved congregation, and his authority was dwarfed by the great power of the General Court, which exercised both legislative and judicial functions. A second colony, Saybrook, had been established at the mouth of the Connecticut River in 1635 by a group of Englishmen. The colony's founders (who included Viscount Saye and Sile and Baron Brooke, for whom the colony was named) subsequently became embroiled in politics at home during the ENGLISH CIVIL WAR (1642–52) and sold the Saybrook settlement to Connecticut colony in 1644. Connecticut's population expanded gradually, and by 1662 the colony included over a dozen towns, including Saybrook, NEW LONDON, FAIRFIELD, and NORWALK as well as East Hampton and Southampton on Long Island. Another Puritan settlement, New Haven, was established in 1638. It was not connected with Connecticut colony. Theophilus Eaton and John Davenport, a pastor, were the leaders of the settlement, which was initially founded as a trade center. New Haven was an extreme Puritan theocracy. Its freemen, unlike those of Connecticut colony, had to be church members, and a select group among them formed the General Court, which drew up the settlement's laws. New Haven was unique among the Puritan colonies in denying its people trial by jury. The towns of Milford, Guilford, Stamford, Southold (on Long Island), and Branford were dominated by New Haven and in 1643 formed with the mother town a loose confederation called New Haven colony. In 1643, New Haven and Connecticut colonies joined with Massachusetts Bay colony and Plymouth colony to form the NEW ENGLAND CONFEDERATION, a loose union for mutual defense against attack by Indians or by the Dutch who at that time still maintained a fort in the Hartford area. In 1660 the restoration of Charles II to the English throne caused alarm in the New Haven and Connecticut settlements because neither colony had obtained a charter for its establishment and thus had no legal standing in England as colonies. Connecticut sent its governor, John Winthrop (1606–76), to London to secure a royal charter for the colony. In 1662, Winthrop obtained the charter, by which Connecticut not only won its legal right to exist as a corporate colony but also acquired New Haven. Most of the towns within the New Haven colony quickly affirmed the union, but New Haven itself bitterly resisted absorption until, faced with the even more unpleasant prospect of becoming part of the proprietary grant to the west given (1664) to the duke of York, it formally submitted on Jan. 5, 1665. The duke of York surrendered his claim to New Haven in return for the Long Island towns formerly incorporated into the New Haven colony. Connecticut's size varied little after that time, though there were boundary squabbles with Massachusetts, Rhode Island, and New York for many years thereafter. Connecticut's new charter confirmed the Fundamental Orders and subsequent laws so that government went on much as before, except for a brief interruption from 1687 to 1689 when the English tried to assert control over the colony and dispatched an administrator, Sir Edmund Andros, to Connecticut. Andros sought to recover the charter from the colonists, who hid it in an oak tree that came to be known as the Charter Oak. In 1708, Congregationalism was established as the official religion of the colony by the Saybrook Platform, and a modified Presbyterian type of church government was adopted. In 1708 the General Court also passed a limited toleration act, and later the Angli-

cans (1727), the Baptists, and the Quakers (1729) were exempted from contributing to the support of the Established Church. However, other dissenting groups that lacked the political influence in England possessed by the Anglican, Baptist, and Quaker sects were treated harshly. Connecticut thus occupied a position midway between the more autocratic ecclesiastical system of Massachusetts and the liberal one of Rhode Island. Nevertheless religious harmony generally prevailed until the 1730s, when the GREAT AWAKENING split the Congregational Church into radical and conservative factions. Connecticut's agrarian economy was gradually being transformed, as a small but vigorous merchant class arose. Most of Connecticut's trade, which was based on the exportation of agricultural products and the importation of manufactured goods, was controlled by New York and Boston merchants. Connecticut's ports on Long Island Sound, however, maintained commercial relations with the West Indies, and the colony came to resent England's increasingly burdensome commercial and colonial policy. The years from 1750 to 1776 saw much bitter disagreement between radicals and conservatives in the colony, and in 1766 the radicals managed to oust the governor, Thomas Fitch, and four of his assistants. The conservatives never recovered their power in colonial days. Most of the conservative Congregationalists ultimately supported the patriot cause, but the Anglicans made up the bulk of the state's die-hard Tories. In 1776, the patriot governor, Jonathan Trumbull, was re-elected almost unanimously (Connecticut and Rhode Island were the only colonies privileged to elect their chief executives), and he was the only governor of any colony to be retained in office after the outbreak of the American Revolution. There was little fighting in Connecticut during the Revolution—skirmishes at Stonington (1775), Danbury (1777), New Haven (1779), and New London (1781)—but the state was the principal supply area for the Continental Army. After the war the state relinquished (1786) to the United States its claims to western land, except the WESTERN RESERVE, an area in present-day Ohio. The claim was retained until part of the land was given to Connecticut citizens in 1792 and the remainder sold in 1795. In 1799, Connecticut's long dispute with Pennsylvania over the WYOMING VALLEY was finally settled. Connecticut was one of the first states to approve the Federal Constitution (see FEDERAL CONSTITUTIONAL CONVENTION). The Embargo Act of 1807, passed during the administration of Thomas Jefferson, was vehemently denounced throughout New England, the ports on Long Island Sound and on the Connecticut River had developed a lively carrying trade with which the embargo interfered. The War of 1812 was also so unpopular that New England Federalists, meeting at the HARTFORD CONVENTION in late 1814, considered secession. Soon thereafter, in early 1815, the war was ended and the Federalist party subsequently declined as a result of its participation in the Hartford Convention, which some considered to have been a treasonable meeting. In 1818 the Jeffersonians came into power in the state, and a new constitution, replacing the old charter of 1662, was adopted. It disestablished the Congregational Church and greatly extended the franchise, although universal manhood suffrage was not proclaimed until 1845. Meanwhile, after Connecticut's shipping industry had been ruined by the embargo and the war, the state turned to manufacturing. Artisans and craftsmen had become increasingly numerous in late colonial days, and from native iron ore Connecticut forges had produced guns for the patriot soldiers. Modern mass production had its beginning in the state when Eli Whitney, probably the best known of Connecticut's inventors, established (1798) at New Haven a firearms factory that began making guns with standardized, interchangeable parts. Earlier, in 1793, he had invented and manufactured the cotton gin at New Haven. The manufacture of notions (buttons, pins, needles, metal goods, and clocks) gave rise to the enterprising "Yankee peddler," who, with horse and team, covered the nation hawking his wares. Connecticut's insurance industry also developed during this period, and in 1810 the Hartford Fire Insurance Company was established. Connecticut, which had placed limitations on slavery in 1784 and abolished it in 1848, supported the Union during the Civil War with nearly 60,000 troops and an able Secretary of the Navy, Gideon Welles. During and after the war, industry expanded greatly. Immigration provided a cheap labor supply as English, Scottish, and many Irish immigrants, who had arrived in large numbers even before the war, were followed by French Canadians and, in the late 19th and early

20th cent., by Italians, Poles, and others. During World Wars I and II Connecticut prospered, providing munitions and other supplies for the war effort. However, between the two wars the Great Depression left many unemployed in the state. Connecticut's industries have continued to grow and develop since the end of World War II, and in 1954 the world's first nuclear-powered submarine was launched at Groton. Prior to 1965, Connecticut's constitution provided for a bicameral legislature with a house of representatives elected on the basis of geographical distribution. No town or city had less than one or more than two representatives, thus the larger cities were underrepresented. The 1965 constitution remedied this situation by providing for the election of both houses of the general assembly, as the legislature is called, on the basis of election districts apportioned according to population. Connecticut's state senate has 36 members and its house of representatives has 177, members of both houses are elected for two-year terms. The state executive branch is headed by a governor elected for a term of four years, Ella T. GRASSO, a Democrat, was elected governor in 1974. Connecticut is represented in the U.S. Congress by six Representatives and two Senators and has eight electoral votes. In recent decades political power in the state has generally shifted back and forth between Democrats and Republicans. The Connecticut shore is a popular summer resort area, and the protected waters of Long Island Sound lure boating enthusiasts to the state. Another prominent summer attraction is the Stratford Shakespeare Festival, which has been operating since 1965. Institutions of higher learning in Connecticut include Yale Univ., at New Haven, Trinity College, at Hartford, Wesleyan Univ., at Middletown, the Univ. of Connecticut, at Storrs, and the UNITED STATES COAST GUARD ACADEMY and Connecticut College, at New London. See *Federal Writers' Project, Connecticut: A Guide to Its Roads, Lore, and People* (1938), Stewart H. Holbrook, *The Yankee Exodus* (1950), Albert E. Van Dusen, *Connecticut* (1961), R. J. Purcell, *Connecticut in Transition 1775–1818* (1963), J. Niven, *Connecticut for the Union* (1965), R. L. Bushman, *From Puritan to Yankee* (1967), William S. Bixby, *The Connecticut Guide* (1974).

Connecticut, river, longest river in New England, 407 mi (655 km) long, rising in Connecticut Lakes, N. N. H., and flowing S along the Vt.-N. H. line, then across Mass. and Conn. to enter Long Island Sound at Old Saybrook, Conn., drains c 11,000 sq mi (28,500 sq km). There are many rapids and falls on the river, Holyoke Falls, the highest, drops 57 ft (17 m). The river is navigable to Hartford, Conn. The Connecticut Valley is one of the best agricultural regions in New England. World-famous cigar binder and wrapper tobacco are grown in the lower part of the valley, truck farming and dairying are also important. Waterpower resources led to the rise of industrial cities in the 1800s, and the valley became a major manufacturing region, large centers include Holyoke and Springfield, Mass., and Windsor, Conn. There are several hydroelectric facilities on the river. Floods and hurricanes caused great damage in the valley in 1938 and 1953, in the latter year, the Connecticut River Flood Control Compact was established and has since sponsored the building of flood-control devices on the river.

Connecticut, University of, mainly at Storrs, coeducational, land grant and state supported, chartered and opened 1881 as Storrs Agricultural School. It became a college in 1893 and a university in 1939. The schools of medicine, law, insurance, and social work are in Hartford. There are two-year branch campuses at Hartford, Waterbury, Stamford, Groton, and Torrington. The Storrs Agricultural Experiment Station is noteworthy.

Connecticut College, at New London, coeducational, chartered 1911 (as Thames College, name changed the same year to Connecticut College for Women), opened 1915. In 1959 men were admitted for graduate work and the school became known by its present name. In 1969 the undergraduate college became coeducational. A 313-acre (127-hectare) arboretum and a plant hormone laboratory are noteworthy.

Connecticut Reserve. see WESTERN RESERVE

Connecticut Wits or Hartford Wits, an informal association of Yale students and rectors formed in the late 18th cent. At first they were devoted to the modernization of the Yale curriculum and declaring the independence of American letters. In their political views they were conservative Federalists, and they attacked their more liberal opponents in jointly

written satirical verses—*The Anarchiad* (in the *New Haven Gazette*, 1786–87), *The Political Greenhouse* (in the *Connecticut Courant*, 1799), and *The Echo* (in the *American Mercury*, 1791–1805). Members of the group at various times were Joel Barlow, Timothy Dwight, David Humphreys, John Trumbull, Lemuel Hopkins, Richard Alsop, and Theodore Dwight. See studies by V. L. Parrington (1926, repr. 1969) and Leon Howard (1943).

connective tissue, supportive tissue widely distributed in the body, characterized by large amounts of intercellular substance and relatively few cells. The intercellular material, or matrix, is produced by the cells and gives the tissue its particular character. Connective tissue is diversified in function and may be divided into four categories according to the type of matrix. In connective tissue proper (which forms the framework for most organs) the matrix is soft. In CARTILAGE it is firm but flexible. The intercellular substance of BONE, which is high in mineral salts, is rigid. BLOOD and lymph have a fluid matrix. Three kinds of fibers generally form the supportive material in connective tissue proper. White, or collagenous, fibers vary in size and are composed of fine, parallel fibrils; reticular fibers are small, branching fibers that take on a meshlike pattern, yellow, or elastic; fibers are highly flexible and are capable of branching and anastomosing (or opening) directly into one another. Loose, or areolar, connective tissue is composed of all three of the above fibers; it supports most of the organs in the body and is widely distributed under the skin. The type of connective tissue that forms TENDONS, LIGAMENTS, and FASCIA is composed mainly of collagenous fibers. It is known as compact tissue. Reticular connective tissue forms the bone marrow and the framework for lymphoid tissue. Adipose, or fat, tissue serves as a cushion for various organs and as a fat reservoir. The colored area of the eye, or iris, is composed of pigmented connective tissue.

Connellsville, city (1970 pop. 11,643), Fayette co., SW Pa., on the Youghiogheny River in the Allegheny Mts., settled c. 1770, inc. as a borough 1806, as a city 1911. A major producer of coal and coke, the city also has railroad shops, its manufactures include glass, iron, and steel products. The attack upon Henry C. Frick by the anarchist Alexander Berkman occurred (1892) in Connellsville during the HOMESTEAD STRIKE. A branch of Pennsylvania State Univ. is just south of the city.

Connelly, Marc (Marcus Cook Connelly), 1890–, American dramatist, b. McKeesport, Pa. He is best known for his folk play *The Green Pastures* (1930), a fantasy of Biblical history presented in terms of the life of the Southern Negro; it was based on Roark Bradford's book *Ol' Man Adam an' His Chillun* (1928). Connelly also collaborated with George S. Kaufman on the plays *Dulcy* (1921), *To the Ladies* (1922), *Merton of the Movies* (1922), and *Beggar on Horseback* (1924). At the age of 74 Connelly published his first novel, *A Souvenir from Quam* (1965), which satirizes spy stories. See his memoirs (1968).

Connemara (kōnəmar'ə), wild, mountainous region, Co. Galway, W. Republic of Ireland, lying between the Atlantic Ocean and Loughs Corrib and Mask. There are many mountains, lakes, streams, and glens. It is a well-known vacation area. Most of the villages are found along the coast. Clifden is the chief town. The peat bogs of S. Connemara are major fuel sources. Particularly famous is the hardy breed of ponies peculiar to the region.

Connorsville, city (1970 pop. 17,604), seat of Fayette co., E. central Ind., on the Whitewater River, in a farm area, founded 1813 by John Connor (who had been kidnapped from his white parents and raised by Indians), inc. as a city 1870. Nearby are a bird sanctuary of the state Audubon Society, a state park, and several historic covered bridges.

Connolly, Cyril, 1903–74, English critic and editor. He began his career as a journalist. With Stephen SPENDER he founded *Horizon* (1940–49), a small literary magazine that reflected Connolly's own iconoclastic and mordant attitudes toward contemporary society. Among his works are *Rock Pool* (1935), a satirical novel that ranks with the best of Huxley and Waugh, *Enemies of Promise* (1938), an autobiography of ideas, *The Unquiet Grave* (1944), a potpourri of critical commentaries and aphorisms, *The Condemned Playground* (1945) and *Previous Convictions* (1964), both collections of literary essays, and *The Modern Movement: 100 Key Books From England, France, and America, 1880–1950* (1965).

Connolly, James, 1870–1916, Irish nationalist and socialist. An advocate of revolutionary SYNDICALISM, he went (1903) to the United States, where he

helped to organize the Industrial Workers of the World (IWW). Returning to Ireland, he became an organizer of the Belfast dock workers. He helped James LARKIN to organize the Irish Transport and General Workers Union and, during the great lock-out of the Dublin transport workers in 1913, organized a citizen army. Convinced that the triumph of Irish nationalism was a prerequisite for the success of Irish socialism, he joined the Easter Rebellion of 1916. He was wounded, court-martialed, and executed. See two selections from his writings *Socialism and Anatomy* (with intro and notes by Desmond Ryan, 1948) and *The Workers' Republic* (ed. by Desmond Ryan, 1951), biography by C. D. Greaves (1972).

Connolly, Maureen, 1934–1969, American tennis player, b. San Diego, Calif. She became, at 16, the youngest player to win the U.S. national singles. She successfully defended the U.S. title (1952, 1953), won the Wimbledon championship (1952, 1953, 1954), and completed a grand slam of the world's four major titles in 1953 with the French and Australian championships. Little Mo, as she was known, was one of America's greatest woman tennis players. She broke her leg in a horseback accident and was forced to retire (1955).

Connor, Ralph: see GORDON, CHARLES WILLIAM

Conon, 3d cent. B.C., Greek astronomer and mathematician of Samos. He traveled in the western part of the Greek world making astronomical observations, then settled at Alexandria. He was a student of solar eclipses and discovered the constellation Coma Berenices. His mathematical studies included an investigation of conic intersections.

Cononiah (kōn'ōn'ā), Levite of Hezekiah's reign. 2 Chron. 31:12, 13.

Conowingo Dam (kōn'awīng'gō), 4,648 ft (1,417 m) long, 102 ft (31 m) high, on the Susquehanna River, NE Md., completed 1928. It is one of the largest nonfederal hydroelectric power plants in the United States, with a 474,480-kw capacity. Conowingo Lake, formed by the dam, extends 14 mi (23 km) upstream.

conquistador (kōnkwis'tādōr, Span. kōng-kē'-stādōr'), military leader in the Spanish conquest of the New World in the 16th cent. FRANCISCO PIZARRO, the conqueror of Peru, and Hernán CORTÉS, the conqueror of Mexico, were the greatest of the conquistadors. The name is frequently used to mean any daring, ruthless adventurer. See Paul Horgan, *Conquistadors in North American History* (1963), F. A. Kirkpatrick, *The Spanish Conquistadores* (2d ed. 1967).

Conrad I, d. 918, German king (911–18). As duke of Franconia he distinguished himself by military exploits and in 911 was elected successor to LOUIS THE CHILD by the Franconian, Saxon, Bavarian, and Swabian lords. Although supported by the bishops, he was unable to maintain strong central government. His reign was plagued by feuds and rebellions by the great feudal lords. Lorraine broke away and acknowledged CHARLES III of France, the Swabians continued warfare till Conrad's death, the duke of Bavaria, expelled, returned successfully. Conrad's most able foe was Henry the Fowler, duke of Saxony. Despite the enmity, Conrad's own deathbed advice was that Henry succeed him. Henry was elected (919) as HENRY I. Conrad's failure to avert the continued Hungarian invasions and his alienation of the nobility increased provincial autonomy and almost dissolved the kingdom.

Conrad II, c. 990–1039, Holy Roman emperor (1027–39) and German king (1024–39), first of the Salian dynasty of the Holy Roman Empire. With the end of the Saxon line on the death of HENRY II, the succession passed to the matrilineal descendants of OTTO I, and Conrad, a Franconian noble, was elected (1024) as German king. Although the hereditary principle in Germany was strong enough to secure his election, it did not ensure Conrad support throughout the empire. His accession was contested by his stepson, Ernest of Swabia, and by the Lotharingians (see LOTHARINGIA) and the Italians. After the collapse of the revolts of Ernest and the Lotharingians, Conrad brought N. Italy into submission (1026–27) and was crowned emperor at Rome. He suppressed two more revolts (1027, 1030) by Ernest and won (1031) Lusatia from Poland. In 1034 he annexed the kingdom of Burgundy (see ARLES KINGDOM) under the terms of a treaty (1006) between Rudolf III, last independent king of Arles, and Holy Roman Emperor Henry II. In 1036, Conrad returned to Italy, where war was raging between the greater and the lesser nobles. He deposed Archbishop Anbert of Milan, a

powerful ally of the great nobles, and made the fiefs of the lesser nobles hereditary by issuing (1037) the Constitution of Pavia. In Germany also Conrad favored the small nobility, thus reversing the policy of Otto I and Henry II, who had depended for support on the Church. He promoted the servile classes to administrative office, thus building a new hereditary class of *ministeriales* to replace the ecclesiastics in the civil service. Conrad's administration was economical, and he encouraged commerce by granting market and mint privileges. At his death, his son HENRY III ascended the throne at the height of its wealth and power.

Conrad III, c. 1093–1152, German king (1138–52), son of Frederick, duke of Swabia, and Agnes, daughter of Holy Roman Emperor Henry IV, first of the HOHENSTAUFEN dynasty. He joined his brother Frederick, who had been defeated in the imperial election of 1125 by Lothar of Saxony (Holy Roman Emperor LOTHAR II), in rebelling against Lothar. Set up as antiking to Lothar in 1127, he went to Italy (1128) and, despite excommunication by Pope Honorius II, was crowned king at Milan. He subsequently failed to make any progress as king and submitted to Lothar in 1135. After Lothar's death he was elected king by the nobles and ecclesiastics who were afraid to increase the power of Lothar's son-in-law, HENRY THE PROUD of Bavaria. Conrad deprived Henry of his duchies, giving Saxony to ALBERT THE BEAR and Bavaria to Leopold of Austria. A civil war broke out and was continued after Henry's death by his brother Guelph (or Welf) and the Saxons, who supported Henry's young son HENRY THE LION. From this strife emerged the opposing parties of the Guelphs and the Ghibellines, representing the Hohenstaufen. A short-lived truce was made in 1142. At Christmas, 1146, Conrad was induced by St. Bernard of Clairvaux to join in the Second Crusade (see CRUSADES) with Louis VII of France. He left in 1147, took part in the unsuccessful siege of Damascus, and returned in 1149. Conrad was never crowned by the pope, and therefore was not confirmed as Holy Roman emperor. His ambitions for the imperial crown and against Roger II of Sicily were thwarted by Guelph, who was subsidized by Roger, and by Henry the Lion, who claimed the duchy of Bavaria. Conrad was succeeded by his nephew, Holy Roman Emperor Frederick I.

Conrad IV, 1228–54, German king (1237–54), king of Sicily and of Jerusalem (1250–54), son of Holy Roman Emperor FREDERICK II. He was elected (1237) king of the Romans at his father's instigation after Frederick had deposed Conrad's older brother Henry in Germany. Archbishop Siegfried II of Mainz was regent for Conrad until 1241, when he was replaced by Henry Raspe, count of Thuringia. The struggle for supremacy between Frederick and Pope INNOCENT IV resulted in the election (1246) of Raspe as antiking at the behest of the pope. Germany was plunged into disorder, after Raspe's death (1247) WILLIAM, COUNT OF HOLLAND became antiking. When Frederick II died (1250) Conrad carried on the struggle with the pope, who was determined to bring about the downfall of the house of HOHENSTAUFEN and to rule in Italy. In 1251, Conrad went to Italy in order to subdue the pope's supporters. He had some successes, but Innocent IV refused to give up his scheme for papal control in Italy. He offered the crown of Sicily to RICHARD EARL OF CORNWALL, and to Charles of Anjou (later CHARLES I, king of Naples and Sicily), who both refused, and to King Henry III of England for his second son, Edmund. He accepted. In 1254 Conrad was excommunicated. Just as war was about to erupt he died of fever. It was left for his son, CONRADIN, to witness the final downfall of the house of Hohenstaufen.

Conrad, d. 1192, Latin king of Jerusalem (1192), marquis of Montferrat, a leading figure in the Third Crusade (see CRUSADES). He saved Tyre from the Saracens and became (1187) its lord. In 1189 he joined GUY OF LUSIGNAN at the siege of AKKO, but a year later he sought to displace Guy as king of Jerusalem. To establish a claim to the crown he married Isabella, daughter of Amalric I. A compromise (1191) between the two men was short-lived. In 1192, Conrad was acknowledged as king, but a few days later he was assassinated, probably by Muslim fanatics. The royal title passed to the two later husbands of his widow—Henry, count of Champagne (1192–97), and AMALRIC II.

Conrad, Joseph, 1857–1924, English novelist, b. Poland, originally named Josef Teodor Konrad Walecz Korzeniowski. He is considered one of the greatest novelists and prose stylists in English literature. In 1874, Conrad went to sea and later joined (1878) an

English merchant ship, becoming (1884) a master mariner as well as a British citizen. Retiring from the merchant fleet in 1894, he began his career as a novelist, and all of his novels are written in English, an acquired language. His notable early works include *The Nigger of the Narcissus* (1897), *Lord Jim* (1900), and the novellas *Youth* (1902), *Heart of Darkness* (1902), and *Typhoon* (1903). The novels *Nostromo* (1904), *The Secret Agent* (1907), *Under Western Eyes* (1911), and *Chance* (1913) are regarded by many as Conrad's greatest works. Of his later works, *Victory* (1915) is the best known. He also collaborated on two novels with Ford Madox Ford, *The Inheritors* (1901) and *Romance* (1903). Marked by a distinctive, opulent prose style, Conrad's novels combine realism and romanticism. Their backgrounds shift from the sea to politics to society. Conrad was a genius in the creation of atmosphere and character, the impact of various situations was augmented by his expert use of symbolism. He portrayed acutely the conflict between primitive cultures and modern civilization and was particularly adept at delineating people suffering from isolation, loneliness, and moral deterioration. See his complete works (26 vol., 1924-26), biographies by Jocelyn Baines (1960) and Ford Madox Ford (1965), studies by Richard Curle (1968), J. A. Palmer (1968), and Bruce Johnson (1971), bibliography by T. G. Ehrsam (1969).

Conrad, Michael Georg (mikh'äel gä'örk lön'rät), 1846-1927, German critic and novelist. With Karl Bleibtreu, he founded (1885) the journal *Gesellschaft* as a rallying point for German writers of the naturalistic school. Conrad espoused the cause of Zola with great enthusiasm. His works include a volume of criticism, *Madame Lutetia* (1883), and a naturalistic novel of Munich life, *Was die Isar rauscht* [What the Isar murmurs] (1887).

Conradin (kôn'radin), 1252-68, duke of Swabia, titular king of Jerusalem and Sicily, the last legitimate HOHENSTAUFEN, son of Holy Roman Emperor CONRAD IV. While Conradin was still a child in Germany, his uncle MANFRED made himself (1258) king of Sicily. When Manfred died the kingdom was seized (1266) by CHARLES I (Charles of Anjou). Young Conradin went to Italy in an attempt to recover his kingdom. Several cities rallied to his support, but he was defeated (1268) by Charles at Tagliacozzo. He was captured and executed at Naples.

Conrad of Marburg, d. 1233, German churchman. He was confessor (1225-31) of St. ELIZABETH of Hungary and administrator of her husband's benefices in his absence. His zeal against heresy earned him appointment (1231) as first papal inquisitor in Germany. His harshness made him much disliked, and he was murdered.

Conrad the Red, d. 955, duke of Lotharinga (Lorraine) (944-53). A Franconian adherent of the German king Otto I (later Holy Roman emperor), he was made duke of Lotharinga and married Otto's daughter Liutgard. He accompanied (951) his father-in-law to Italy against BERENGAR II. Remaining in Italy as Otto's representative, he concluded a peace treaty with the defeated Berengar Otto, however, considered the treaty too lenient and drastically revised it. The discontented Conrad then led a revolt against Otto with Otto's son, Ludolf, and Frederick, archbishop of Mainz. Expelled (953) from his duchy, Conrad allied (954) with the Hungarians, who were invading the empire. When the invasion united the people behind Otto, Conrad submitted. He fought with valor under Otto at the Lechfeld but was killed in the battle.

Conrad von Hotzendorf, Franz, Graf (fränts graf kôn'rät fän hö'tsändörf), 1852-1925, Austro-Hungarian field marshal. He served (1906-11, 1912-17) as chief of staff and led the Austro-Hungarian armies in World War I. After his dismissal in 1917 because of his opposition to the peace plans of Emperor Charles I, he held (1917-18) an Austro-Hungarian command on the Italian front. See his memoirs (5 vol., 1921-25).

Conroe (kôn'rō), city (1970 pop. 11,969), seat of Montgomery co., SE Texas, inc. 1885. Long a pine-lumbering town, it prospered after oil was discovered there in 1932. The Conroe oil field is now one of the major producing fields in the state. Other natural resources in the area are timber, clays, and gas. Farm products include beef and dairy cattle and feed for livestock and poultry.

Consalvi, Ercole (ärkö'lä kōnsäl'vë), 1757-1824, Italian cardinal and papal diplomat. In his first term (1800-1806) as secretary of state for Pope Pius VII he negotiated the CONCORDAT OF 1801 with Napoleon Bonaparte (later Emperor Napoleon I). Despite Con-

salvi's astute diplomacy, Napoleon annexed the papal states in 1809. Consalvi was compelled to go to Paris, where his refusal to attend Napoleon's second marriage (1809) resulted in exile at Reims. Reinstated as secretary of state after Napoleon's second abdication (1814), Consalvi vainly struggled against reactionary elements to reform the administration of the Papal States.

consanguinity (kōn'säng-gvīn'itē), state of being related by blood or descended from a common ancestor. This article focuses on legal usage of the term as it relates to the laws of marriage, descent, and inheritance, for its broader anthropological implications, see INCEST. Consanguinity is to be distinguished from affinity, which is the relation of a person, through marriage, to the consanguineous relatives of his spouse. Marriage between persons in lineal consanguinity (persons in the direct line of descent, such as father and daughter) and between brothers and sisters is void under common law, church law, and under statute. Whether or not marriages between persons of collateral consanguinity (those having a common ancestor but not related in direct line of descent) are prohibited as incestuous depends on statutory provision and judicial interpretation. In more than half the states of the United States, marriage between first cousins is prohibited by law, and the Roman Catholic Church and the Orthodox Eastern Church have strict rules on consanguinity as an impediment to marriage. Statutes in the United States discard affinal relationship as an impediment to marriage. Whether incestuous marriages are void or voidable in the United States depends on local statutes and their interpretation. In the law of descent and inheritance, the concept of consanguinity is most important in the area of intestate succession. Most states award the wife of a man who dies intestate a certain share of the estate, even though there exists neither lineal nor collateral consanguinity between the spouses. See G. B. L. Arner, *Consanguineous Marriages in the American Population* (1908, repr. 1969), B. D. Inglis, *Family Law* (2d ed., 2 vol., 1968-70).

Conscience, Hendrik (hën'drik kōnsēāns'), 1812-83, Flemish novelist, a founder of modern Flemish literature. His many historical novels were romantic but powerful, in the tradition of Scott, outstanding is *De Leuw van Vlaenderen* (1831, tr. *The Lion of Flanders*, 1885). In later years Conscience devoted his talents to moralistic social novels and idealized stories of Flemish village life. Among these are *The Poor Nobleman* (1851, tr. 1856) and *Ricke tickle tack* (1851, tr. 1856). His work enjoyed a great vogue in the United States in the late 1800s.

conscience, sense of moral awareness or of right and wrong. The concept has been variously explained by moralists and philosophers. In the history of ETHICS, the conscience has been looked upon as the will of a divine power expressing itself in man's judgments, an innate sense of right and wrong resulting from man's unity with the universe, an inherited intuitive sense evolved in the long history of the human race, and a set of values derived from the experience of the individual. Psychologists also differ in their analyses of the nature of conscience. It is variously believed to be an expression of values differing from other expressions of value only in the subject matter involved, a feeling of guilt for known or unknown actions done or not done, the manifestation of a special set of values introjected from the example and instruction of parents and teachers, and the value structure that essentially defines the personality of the individual. As a practical matter, the consciences of different people within a society or from different societies may vary widely.

conscientious objector, person who, on the grounds of conscience, resists the authority of the state to compel military service. Such resistance, emerging in time of war, may be based on membership in a pacifistic religious sect, such as the Society of Friends (Quakers), the Dukhobors, or Jehovah's Witnesses, or on personal religious or humanitarian convictions. Political opposition to the particular aim of conscription, such as that maintained by the Copperheads during the Civil War, by radical groups during World War I and, to a more limited extent, during World War II, and by large numbers during the Vietnam War, is usually considered in a separate category. The problem of conscientious objectors, although present in different forms since the beginning of the Christian era, became acute in World Wars I and II because of the urgent demands for manpower of the warring governments. The United States and Great Britain allowed members of recognized pacifistic religious groups to substitute

for combat service: (1) noncombatant military service, (2) nonmilitary activity related to the war effort, or (3) activity considered socially valuable. Pacifists without recognized claim to exemption were liable to harsher treatment, and about 5,000 conscientious objectors were imprisoned in the United States between 1940 and 1945. The postwar Selective Service Act, passed in 1948 and amended in 1951, required that conscientious objection be based on religious belief and training that included belief in a Supreme Being. In 1970 the Supreme Court removed the religious requirement and allowed objection based on a deeply held and coherent ethical system with no reference to a Supreme Being. In 1971 the Supreme Court refused to allow objection to a particular war, a decision affecting thousands of objectors to the Vietnam War. Some 50,000-100,000 men are estimated to have left the United States to avoid being drafted to serve in that war. See G. C. Field, *Pacifism and Conscientious Objection* (1945), M. Q. Sibley and P. E. Jacob, *Conscription of Conscience* (1952, repr. 1965), Lillian Schlissel, ed., *Conscience in America* (1968), G. C. Zahn, *War, Conscience, and Dissent* (1967), Michael Ferber and Staughton Lynd, *The Resistance* (1971).

consciousness, in psychology, a term commonly used to indicate a state of being aware of the environment. In Freudian psychology, conscious behavior largely includes cognitive processes of the ego, such as thinking, perception, and planning, as well as some aspects of the superego, such as conscience. Other activities, such as those stemming from primitive and instinctive needs, are under UNCONSCIOUS control. In this view, all behavior has an unconscious aspect. Some psychologists deny the distinction between conscious and unconscious behavior, others use the term consciousness to indicate all the activities of an individual that constitute the personality. See also DEFENSE MECHANISM, PSYCHOANALYSIS.

conscription, compulsory enrollment of personnel for service in the armed forces. Although obligatory service in the armed forces existed in ancient Greece and Rome and during the Middle Ages in Europe, conscription in the modern sense of the term dates from the French Revolution, when the idea was introduced that every able-bodied man in a nation was a potential soldier and that he could by means of conscription be made to serve in the armed forces, the militia of Greece and Rome, though compulsory, were organized at local levels for brief periods of time. Conscription enabled Napoleon to mold his tremendous fighting forces, and compulsory peacetime recruitment was introduced (1811-12) by Prussia. Mass armies, raised at little cost by conscription, led to the mass warfare of the Napoleonic Wars. The institution of conscription, which was increasingly justified by statesmen on grounds of national defense and economic stimulation, spread to other European nations in the 19th cent. In England compulsory military service was employed in the Anglo-Saxon fyrd as early as the 9th cent., this arrangement, however, was always at a local level and when the British Empire began expanding after the 16th cent., professional soldiers were relied upon. At the outbreak of World War I, Great Britain adopted conscription and used it again in World War II, it was abolished in 1962. Though little used in the United States prior to the Civil War, conscription was used by both sides in that war. Conscription, or the draft, was not used again until World War I (see SELECTIVE SERVICE). Peacetime conscription was introduced in 1940, and draftees fought in World War II, the Korean War, and the Vietnam War. During the Vietnam War conscription became a highly controversial issue, it was abolished by Congress in 1973. All major military powers of the 20th cent. have used conscription as a means of raising their armed forces. Conscription differs from IMPRESSMENT, which is the forcible mustering of recruits. Largely strongarm in technique, impressment preceded conscription historically and though for a time it was a means of enforcing conscription it has generally passed from use.

consecration* see ORDERS HOLY

consent, in law, active acquiescence or silent compliance by a person legally capable of consenting (see AGE OF CONSENT). It may be evidenced by words or acts or by silence when silence implies concurrence. Actual or implied consent is necessarily an element in every CONTRACT and every agreement. In criminal charges, the consent of the party injured (if not obtained by FRAUD or DURESS) is a defense for the accused, unless a third party or the state is injured.

conservation, in art see ART CONSERVATION AND RESTORATION

conservation laws, in physics, basic laws that together determine which processes can or cannot occur in nature, each law maintains that the total value of the quantity governed by that law, e.g., mass or energy, remains unchanged during physical processes. Conservation laws have the broadest possible application of all laws in physics and are thus considered by many scientists to be the most fundamental laws in nature. Most conservation laws are exact, or absolute, i.e., they apply to all possible processes, a few conservation laws are only partial, holding for some types of processes but not for others. By the beginning of the 20th cent. physics had established conservation laws governing the following quantities: energy, mass (or matter), linear MOMENTUM, angular momentum, and electric charge. When the theory of RELATIVITY showed (1905) that mass was a form of energy, the two laws governing these quantities were combined into a single law conserving the total of mass and energy. With the rapid development of the physics of ELEMENTARY PARTICLES during the 1950s, new conservation laws were discovered that have meaning only on this subatomic level. There are three absolute laws relating to the creation or annihilation of particles belonging to three different groups: the BARYON class of particles and the electron and muon families of particles in the LEPTON class. According to these conservation laws, particles of a given group cannot be created or destroyed except in pairs, where one of the pair is an ordinary particle and the other is an ANTIPARTICLE belonging to the same group. Two partial conservation laws that have been discovered for particles, governing the quantities known as strangeness and isotopic spin. Strangeness is conserved during the so-called strong interactions and the electromagnetic interactions, but not during the weak interactions associated with particle decay, isotopic spin is conserved only during the strong interactions. One very important discovery has been the link between conservation laws and basic symmetries in nature. For example, empty space possesses the symmetries that it is the same at every location (homogeneity) and in every direction (isotropy), these symmetries in turn lead to the invariance principles that the laws of physics should be the same regardless of changes of position or of orientation in space. The first invariance principle implies the law of conservation of linear momentum, while the second implies conservation of angular momentum. The symmetry known as the homogeneity of time leads to the invariance principle that the laws of physics remain the same at all times, which in turn implies the law of conservation of energy. The symmetries and invariance principles underlying the other conservation laws are more complex, and some are not yet understood. Three special conservation laws have been defined with respect to symmetries and invariance principles associated with inversion or reversal of space, time, and charge. Space inversion yields a mirror-image world where the "handedness" of particles and processes is reversed, the conserved quantity corresponding to this symmetry is called space parity, or simply PARITY, P . Similarly, the symmetries leading to invariance with respect to time reversal and charge conjugation (changing particles into their antiparticles) result in conservation of time parity, T , and charge parity, C . Although these three conservation laws do not hold individually for all possible processes, the combination of all three is thought to be an absolute conservation law, known as the CPT theorem, according to which if a given process occurs, then a corresponding process must also be possible in which particles are replaced by their antiparticles, the handedness of each particle is reversed, and the process proceeds in the opposite direction in time. It is expected that further research will discover more conservation laws and reveal their basis in fundamental symmetries of the physical world. Thus, conservation laws provide one of the keys to our understanding of the universe and its material basis. See K. W. Ford, *The World of Elementary Particles* (1963), I. J. Sakurai, *Invariance Principles and Elementary Particles* (1964), R. P. Feynman, *The Character of Physical Law* (1967), Martin Gardner, *The Ambidextrous Universe* (1967), *Right, and the Fall of Parity* (rev. ed. 1969), W. L. Scott, *History of Science Library: Conflict Between Atomism and Conservation Theory 1644-1860* (1970).

conservation of natural resources, the wise use of the earth's resources by man. The term conservation came into use in the late 19th cent. and referred

to the management, mainly for economic reasons, of such valuable natural resources as timber, fish, game, topsoil, pastureland, and minerals, and also to the preservation of forests (see FORESTRY), wildlife (see WILDLIFE REFUGE), parkland, WILDERNESS, and WATERSHED areas. In recent years the science of ECOLOGY has clarified the workings of the BIOSPHERE, i.e., the complex interrelationships among man, other animals, plants, and the physical environment. At the same time burgeoning population and industry and the ensuing POLLUTION have demonstrated how delicately balanced ecological relationships are and how easily they can be disrupted (see AIR POLLUTION, WATER POLLUTION, SOLID WASTE). Today, conservation of natural resources is embraced in the much broader conception of conserving the earth itself by protecting its capacity for self-renewal. Particularly complex are the problems of nonrenewable resources such as oil and coal (see ENERGY, SOURCES OF) and other minerals in great demand. Conservation practice was first included in U.S. government policy with the creation in 1871 of a U.S. commissioner of fish and FISHERIES. The Forestry Bureau of the Dept. of Agriculture created the first national forest reserve in 1891. The Irrigation Division in the U.S. Geological Survey developed into the Bureau of Reclamation. The Geological Survey has cataloged and classified the resources of the public domain. In 1906 an act protected the Alaskan fisheries. Conservation as part of a total approach to the use of natural resources was first introduced by President Theodore Roosevelt and his chief forester, Gifford Pinchot. They popularized the philosophy of conservation, inspired a widespread movement, and gave impetus to much legislation. In 1907, President Roosevelt appointed the Inland Waterways Commission, which emphasized the connection between forests, water supply, and stream flow. In 1909 he appointed the National Conservation Commission, which published the first inventory of the country's natural resources. Roosevelt in 1907 also began to withdraw large areas of Western public land from sale and settlement, so that their resources might be investigated, and he also set apart forest reserves, following the example of President Cleveland. Approximately one fifth of all standing timber is held by the government. Reclamation of eroded lands, begun in 1880, was aided by the Newlands Act of 1902, withdrawing areas of water supply from future settlement. In 1920 the development of water power on navigable streams was placed under the control of the Federal Power Commission. The National Park Service was created in 1916. In the 1930s the erosion of much arable land in the Midwest revealed the need for land reclamation and for conservation in general. The National Industrial Recovery Act of 1933 contained provisions for conservation. The Civilian Conservation Corps, founded in 1933 to relieve unemployment, furnished the personnel for many conservation projects. The Tennessee Valley Authority, set up in 1933, was an outstanding attempt to apply principles of conservation, soil reclamation, and electrification to an entire area. The New Deal era as a whole was outstanding for legislation on conservation. By 1960 the Soil Conservation Service, established in 1935, covered 95% of all farms and ranches in the United States. By the same year, under the Conservation Reserve Program, some 28 million acres of cropland had been returned to grass and forest cover. Throughout the 1950s attention was focused on the problem of conservation of water resources, particularly in the Southwest. In the 1960s pollution problems came to the fore in all industrialized countries. In the United States numerous laws were passed to protect the environment and its resources (see ENVIRONMENTALISM). In 1972 the United Nations held a conference on the human environment in Stockholm that drew up conservation principles for all nations. The UN Conference on the Law of the Sea, begun in 1974, will attempt to establish guidelines for conserving the food and mineral resources of the earth's oceans and the seabed. See Frank Graham, Jr., *Man's Dominion: The Story of Conservation in America* (1971), David W. Ehrenfeld, *Conserving Life on Earth* (1972).

conservation of wildlife, see WILDLIFE REFUGE, ENDANGERED SPECIES, CONSERVATION OF NATURAL RESOURCES

conservatism, in politics, the desire to maintain, or conserve, the existing order. Conservatives value highly the wisdom of the past and are generally opposed to widespread reform. Modern political conservatism emerged in the 19th cent. in reaction to the overwhelming political and social changes associated with the eras of the French Revolution and

the Industrial Revolution. By 1850 the term *conservatism*, probably first used by Chateaubriand, was generally used to define the politics of the RIGHT. The original tenets of European conservatism had already been formulated by Edmund BURKE, Joseph de MAISTRE, and others. They emphasized preserving the power of king and aristocracy, maintaining the influence of landholders against the rising industrial bourgeoisie, limiting suffrage, and continuing ties between CHURCH AND STATE. From the conservative view that social welfare was the responsibility of the privileged stemmed the passage of much humanitarian legislation, in which English conservatives usually led the way. In the late 19th cent. great conservative statesmen, notably Benjamin DISRAELI, exemplified the conservative tendency to resort to moderate reform in order to preserve the foundations of the established order. By the 20th cent. conservatism was being redirected by erstwhile liberal manufacturing and professional groups who had achieved many of their political aims and had become more concerned with preserving them from attack by groups not so favored by the political and social system. The new conservatism lost its predominantly agrarian and semifeudal bias, and accepted democratic suffrage, advocated economic LAISSEZ FAIRE, and opposed extension of the welfare state. This form of conservatism is best seen in highly industrialized nations, where it has been flexible and receptive to moderate change. Conservatism should therefore be distinguished both from a reactionary desire for a past age and the radical right-wing ideology of FASCISM and National Socialism. See Peter Viereck, *Conservatism: From John Adams to Churchill* (1956), Russell Kirk, *The Conservative Mind* (rev. ed. 1960), C. L. Rossiter, *Conservatism in America* (2d ed. 1962).

Conservative party, British political party. The Conservatives are a continuation of the historic TORY party. The name was used by George Canning as early as 1824 and was first popularized by John Wilson Croker in the *Quarterly Review* in 1830. The REFORM BILL of 1832, which created some 500,000 new middle-class voters, marked the advent of the new party. The 19th-century Conservatives, like their Tory predecessors, were defenders of the established Church of England. They supported aristocratic government and a narrow franchise. They attempted, by passing factory acts and moderating the poor law of 1834, to ease hardships stemming from the Industrial Revolution, but they had no comprehensive plan to cope with its widespread dislocations. They were stronger in rural than in urban areas and were defenders of agricultural interests. Sir Robert PEELE, in his *Tamworth Manifesto* (1834) and after, attempted to make the party attractive to the new business classes. But his repeal (1846) of the CORN LAWS brought about an angry reaction from protectionist agricultural interests, led by Lord George Bentinck and Benjamin DISRAELI, and resulted in a party split. The "Peelites" eventually merged with the LIBERAL PARTY, and the Conservatives were hampered by the loss to the Liberals of able young leaders like William Gladstone. In the heyday (1846-73) of free trade and anti-imperial sentiment, the Conservatives were out of office, except for three brief ministries, until the Disraeli government of 1874-80. Disraeli's strong imperialism and his wooing of a broadened electorate with plans for reform, a program known as "Tory democracy," was attractive in a period of depression and increasing imperial competition. After the Reform Bill of 1884 campaign organizations like the Primrose League and the development of the caucus gave the Conservatives greater solidarity and cohesion. They gained additional strength as a result of the secession (1886) from the Liberal party of the Liberal Unionists, who, like the Conservatives, opposed HOME RULE for Ireland. (In 1912 the Liberal Unionists formally merged with the Conservative party.) The party was in office under the 3d marquess of SALISBURY (1886-92, 1895-1902) and Arthur BALFOUR (1902-5). Efforts by Lord Randolph CHURCHILL to implement further domestic reforms in the tradition of Tory democracy were unsuccessful under Salisbury's leadership, but the popular imperialistic emphasis remained. In this period the party was gradually drawing closer to middle-class business interests, but the insistence of Joseph CHAMBERLAIN on a program of tariff reform, including imperial preference, split the party and resulted (1906) in failure at the polls. Conservatives were next in office as part of the coalition government during World War I.

The Modern Conservative Party. In 1922 the Conservatives refused to continue the coalition, and under

Andrew Bonar LAW they emerged victorious at the polls. With the Liberals in decline and the LABOUR PARTY still developing, the Conservatives entered a period of almost continuous hegemony. They held office from 1922 to 1929, interrupted only by a brief Labour ministry in 1924. They were the dominant power in the National governments of Ramsay MACDONALD (1931-35), Stanley BALDWIN (1935-37), and Neville CHAMBERLAIN (1937-40). Under the long leadership of Baldwin (1922-37), the party spoke for the interests of business, the aristocracy, the professional and white-collar classes, and farmers. They lost prestige by the failure of the appeasement policy of Chamberlain toward Nazi Germany, but the country rallied to his successor, Sir Winston CHURCHILL. Triumph in war preceded electoral defeat (1945), owing to popular demand for urgently needed social reform, which the Conservatives would not carry through. Returning to office (1951) under Churchill, the Conservatives displayed a sense of pragmatic modernity in accepting many of the social reforms instituted by the Labour government. The party's majority in the House of Commons was increased in 1955, and Sir Anthony EDEN became (1955) prime minister upon Churchill's retirement. Popularity diminished temporarily during the SUEZ CANAL crisis, but favorable economic conditions and the political skill of Harold MACMILLAN, who headed the government after Eden's retirement (1957), resulted in a solid electoral victory in 1959. Under the leadership of Sir Alec DOUGLAS-HOME, who succeeded Macmillan (1963), the party lost narrowly to the Labour party in 1964, and then, with Edward HEATH as leader, it lost again in 1966. Returning to power in 1970, Heath and the Conservatives faced the problems of a stagnant economy and a declining international political position. The party, in response, moved to curb the power of trade unions and encouraged more economic self-reliance. In foreign affairs, it continued the policy of restricting Great Britain's Commonwealth and international roles while expanding ties with Western Europe, as demonstrated by Britain's entry (1973) into the European Common Market. In Feb., 1974, in the middle of a severe economic crisis and a confrontation with striking coal miners, whose wage demands the government considered inflationary, Heath called a general election, in which the Conservatives lost their majority in the House of Commons. Since Labour did not win a majority either (although it secured more seats), Heath at first sought to remain in office by forming a coalition government with the Liberals. The Liberals, however, refused to participate in such a government, thus forcing Heath's resignation. The Conservatives lost again in the election of Oct., 1974. See studies by Arthur Bryant (1929) and R. B. McDowell (1959), R. T. McKenzie, *British Political Parties* (2d ed. 1963), J. D. Hoffman, *The Conservative Party in Opposition, 1945-51* (1964), E. J. Feuchtwanger, *Disraeli, Democracy and the Tory Party* (1968), Robert Blake, *The Conservative Party from Peel to Churchill* (1970).

Consett, urban district (1971 pop. 35,391), Durham, NE England. There are coal mines, iron and steel plants, and nurseries in Consett. The district has associations with the Roman, Saxon, and Norman conquests. A German colony of swordmakers settled in Consett in the 17th cent.

Conshohocken (kōn'shahōk'an), industrial borough (1970 pop. 10,195), Montgomery co., SE Pa., on the Schuylkill River, in a fertile farm area that also has clay pits, inc. 1850.

Considérant, Victor Prosper (vēktōr' prōspār' kōnsédārān'), 1808-93, French socialist, follower of Charles FOURIER. In 1837, at the death of Fourier, he became the acknowledged leader of Fourierism. He edited Fourierist newspapers, including the *Philantropie* and the *Phalange*, and published works on the subject, notably a digest of Fourier's writings, *Destinée sociale* (2d ed. 1847-49). As a member of the national assembly, he took part in the JUNE DAYS insurrection (1848) and was forced to leave Paris and live in Belgium. At the request of Albert Brisbane, Considérant tried unsuccessfully to establish (1855-57) a Fourierist colony in Texas. His several books include *Principes du socialisme* (1847), an argument favoring Fourierism over other kinds of socialism. See biography by Maurice Dommanget (1929).

consideration, in law see CONTRACT

consols, contraction of consolidated annuities, a bond issue designed to consolidate two or more outstanding issues, used in reference to British government stock. Public borrowing began in England with the establishment of the Bank of England and the national debt (1693-94), and the growth of the

debt produced a confusing variety of stocks. Prime minister Henry Pelham began to consolidate existing stocks in 1751. The consolidated stocks had a fixed rate of interest, or annuity, payable by the Bank of England, with premiums to be paid if the market conditions justified such payments. Consols bore no maturity date and were redeemable on call by the government. During the late 19th and early 20th cent., consols constituted the major part of the national debt and were thus a reliable index to the state of national credit.

conspiracy, in law, agreement of two or more persons to commit a criminal or otherwise unlawful act. At COMMON LAW, the crime of conspiracy was committed with the making of the agreement, but present-day statutes require an overt step by a conspirator to further the conspiracy. It is not necessary for guilt that the act be fully consummated. Many acts that would not be criminal if accomplished by an individual alone may nevertheless be the object of a conspiracy. With the rise of the labor movement in the 19th cent., British and American courts used this against unions; courts held that while an individual employee might lawfully abstain from work, the concerted stoppage of a group of employees, as in a strike, might be criminal. In 1875, Britain passed a law exempting unions from prosecution for conspiracy, and in 1932 the U.S. Congress passed a law that limited the power of Federal courts to restrain union activity. Other controversial aspects of conspiracy laws include the modification of the rules of EVIDENCE and the potential for a dragnet. A statement of a conspirator in furtherance of the conspiracy is admissible against all conspirators, even if the statement includes damaging references to another conspirator, and often even if it violates the rules against hearsay evidence. The conspiracy can be proved by circumstantial evidence. Any conspirator is guilty of any substantive crime committed by any other conspirator in furtherance of the enterprise. It is a Federal crime to conspire to commit any activity prohibited by Federal statute, whether or not Congress imposed criminal sanctions on the activity itself. An individual injured by a conspiracy may sue the conspirators to recover damages. See P. W. Winfield, *The History of Conspiracy and Abuse of Legal Procedure* (1921), Milton Handler, *Contract, Combination or Conspiracy* (1953).

Constable, Henry, 1562-1613, English poet. After graduating from Cambridge in 1580 he went to Paris, where the atmosphere was more congenial for one of Roman Catholic faith. There he wrote *Diana* (1592), a volume of sonnets. In addition he was the author of four pastorals that appeared in *England's Helicon* (1600) and *Spiritual Sonnets* (1815). Constable's work is considered to have had an important influence on the development of the sonnet.

Constable, John, 1776-1837, English painter, b. Suffolk. Constable and Turner were the leading figures in English landscape painting of the 19th cent. Constable became famous for his landscapes of Suffolk, Hampstead, Salisbury, and Brighton. The son of a prosperous miller, he showed artistic talent while very young but did not devote himself to art until he was 23, when he went to London to study at the Royal Academy. Influenced by the 17th-century landscape painters Ruisdael and Claude Lorrain, his poetic approach to nature paralleled in spirit that of his contemporary, the poet Wordsworth. Constable's direct observations of nature and his free use of broken color were extraordinary in his day. He received but modest recognition in England, being tardily admitted to the Royal Academy in 1829. His work was more popular in France. In 1824, his *View on the Stour* (1819) and *The Hay Wain* (1821, National Gall., London) were exhibited at the Salon in Paris, winning gold medals. His work made a profound impression on the French romantics including the young Delacroix and Bonington. Later his painting affected the Barbizon school and, more indirectly, the general course of French 19th-century landscape art. Today he is especially admired for the spontaneous, vigorous, and very complete sketches made as preparatory exercises for large paintings (e.g., *Weymouth Bay*, National Gall., London). In the United States he is represented in the Metropolitan Museum and the Frick Collection, New York City, and in the galleries of Philadelphia, Toledo, and Chicago. Splendid examples of his work are contained in the National Gallery, London and the Victoria and Albert Museum. See catalogue of the latter collection by Graham Reynolds (1960), C. R. Leslie, *Memoirs of the Life of John Constable* (enl. ed. 1937), collections of his letters by P. Holmes (1931) and R. B. Beckett (1962), biography by Basil

Taylor (1973), studies by Sir C. J. Holmes (1902) and Carlos Peacock (rev. ed. 1972).

Constance, 1154-98, Holy Roman empress, wife of Holy Roman Emperor HENRY VI, daughter of King Roger II of Sicily. She was named heiress of Sicily by her nephew King William II. On his death, however (1189), the Sicilian nobles, wishing to prevent German rule in Sicily, chose Constance's nephew TANCRED of Lecce as William's successor. Henry VI conducted an unsuccessful campaign (1191) against Tancred during which Constance was captured but soon released. After Tancred's death (1194) Henry was crowned king of Sicily. When he died (1197) all of Italy revolted against German rule. In order to save the throne of Sicily for her infant son Frederick (later Holy Roman emperor as FREDERICK II), Constance renounced the German kingship for Frederick and had him crowned (1198) king of Sicily. She was regent for her son, before her death she named Pope Innocent III his guardian.

Constance, Ger. *Konstanz*, city (1970 pop. 61,160), Baden-Württemberg, 5 West Germany, on the Rhine River at the western end of the Lake of Constance (Bodensee), and near the Swiss border. Its manufactures include textiles, chemicals, and electrical equipment. The city is also a tourist center. Constance was founded as a Roman fort in the 4th cent. A.D. and became an episcopal see at the end of the 6th cent. The bishops became powerful and held large territories, including much of Baden-Württemberg and Switzerland, as princes of the Holy Roman Empire. In Constance in 1183, Emperor Frederick I recognized the LOMBARD LEAGUE. Located on a trade route between Germany and Italy, Constance became a free imperial city in 1192. During the Council of Constance (1414-18), John Huss was burned at the stake. In 1531 the city, which had accepted the Reformation, joined the Schmalkaldic League. Emperor Charles V, after defeating the League, deprived Constance of its free imperial status and gave it to his brother, later Emperor Ferdinand I. Constance was in Austrian hands from 1548 until it was ceded (1805) to Baden. The bishopric was suppressed in 1821, and the diocese was abolished in 1827. Among the numerous historic buildings in Constance are the cathedral (11th cent., additions 15th and 17th cent.), the Council building (1388), and a former Dominican convent (now a hotel), the birthplace (1838) of Graf von Zeppelin, the soldier and aviator. Constance is the seat of a university.

Constance, Council of, 1414-18, council of the Roman Catholic Church, some of its sessions being reckoned as the 16th ecumenical council. It was summoned to end the Great Schism (see SCHISM, GREAT) in which three men were claiming to be pope—GREGORY XII (since recognized as canonical pope), John XXIII (see COSSA, BALDASSARRE), and Benedict XIII (see LUNA, PEDRO DE). Reform of Christian life and extirpation of heresy were also aims of the convocation, which was called by John at the insistence of Holy Roman Emperor SIGISMUND. Sigismund chose Constance, an imperial city, as the meeting place. During the council enormous crowds visited the city, there was much pageantry. The first session was in Nov., 1414, the 45th and last was on April 22, 1418. The council was dominated by theologians, especially French, who held the conciliar theory (i.e., that councils held supreme power in the church and that even the pope was subject to their edicts) that had appeared at the Council of Pisa (see PISA, COUNCIL OF). Instead of the traditional assembly of bishops, the council was organized as a convention of nations (German, Italian, French, and English, the Spanish entered later), each nation having one vote. The decisions were made in caucuses of the nations between sessions. The convention declared in the Articles of Constance (April 6, 1415) that it was an ecumenical council and supreme in the church. Next it declared John deposed (May 29, 1415). Gregory XII, meanwhile, sent legates with a formal decree to convene a council, this was accepted by the convention, which then ceremonially declared the council convened, at the same time Gregory resigned the papacy (July 4, 1415). Benedict provided a hard problem, he would abdicate only if allowed to name his successor. At last, after a trial held in his absence, he was deposed (July 26, 1417). This ended the schism. An elaborate method of electing the new pope was adopted, and the conclave soon agreed on MARTIN V (Nov. 11, 1417). The council, however, had already provided a plan to perpetuate its rule over the church by calling for frequent councils, furthermore, the modest reforms enacted by the council seemed designed to limit the pope's power of taxation and to protect the interests of the national clergy. Martin agreed to all

enactments of the council—except, Catholic theologians argue, the council's extreme claim to supremacy—and signed concordats embodying these reforms with Germany, England, and the Latin countries. John Huss and Jerome of Prague were tried and burned at the stake for heresy. St. Bridget of Sweden was canonized. The conciliarists John Gerson and Pierre d'Ailly were among the figures prominent at the council. Church theologians tend to regard as ecumenical in character only those sessions of the council meeting after the convocation by Gregory XII, or the sessions following the election of Martin V. See E. F. Jacob, *Essays in the Conciliar Epoch* (rev. ed. 1963); Brian Tierney, *Foundations of Conciliar Theory* (1955); L. R. Loomis, *The Council of Constance* (1961).

Constance, Lake of, Ger. Bodensee, lake, 208 sq mi (539 sq km), bordering on Switzerland, West Germany, and Austria. It is 42 mi (68 km) long and has a maximum depth of 827 ft (252 m). The lake is fed and drained by the Rhine River and divides near the city of Constance into two arms, Untersee and Überlinger See. The main body of the lake is called the Obersee. Fruit is grown on the lake's fertile shores, and wine making and fishing are major industries. The chief towns and cities of the lake are Constance, Friedrichshafen, and Lindau, all in West Germany; Bregenz in Austria; and Rorschach in Switzerland. Remains of lake dwellings have been found.

Constans I (kōn'stānz), b. 320 or 323, d. 350, Roman emperor, youngest son of Constantine I. At his father's death in 337 he received Italy and Africa as well as Pannonia and Dacia, while his brothers, Constantine II and Constantius II, received other portions of the empire. Trouble arose among them, and in 340 Constantine invaded Italy to win some of Constans' territory. Constantine was, however, killed in an ambush, and Constans was left to rule until his extortionist and infamous conduct led to his assassination 10 years later.

Constans II (Constans Pogonatus), 630-68, Byzantine emperor (641-68), son and successor of Constantine III and grandson of Heraclius I. Early in his reign Armenia and Asia Minor were invaded by the Muslims, who challenged Byzantine supremacy at sea, took Cyprus, and threatened Sicily and Constantinople. An able and vigorous ruler, he sought to end the religious controversy centering about MONOTHEISM by issuing a decree (648) forbidding its discussion. This involved him in conflict with Pope MARTIN I, whom he finally had arrested and banished. Constans campaigned (658) in the Balkans against the Slavs, and in 662 he moved to Italy, with the purpose of establishing his capital at Rome, but fought with little result against the Lombards and finally settled (663) at Syracuse. From there he directed a successful resistance to the Muslims. Constans extended the administrative reorganization of the empire begun by HERACLIUS. Assassinated, he was succeeded by his son, Constantine IV.

Constant, Benjamin (Henri Benjamin Constant de Rebecque) (aNRē' baNzhamaN' kōNstaN' də rabēk'), 1767-1830, French-Swiss political writer and novelist, b. Lausanne. His affair (1794-1811) with Germaine de Staël turned him to political interests. He accompanied her to Paris in 1795 and served (1799-1801) as a tribune under the first consul, Napoleon. When Mme de Staël was expelled (1802), however, he went into exile with her, spending the following 12 years in Switzerland and Germany. In 1813 he published a pamphlet attacking Napoleon and urging constitutional government and civil liberties. On Napoleon's return from Elba, however, Constant accepted office under him. After Napoleon's final defeat at Waterloo and the restoration of the Bourbons, Constant continued his political pamphleteering, calling for a constitutional monarchy. He served (1819-22, 1824-30) in the chamber of deputies. Constant gained a great reputation as a liberal publicist, and his funeral (shortly after the July Revolution, 1830, which he had supported) was the occasion for great demonstrations. His most important work, the introspective and semi-autobiographical novel, *Adolphe* (1816, tr. 1959), is highly regarded for its style. Parts of his correspondence and journals have been published, the latter as *Le Journal intime* (1887-89) and *Le Cahier rouge* [the red notebook] (1907). The discovery of an unfinished novel, *Cécile* (1951, tr. 1953), has contributed to a new appreciation of Constant's literary merit. See studies by E. W. Schermerhorn (1924, repr. 1970), Harold Nicolson (1949), and W. W. Holdheim (1961).

Constant, Paul Henri Benjamin, baron d'Estournelles de, see ESTOURNELLES DE CONSTANT

Constanța (kōnstan'tsa), city (1970 est. pop. 172,000), SE Rumania, on the Black Sea. It is the administrative center of DOBRUJA and a major railroad junction and industrial city, but its chief importance derives from its role as Rumania's main seaport. Petroleum (brought by pipeline from the Ploiești oil fields), grain, and lumber are the leading exports. Besides handling general overseas trade, Constanța is important in the transit traffic with Hungary and Czechoslovakia. It also serves as Rumania's major naval and air base and as a seaside resort. The city was founded in the 7th cent. B.C. as the Greek colony of Tomi and came under Roman rule in 72 B.C. Ovid lived in exile there. Constantine I (4th cent. A.D.) named the city Constantiniana and made it an episcopal see. It was captured by the Turks in 1413. Rumania acquired it in 1878. There are several synagogues and mosques, an Orthodox cathedral, and a statue of Ovid, as well as many Roman and Byzantine remains. The regional archaeological museum and the marine biology station are also of interest.

Constant de Rebecque, Henri Benjamin: see CONSTANT, BENJAMIN

Constantine I or Constantine the Great (kōn'stāntēn, -tīn), 288?-337, Roman emperor, b. Naissus (present-day Nis, Yugoslavia). He was the son of CONSTANTIUS I and St. HELENA and was named in full Flavius Valerius Constantinus. When his father was made caesar (subemperor), Constantine was left at the court of the emperor DIOCLETIAN, where he was under the watchful eye of GALERIUS, who was caesar with Constantius. When Diocletian and MAXIMIAN resigned in 305, Constantius and Galerius became emperors. Constantius requested that Constantine be sent to him in Britain, and Galerius reluctantly complied. Constantius died at York the next year. There, his soldiers proclaimed Constantine emperor, but much rivalry for the vacated office ensued. In Italy, MAXENTIUS, supported by the Romans and by his father Maximian, vied with SEVERUS and Galerius Constantine, accepting the lesser title of caesar from Galerius, remained aloof while Maxentius and Maximian defeated Severus and Galerius. Constantine made an alliance with Maximian, marrying Maximian's daughter Fausta and recognizing Maxentius after a fashion. When Maximian, in dispute with his son, fled to Constantine, Constantine received and sheltered him until Maximian, in an attempt to regain the throne, undertook (310) a revolt against Constantine's rule in Gaul. Unsuccessful against Constantine, Maximian was forced to commit suicide. Constantine, having already declared against Maxentius and ignoring the fact that Galerius had recognized LICINIUS in the East, now considered himself emperor. When Galerius died in 310, still another claimant to the imperial throne appeared in MAXIMIN (d. 313), who allied himself with Maxentius against the alliance of Licinius and Constantine. While Licinius attacked Maximin, Constantine moved into Italy against Maxentius. The rivals for Italy met (312) at the Milvian or Mulvian Bridge over the Tiber near Rome. Before the battle Constantine, who was already sympathetic toward Christianity, is said by Eusebius of Caesarea to have seen in the sky a flaming cross inscribed with the words, "In this sign thou shalt conquer." He adopted the cross and was victorious. Maxentius was routed and killed. The battle is regarded as a turning point for Christianity. In 313 Constantine and his fellow emperor, Licinius, met at Milan and there issued the so-called Edict of Milan, confirming Galerius' edict of 309, which stated that Christianity would be tolerated throughout the empire. The edict in effect made Christianity a lawful religion, although it did not, as is sometimes believed, make Christianity the official state religion. No longer having Maximin to contend with, Licinius challenged Constantine, and a brief struggle followed. Constantine, victorious, took (315) control over Greece and the Balkans, and the uneasy peace that followed lasted until 324, when Licinius again vied with Constantine. This time Licinius lost his throne and ultimately his life. Constantine was now sole ruler of the empire, and in a reign of peace he set about rebuilding the strength of old Rome. Constantine continued to tolerate paganism and even to encourage the imperial cult. At the same time, however, he endeavored to unify and strengthen Christianity. In 314 he convened a synod at Arles to regulate the Church in the West, and in 325 he convened and presided over a council at Nicaea to deal with the troubles over Arianism (see NICAEA FIRST COUNCIL OF). Thus Constantine evolved the idea of the ecumenical COUNCIL. In 330 he moved the capital to Byzantium, which was rebuilt as CONSTANTINOPE, a city predominantly Chris-

tian and dedicated to the Virgin. He seems to have favored compromise with Arianism, and in 335, in defiance of the Council of Tyre, he exiled St. ATHANASIUS. As the founder of the Christian empire, Constantine began a new era. He was an absolute ruler, and his reign saw the culmination of the tendency toward despotic rule, centralized bureaucracy, and separation of military and civil powers evolved by Diocletian. Constantine's legal reforms were marked by great humanity, perhaps a result of Christian influence. Though he had done much to unify the empire, at his death Constantine divided it again, providing for his three surviving sons and also to some extent for the sons of his half brother. These nephews were soon killed (though others, notably Julian the Apostate, survived), but complex contests ensued between Constans I, Constantine II, and Constantius II. Historians differ greatly in their assessments of Constantine's motives and the depth of his Christian conviction. Early Christian writers portray him as a devout convert, although they have difficulty explaining his execution in 320 (on adultery charges) of Crispus, his son by his first wife, and FAUSTA, his wife. Some later historians see him as a political genius, expeditiously using Christianity to unify his empire. An intermediate interpretation pictures him as a pagan gradually converted to Christianity (he was baptized on his deathbed), using his new belief for personal ends much as earlier emperors had used the imperial cult. The chief contemporary historians of Constantine's reign are Lactantius and Eusebius. See biographies by Norman H. Baynes (1931, repr. 1972), L. B. Holsapple (1942), A. H. M. Jones (rev. ed. 1962), John Holland Smith (1971), and F. G. Slaughter (1972); C. B. Coleman, *Constantine the Great and Christianity* (1914); G. P. Baker, *Constantine the Great and the Christian Revolution* (1930, repr. 1967).

Constantine II, 316-40, Roman emperor, son of Constantine I. When the empire was divided at the death (337) of Constantine I, among the brothers Constantius II, Constans I, and Constantine II, Constantine II received Britain, Gaul, and Spain. Maintaining that he had been cheated, he demanded some of the territory given Constans I. In an invasion of Italy intended to win some of that territory, he was killed in an ambush.

Constantine IV, c. 652-685, Byzantine emperor (668-85), son and successor of Constans II. He defended Constantinople against the annual naval attacks of the Muslims, who finally withdrew in 678. GREEK FIRE was a conspicuous weapon in the defense. Severely defeated (679) by the Bulgars, Constantine ceded them territory S of the Danube, where they founded a kingdom. In 680 he summoned the Third Council of Constantinople, which briefly reestablished peace between the Eastern and Western churches by condemning MONOTHEISM. Constantine was succeeded by his son, Justinian II.

Constantine V (Constantine Copronymus), 718-75, Byzantine emperor (741-75), son and successor of LEO III. An able general and administrator, he fought successfully against the Arabs, Slavs, and Bulgars, improved the water supply of Constantinople, forcibly resettled the city after a great plague, and continued his father's financial and religious policies. In 754 he summoned a synod at Constantinople, which sustained ICONOCLASM. He rigidly enforced a decree forbidding the use of images in worship, and he opposed monasticism. A serious result of this policy was the loss of Rome and, ultimately, of Italy to the Byzantines. Pope Zacharias broke with Constantine, and Pope Stephen II placed Rome under the protection of PEPIN THE SHORT. Constantine was succeeded by his son Leo IV.

Constantine VI, b. c. 770, Byzantine emperor (780-97), son and successor of LEO IV. His mother, IRENE, was regent until 790, when she was deposed by a military revolt. Constantine recalled her in 792 and made her joint ruler. His subsequent acts of cruelty and his divorce and immediate remarriage (795) alienated his supporters. In 797, Irene deposed her son, had him blinded, and assumed the imperial title. Constantine died in obscurity during the reign (820-29) of Michael II. In his minority the Second Council of Nicaea, which restored icon veneration, took place (787). Constantine fought indecisively against the Bulgarians and the Arabs.

Constantine VII (Constantine Porphyrogenitus), 905-59, Byzantine emperor (913-59). He acceded after the brief reign of his uncle Alexander, who succeeded Constantine's father, LEO VI. A regency (913-20) was followed by the rule (920-44) of the usurper ROMANUS I. In 945, Constantine expelled the sons of Romanus and began his personal rule. His main in-

terests lay in legal reforms, in the fair redistribution of land among the peasants, and in the encouragement of art and learning. He was succeeded by his son, Romanus II. See study by Arnold Toynbee (1973).

Constantine XI (Constantine Palaeologus), d. 1453, last Byzantine emperor (1449–53), brother and successor of John VIII. To secure Western aid against the Turkish assault on what remained of the empire, he proclaimed (1452) the union of the Western and Eastern Churches. No help came, however, and in 1453 Constantine, with some 8,000 Greeks, Venetians, and Genoese, faced 150,000 Turkish besiegers under Sultan Muhammad II. After almost two months of heroic defense, directed by the emperor, the city and the empire fell. Constantine died fighting with the last of his men.

Constantine I, 1868–1923, king of the Hellenes, eldest son of George I, whom he succeeded in 1913. Married to Sophia, sister of the German emperor William II, he opposed the pro-Allied policy of the Greek premier, Eleutherios VENIZELOS, and was forced to abdicate in 1917 under Allied military pressure. His second son, ALEXANDER, succeeded to the throne. Recalled (1920) on Alexander's death, he continued the war against Turkey, although the Allies withdrew their support from Greece. The Turkish victory at Izmir caused a military rebellion, and Constantine in 1922 was again deposed and exiled. His eldest son, George II, succeeded. Constantine is also known as Constantine XII.

Constantine II, 1940–, king of the Hellenes, also known as Constantine XIII. He was appointed regent in 1964 and succeeded to the throne the same year on the death of his father, King Paul I. In 1967, after a military junta had seized political power in Greece, Constantine made an abortive attempt to overthrow the generals. When the coup failed, he and his family fled into exile. The junta declared him formally deposed in June, 1973, and established a republic. In Dec., 1974, after the overthrow of the junta, the Greek voters chose not to restore the monarchy.

Constantine (Konstantin Pavlovich) (kənstāntyēn' pāv'levich), 1779–1831, Russian grand duke, second son of Czar Paul I and brother of Alexander I and Nicholas I. On the death of Alexander I (1825), Constantine was next in line for succession to the throne. However, in 1822 he had secretly renounced his claim in favor of Nicholas in return for Alexander's permission to divorce his first wife and marry a Polish countess. The arrangement was not made public and some confusion resulted concerning the succession. A group known as the DECEMBRISTS took advantage of the situation and attempted to seize power under the slogan "Constantine and Constitution." Nicholas quelled the uprising. During the entire episode Constantine remained in Poland, where he had been commander in chief and virtual governor since 1815. The severity of his administration there led to the Polish uprising of 1830. Constantine died before the rebellion was suppressed.

Constantine, d. 411, Roman general. He was proclaimed emperor by the Roman troops in Britain in 407 and led a revolt in Gaul and Spain against the Western emperor Honorius. He conquered part of Gaul and, through his son Constans, took Spain. Constantine forced recognition from Honorius as joint emperor, but his triumph was short. The counter-revolt of GERONTIUS halted him, and he was defeated by Honorius' general Constantius (later Emperor CONSTANTINUS III). Constantine was beheaded. His withdrawal of Roman troops from Britain had greatly weakened the Roman hold on that island.

Constantine, Learie (kōn'stāntīn'), 1902–71, West Indian cricket player and the first black man to sit in the British House of Lords, b. Trinidad. The son of a sugar plantation foreman, he became world famous as a cricket player in the 1920s and 30s. He settled in England (1929), and after World War II studied law and was called to the bar. Returning to Trinidad, he began a career in public service, first as minister of works and transport and then as Trinidad's high commissioner in London (1962–64). He was knighted in 1962 and raised to the peerage in 1969.

Constantine (kōn'stāntēn), ancient Cirta, city (1966 pop. 253,649), capital of Constantine dept., NE Algeria, on the gorge of the Rhumel River. A major inland city, it is the railhead of a prosperous and diverse agricultural area. Constantine is also a center of the grain trade and has flour mills, a tractor factory, and industries producing textiles and leather goods. Products made by local artisans are economically important. Founded by Carthaginians (who called it Sarim Batim), Constantine became

the capital and commercial center of Numidia and was named Cirta [the city]. Under Roman rule it was a major grain-shipping point and one of the wealthiest cities of Africa. Destroyed (A.D. 311) during the war preceding the accession of Constantine I, it was rebuilt by Constantine himself and renamed in his honor. The city was pillaged by the Vandals in the 5th cent. and later became an object of contention among various Muslim dynasties. The Turks captured it in the 16th cent. and made it a provincial capital. By the time of the French conquest in 1837 the district governor of Constantine had become virtually independent of the Ottoman Empire. Modern Constantine is the seat of a Roman Catholic bishop, a university, and a Muslim school of higher education.

Constantine, Donation of, Lat. *Donatio Constantini*, also called the *Constitutum Constantini*, forged document, probably drafted in the 8th cent. It purported to be a grant by Roman Emperor Constantine I of great temporal power in Italy and the West to the PAPACY. Its purpose was apparently to enhance papal territorial claims in Italy by giving them greater antiquity. The document also recognized the spiritual authority of the popes, but this statement had no weight, since at no time was it argued in the Roman Catholic Church that spiritual authority could emanate from the emperor. It was not, as a matter of fact, ever of great practical value, nor was it, as is sometimes asserted, universally accepted in the Middle Ages. It owes its great fame to the fact that the scholar Lorenzo VALLA demonstrated the falsity of the document by critical methods that became the model for later textual criticism and are said by some to be the beginning of modern textual criticism. See Lorenzo Valla, *Treatise on the Donation of Constantine* (tr. by C. B. Coleman, 1922, repr. 1971).

Constantine Nikolayevich (nēkōlāyá'vich), 1827–92, grand duke of Russia, brother of Czar Alexander II. Constantine supported all the reforms instituted by his brother, who gave him command of the fleet and made him governor general of Poland in 1862. There his conciliatory policy could not prevent the insurrection of 1863 against Russian rule. He resigned and in 1865 was appointed president of the state council. He retired from state service in 1881.

Constantine the Great: see CONSTANTINE I, Roman emperor.

Constantinople, former capital of the BYZANTINE EMPIRE and of the OTTOMAN EMPIRE, since 1930 officially called Istanbul (for location and description, see ISTANBUL). It was founded (A.D. 330) at ancient BYZANTIUM as the new capital of the Roman Empire by Constantine I, after whom it was named. The largest and most splendid European city of the Middle Ages, Constantinople shared the glories and vicissitudes of the Byzantine Empire, which in the end was reduced to the city and its environs. Although besieged innumerable times by various peoples, it was taken only three times—in 1204 by the army of the Fourth Crusade (see CRUSADES), in 1261 by Michael VIII, and in 1453 by the Ottoman Sultan Muhammad II. Defended by GREEK FIRE, it was also well fortified. An early inner wall was erected by Constantine I, and the enlarged Constantinople was surrounded by a triple wall of fortifications, begun (5th cent.) by Theodosius II. Built on seven hills, the city on the Bosphorus presented the appearance of an impregnable fortress enclosing a sea of magnificent palaces and gilded domes and towers. In the 10th cent., it had a cosmopolitan population of about 1 million. The Church of HAGIA SOPHIA, the sacred palace of the emperors (a city in itself), the huge hippodrome, center of the popular life, and the Golden Gate, the chief entrance into the city, were among the largest of the scores of churches, public edifices, and monuments that lined the broad arcaded avenues and squares. Constantinople had a great wealth of artistic and literary treasures before it was sacked in 1204 and 1453. Virtually depopulated when it fell to the Ottoman Turks, the city recovered rapidly. The Ottoman sultans, whose court was called the Sublime Porte, embellished Constantinople with many beautiful mosques, palaces, monuments, fountains, baths, aqueducts, and other public buildings. After World War I the city was occupied (1918–23) by the Allies. In 1922 the last Ottoman sultan was deposed and Ankara became (1923) the new capital of Turkey.

Constantinople, First Council of, 381, second ecumenical council. It was convened by Theodosius I, then emperor of the East and a recent convert, to confirm the victory over Arianism. The council drew up a dogmatic statement on the Trinity and defined

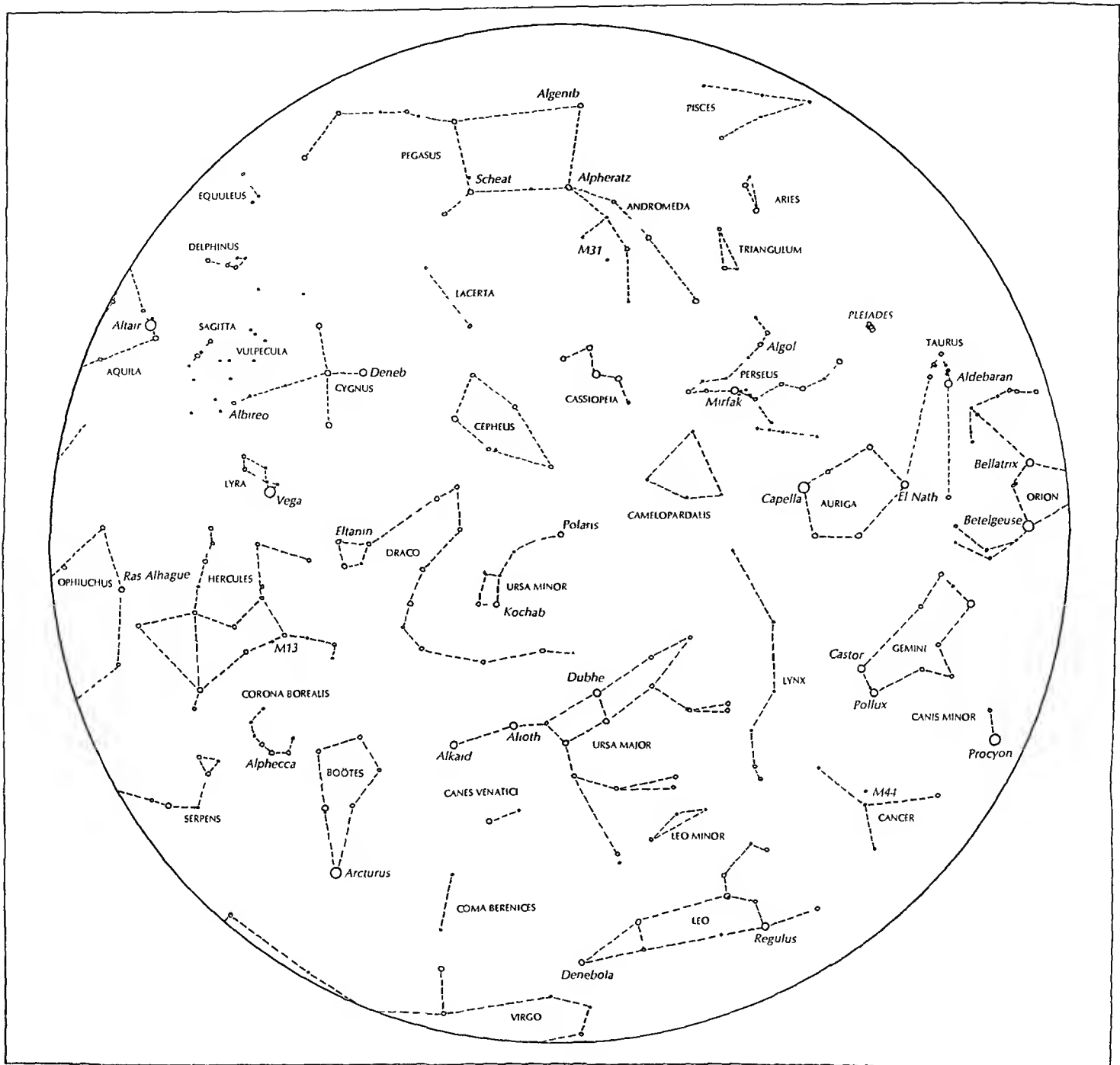
Holy Spirit as having the same divinity expressed for the Son by the Council of Nicaea 56 years earlier. That statement has been lost, but the work of the council established the orthodox teaching of the Trinity as it is held today. The traditional belief ascribing the present form of the Nicene Creed (see CREED) to this council has been questioned by modern scholars. The council condemned all varieties of Arianism along with the new heresy, Apollinarianism. The sessions, which were attended only by bishops of the East, lasted two months. Gregory Nazianzen was reinstated as bishop of Constantinople and then made president of the council when its first president, Meletius of Antioch, died. Gregory resigned when the council disregarded his wishes and elected Flavian of Antioch as Meletius' successor at Antioch. One canon of the council, making the bishop of Constantinople second only to the pope in precedence, was not admitted in the West until the Fourth Lateran Council (1215).

Constantinople, Second Council of, 553, regarded generally as the fifth ecumenical council. It was convened by Byzantine Emperor Justinian I to settle the dispute known as the Three Chapters. In an attempt to reconcile moderate Monophysite parties to orthodoxy, Justinian had issued (544) a declaration of faith. The last three chapters anathematized the writings of THEODORE OF MOPSUESTIA, THEODORET of Cyrus, and Ibas for NESTORIANISM. While the charge was true of their writings to a certain extent, the Council of Chalcedon had cleared those men of any personal heresy. Justinian's edict had the effect of slighting the council and encouraging MONOPHYSITISM; it was deeply resented in the West. Pope VIGILIUS, resisting at first, was constrained to support the edict. Under pressure from the Western bishops he then reversed himself. In retaliation, Justinian called a council at Constantinople, it was attended by only six Western bishops, boycotted by Vigilius, and dominated by Justinian and the Eastern bishops. The council approved the imperial edict and seems to have censured Vigilius. The pope was forced to ratify the council's work the following year. The West, in general, was slow in recognizing it as an ecumenical council, though ultimately it was accepted, chiefly because of the orthodoxy of its pronouncements.

Constantinople, Third Council of, 680, regarded by Roman Catholic and Orthodox Eastern churches as the sixth ecumenical council. It was convoked by Byzantine Emperor Constantine IV to deal with MONOTHELETISM. The council was attended by more than 150 bishops from all over the world, and it was presided over by the papal legates. It condemned Monothelism very clearly by defining the orthodox faith as the acceptance of a separate will and operation in each of the natures of Christ. It also condemned several churchmen as Monothelites, among them an earlier pope, HONORIUS I. The condemnation of Honorius is a much-discussed point in church history. The Orthodox Church accepts as an ecumenical part of the Third Council of Constantinople the Oriental Council of 692, summoned by Justinian II, son and successor of Constantine. It is called in the West the Trullan Synod because it met in the Trullo, i.e., in the dome of the palace, or the Quinisext Synod [Lat., = fifth-sixth] because it is considered in the East to supplement the fifth and sixth ecumenical councils. The Trullan Synod was entirely legislative, and its principal work was the pronouncement of the obligation to observe the canons of the Apostolic CONSTITUTIONS. There was apparently in the legislation an anti-Western tone, and certain practices of the West were condemned.

Constantinople, Fourth Council of, 869–70, regarded as the eighth ecumenical council by the modern Roman Catholic Church. It has never been accepted by the Orthodox Church, which instead recognizes the council of 880 that supported PHOTIUS. The council of 869 was convoked at the suggestion of Basil I, the new Byzantine emperor, to confirm the restoration of St. IGNAZIUS OF CONSTANTINOPLE to the see that Photius had resigned. Only 12 bishops attended at first, and attendance never exceeded 103. The legates of Pope Adrian II presided. Photius had already been condemned, without a hearing, at a Roman synod. At Constantinople his defense was cut short, and when he refused to sign his own condemnation, he was excommunicated. The result of these councils was to intensify the bitterness between East and West.

Constantinople, Latin Empire of, 1204–61, feudal empire established in the S Balkan Peninsula and the Greek archipelago by the leaders of the Fourth Crusade (see CRUSADES) after they had sacked (1204)



Constellations Northern sky

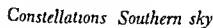
Constantinople, also known as the empire of *Romania* (not to be confused with the modern nation Rumania). Its secular and ecclesiastic governments were carefully divided among the Crusaders and their Venetian creditors. It was on both sides of the Dardanelles, its rulers were also suzerains of the kingdom of Thessalonica, the principality of Achaia, and other fiefs. BALDWIN I, HENRY OF FLANDERS, Peter of Courtenay and his wife, Yolande, ROBERT OF COURTENAY, JOHN OF BRIENNE, and BALDWIN II were rulers. The empire declined immediately after its creation, being beset by the Greek emperors of Nicaea (see NICAIA, EMPIRE OF) and despots of Epirus (see EPIRUS, DESPOTATE OF), by the Bulgars under IVAN II (Ivan Asen), by the Turks, by discord among the Westerners, and by Greek resistance. In 1222, Thessalonica fell to the despot of Epirus. By 1224 the Nicaean Emperor JOHN III had recovered Asia Minor. Constantinople, nearly captured by Ivan Asen in 1234, fell to Emperor MICHAEL VIII in 1261. Venice, however, retained possession of most of the Greek isles, the duchy of Athens passed under Catalan rule, and Achaia stayed in the hands of the VILLEHARDOUIN family until 1278. See William Miller, *The Latins in the Levant* (1908, repr. 1964), D. E. Queller, ed., *The Latin Conquest of Constantinople* (1971).

Constantinus Africanus (kōn'stāntī'nās āfrīkā'nās), c. 1010–1087, medical translator and Benedictine monk. The life of Constantinus before his arrival at Salerno c. 1070 is obscure. According to the monk who wrote his biography, Constantinus was born in Carthage, traveled extensively in North Africa and various parts of Asia for four decades, and accumulated everywhere manuscripts on medicine and other sciences. Ejected from Carthage as a magician, he fled to Salerno, where he remained for several years before retiring in 1076 to Monte Cassino. There he spent his remaining years in great activity, among the 30-odd works attributed to him are translations of HIPPOCRATES, GALEN, Isaac Judaeus, and Haly Abbas.

Constantius I (Constantius Chlorus) (kōn'stāntī'shās), c. 250–306, Roman emperor (305–6). A career general, he gave up St. HELENA to marry Theodora, the daughter of MAXIMIAN. He was made caesar (subemperor) under Maximian in 293 and gained prestige when his forces defeated the rebel CARAUSIUS. He went to Britain in 296, where he put down a rebellion of Carausius' successor, Allectus. Returning to Gaul, he defeated the Alemanni in 298. His vigor and his moderation made him popular with the people of the colonies as well as with his soldiers. The two

emperors, Diocletian and Maximian, abdicated in 305, and Constantius and Galerius became emperors. The next year, however, Constantius died at York. On his death the imperial throne was claimed by his son Constantine (CONSTANTINE I), but the office was long contested.

Constantius II, 317–61, Roman emperor, son of Constantine I. When the empire was divided (337) at the death of Constantine, Constantius II was given rule over Asia Minor, Syria, and Egypt, while his brothers, Constans I and Constantine II, received other portions. He gained prestige by fighting successfully against the Persians. When in 350 the murder of Constans I threw the West into disorder, Constantius II defeated the usurping Magnentius, a German who had been a commander under Constans I, and became sole emperor. He delegated much power to his cousin Julian (JULIAN THE APOSTATE) in Gaul. When a new dispute erupted with the Persians, Constantius ordered Julian to the East, but Julian's men revolted and proclaimed (360) Julian emperor in the West. Constantius died in the Persian campaign in Cilicia, naming Julian as his successor. A confirmed Arian, Constantius vigorously repressed paganism and was involved in a struggle with St. Athanasius.



Constellation, U.S. frigate, launched in 1797. She was named by President Washington for the constellation of 15 stars in the U.S. flag of that time. The frigate was built to serve against the pirates of the Barbary States, but after the outbreak (1798) of hostilities between the United States and France, she was stationed in Caribbean waters. After the *Constellation*, commanded by Thomas Truxtun, encountered and captured (Feb., 1799) the vessel *Insurgente*, she won (Feb., 1800) a hard-fought victory

constellation (kɒnstɪlˈəʃən), in common usage, group of stars that are imagined to form a configuration in the sky, properly speaking, a constellation is a definite region of the sky in which the configuration of stars is contained. Identifiable groupings of bright stars have been recognized and named since ancient times, the names corresponding to mythological figures (e.g., Perseus, Andromeda, Hercules, Orion), animals (e.g., Leo the Lion, Cygnus the Swan, Draco the Dragon), or objects (e.g., Libra the Balance, Corona the Crown). Ptolemy listed 48 constellations in his *Almagest* (2d cent. A.D.). As systematic observations were extended to the entire southern sky from the 17th cent. on, more constella-

tions were added to the list by J. Bayer, N. L. de Lacaille, and others. For example, Ptolemy's 48th constellation, Argo Navis, representing a ship, was divided into four smaller constellations corresponding to different parts of the ship. The final list consists of 88 constellations, each associated with a definite region of the sky. Thus, the entire CELESTIAL SPHERE is divided, with the boundaries fixed by international agreement, along lines of right ascension (R.A.) and declination (Dec.). See EQUATORIAL COORDINATE SYSTEM. The 12 constellations located along or near the ECLIPTIC, the apparent path of the sun through the heavens, are known as the constellations of the ZODIAC; the remaining constellations are officially classified as northern (28 constellations) or southern (48 constellations). The accompanying table lists the constellations according to their official Latin names, with the English equivalents and the approximate positions given. In some cases the English name is not an exact translation of the Latin, e.g., the English name for the constellation Pictor reflects the fact that the figure in the constellation is not the painter himself but his easel. Certain familiar star groups are not listed as constellations because they form only part of a larger constellation; the Big Dipper and Little Dipper are parts of the

CONSTELLATIONS							
Constellation	English name	Position		Constellation	English name	Position	
		RA	DEC			RA	DEC
ANDROMEDA	Andromeda (Chained Lady)	1 ^h	+43°	Leo Minor	Small Lion	10	+35
Antlia	Air Pump	10	-33	Lepus	Hare	5	-23
Apus	Bird of Paradise	16	-75	LIBRA*	Balance	15	-13
AQUARIUS*	Water Bearer	23	-13	Lupus	Wolf	15	-36
AQUILA	Eagle	20	+4	Lynx	Lynx	8	+41
Ara	Altar	17	-52	LYRA	Lyre	19	+42
ARIES*	Ram	2	+19	Mensa	Table	6	-78
AURIGA	Charioteer	6	+42	Microscopium	Microscope	21	-36
BOÖTES	Herdsman	15	+34	Monoceros	Unicorn	7	-8
Caelum	Chisel	5	-39	Musca	Fly	13	-72
Camelopardalis	Giraffe	5	+67	Norma	T-square	16	-52
CANCER*	Crab	8	+14	Octans	Octant	20	-79
Canes Venatici	Hunting Dogs	13	+43	Ophiuchus	Serpent Holder	17	-7
CANIS MAJOR	Large Dog	7	-23	ORION	Orion (the Hunter)	5	+2
CANIS MINOR	Small Dog	7	+5	Pavo	Peacock	19	-64
CAPRICORNUS*	(Sea) Goat	21	-21	PEGASUS	Pegasus (Winged Horse)	22	+18
CARINA	Keel	9	-62	PERSEUS	Perseus (Rescuer of Andromeda)	4	+44
CASSIOPEIA	Cassiopeia (Seated Lady)	1	+64	Phoenix	Phoenix	0	-52
CENTAURUS	Centaur	13	-44	Pictor	Painter's Easel	5	-49
Cepheus	Cepheus (the King)	22	+68	PISCES*	Fishes	1	+12
Cetus	Whale	1	-6	Piscis Austrinus	Southern Fish	22	-28
Chamaeleon	Chameleon	11	-78	Puppis	Stern	7	-39
Circinus	Pair of Compasses	15	-65	Pyxis	Mariner's Compass	9	-32
Columba	Dove	5	-32	Reticulum	Net	4	-64
Coma Berenices	Berenice's Hair	13	+22	Sagitta	Arrow	19	+18
Corona Australis	Southern Crown	19	-40	SAGITTARIUS*	Archer	19	-32
CORONA BOREALIS	Northern Crown	16	+31	SCORPIUS*	Scorpion	17	-32
Corvus	Crow	12	-14	Sculptor	Sculptor's Workshop	0	-32
Crater	Cup	11	-13	Scutum	Shield	19	-11
CRUX	Southern Cross	12	-61	Serpens—Caput	Serpent—Head	16	+10
CYGNUS	Swan	21	+48	Cauda	Tail	18	-13
Delphinus	Dolphin	21	+18	Sextans	Sextant	10	-5
Dorado	Dorado (a fish)	5	-64	TAURUS*	Bull	4	+25
DRACO	Dragon	17	+61	Telescopium	Telescope	19	-51
Equuleus	Colt	21	+8	Triangulum	Triangle	2	+32
ERIDANUS	Eridanus (a river)	4	-18	Triangulum Aus- trale	Southern Triangle	16	-65
Fornax	Furnace	3	-31	Tucana	Toucan (a bird)	23	-63
GEMINI*	Twins	7	+18	URSA MAJOR	Large Bear	10	+48
Grus	Crane	22	-41	URSA MINOR	Small Bear	15	+73
HERCULES	Hercules	18	+22	Vela	Sails	9	-46
Horologium	Clock	3	-53	VIRGO*	Virgin	13	-3
HYDRA	Water Monster	10	-16	Volans	Flying Fish	8	-69
Hydrus	Water Snake	3	-72	Vulpecula	Little Fox	20	+25
Indus	Indian	21	-54				
Lacerta	Lizard	22	+45				
LEO*	Lion	11	+17				

* Zodiac constellation

constellations Ursa Major and Ursa Minor, and the Northern Cross is part of Cygnus. Bright stars within a constellation are designated according to a system originated by Bayer: the brightest star is designated by the Greek letter *alpha* followed by the genitive form of the Latin name for the constellation, the second brightest star by *beta*, and so on, with Roman letters and pairs of Roman letters being used after the Greek letters have all been assigned. For example, the brightest star in Taurus, Aldebaran, is designated Alpha Tauri, the second brightest, El-nath, is designated Beta Tauri, and so on. Some stars have changed in brightness since Bayer's time, so that the alphabetical order does not necessarily indicate their present relative brightness. In a few cases, e.g., Ursa Major, the assignment of a Bayer name is according to position rather than brightness.

constipation, infrequent or difficult passage of feces. Constipation may be caused by the lack of adequate roughage or fluid in the diet, prolonged physical inactivity, certain drugs, or emotional disturbance. Sudden unexplained changes in bowel habits can be a symptom of a serious disorder (such as lower intestinal obstruction by a growth) and should receive medical attention. Most cases of constipation can be relieved by following a diet that includes adequate roughage and fluid and by establishing regular habits of evacuation. The continued use of laxatives is inadvisable. Daily bowel movements are not essential, many persons suffer from the harm caused by constant use of laxatives and enemas in an effort to establish the desired regularity.

Constitution, U.S. 44-gun frigate, nicknamed *Old Ironsides*. She was perhaps the most famous vessel in the history of the U.S. navy. Authorized by Congress in 1794, she was launched in 1797 and was

commissioned and put to sea in 1798 in the undeclared naval war with the French. She participated in the Tripolitan War. In the War of 1812, serving as flagship for Isaac Hull, she won a battle with the British vessel *Guerrriere* on Aug. 19, 1812, and under the command of William Bainbridge she defeated the *Java* on Dec. 29, 1812. Charles Stewart was commanding the *Constitution* when on Feb. 20, 1815, she overcame the *Cyane* and the *Levant* (though the *Levant* was later recaptured by the British). The *Constitution* was condemned (1830) as unseaworthy, but public sentiment, aroused by Oliver Wendell Holmes's poem "Old Ironsides," saved the ship from dismantling, and she was rebuilt in 1833. She was laid up at the Portsmouth navy yard in 1855 and was there used as a training ship. In 1877 she was rebuilt, and the next year she crossed the Atlantic. In 1897 she was stored at the Boston navy yard, and in 1925, under authorization of Congress, she was rebuilt by public subscription. She is now maintained at the Boston navy yard. See James Barnes, *Naval Actions of the War of 1812* (1896), Ira N. Hollis, *The Frigate Constitution* (1901), Elliot Snow, *On the Deck of "Old Ironsides"* (1932), T. P. Horgan, *Old Ironsides* (1963), J. E. Jennings, *Tattered Ensign* (1966).

constitution, fundamental principles of government in a nation, either implied in its laws, institutions, and customs or embodied in one document or in several. In the first category—customary and unwritten constitutions—is the British constitution, which is contained implicitly in the whole body of common and statutory law of the realm and in the practices and traditions of the workings of the government. Because it can be modified by an ordinary act of PARLIAMENT, the British constitution is often termed flexible. In the 18th, 19th, and 20th centuries many countries, having made sharp political and

economic departures from the past, had little legal custom to rely upon and therefore set forth their organic laws in written constitutions—some of which are judicially enforced. While the written constitutions of several countries could, in theory, be drastically changed overnight by legislative enactment (and thus are also termed flexible), the CONSTITUTION OF THE UNITED STATES is classified as rigid—one that has superior sanction to the ordinary laws of the land and that is subject to a specially prescribed process of AMENDMENT. Its so-called rigidity, however, has been counterbalanced by growth and usage. Statutory elaboration (see CONGRESS OF THE UNITED STATES) and judicial construction (see SUPREME COURT, UNITED STATES, and MARSHALL JOHN) have kept the written document abreast of the times. See Carl J. Friedrich, *Constitutional Government and Democracy* (1950), W. G. Andrews, ed., *Constitutions and Constitutionalism* (1961), John H. Franklin, *Constitutionalism and Resistance in the Sixteenth Century* (1969).

Constitutional Convention. see FEDERAL CONSTITUTIONAL CONVENTION

Constitutional Union party, in U.S. history, formed when the conflict between North and South broke down the older parties. The Constitutional Union group, composed of former Whigs and remnants of the Know-Nothings and other groups in the South, was organized just before the election of 1860. Delegates from 20 states attended the party convention at Baltimore in May, 1860, and John Bell, of Tennessee, and Edward Everett, of Massachusetts, were nominated for President and Vice President. The party recognized "no political principle but the Constitution of the country, the union of the states and the enforcement of laws." The party carried Kentucky, Tennessee, and Virginia in the election.

Constitution Island, in the Hudson River opposite West Point, SE N.Y., part of the U.S. Military Academy. The ruins of Fort Constitution, built in 1775, are there. During the American Revolution, a chain was stretched across the Hudson at Constitution Island to prevent the ascent of British ships.

Constitution of Athens, treatise by Aristotle or a member of his school, written in the late 4th cent. B.C. It was lost until discovered on Egyptian papyrus in 1890. It is a history of the Athenian government and an account of its operation in the time of Aristotle. It is a valuable historical source. See tr. by Harris Rackham (rev. ed. 1961), study by J. H. Day and Mortimer Chambers (1962).

Constitution of the United States, document embodying the fundamental principles upon which the American republic is conducted. Drawn up at the FEDERAL CONSTITUTIONAL CONVENTION in Philadelphia in 1787, the Constitution was signed on Sept. 17, 1787, and ratified by the required number of states (nine) by June 21, 1788. It superseded the original charter of the United States in force since 1781 (see CONFEDERATION, ARTICLES OF) and established the system of Federal government that began to function in 1789. The Constitution is concise, and its very brevity and its general statement of principles have, by accident more than by design, made possible the extension of meaning that has fostered growth. There are seven articles and a Preamble, 26 amendments have been adopted. The Preamble does not confer power, but its first words, "We the People of the United States," describe the source of the powers conferred by the rest of the Constitution and have been used by the advocates of a strong union arguing against the proponents of STATES' RIGHTS. The Preamble also states the purpose of the document. One of the statements of purpose, "to promote the general welfare," has been of great importance in the 20th cent. in upholding social legislation, for which no warrant could be found in the enumerated powers of Congress. The first three articles set up the three-fold separation of powers, said to have been modeled on Montesquieu's study of the British government. In actuality this separation has been weakened by the granting of greater powers to the President and his administrative agencies, which now have legislative and judicial as well as executive functions. Article 1 provides for the establishment of the bicameral Congress composed of the Senate and the House of Representatives. The various powers of the Congress and the respective houses, together with their methods of election, are enumerated in the article. The Seventeenth Amendment, passed in 1916, instituted the direct popular election of Senators and removed the power of their election from the state legislatures as had originally been provided in Article 1. Section 4 of Article 1

TEXT* OF THE

CONSTITUTION OF THE UNITED STATES

PREAMBLE

We, the people of the United States, in order to form a more perfect union, establish justice, insure domestic tranquillity, provide for the common defense, promote the general welfare, and secure the blessings of liberty to ourselves and our posterity, do ordain and establish this Constitution for the United States of America.

ARTICLE I

SECTION I

All legislative powers herein granted shall be vested in a Congress of the United States, which shall consist of a Senate and House of Representatives

SECTION II

[1] The House of Representatives shall be composed of members chosen every second year by the people of the several States, and the electors in each State shall have the qualifications requisite for electors of the most numerous branch of the State legislature

[2] No person shall be a Representative who shall not have attained to the age of twenty-five years, and been seven years a citizen of the United States, and who shall not, when elected, be an inhabitant of that State in which he shall be chosen

[3] Representatives and direct taxes shall be apportioned among the several States which may be included within this Union, according to their respective numbers, which shall be determined by adding to the whole number of free persons, including those bound to service for a term of years, and excluding Indians not taxed, three-fifths of all other persons. The actual enumeration shall be made within three years after the first meeting of the Congress of the United States, and within every subsequent term of ten years, in such manner as they shall by law direct. The number of Representatives shall not exceed one for every thirty thousand, but each State shall have at least one Representative, and until such enumeration shall be made, the State of New Hampshire shall be entitled to choose three, Massachusetts, eight, Rhode Island and Providence Plantations, one, Connecticut, five, New York, six, New Jersey, four, Pennsylvania, eight, Delaware, one, Maryland, six, Virginia, ten, North Carolina, five, South Carolina, five, and Georgia, three

[4] When vacancies happen in the representation from any State, the executive authority thereof shall issue writs of election to fill such vacancies

[5] The House of Representatives shall choose their Speaker and other officers, and shall have the sole power of impeachment

SECTION III

[1] The Senate of the United States shall be composed of two Senators from each State, chosen by the legislature thereof for six years, and each Senator shall have one vote

[2] Immediately after they shall be assembled in consequence of the first election, they shall be divided as equally as may be into three classes. The seats of the Senators of the first class shall be vacated at the expiration of the second year, of the second class at the expiration of the fourth year, and of the third class at the expiration of the sixth year, so that one-third may be chosen every second year, and if vacancies happen by resignation or otherwise during the recess of the legislature of any State, the executive thereof may make temporary appointments until the next meeting of the legislature, which shall then fill such vacancies

[3] No person shall be a Senator who shall not have attained to the age of thirty years, and been nine years a citizen of the United States, and who shall not, when elected, be an inhabitant of that State for which he shall be chosen

[4] The Vice-President of the United States shall be President of the Senate, but shall have no vote unless they be equally divided

[5] The Senate shall choose their other officers and also a President pro tempore in the absence of the Vice-President, or when he shall exercise the office of President of the United States

[6] The Senate shall have the sole power to try all impeachments. When sitting for that purpose, they shall be on oath or affirmation. When the President of the United States is tried, the Chief Justice shall preside, and no person shall be convicted without the concurrence of two-thirds of the members present

[7] Judgment in cases of impeachment shall not extend further than to removal from office, and disqualification to hold and enjoy any office of honor, trust, or profit under the United States, but the party convicted shall, nevertheless, be liable and subject to indictment, trial, judgment, and punishment, according to law

SECTION IV

[1] The times, places, and manner of holding elections for Senators and Representatives shall be prescribed in each State by the legislature thereof, but the Congress may at any time by law make or alter such regulations, except as to the places of choosing Senators

[2] The Congress shall assemble at least once in every year, and such meeting shall be on the first Monday in December, unless they shall by law appoint a different day

SECTION V

[1] Each House shall be the judge of the elections, returns, and qualifications of its own members, and a majority of each shall constitute a quorum to do business, but a smaller number may adjourn from day to day, and may be authorized to compel the attendance of absent members, in such manner, and under such penalties, as each House may provide

[2] Each House may determine the rules of its proceedings, punish its members for disorderly behavior, and with the concurrence of two-thirds, expel a member

[3] Each House shall keep a journal of its proceedings, and from time to time publish the same, excepting such parts as may in their judgment require secrecy, and the yeas and nays of the members of either House on any question shall, at the desire of one-fifth of those present, be entered on the journal

[4] Neither House, during the session of Congress, shall, without the consent of the other adjourn for more than three days, nor to any other place than that in which the two Houses shall be sitting

SECTION VI

[1] The Senators and Representatives shall receive a compensation for their services, to be ascertained by law and paid out of the Treasury of the United States. They shall, in all cases except treason, felony, and breach of the peace, be privileged from arrest during their attendance at the session of their respective Houses, and in going to and returning from the same, and for any speech or debate in either House they shall not be questioned in any other place

[2] No Senator or Representative shall, during the time for which he was elected, be appointed to any civil office under the authority of the United States, which shall have been created, or the emoluments whereof shall have been increased during such time, and no person holding any office under the United States shall be a member of either House during his continuance in office

SECTION VII

[1] All bills for raising revenue shall originate in the House of Representatives, but the Senate may propose or concur with amendments as on other bills

[2] Every bill which shall have passed the House of Representatives and the Senate shall, before it become a law, be presented to the President of the United States, if he approve he shall sign it, but if not he shall return it, with his objections, to that House in which it shall have originated, who shall enter the objections at large on their journal and proceed to reconsider it. If after such reconsideration two-thirds of that House shall agree to pass the bill, it shall be sent, together with the objections, to the other House, by which it shall likewise be reconsidered, and if approved by two-thirds of that House it shall become a law. But in all such cases the vote of both Houses shall be determined by yeas and nays, and the names of the persons voting for and against the bill shall be entered on the journal of each House respectively. If any bill shall not be returned by the President within ten days (Sundays excepted) after it shall have been presented to him, the same shall be a law, in like manner as if he had signed it, unless the Congress by their adjournment prevent its return, in which case it shall not be a law

[3] Every order, resolution or vote to which the concurrence of the Senate and House of Representatives may be necessary (except on a question of adjournment) shall be presented to the President of the United States, and before the same shall take effect shall be approved by him, or being disapproved by him, shall be repassed by two-thirds of the Senate and House of Representatives, according to the rules and limitations prescribed in the case of a bill

SECTION VIII

[1] The Congress shall have power to lay and collect taxes, duties, imposts and excises, to pay the debts and provide for the common defense and general welfare of the United States, but all duties, imposts and excises shall be uniform throughout the United States,

[2] To borrow money on the credit of the United States,

[3] To regulate commerce with foreign nations, and among the several States, and with the Indian tribes,

[4] To establish a uniform rule of naturalization, and uniform laws on the subject of bankruptcies throughout the United States,

[5] To coin money, regulate the value thereof, and of foreign coin, and fix the standard of weights and measures

* Modern usage in spelling, punctuation and capitalization has been employed

[6] To provide for the punishment of counterfeiting the securities and current coin of the United States,

[7] To establish post offices and post roads,

[8] To promote the progress of science and useful arts by securing for limited times to authors and inventors the exclusive right to their respective writings and discoveries,

[9] To constitute tribunals inferior to the Supreme Court,

[10] To define and punish piracies and felonies committed on the high seas and offenses against the law of nations,

[11] To declare war, grant letters of marque and reprisal, and make rules concerning captures on land and water,

[12] To raise and support armies, but no appropriation of money to that use shall be for a longer term than two years,

[13] To provide and maintain a navy,

[14] To make rules for the government and regulation of the land and naval forces,

[15] To provide for calling forth the militia to execute the laws of the Union, suppress insurrections, and repel invasions,

[16] To provide for organizing, arming and disciplining the militia, and for governing such part of them as may be employed in the service of the United States, reserving to the States respectively the appointment of the officers, and the authority of training the militia according to the discipline prescribed by Congress,

[17] To exercise exclusive legislation in all cases whatsoever over such district (not exceeding ten miles square) as may, by cession of particular States and the acceptance of Congress, become the seat of the Government of the United States, and to exercise like authority over all places purchased by the consent of the legislature of the State in which the same shall be, for the erection of forts, magazines, arsenals, dockyards, and other needful buildings,

[18] To make all laws which shall be necessary and proper for carrying into execution the foregoing powers, and all other powers vested by this Constitution in the Government of the United States, or in any department or officer thereof

SECTION IX

[1] The migration or importation of such persons as any of the States now existing shall think proper to admit shall not be prohibited by the Congress prior to the year one thousand eight hundred and eight, but a tax or duty may be imposed on such importation, not exceeding ten dollars for each person

[2] The privilege of the writ of habeas corpus shall not be suspended, unless when in cases of rebellion or invasion the public safety may require it

[3] No bill of attainder or ex post facto law shall be passed

[4] No capitation or other direct tax shall be laid, unless in proportion to the census or enumeration hereinbefore directed to be taken

[5] No tax or duty shall be laid on articles exported from any State

[6] No preference shall be given by any regulation of commerce or revenue to the ports of one State over those of another, nor shall vessels bound to or from one State be obliged to enter, clear or pay duties in another

[7] No money shall be drawn from the Treasury but in consequence of appropriations made by law, and a regular statement and account of the receipts and expenditures of all public money shall be published from time to time

[8] No title of nobility shall be granted by the United States, and no person holding any office of profit or trust under them shall, without the consent of the Congress, accept of any present, emolument, office, or title of any kind whatever from any king, prince, or foreign state

SECTION X

[1] No State shall enter into any treaty, alliance, or confederation, grant letters of marque and reprisal, coin money, emit bills of credit, make anything but gold and silver coin a tender in payment of debts, pass any bill of attainder, ex post facto law or law impairing the obligation of contracts, or grant any title of nobility

[2] No State shall, without the consent of the Congress, lay any imposts or duties on imports or exports, except what may be absolutely necessary for executing its inspection laws, and the net produce of all duties and imposts, laid by any State on imports or exports, shall be for the use of the Treasury of the United States, and all such laws shall be subject to the revision and control of the Congress

[3] No State shall, without the consent of Congress, lay any duty of tonnage, keep troops and ships of war in time of peace, enter into any agreement or compact with another State or with a foreign power, or engage in war, unless actually invaded or in such imminent danger as will not admit of delay

ARTICLE II

SECTION I

[1] The executive power shall be vested in a President of the United States of America. He shall hold his office during the term of four years, and together with the Vice-President, chosen for the same term, be elected as follows

[2] Each State shall appoint, in such manner as the legislature thereof may direct, a number of Electors, equal to the whole number of Senators and Representatives to which the State may be entitled in the Congress, but no Senator or Representative, or person holding an office of trust or profit under the United States, shall be appointed an Elector

[3] The Electors shall meet in their respective States and vote by ballot for two persons, of whom one at least shall not be an inhabitant of the same State with themselves. And they shall make a list of all the persons voted for, and of the number of votes for each, which list they shall sign and certify, and transmit sealed to the seat of government of the United States, directed to the President of the Senate. The President of the Senate shall, in the presence of the Senate and House of Representatives, open all the certificates, and the votes shall then be counted. The person having the greatest number of votes shall be the President, if such number be a majority of the whole number of Electors appointed, and if there be more than one who have such majority, and have an equal number of

votes, then the House of Representatives shall immediately choose by ballot one of them for President, and if no person have a majority, then from the five highest on the list the said House shall in like manner choose the President. But in choosing the President the votes shall be taken by States, the representation from each State having one vote, a quorum for this purpose shall consist of a member or members from two-thirds of the States, and a majority of all the States shall be necessary to a choice. In every case, after the choice of the President, the person having the greatest number of votes of the Electors shall be the Vice-President. But if there should remain two or more who have equal votes, the Senate shall choose from them by ballot the Vice-President

[4] The Congress may determine the time of choosing the Electors and the day on which they shall give their votes, which day shall be the same throughout the United States

[5] No person except a natural-born citizen, or citizen of the United States at the time of the adoption of this Constitution, shall be eligible to the office of President, neither shall any person be eligible to that office who shall not have attained to the age of thirty-five years, and been fourteen years a resident within the United States

[6] In case of the removal of the President from office, or of his death, resignation, or inability to discharge the powers and duties of the said office, the same shall devolve on the Vice-President, and the Congress may by law provide for the case of removal, death, resignation, or inability, both of the President and Vice-President, declaring what officer shall then act as President, and such officer shall act accordingly until the disability be removed or a President shall be elected

[7] The President shall, at stated times, receive for his services a compensation, which shall neither be increased nor diminished during the period for which he shall have been elected, and he shall not receive within that period any other emolument from the United States or any of them

[8] Before he enter on the execution of his office he shall take the following oath or affirmation

"I do solemnly swear (or affirm) that I will faithfully execute the office of President of the United States, and will to the best of my ability preserve, protect, and defend the Constitution of the United States"

SECTION II

[1] The President shall be Commander-in-Chief of the Army and Navy of the United States, and of the militia of the several States when called into the actual service of the United States, he may require the opinion, in writing, of the principal officer in each of the executive departments, upon any subject relating to the duties of their respective offices, and he shall have power to grant reprieves and pardons for offenses against the United States, except in cases of impeachment

[2] He shall have power, by and with the advice and consent of the Senate, to make treaties, provided two-thirds of the Senators present concur, and he shall nominate, and, by and with the advice and consent of the Senate, shall appoint ambassadors, other public ministers and consuls, judges of the Supreme Court, and all other officers of the United States whose appointments are not herein otherwise provided for, and which shall be established by law, but the Congress may by law vest the appointment of such inferior officers, as they think proper, in the President alone, in the courts of law, or in the heads of departments

[3] The President shall have power to fill up all vacancies that may happen during the recess of the Senate, by granting commissions which shall expire at the end of their next session

SECTION III

He shall from time to time give to the Congress information of the state of the Union, and recommend to their consideration such measures as he shall judge necessary and expedient, he may, on extraordinary occasions, convene both Houses, or either of them, and in case of disagreement between them with respect to the time of adjournment, he may adjourn them to such time as he shall think proper, he shall receive ambassadors and other public ministers, he shall take care that the laws be faithfully executed, and shall commission all the officers of the United States

SECTION IV

The President, Vice-President and all civil officers of the United States shall be removed from office on impeachment for and conviction of treason, bribery, or other high crimes and misdemeanors

ARTICLE III

SECTION I

The judicial power of the United States shall be vested in one Supreme Court, and in such inferior courts as the Congress may from time to time ordain and establish. The judges, both of the Supreme and inferior courts, shall hold their offices during good behavior, and shall, at stated times, receive for their services a compensation which shall not be diminished during their continuance in office

SECTION II

[1] The judicial power shall extend to all cases, in law and equity, arising under this Constitution, the laws of the United States, and treaties made, or which shall be made, under their authority, to all cases affecting ambassadors, other public ministers, and consuls, to all cases of admiralty and maritime jurisdiction, to controversies to which the United States shall be a party, to controversies between two or more States, between a State and citizens of another State, between citizens of different States, between citizens of the same State claiming lands under grants of different States, and between a State, or the citizens thereof, and foreign states, citizens, or subjects

[2] In all cases affecting ambassadors, other public ministers and consuls, and those in which a State shall be party, the Supreme Court shall have original jurisdiction. In all the other cases before mentioned the Supreme Court shall have

appellate jurisdiction, both as to law and fact, with such exceptions and under such regulations as the Congress shall make

[3] The trial of all crimes, except in cases of impeachment, shall be by jury, and such trial shall be held in the State where the said crimes shall have been committed, but when not committed within any State, the trial shall be at such place or places as the Congress may by law have directed

SECTION III

[1] Treason against the United States shall consist only in levying war against them, or in adhering to their enemies, giving them aid and comfort No person shall be convicted of treason unless on the testimony of two witnesses to the same overt act, or on confession in open court

[2] The Congress shall have power to declare the punishment of treason, but no attainder of treason shall work corruption of blood or forfeiture except during the life of the person attained

ARTICLE IV

SECTION I

Full faith and credit shall be given in each State to the public acts, records, and judicial proceedings of every other State And the Congress may by general laws prescribe the manner in which such acts, records, and proceedings shall be proved, and the effect thereof

SECTION II

[1] The citizens of each State shall be entitled to all privileges and immunities of citizens in the several States

[2] A person charged in any State with treason, felony, or other crime, who shall flee from justice, and be found in another State, shall, on demand of the executive authority of the State from which he fled, be delivered up, to be removed to the State having jurisdiction of the crime

[3] No person held to service or labor in one State, under the laws thereof, escaping into another, shall, in consequence of any law or regulation therein, be discharged from such service or labor, but shall be delivered up on claim to the party to whom such service or labor may be due

SECTION III

[1] New States may be admitted by the Congress into this Union, but no new State shall be formed or erected within the jurisdiction of any other State, nor any State be formed by the junction of two or more States or parts of States, without the consent of the legislatures of the States concerned as well as of the Congress

[2] The Congress shall have power to dispose of and make all needful rules and regulations respecting the territory or other property belonging to the United States, and nothing in this Constitution shall be so construed as to prejudice any claims of the United States or of any particular State

SECTION IV

The United States shall guarantee to every State in this Union a republican form of government, and shall protect each of them against invasion, and on application of the legislature, or of the executive (when the legislature cannot be convened), against domestic violence

ARTICLE V

The Congress, whenever two-thirds of both Houses shall deem it necessary, shall propose amendments to this Constitution, or, on the application of the legislatures of two-thirds of the several States, shall call a convention for proposing amendments, which in either case shall be valid to all intents and purposes as part of this Constitution, when ratified by the legislatures of three-fourths of the several States, or by conventions in three-fourths thereof, as the one or the other mode of ratification may be proposed by the Congress, provided that no amendment which may be made prior to the year one thousand eight hundred and eight shall in any manner affect the first and fourth clauses in the Ninth Section of the First Article, and that no State, without its consent shall be deprived of its equal suffrage in the Senate

ARTICLE VI

[1] All debts contracted and engagements entered into, before the adoption of this Constitution, shall be as valid against the United States under this Constitution as under the Confederation

[2] This Constitution, and the laws of the United States which shall be made in pursuance thereof, and all treaties made, or which shall be made, under the authority of the United States, shall be the supreme law of the land, and the judges in every State shall be bound thereby, anything in the Constitution or laws of any State to the contrary notwithstanding

[3] The Senators and Representatives before mentioned and the members of the several State legislatures, and all executive and judicial officers both of the United States and of the several States, shall be bound by oath or affirmation to support this Constitution, but no religious test shall ever be required as a qualification to any office or public trust under the United States

ARTICLE VII

The ratification of the conventions of nine States shall be sufficient for the establishment of this Constitution between the States so ratifying the same

AMENDMENT I

Congress shall make no law respecting an establishment of religion, or prohibiting the free exercise thereof, or abridging the freedom of speech or of the press, or the right of the people peaceably to assemble, and to petition the government for a redress of grievances

AMENDMENT II

A well-regulated militia being necessary to the security of a free State, the right of the people to keep and bear arms shall not be infringed

AMENDMENT III

No soldier shall, in time of peace, be quartered in any house without the consent of the owner, nor in time of war, but in a manner to be prescribed by law

AMENDMENT IV

The right of the people to be secure in their persons, houses, papers, and effects, against unreasonable searches and seizures, shall not be violated, and no warrants shall issue but upon probable cause, supported by oath or affirmation, and particularly describing the place to be searched, and the persons or things to be seized

AMENDMENT V

No person shall be held to answer for a capital, or otherwise infamous crime, unless on a presentment or indictment of a grand jury, except in cases arising in the land or naval forces, or in the militia, when in actual service in time of war or public danger, nor shall any person be subject for the same offense to be twice put in jeopardy of life or limb, nor shall be compelled in any criminal case to be a witness against himself, nor be deprived of life, liberty or property, without due process of law, nor shall private property be taken for public use without just compensation

AMENDMENT VI

In all criminal prosecutions, the accused shall enjoy the right to a speedy and public trial, by an impartial jury of the State and district wherein the crime shall have been committed, which district shall have been previously ascertained by law, and to be informed of the nature and cause of the accusation, to be confronted with the witnesses against him, to have compulsory process for obtaining witnesses in his favor, and to have the assistance of counsel for his defense

AMENDMENT VII

In suits at common law, where the value in controversy shall exceed twenty dollars, the right of trial by jury shall be preserved, and no fact tried by a jury shall be otherwise re-examined in any court of the United States, than according to the rules of the common law

AMENDMENT VIII

Excessive bail shall not be required, nor excessive fines imposed, nor cruel and unusual punishments inflicted

AMENDMENT IX

The enumeration in the Constitution of certain rights shall not be construed to deny or disparage others retained by the people

AMENDMENT X

The powers not delegated to the United States by the Constitution, nor prohibited by it to the States, are reserved to the States respectively, or to the people

AMENDMENT XI

The judicial power of the United States shall not be construed to extend to any suit in law or equity, commenced or prosecuted against one of the United States by citizens of another State, or by citizens or subjects of any foreign state

AMENDMENT XII

[1] The Electors shall meet in their respective States and vote by ballot for President and Vice-President, one of whom, at least, shall not be an inhabitant of the same State with themselves, they shall name in their ballots the person voted for as President, and in distinct ballots the person voted for as Vice-President, and they shall make distinct lists of all persons voted for as President and of all persons voted for as Vice-President, and of the number of votes for each, which lists they shall sign and certify, and transmit sealed to the seat of the government of the United States, directed to the President of the Senate The President of the Senate shall, in the presence of the Senate and House of Representatives, open all the certificates and the votes shall then be counted The person having the greatest

number of votes for President shall be the President, if such number be a majority of the whole number of Electors appointed, and if no person have such majority, then from the persons having the highest numbers not exceeding three on the list of those voted for as President, the House of Representatives shall choose immediately, by ballot, the President. But in choosing the President the votes shall be taken by States, the representation from each State having one vote, a quorum for this purpose shall consist of a member or members from two-thirds of the States, and a majority of all the States shall be necessary to a choice. And if the House of Representatives shall not choose a President whenever the right of choice shall devolve upon them, before the fourth day of March next following, then the Vice-President shall act as President, as in the case of the death or other constitutional disability of the President.

[2] The person having the greatest number of votes as Vice-President shall be the Vice-President, if such number be a majority of the whole number of Electors appointed, and if no person have a majority, then from the two highest numbers on the list the Senate shall choose the Vice-President, a quorum for the purpose shall consist of two-thirds of the whole number of Senators, and a majority of the whole number shall be necessary to a choice. But no person constitutionally ineligible to the office of President shall be eligible to that of Vice-President of the United States.

AMENDMENT XIII

SECTION I

Neither slavery nor involuntary servitude, except as a punishment for crime whereof the party shall have been duly convicted, shall exist within the United States, or any place subject to their jurisdiction.

SECTION II

Congress shall have power to enforce this article by appropriate legislation.

AMENDMENT XIV

SECTION I

All persons born or naturalized in the United States, and subject to the jurisdiction thereof, are citizens of the United States and of the State wherein they reside. No State shall make or enforce any law which shall abridge the privileges or immunities of citizens of the United States, nor shall any State deprive any person of life, liberty or property, without due process of law, nor deny to any person within its jurisdiction the equal protection of the laws.

SECTION II

Representatives shall be apportioned among the several States according to their respective numbers, counting the whole number of persons in each State, excluding Indians not taxed. But when the right to vote at any election for the choice of Electors for President and Vice-President of the United States, Representatives in Congress, the executive and judicial officers of a State, or the members of the legislature thereof, is denied to any of the male inhabitants of such State, being twenty-one years of age, and citizens of the United States, or in any way abridged except for participation in rebellion or other crime, the basis of representation therein shall be reduced in the proportion which the number of such male citizens shall bear to the whole number of male citizens twenty-one years of age in such State.

SECTION III

No person shall be a Senator or Representative in Congress, or elector of President and Vice-President, or hold any office, civil or military, under the United States or under any State, who, having previously taken an oath as a member of Congress, or as an officer of the United States, or as a member of any State legislature, or as an executive or judicial officer of any State, to support the Constitution of the United States, shall have engaged in insurrection or rebellion against the same, or given aid or comfort to the enemies thereof. But Congress may, by a vote of two-thirds of each House, remove such disability.

SECTION IV

The validity of the public debt of the United States, authorized by law, including debts incurred for payment of pensions and bounties for services in suppressing insurrection or rebellion, shall not be questioned. But neither the United States nor any State shall assume or pay any debt or obligation incurred in aid of insurrection or rebellion against the United States, or any claim for the loss or emancipation of any slave, but all such debts, obligations, and claims shall be held illegal and void.

SECTION V

The Congress shall have power to enforce, by appropriate legislation, the provisions of this article.

AMENDMENT XV

SECTION I

The right of citizens of the United States to vote shall not be denied or abridged by the United States or by any State on account of race, color, or previous condition of servitude.

SECTION II

The Congress shall have power to enforce this article by appropriate legislation.

AMENDMENT XVI

The Congress shall have power to lay and collect taxes on incomes, from whatever source derived, without apportionment among the several States, and without regard to any census or enumeration.

AMENDMENT XVII

SECTION I

The Senate of the United States shall be composed of two Senators from each State, elected by the people thereof, for six years, and each Senator shall have one vote. The electors in each State shall have the qualifications requisite for electors of the most numerous branch of the State legislatures.

SECTION II

When vacancies happen in the representation of any State in the Senate, the executive authority of such State shall issue writs of election to fill such vacancies. Provided, that the legislature of any State may empower the executive thereof to make temporary appointments until the people fill the vacancies by election as the legislature may direct.

SECTION III

This amendment shall not be so construed as to affect the election or term of any Senator chosen before it becomes valid as part of the Constitution.

AMENDMENT XVIII

SECTION I

After one year from the ratification of this article the manufacture, sale or transportation of intoxicating liquors within, the importation thereof into, or the exportation thereof from the United States and all territory subject to the jurisdiction thereof, for beverage purposes, is hereby prohibited.

SECTION II

The Congress and the several States shall have concurrent power to enforce this article by appropriate legislation.

SECTION III

This article shall be inoperative unless it shall have been ratified as an amendment to the Constitution by the legislatures of the several States, as provided in the Constitution, within seven years from the date of the submission hereof to the States by the Congress.

AMENDMENT XIX

SECTION I

The right of citizens of the United States to vote shall not be denied or abridged by the United States or by any State on account of sex.

SECTION II

Congress shall have power to enforce this article by appropriate legislation.

AMENDMENT XX

SECTION I

The terms of the President and Vice-President shall end at noon on the 20th day of January, and the terms of Senators and Representatives at noon on the 3d day of January, of the years in which such terms would have ended if this article had not been ratified, and the terms of their successors shall then begin.

SECTION II

The Congress shall assemble at least once in every year, and such meeting shall begin at noon on the 3d day of January, unless they shall by law appoint a different day.

SECTION III

If, at the time fixed for the beginning of the term of the President, the President-elect shall have died, the Vice-President-elect shall become President. If a President shall not have been chosen before the time fixed for the beginning of his term or if the President-elect shall have failed to qualify, then the Vice-President-elect shall act as President until a President shall have qualified, and the Congress may by law provide for the case wherein neither a President-elect nor a Vice-President-elect shall have qualified, declaring who shall then act as President, or the manner in which one who is to act shall be selected, and such person shall act accordingly until a President or Vice-President shall have qualified.

SECTION IV

The Congress may by law provide for the case of the death of any of the persons from whom the House of Representatives may choose a President whenever the right of choice shall have devolved upon them, and for the case of death of any of the persons from whom the Senate may choose a Vice-President whenever the right of choice shall have devolved upon them.

SECTION V

Sections I and II shall take effect on the 15th day of October following the ratification of this article

SECTION VI

This article shall be inoperative unless it shall have been ratified as an amendment to the Constitution by the legislatures of three-fourths of the several States within seven years from the date of its submission

AMENDMENT XXI

SECTION I

The eighteenth article of amendment to the Constitution of the United States is hereby repealed

SECTION II

The transportation or importation into any State, territory, or possession of the United States for delivery or use therein of intoxicating liquors, in violation of the laws thereof, is hereby prohibited

SECTION III

This article shall be inoperative unless it shall have been ratified as an amendment to the Constitution by conventions in the several States, as provided in the Constitution, within seven years from the date of the submission hereof to the States by the Congress

AMENDMENT XXII

SECTION I

No person shall be elected to the office of President more than twice, and no person who has held the office of President, or acted as President, for more than two years of a term to which some other person was elected President shall be elected to the office of President more than once. But this Article shall not apply to any person holding the office of President when this Article was proposed by the Congress, and shall not prevent any person who may be holding the office of President, or acting as President, during the term within which this Article becomes operative from holding the office of President or acting as President during the remainder of such term

SECTION II

This article shall be inoperative unless it shall have been ratified as an amendment to the Constitution by the legislatures of three-fourths of the several States within seven years from the date of its submission to the States by the Congress

AMENDMENT XXIII

SECTION I

The District constituting the seat of Government of the United States shall appoint in such manner as the Congress may direct

A number of electors of President and Vice-President equal to the whole number of Senators and Representatives in Congress to which the District would be entitled if it were a State, but in no event more than the least populous State, they shall be in addition to those appointed by the States, but they shall be considered, for the purposes of the election of President and Vice-President, to be electors appointed by a State, and they shall meet in the District and perform such duties as provided by the twelfth article of amendment

SECTION II

The Congress shall have power to enforce this article by appropriate legislation

gives the states power over the conduct of Federal elections but permits the Congress to alter such regulations at any time. In 1842 the Congress imposed the district system on the United States. In 1962 the Supreme Court dealt with proper apportionment of election districts and in its decision in *Baker vs. Carr* allowed voters to go into a Federal court to force equitable representation in a state legislature. This decision was, however, based on the equal protection clause of the Fourteenth Amendment. Later, the court ruled (1964) that state legislative apportionment must reflect the one-man one-vote principle. As a legislative body Congress has certain inherent powers. Among these are the power to investigate pursuant to legislative needs. Congressional investigations have led to a great many court decisions concerning the right of a witness before a Congressional committee to refuse to testify even when granted immunity from prosecution. Section 8 of Article 1 lists the enumerated powers of the Congress. The clause of this section, the "commerce clause," which grants the Congress the right to "regulate commerce with foreign nations, and among the several States," has, in the 20th century, been used as a strong argument for the expansion of government power. Since the historic case

of *GIBBONS vs. OGDEN*, the commerce clause has been the battleground over which much of the struggle for and against increased Federal regulation of private enterprise has been fought. Until the late 1930s Congress exercised its powers under the clause solely with reference to transportation. But after a series of dramatic reversals by the Supreme Court, Congress began to enter areas that had previously been controlled only by the states. The commerce clause is now the source of important peacetime powers of the national government and an important basis for the judicial review of state actions. Besides its enumerated and inherent powers, the Congress has implied powers under Article 1 "to make all laws which shall be necessary and proper for carrying into execution" the enumerated or expressed powers. Sections 9 and 10 of Article 1 contain guarantees of the writ of HABEAS CORPUS, prohibit bills of attainder and ex post facto laws, and also improve certain limitations on state power. Article 2 creates the executive branch of government headed by the President, elected, along with the Vice President, for a term of four years (see PRESIDENT, ELECTORAL COLLEGE). The Twenty-second Amendment (1951) provides that no person may be elected President more than twice. The Twenty-third Amendment (1961) permits District of Colum-

bia residents to vote in presidential elections. Since the adoption of the Constitution there have been two conflicting views of Article 2. The first is that the powers of the President are limited to those enumerated in the article. The opposite view is that the President is given executive power not limited by the provisions of the rest of the article. Every President has had to make the choice of interpretations for himself. Article 3 provides for a judiciary and defines TREASON. Besides its enumerated powers, the judiciary has the inherent authority to interpret laws and the Constitution with an authority that must be deferred to. Article 3 also guarantees trial by jury in criminal cases and lays the basis for Federal jurisdiction. The Eleventh Amendment (1798), which prohibits suits against any state by citizens of another state or foreigners (see SOVEREIGNTY), was passed in reaction to the Supreme Court's accepting jurisdiction of a suit against a state by a citizen of another state. Article 4, dealing with the relations of the states (see CONFLICT OF LAWS), provides that "Full faith and credit shall be given in each State to the public acts, records, and judicial proceedings of every other State." Section 2 prohibits any state from discriminating against citizens of other states in favor of its own and provides for the extradition of criminals. The article guarantees a republican form

AMENDMENT XXIV

SECTION I

The right of citizens of the United States to vote in any primary or other election for President or Vice-President, for electors for President or Vice-President, or for Senator or Representative in Congress, shall not be denied or abridged by the United States or any State by reason of failure to pay any poll tax or other tax

SECTION II

The Congress shall have power to enforce this article by appropriate legislation

AMENDMENT XXV

SECTION I

In case of the removal of the President from office or of his death or resignation, the Vice-President shall become President

SECTION II

Whenever there is a vacancy in the office of the Vice-President, the President shall nominate a Vice-President who shall take office upon confirmation by a majority vote of both Houses of Congress

SECTION III

Whenever the President transmits to the President pro tempore of the Senate and the Speaker of the House of Representatives his written declaration that he is unable to discharge the powers and duties of his office, and until he transmits to them a written declaration to the contrary, such powers and duties shall be discharged by the Vice-President as Acting President

SECTION IV

Whenever the Vice-President and a majority of either the principal officers of the executive departments or of such other body as Congress may by law provide, transmit to the President pro tempore of the Senate and the Speaker of the House of Representatives their written declaration that the President is unable to discharge the powers and duties of his office, the Vice-President shall immediately assume the powers and duties of the office as Acting President

Thereafter, when the President transmits to the President pro tempore of the Senate and the Speaker of the House of Representatives his written declaration that no inability exists, he shall resume the powers and duties of his office unless the Vice-President and a majority of either the principal officers of the executive department or of such other body as Congress may by law provide, transmit within four days to the President pro tempore of the Senate and the Speaker of the House of Representatives their written declaration that the President is unable to discharge the powers and duties of his office. Thereupon Congress shall decide the issue, assembling within forty-eight hours for that purpose if not in session. If the Congress, within twenty-one days after receipt of the latter written declaration, or, if Congress is not in session, within twenty-one days after Congress is required to assemble, determines by two-thirds vote of both Houses that the President is unable to discharge the powers and duties of his office, the Vice-President shall continue to discharge the same as Acting President, otherwise the President shall resume the powers and duties of his office

AMENDMENT XXVI

SECTION I

The right of citizens of the United States who are eighteen years of age or older, to vote shall not be denied or abridged by the United States or by any State on account of age

SECTION II

The Congress shall have power to enforce this article by appropriate legislation

of government to every state and provides for the admission of new states as well as the government of territories. Article 5 provides for amending the Constitution (see AMENDMENT). Article 6 establishes the supremacy of the Federal Constitution and laws in case of conflict with those of the states. This clause is the heart of the Federal system. Article 6 also provides for an oath of office for members of the three branches of the Federal government and the states and specifically forbids any religious qualification for office. Article 7 declares that the Constitution should go into force when ratified by nine states. The Constitution has undergone gradual alteration with the growth of the country. Some of the 26 amendments were brought on by Supreme Court decisions. The first 9 amendments, which constitute the Bill of Rights, were added, however, within two years of the signing of the Federal Constitution in order to ensure sufficient guarantees of individual liberties. The Bill of Rights applied only to the Federal government. But since the passage of the FOURTEENTH AMENDMENT (1868), many of the guarantees contained in the Bill of Rights have been extended to the states through the "due process" clause of the Fourteenth Amendment. The First Amendment guarantees the freedom of worship, of speech, of the press, of assembly, and of petition to the government for redress of grievances. This amendment has been the center of controversy in recent years in the areas of free speech and religion. The Supreme Court has held that freedom of speech does not include the right to refuse to testify before a Congressional investigating committee and that any organized prayer in the public schools violates the First Amendment. The Second Amendment guarantees the right to bear arms openly—adopted with reference to state militias. Freedom from the quartering of soldiers without the consent of the owner of the house is guaranteed by the Third Amendment. The Fourth Amendment guarantees against unreasonable search and seizure. This safeguard has only recently been extended to the states. The Fifth Amendment provides that no person shall be held for "a capital or otherwise infamous crime" without indictment, be twice put in "jeopardy of life or limb" for the same offense, be compelled to testify against himself, or "be deprived of life, liberty or property, without due process of law." The privilege against self-incrimination has been the center of a great deal of controversy as a result of the growth of Congressional investigations. The phrase "due process of law," which appears in the Fifth Amendment, is also included in the Fourteenth Amendment. As a result there has been much debate as to whether both amendments guarantee the same rights. Those in favor of what is termed fixed due process claim that all the safeguards applied against the Federal government should be also applied against the states through the Fourteenth Amendment. The supporters of the concept of flexible due process are willing only to impose those guarantees on the states that "are implicit in the concept of ordered liberty." The Sixth Amendment guarantees the right of a speedy and public trial by an impartial jury in all criminal proceedings, while the Seventh Amendment guarantees the right of trial by jury in all common-law suits "where the value in controversy shall exceed twenty dollars," and the Eighth Amendment prohibits excessive bail and fines and "cruel and unusual" punishment. The Ninth Amendment states that "The enumeration in the Constitution of certain rights shall not be construed to deny or disparage others retained by the people." By the Tenth Amendment, generally considered with the first nine (they all went into effect in 1791), "The powers not delegated to the United States by the Constitution, nor prohibited by it to the States, are reserved to the States respectively, or to the people." Powers reserved to the states are often termed "residual powers." This amendment, like the commerce clause, has been a battleground in the struggle against states' rights and for Federal supremacy. The Eleventh Amendment has already been discussed under Article 3. The Twelfth (1804) revised the method of electing President and Vice President. The Thirteenth (1865), Fourteenth (1868), and Fifteenth (1870) amendments, arising out of the Civil War and Reconstruction, abolish slavery and guarantee civil rights and the suffrage to U.S. citizens, including former slaves. The Sixteenth Amendment (1913) authorizes the INCOME TAX. The Seventeenth has been described under Article 1. The Eighteenth (1919)—repealed by the Twenty-first (1933)—introduced PROHIBITION. The Nineteenth (1920) grants WOMAN SUFFRAGE. The Twentieth (1933) abolishes the so-called lame-duck Congress and al-

ters the date of the presidential inauguration. The Twenty-second and the Twenty-third amendments have been discussed under Article 2. The Twenty-fourth Amendment (1964) outlaws the poll tax and any other tax as a requirement for voting in primaries and elections for Federal office. The Twenty-fifth (1967) establishes the procedure for filling the office of Vice President between elections and for governing in the event of presidential disability. The Twenty-sixth (1971) lowers the voting age in all elections to 18. In 1972 an amendment prohibiting all legal forms of discrimination based on sex was submitted to the states for ratification. The wording of the Constitution is general, necessitating interpretation, and any short summary is only rough and approximate. From its very beginnings, the Constitution has been subject to violent controversies, not only in interpretation of some of its phrases, but also between the "loose constructionists" and "strict constructionists." The middle of the 19th cent. saw a tremendous struggle concerning the nature of the Union and the extent of states' rights. The Civil War decided the case in favor of the advocates of strong union, and since that time the general tendency has been toward the centralization and strengthening of Federal power. See C. A. Beard, *An Economic Interpretation of the Constitution* (1913, repr. 1965), C. H. McIlwain, *Constitutionalism, Ancient and Modern* (rev. ed. 1947, repr. 1958), Edward Dumbauld, *The Bill of Rights and What It Means Today* (1957) and *The Constitution of the United States* (1964), A. H. Kelly and W. A. Harbison, *The American Constitution* (4th ed. 1970), E. S. Corwin, *The Constitution and What It Means Today* (13th rev. ed. 1973), Rexford Tugwell, *The Emerging Constitution* (1974).

Constitutions, Apostolic, late 4th-century compilation, in eight books, of administrative canons for the clergy and the laity and of guides for worship. They were supposed to be works of the apostles, but actually included the greater part of the *Didascalia Apostolorum*, a lost Greek treatise of 3d-century origin, most of the DIDACHE, and fragments from Hippolytus and Papias. The work concludes with a collection of 85 moral and liturgical canons known as the "Apostolic Canons," a portion of which became part of canon law of the Western Church. The work is thought to be of Syrian origin. The whole is a valuable primary source on early church history and practice.

Constructivism, Russian art movement founded c. 1913 by Vladimir Tatlin (1885-1956), related to the movement known as SUPREMATISM. After 1916 the brothers Naum (Pevsner) Gabo and Antoine Pevsner gave new impetus to Tatlin's art of purely abstract constructions. Their sculptural works derived from cubism and futurism, but had a more architectonic emphasis, related to the technology of the society in which they were created. The Soviet regime at first encouraged this new style. However, beginning in 1921, constructivism (and all modern art movements) were officially disparaged as unsuitable for mass propaganda purposes. Gabo and Pevsner went into exile, while Tatlin remained in Russia. In theatrical scene design constructivism spread beyond Russia through the efforts of Vsevolod MEYERHOLD. See George Rickey, *Constructivism* (1967).

consubstantiation see LORD'S SUPPER

consul, title of the two chief magistrates of ancient Rome. The institution is supposed to have arisen with the expulsion of the kings, traditionally in 510 B.C., and it was well established by the early 4th cent. B.C. The consuls led the troops, controlled the treasury, and were supreme in the government. At first only patricians were eligible, but in 367 B.C. the Licinian law opened the office to plebeians. Before becoming consul a man generally had to have experience as quaestor, aedile, and praetor, and the minimum age for a consul was normally set at 40 or 45. Ex-consuls became provincial governors as pro-consuls. The year was identified by the names of the two consuls in office during that time. Under the empire the title of consul was continued, but only as a title of honor, sometimes conferred on infants or small boys.

consular service, organized body of public officers maintained by a government in the important ports and trade centers of foreign countries to protect the persons and interests of its nationals and to aid them in every possible way. Consuls are officially recognized by a foreign state through the issuance of an authorization known as an exequatur, which may be revoked by the admitting state at any time. The many duties of U.S. consuls in foreign states

include promoting and protecting American commercial interests, issuing passports and verifying citizenship, certifying the sanitary conditions of the cargo, crew, and passengers of vessels leaving for U.S. ports, and mediating with local officials in cases of legal matters involving American citizens. The consular service was once strictly distinguished from the DIPLOMATIC SERVICE, but because of the interrelated duties of the two branches, the Rogers Act of 1924 consolidated both into the Foreign Service of the Department of State. The Department of Commerce and the Department of the Treasury may place commercial attaches at a consulate office to aid in gathering statistics and promoting trade. The persons of consuls enjoy immunity and EXTRATERRITORIALITY in all matters pertaining to their official functions, and the premises of consulates are likewise privileged. Such privileges are granted either by courtesy or through special consular treaties.

Consulate, 1799-1804, in French history, form of government established after the coup d'état of 18 Brumaire (Nov. 9-10, 1799), which ended the DIRECTORY. Three consuls were appointed to rule France—Napoleon Bonaparte (see NAPOLEON I), Emmanuel Joseph SIEYÈS, and Roger Ducos. Sieyès and Ducos were soon replaced by Jean Jacques Régis de CARNOT and C. F. LEBRUN, and the Consulate became little more than a scheme for autocratic government by Bonaparte, who was made first consul for life in 1802 and emperor in 1804.

Consumer Affairs, Office of, agency of the U.S. Department of Health, Education, and Welfare, established 1971. The office advises and represents the President on matters of consumer interest and analyzes and coordinates activities of the Federal government in the area of consumer protection. It conducts investigations and surveys on matters of consumer interest, takes action on individual consumer complaints, makes available to the public information the government has acquired in making its own purchases, and presses for legislation to protect the consumer.

Consumers' League, National, organization designed to promote better conditions among workers by encouraging the purchase of articles made and sold under good working conditions. The movement started in England (1890), the U.S. group was founded (1899) by Florence Kelley and her followers. The league undertook to investigate factories and to educate consumers in purchasing habits. For many years the league used a label for goods which had passed inspection, and many consumers learned to purchase only those goods thus labeled. Many of the objectives of the league are now a matter of law, e.g., shorter hours, a minimum wage, payment for overtime, and the abolition in most states of child labor. It has a membership of about 15,000. See Maud Nathan, *Story of an Epoch-making Movement* (1926).

Consumers' Union, product testing and rating organization founded (1936) to provide consumers with information and counsel regarding major retail goods and services. Through its monthly *Consumer Reports* (circulation c. 2 million), the union reports on a diverse range of products, from major appliances and automobiles to health-care and family-planning aids. The organization, whose headquarters is in Mount Vernon, N.Y., also represents consumer interests at government hearings.

consumption, in economics, utilization of goods and services. Consumption may be considered either productive or unproductive. Productive consumption involves wealth used in the process of producing other wealth (e.g., the use of materials and capital to produce other goods), and unproductive consumption involves using wealth for the direct satisfaction of human wants. In a second sense, consumption is viewed as a basically subjective phenomenon, with individual utility, or satisfaction, assuming primary importance. The foremost economist associated with the subjective view was Jeremy Bentham (1748-1832), whose English followers long sought to measure quantitatively the utility provided by consumption. The process of consumption is central to any system of economics. Adam Smith made it the sole end of production. Production, the wholesale and retail trades, and consumption are closely linked, and the exchange of goods and services for money along the various stages from the producer to the ultimate consumer is the foundation of modern capitalist economy. Advertising is today the chief means by which manufacturers and retailers seek to increase consumption, leading many to contend that modern consumption is often governed by false needs. Since the introduction of

the theories of John Maynard KEYNES, contemporary economics has increasingly concerned itself with studying total consumption, in the hope that a better understanding of its relationship to national income would lead to effective governmental control of the business cycle. Experience has shown that through taxation the modern government is often able to regulate the amount of its citizenry's disposable income, thus ultimately affecting the nation's total consumption. See E. W. Gilboy, *Primer on the Economics of Consumption* (1968); Thomas Mayer, *Permanent Income, Wealth, and Consumption* (1973).

contact lens, thin plastic lens worn between the eye and eyelid that may be used instead of eyeglasses. Actors, models, and others wear them for appearance, and athletes use them for safety and convenience. Contact lenses may also be used to correct certain abnormalities of the eye that cannot be corrected by regular glasses. A. E. Fick, a Swiss physician, made the first contact lens in 1887. The heavy glass lenses exerted an uncomfortable pressure on the eyeball, covered the entire eye surface, and were difficult to fit. In 1938 the first plastic contact lens was made by Theodore E. Obrig from a newly discovered methylmethacrylate plastic, known as Plexiglas or Lucite, that could be molded into shape. He also devised a quick way to fit the lens that did not involve months of trial and error. The major drawback was that a solution placed between the lens and eye had to be changed every few hours because the wearer's tears could not circulate beneath the lens. In 1950 the corneal contact lens was introduced. It covered only the cornea of the eye, floated on the tears of the wearer, and could be worn all day without difficulty. Recent improvements include a flexible lens that shortens the initial period of adjustment for the wearer and a porous lens that does not have to be removed each day.

contact process. see SULFURIC ACID

contagious diseases. see COMMUNICABLE DISEASES

Contarini (kōntā-rē-nē), ancient Venetian family, including eight doges, a cardinal, and several artists. The most celebrated member was Andrea Contarini, 1300?-1382. He was doge (1368-82) at the time of the War of CHIOGGIA between Venice and Genoa, he proved his patriotism by melting his gold and silver plate and mortgaging his lands to raise money for the state.

contempt, in law, interference with the functioning of a legislature or court. In its narrow and more usual sense, contempt refers to the despising of the authority, justice, or dignity of a court. A contempt of court can be classified as civil or criminal, direct or constructive. Civil and criminal contempts are distinguished by the function of the punishment—if it is to vindicate judicial authority, the contempt is criminal, if it is to enforce the rights and remedies of a party, the contempt is civil. A direct contempt is one committed in the presence of the court while it is in session. A constructive contempt is one that is committed at a distance from the court and that tends to obstruct or defeat the administration of justice. A refusal to answer a question when directed to answer by a judge is a direct criminal contempt. Disobeying an INJUNCTION or a court order that a judgment (e.g., ALIMONY) be satisfied is a civil contempt. A major distinction is whether the court needs to hear evidence to determine if a contempt was committed. Direct criminal contempts may be punished summarily by fine or imprisonment, civil and constructive criminal contempts can also be punished by fine or imprisonment, but the accused must be granted a hearing. A contempt arising over comment on a court case involves an apparent danger to freedom of expression, and some jurisdictions require indictment and trial by jury. In the United States, Congress can punish for contempt of Congress behavior that occurred during legislative proceedings and that threatened legislative power. Congress must act before it adjourns, and any imprisonment can last no longer than that session. State legislatures also have limited powers to punish for contempt. See R. L. Goldfarb, *Contempt Power* (1963; repr. 1971).

Conti (kōN-tē'), cadet branch of the French royal house of BOURBON. Although the title of prince of Conti was created in the 16th cent., the founder of the continuous line was Armand de Bourbon, prince de Conti, 1629-66, son of Henry II de Condé (see under CONDÉ, family) and brother of Louis II de Bourbon, prince de Conde, with whom he was in rivalry. Disappointed in his expectation of a cardinal's hat, Armand led rebel armies during the first FROVDE, his brother supported the government. Lat-

er they joined together in the second Fronde. Armand was reconciled (1653) with the court and married (1654) a niece of Cardinal Mazarin. He was given command of the army in the Italian and Spanish campaigns (1654-57). Toward the end of his life he turned to religious mysticism and retired (1657) to his estates, where he wrote several theological and moral treatises. He was a friend and protector of Molière. His eldest son, Louis Armand I de Bourbon, died while young, and his next son, François Louis de Bourbon, prince de Conti, 1664-1709, succeeded. His debauchery and his mockery of Louis XIV caused him to be banished (1683) to Chantilly. He then joined the Hungarian campaign of Charles V of Lorraine. Later he returned to Louis XIV's service and fought in the Dutch War. In 1697 he competed unsuccessfully with Augustus II (Frederick Augustus I, elector of Saxony) for the Polish throne. Louis François de Bourbon, prince de Conti, 1717-76, French general, grandson of François, served in the War of the Austrian Succession under General Belle-Isle in Bavaria, and in 1744 he received command of the army in Piedmont. He also distinguished himself in the campaigns in Germany (1745) and Flanders (1746). He resigned his commission in 1747 and for a while was a candidate for the Polish throne. Disliked by Mme de POMPADOUR, however, he lost favor at court. In opposition to the king, he supported the PARLEMENT against René Nicolas de MAUPEOU, later he opposed the reforms of A. R. J. Turgot. He was a writer and a friend of Jean Jacques Rousseau. His son, the last of the line, Louis François Joseph, prince de Conti, 1734-1814, fought in the Seven Years War, notably at the battles of Hastenbeck (1757) and Krenfeld (1758). He was the only prince of the blood to favor the edicts of Maupeou (1771). He signed the protests of the princes in 1789 and left France, but he returned in 1790. He was arrested in 1793 and detained at Marseilles. In 1795 he was exiled to Spain.

continent, largest unit of land on the EARTH. The continents include Eurasia (conventionally regarded as two continents, EUROPE and ASIA), AFRICA, NORTH AMERICA, SOUTH AMERICA, AUSTRALIA, and ANTARCTICA. The continents are not distributed regularly over the earth's surface. More than two thirds of the continental regions are in the Northern Hemisphere, rimming the Arctic Ocean. South America and Africa project into the Southern Hemisphere as southward-pointing triangles, forming extensive peninsular regions separating the Atlantic, Pacific, and Indian oceans. In addition, the continents are antipodal to the OCEAN basins, i.e., ocean basins are found on the opposite parts of the earth from continental masses. There is an antipodal relationship between the continental Antarctic region and the Arctic Ocean, and the Pacific Ocean comprises virtually an entire hemisphere of ocean water, while a hemisphere dominated by land is centered in NW Europe. The continental areas bounded by the sea level contour comprise about 29% of the earth's surface. However, from a geological point of view, the submerged continental shelves are also parts of the continents. Inclusion of the shelf area increases the extent of the continents to 34% of the globe. Geologically and topographically the continents are exceedingly complex and variable in detail, yet certain large-scale structural and topographic features appear to be common to all. Generally, the continents contain vast interior plains or plateaus, underlain by a basement complex of igneous and metamorphic rocks of PRECAMBRIAN age. In some places, the basement complex is exposed at the surface, where it is often called the shield, or craton. The Canadian Shield area of E Canada is the exposed basement complex of North America. Portions of shield areas are covered with veneers of flat-lying sedimentary rocks of younger age. The interior plains are frequently surrounded on one or more sides by ranges of mountains. These mountains are largely composed of younger sedimentary rocks that have been intricately folded and faulted and are approximately aligned parallel to the coasts. They also display abundant evidence of volcanic activity and large-scale igneous intrusions. In the United States the folded Appalachian Mts. lie to the east of the interior plains and the Rocky Mts. to the west. The Rockies are huge granitic masses that pushed upward through overlying sedimentary rocks which were then eroded away. How the continents originated has been a continuous major problem of geology. The oldest continental rocks dated by radioactivity are 3.98 billion years old, which suggests that the continents and oceans are probably permanent features of the earth's surface. Although the continental regions have been periodically covered

by shallow seas, they appear never to have been the sites of ocean depths. Radioactive dating has also revealed that the rocks of the continental shields occur in large belts, with structures similar to those found in more recent mountain ranges. The oldest rocks are found in the interior, central portion of a shield. These discoveries suggest that the central shield areas of continents originally formed close to the time that the earth's crust first solidified and that the process of continental formation, or accretion, is continuing today. Accretion occurs on the edge of a continent where huge plates of the earth's crust are converging. The rocks in the area of convergence are crushed by the plates and thrown up against the continents in the form of mountains (see PLATE TECTONICS). The continents are composed mainly of granitic rocks, called sial (from a contraction of the names of the two chief constituent elements, silicon and aluminum). Underlying the ocean floor and the sial layer of the continents are denser basaltic rocks called sima (a contraction of silicon and magnesium). The sial and sima form the crust of the earth. Below the crust lies a region of the earth called the mantle. Although the crust is entirely solid, evidence indicates that part of the mantle consists of semimolten rocks on which the continents and ocean basins, in effect, are floating. A condition of gravitational balance, called isostasy, exists between different parts of the earth's crust. The theory of isostasy claims that the continental crust floats higher than the oceanic crust because the former is composed of a thick layer of lower density rocks while the latter is composed of a thin layer of higher density rocks. It is believed that isostatic adjustments for changes in mass distribution on the earth's surface occur through a flow of semimolten materials deep in the earth. These materials cause a compensatory uplift of mountains and plateau areas as erosion wears them down. The mass of eroded material is added to and thus depresses the continental shelves and the ocean floor. Adjustments to maintain equilibrium also accompany such mass changes as the growth and melting of ice sheets on continents. The average land elevation is c. 2,700 ft (820 m) above sea level, the highest point on any continent being the summit of Mt. Everest at 29,028 ft (8,848 m), and the lowest point being the surface of the Dead Sea at 1,292 ft (394 m) below sea level. See CONTINENTAL DRIFT.

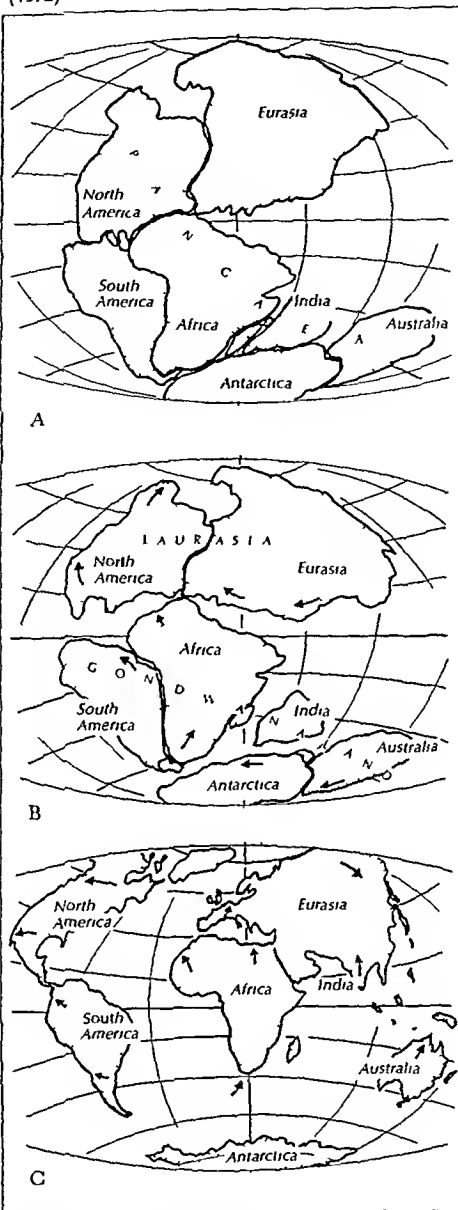
Continental Congress, 1774-89, Federal legislature of the Thirteen Colonies and later of the United States in the AMERICAN REVOLUTION and under the Articles of Confederation (see CONFEDERATION ARTICLES OF). Indignation against England's colonial policy reached fever pitch in the colonies after the passage (1774) of the INTOLERABLE ACTS, and the Sons of Liberty and the committees of correspondence promoted the idea of an intercolonial assembly similar to the one held (1765) at the time of the STAMP ACT. The First Continental Congress (Sept. 5-Oct. 26, 1774) was made up of delegates from all the colonies except Georgia. It met in Carpenter's Hall, Philadelphia, and Peyton Randolph was chosen to preside. The meeting's general purpose was to express colonial grievances against British policy, and only a few radical members considered the possibility of breaking with England. The plan of Joseph GALLOWAY for reconciling Great Britain and the colonies under a new imperial scheme was introduced but rejected. The session's most important act was the creation of the Continental Association, which forbade importation and use of British goods and proposed prohibition of colonial exports. Several petitions of grievances, written principally by John DICKINSON, were sent to the king, and the meeting was adjourned until May 10, 1775. Smoke from the battles of Lexington and Concord (April 19, 1775) had scarcely cleared when the Second Continental Congress met on the appointed day in Philadelphia. Armed conflict strengthened the radical element, but only gradually did the delegates swing toward independence. A Continental army was created to oppose the British and, through the agency of John ADAMS, George Washington was appointed (June 15, 1775) commander in chief. The reconciliation plan offered (1775) by Lord North's government was tabled. A diplomatic representative, Silas DEANE, was sent (March, 1776) to France. American ports were opened in defiance of the Navigation Acts. Finally, the momentous step was taken. Congress on July 4, 1776, adopted the DECLARATION OF INDEPENDENCE. The Congress, a young and unsteady organization, had little money and poor means of obtaining more. Nevertheless, it struggled to press the conduct of the war while moving under force

of military circumstances, from place to place, it met at Philadelphia (1775-76), Baltimore (1776-77), Philadelphia again (1777), Lancaster, Pa (1777), York, Pa (1777-78), and Philadelphia once more (after 1778). There was friction between Congress and the military leaders, and the soldiers, contemptuous (sometimes justly) of the politicians, constantly agitated for their pay and their rights. The Congress, jealous of its powers, frequently hindered Washington in his strategy. After the war ended and the Articles of Confederation took force, the quality of Congressional membership declined, since state offices were more desirable, and the Congress itself eventually dissolved. The Congress of the postwar period has, however, been underrated by many. Though shackled by the weaknesses of the Federal structure, which sharply curtailed its power and particularly its ability to raise funds, the Congress can be credited with some accomplishments—notably the Ordinance of 1787, which set up the Northwest Territory, decision of the WYOMING VALLEY territorial dispute, and adoption of the decimal system of currency. See *Journals of the Continental Congress* (34 vol., 1904-37), *Letters of Members of the Continental Congress* (ed. by E. C. Burnett, 6 vol., 1921-33, repr. 1963), E. C. Burnett, *The Continental Congress* (1941, repr. 1964), Lynn Montross, *The Reluctant Rebels: The Story of the Continental Congress, 1774-1789* (1950, repr. 1970).

Continental Divide, the "backbone" of a continent. In North America, from N. Alaska to New Mexico, it is the great ridge of the Rocky Mts., which separates westward-flowing streams from eastward-flowing waters. In SW New Mexico the divide crosses an area of low relief, it becomes more distinct in N. Mexico, where it follows the Sierra Madre Occidental. In the United States it has sometimes been called the Great Divide, a name also occasionally used to designate the whole Rocky Mt. system, especially the southern section where the high, rugged ranges presented an almost impenetrable barrier to westbound explorers and settlers. Glacier, Yellowstone, and Rocky Mt. national parks lie on the Continental Divide.

continental drift, geological theory that the positions of the continents on the earth's surface have changed considerably through geologic time. The first comprehensive and modern theory of continental drift was put forth by the German meteorologist Alfred Wegener in 1912. He cited as evidence the jigsaw fit of the opposing Atlantic coasts, particularly in the region of the coast of Brazil and the Gulf of Guinea of Africa. Wegener was particularly exacting and detailed in correlating geological and paleontological similarities on the two sides of the Atlantic to strengthen his argument. On the basis of the correlations he believed that late in the Paleozoic era, which ended 225 million years ago, all the continents were united into a vast supercontinent, which he called Pangaea. Later, Pangaea broke into two supercontinental masses—Laurasia to the north, and Gondwanaland to the south. The present continents began to split apart early in the next era, the Mesozoic, drifting to their present positions. As additional evidence he cited the unusual presence of coal deposits in South Polar regions and of glacial features in present-day equatorial regions. He also pointed out that a plastic layer in the interior of the earth must exist to accommodate vertical adjustments caused by the creation of new mountains and by the wearing down of old mountains by erosion (see CONTINENT). He postulated that the earth's rotation caused horizontal adjustment of rock in this plastic layer, exerting forces against the roots of the continents. These forces send the continents drifting on the "sea" of the basaltic ocean floor on which they rest. The mystery of mountain building was thus explained by Wegener as resulting from frictional drag along the leading edges of the drifting continents. Wegener's theory stirred considerable controversy throughout the 1920s, but was not generally accepted, particularly by American geologists, and later became the butt of ridicule. In 1954 the theory of continental drift was revived when a group of British geophysicists reported on magnetic studies of rocks from many places and from each major division of geologic time. They found that for each continent, the magnetic pole had apparently changed position through geologic time, forming a smooth curve (or pole path), they called this phenomenon polar wandering. Surprisingly, they found that each continent had its own pole path, and that the pole paths for Europe and North America could be made to coincide by closing the Atlantic Ocean, thus bringing the continents together. They could

explain these findings only by assuming continental movements. See PLATE TECTONICS. See Hitoshi Takeuchi et al., *Debate About the Earth* (1967), D. H. Tarling, *Continental Drift* (1971), J. T. Wilson, ed., *Continents Adrift: Readings From Scientific American* (1972).



Continental drift (arrows indicate the direction of motion of the landmasses)

A Proposed reconstruction of the original, single supercontinent, Pangaea, indicating the major present landmasses

B Proposed reconstruction of the supercontinents, Laurasia and Gondwanaland

C The landmasses in their present positions

continental shelf: see OCEAN

Continental System, scheme of action adopted by NAPOLEON I in his economic warfare with England from 1806 to 1812. Economic warfare had been carried on before 1806, but the system itself was initiated by the BERLIN DECREE and extended by the Warsaw Decree (1807), the MILAN DECREE (1807), and the Fontainebleau Decree (1810), which forbade trade with Great Britain on the part of France, her allies, and neutrals. Napoleon expected that the unfavorable trade balance and loss of precious metals would destroy England's credit, break the Bank of England, and ruin English industry. Great Britain retaliated by the ORDERS IN COUNCIL, which forbade nearly all trade between England and any nation obeying the Berlin Decree. One of the most dramatic results of the commercial warfare was the English bombardment of neutral COPENHAGEN (1807) and the seizure of the Danish fleet. England had control of the sea, and large-scale smuggling thrived

all along the European coast (with U.S. privateers taking a large part in the illegal trade). Napoleon himself issued special licenses for trade bringing in colonial goods on the payment of duties. Napoleon's Russian campaign of 1812 was brought on by Russia's refusal to conform to the decrees, and the war between England and the United States, known as the WAR OF 1812, was to some extent a result of the economic warfare. But so difficult was the enforcement of the system that in his effort to impose it on Russia, Napoleon had to violate it in France. Napoleon's failure, although it delayed the introduction of the Industrial Revolution in France, resulted in the creation of several new industries on the Continent, notably the manufacture of beet sugar. See F. E. Melvin, *Napoleon's Navigation System* (1919), E. F. Heckscher, *The Continental System* (1922).

continuation school: see VOCATIONAL EDUCATION

contour or **contour line**, line on a map connecting points of equal elevation above or below mean sea level. It is thus a kind of isopleth, or line of equal quantity. Contour lines are drawn on maps with a uniform interval of vertical distance separating them (usually 10, 20, 50, or 100 ft on American maps) and thus outline the landform configuration, or relief. They may be visualized as representing shorelines if sea level were raised in small increments. Thus the tops of hills, which would appear as separate islands, are shown as a series of closed circular contours, valleys, which would appear as elongate bays, are shown as contour lines converging toward a point at the head of the valley. Since on steep slopes there is little horizontal distance between points greatly different in height, contour lines indicating such terrain are close together, contour lines of gentle slopes are more widely separated. Maps employing contour lines are called contour, or relief, maps although they are popularly called topographic maps (see TOPOGRAPHY) in the United States. Certain conventions are employed on these maps to assist the user. Contours indicating land elevations are printed in brown with every fifth contour drawn thicker and labeled with its elevation, those indicating depths of bodies of water are printed in blue. Hachure lines, pointing downslope, are attached to contour lines in order to emphasize a depression with a steep gradient. In the past, contour maps were made from ground surveys, but today they are constructed from stereographic aerial photographs after ground parties have established the precise location and elevation of selected reference points.

contraband, in international law, goods necessary or useful in the prosecution of war that a belligerent may lawfully seize from a neutral who is attempting to deliver them to the enemy. The term is sometimes also applied to the goods carried into a country by SMUGGLING. The penalty for carrying contraband goods is the confiscation of the goods and often also of the vessel (see PRIZE). Neutral ships guilty of direct assistance to the enemy may be treated as enemy ships. International law has not precisely defined all classes of goods that are contraband of war per se. Munitions are certainly absolute contraband, but the status of food and other conditional contraband at least indirectly needed for war is often in doubt. At the second (1907) of the HAGUE CONFERENCES a vain attempt to define the classes of contraband was made. In World War I many powers at first agreed to abide by the terms of the Declaration of London (see LONDON, DECLARATION OF) respecting contraband, but in time unconditional blockade of all goods was adopted. At the beginning of World War II the belligerents drew up lists of absolute and conditional contraband, but the total absorption of the economy in warfare led to the prohibition, so far as possible, of all shipping to the enemy. See P. C. Jessup, *The Early Development of the Law of Contraband of War* (1933).

contrabassoon, large, deep-toned instrument of the oboe family, also called double bassoon. Its tube, over 16 ft (5 m) long, is doubled upon itself four times. It was first made by Hans Schreiber of Berlin in 1620. Handel, Haydn, and Beethoven used it for special effects, but it was characterized by faulty intonation until a German, Wilhelm Heckel, in the late 19th cent. made the type generally used today.

contraception: see BIRTH CONTROL

contract, in law, a promise, enforceable at law, to perform or to refrain from some specified act. In a general sense, all civil obligations fall under TORT or contract law. Torts are usually characterized as violations of duties that have been entirely established by law. In contracts, on the other hand, the parties determine, at least in part, what their obligations to

one another will be. This article considers contracts in general, special types are given separate articles, e.g., **NEGOTIABLE INSTRUMENT**, **INSURANCE**, and **DEED**. For a contract to be valid both parties must indicate that they agree to its terms. This is accomplished when one party submits an offer that the other accepts within a reasonable time or a stipulated period. If the terms of the acceptance vary from the offer, that acceptance legally constitutes a counteroffer, the original offering party may then accept it or reject it. At any time prior to acceptance, the offer may be rescinded on notice unless the offering party is bound by a separate option contract not to withdraw. If the parties conduct their negotiations by mail or telegraph, the contract is ordinarily concluded on the day the acceptance is dispatched, in some jurisdictions, however, the offering party may revoke any time prior to receipt of the acceptance at his usual place of business. Only those terms expressed in the contract can be enforced, secret intentions are not recognized. For a contract to be binding it must not have an immoral or a criminal purpose or be against **PUBLIC POLICY**. Other criteria for the enforcement of contracts have varied. In the earliest type of enforceable promises it was the form of the contract (e.g., a sealed instrument) or the ceremony accompanying its execution that marked the essence of the transaction, contracts not sealed or not dignified by ceremonies held a lesser status and were therefore not always enforceable. The importance of promises in commercial and industrial society produced a new criterion, and generally a promise is now enforceable only if it is made for some consideration, i.e., in exchange for some action or for another promise. In some jurisdictions statutes have made certain promises enforceable without consideration, e.g., promises to pay debts barred by the statute of limitations. To be enforceable, applicable contracts must also comply with the Statute of Frauds (see **FRAUDS, STATUTE OF**), a law that exists in some form in every jurisdiction. Since a contract is an agreement, it may be made only by parties with the capacity to reach an understanding. Therefore, the insane and the feeble-minded are unable to make binding contracts. Until the late 19th cent. married women were also without contractual capacity, because at common law they were considered the creatures of their husbands and without wills of their own (see **HUSBAND AND WIFE**), this disability has been removed by statute all but universally. Minors are not bound by their contracts, but they are responsible for the value of goods received in contracts made for necessities of life. Otherwise, a minor may denounce his contracts at any time and on attaining majority may elect whether to affirm or repudiate them (see **AGE OF CONSENT**). A contract must also be the uncoerced agreement of the parties, thus, if it is procured by **DURESS** or **FRAUD** it is void. While a contract is still wholly or partly unperformed it is termed executory, contracts may terminate, however, in ways other than by being fully executed. If the object of the contract becomes impossible or unlawful, if the parties make a novation (a new superseding agreement), or if the death of one party prevents him from rendering personal services he had agreed to perform, the contract is terminated. The injured party may also treat the

contract as a nullity if the other party refuses to perform. The law provides several remedies for breach of contract. The most usual is **MONEY DAMAGES** for the loss incurred. In cases where some action other than the payment of money was contracted for, a court may grant the plaintiff an **INJUNCTION** ordering specific performance. If one party may be unjustly enriched by a contract that he then repudiates, restitution may be required. A typical example of this is ordering a minor who revokes a contract to restore the things of value that he obtained. In some jurisdictions a contract made for the benefit of a third party may be enforced by the beneficiary against the defaulting party. See A. L. Corbin, *Contracts* (1952), studies by G. C. Cheshire (7th ed. 1969) and F. Kessler (2d ed. 1970).

contract bridge, see **BRIDGE**

contraction, in physics, see **EXPANSION**

contraction, in writing, see **ABBREVIATION**

contralto (kəntrāl'tō), female voice of lowest pitch. Originally, the term denoted a second voice set against (*contra*) a high voice (*alto*), thus, a second high voice. Since most second parts were for a high male voice or a low woman's voice, the term came to mean a low woman's voice. See also **ALTO**, **COUNTERTENOR**, **VOICE**.

Contreras (kōntrā'rās), village, central Mexico, near Mexico City, site of an important battle (Aug. 19-20, 1847) of the Mexican War. Gen. Winfield Scott, continuing his advance after the battle of Cerro Gordo, approached Mexico City. The Mexicans under General Santa Anna were drawn up for defense. Scott sent out a reconnaissance party under Gideon Pillow, who mistakenly ordered an attack that ended by isolating some of his advance troops. The situation seemed desperate, but brilliant night tactics, supported by reestablishment of communications by Robert E. Lee, prepared the way for a daybreak attack. Santa Anna was forced to retire to Chapultepec. Fierce fighting took place later on that same day at Churubusco, closer to Mexico City, where Mexican troops temporarily stemmed the U.S. advance.

controlled atmosphere storage, practice of storing articles in enclosures in which the atmospheric conditions such as temperature, pressure, humidity, and atmospheric composition, are optimized to prevent undesired changes in or deterioration of the stored articles. Refrigeration is a simple example of controlled atmosphere storage. Machine parts are often stored in air that is as dry as possible to protect them from rust. Substances that react readily with oxygen are often stored in atmospheres of nitrogen, carbon dioxide, or other relatively inert gases. Various fruits such as bananas and oranges are shipped and stored in an atmosphere of ethylene dioxide to retard their ripening.

control surface, see **AIRFOIL**

control systems, combinations of components (electrical, mechanical, thermal, or hydraulic) that act together to maintain actual system performance close to a desired set of performance specifications. Open-loop control systems (e.g., automatic toasters and alarm clocks) are those in which the output has no effect on the input. Closed-loop control systems (e.g., thermostats, engine governors, and aircraft and spacecraft automatic control systems) are those in which the output has an effect on the input in such a way as to maintain the desired output value. See **FEEDBACK**.

Contucci, Andrea, see **SANSOVINO, ANDREA**

convection, mode of heat transfer in fluids (liquids and gases). Convection depends on the fact that, in general, fluids expand when heated and thus undergo a decrease in **DENSITY** (since a given volume of the fluid contains less matter at a higher temperature than at the original, lower temperature). As a result, the warmer, less dense portion of the fluid will tend to rise through the surrounding cooler fluid, in accordance with **ARCHIMEDES' PRINCIPLE**. If heat continues to be supplied, the cooler fluid that flows in to replace the rising warmer fluid will also become heated and also rise. Thus, a current, called a convection current, becomes established in the fluid, with warmer, less dense fluid continually rising from the point of application of heat and cooler, denser portions of the fluid flowing outward and downward to replace the warmer fluid. In this manner, heat eventually may be transferred to the entire fluid. Convection currents are widely observed in both liquids and gases. Many aspects of weather are connected with convection currents. For example, when a portion of the atmosphere becomes heated by contact with a warm area of land, it rises into the

cooler, higher altitudes, with the result that some of the moisture carried with it may be condensed to form clouds and precipitation. Man has used convection currents for heating and ventilation since ancient times. Both hot-air and hot-water heating systems use convection to transfer heat through the entire structure being heated. Convection currents also assist in the ventilation of mines.

convector, see **HEATING**

convent, see **MONASTICISM**

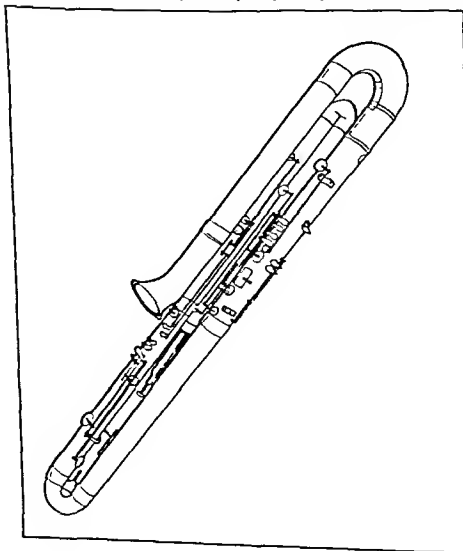
convention, in U.S. politics, a gathering of delegates to nominate candidates for elective office and to formulate party policy. They are held at the national, state, and local levels. Conventions for nominating candidates for state offices were first held in the early 19th cent. The first national convention was held by the Anti-Masonic party in Baltimore in 1831. Formerly the candidates for President and Vice President were always selected by a caucus, i.e., a meeting of influential members of Congress from each party intended to promote the candidate favored in Congress. The Democrats soon followed the lead of the Anti-Masonic party, and in 1832 Andrew Jackson became the first successful candidate to be nominated at a national convention. The Republican party held its first national convention in 1856, when John Frémont was chosen as the presidential candidate. In the past, candidates were often selected only after many ballots had been taken. This was especially true of the Democratic party, which, until 1936, had required successful nominees to win two thirds of the delegates' votes. Thus, Stephen Douglas was nominated on the 59th ballot in 1860, Woodrow Wilson on the 46th ballot in 1912, and John W. Davis on the 103d ballot in 1924. The difficulty of gaining agreement on a candidate at conventions led to a unique feature of the American political scene, the **DARK HORSE**—a candidate with little or no formal support before the opening of the convention, who succeeded in gaining the nomination. Since 1960, however, national conventions have tended to ratify front-runner candidates rather than select from among evenly matched rivals. Although today the acceptance speech of the nominee is the recognized climax of the convention, it was not until Franklin Delano Roosevelt flew to Chicago to accept the Democratic nomination in 1932 that a nominee accepted the nomination in person. The organization of a national convention is the responsibility of the party's national committee, which begins making arrangements for the accommodation of hundreds of delegates and the administration of the convention at least a year in advance. Balloting at both the Republican and Democratic conventions is by states, and only one person at any time has the right to cast the votes for his state. Delegates are chosen by a variety of methods, including primary elections, state and local conventions, or state and local committee meetings. Although the two parties follow the same basic pattern of basing representation on the population of the state and the party's strength within the state, the Democratic party introduced a series of reforms after the 1968 convention that modified its traditional delegate selection system. A quota system, assuring proportional representation for women, youths, and blacks was used for the 1972 convention but subsequently discarded in favor of a general commitment to minority representation. A more lasting change was the abolition of the unit rule, which had been in effect since 1832 and which had required state delegations to cast their votes as a bloc for a single candidate. National political conventions have been criticized by members of both parties, especially those committed to some type of national presidential primary election. See P. T. David et al., *The Politics of National Party Conventions* (rev. ed. 1964), N. W. Polsky and A. B. Wildavsky, *Presidential Elections* (3d ed. 1971).

conversation piece, see **PORTRAITURE**

Converse, Frederick Shepherd, 1871-1940, American composer, b. Newton, Mass., studied with J. K. Paine and G. W. Chadwick and in Germany with Rheinberger. His *Pipe of Desire* (Boston, 1906) was performed at the Metropolitan Opera House, New York City, in 1910, it was the first American opera performed there. His orchestral works include *Fliver Ten Million* (1927) and *American Sketches* (1929). He was dean of the faculty (1930-38) of the New England Conservatory of Music.

conversion, in psychology, see **DEFENSE MECHANISM**, **HYSTERIA**

convertiplane, see **VERTICAL TAKEOFF AND LANDING AIRCRAFT**



Contrabassoon

convict labor, work of prison inmates Until the 19th cent, labor was introduced in prisons chiefly as an added punishment and was often unproductive Such work is now considered a necessary part of the rehabilitation of the criminal, it is also useful in keeping discipline and reducing the costs of prison maintenance The main types of work in prison communities are maintenance activities, outdoor public works (farming, road building, reforestation), and industrial labor Considered a source of cheap labor, convicts were formerly put to work on contract, lease, or piecework bases for private industries In recent decades these methods have been condemned, and prison industries are devoted chiefly to the production of goods to be used in state institutions Because of competition with non-prison labor, interstate commerce in the products of convict labor has also been restricted in the United States since 1934 Wages are paid in many state and Federal prisons in the United States and in many European countries The notorious chain gangs of some Southern states, in which convicts were chained and forced to do heavy labor, have declined but have not disappeared Work release programs have been introduced with some success in France, Norway, Sweden, and the United States, whereby convicts are allowed to work outside prisons in private industry during the latter part of their prison terms, for this work the convict receives the same wages as nonprison workers

convolvulus (kən-vŏl'vū-ləs) see MORNING GLORY

convulsion, sudden violent involuntary contraction of the muscles of the body, often accompanied by loss of consciousness It is not known what causes the abnormal impulses from the brain that result in convulsive seizures, since the disturbance may arise in normal brain tissue as well as in diseased or injured tissue Convulsions may occur in such conditions as epilepsy, poisoning, high fever (especially in young children), disturbances of calcium or phosphorus metabolism, alkalosis, diabetes, oxygen insufficiency, and a low blood-sugar content, as well as in local irritation or injury of the brain Persons undergoing convulsions should be guarded against self-injury (see EPILEPSY) Otherwise, treatment must be directed to the underlying cause

Conway, Henry Seymour, 1721-95, English soldier and politician, nephew of Robert Walpole Early in his life he entered upon concurrent and distinguished military and parliamentary careers He fell into disfavor with George III for defending John Wilkes and was dismissed (1764) from his commands He served (1765-68) as a secretary of state and voiced his dislike of the STAMP ACT In 1782 he helped bring about Lord North's resignation for his handling of the struggle with the North American colonies

Conway, Sir Martin. see CONWAY OF ALLINGTON, WILLIAM MARTIN CONWAY, 1ST BARON

Conway, Moncure Daniel, 1832-1907, American author and preacher, b Stafford co, Va An ardent abolitionist, Conway lectured in England during the Civil War in the interests of the North Brought up as a Methodist, he became a Unitarian minister and later a preacher of free thought Besides editing and contributing essays to periodicals, he was the author of over 70 books, including a biography of Thomas Paine (1892), whose works he also edited (4 vol, 1894-96) See his autobiography (1904), biography by M E Burtis (1952), L D Easton, *Hegel's First American Followers* (1966)

Conway, Thomas, 1735-1800?, general in the Continental army in the American Revolution, b Ireland Educated in France, he was an officer in the French army before coming (1777) to America He fought valiantly as a leader of colonial forces at Germantown, but George Washington attempted to block his promotion from brigadier to major general as unfair to officers with longer service Congress nevertheless appointed him major general (Dec, 1777) and made him inspector general of the army His part in the intrigue known as the CONWAY CABAL was small, but he lost his command, resigned (1778), and returned to France

Conway, city (1970 pop 15,510), seat of Faulkner co, central Ark, in a farm and cotton area, inc 1873 It is a trade and industrial center Conway was settled (c 1865) near the site of a French trading post (c 1770) It is the seat of Hendrix College and the State College of Arkansas A lock and dam on the nearby Arkansas River are tourist attractions Conway Lake offers excellent hunting and fishing

Conway, municipal borough (1971 pop 12,158), Caernarvonshire, N Wales, at the mouth of the Conway River Conway is a picturesque town with sev-

eral notable old structures A high wall (13th cent) encloses the old town, and there is a 13th-century church and a 13th-century castle The Royal Cambrian Academy of Art occupies the Elizabethan mansion Plas Mawr In 1974, Conway became part of the new nonmetropolitan county of Gwynedd

Conway Cabal, 1777, intrigue in the American Revolution to remove George Washington as commander in chief of the Continental Army Washington had been defeated at Brandywine and Germantown, and Horatio GATES was flushed with success by his victory in the Saratoga campaign Some Congressmen and army officers favored Gates as commander in chief Gen Thomas CONWAY, personally irritated with Washington, wrote a letter to Gates severely criticizing Washington James WILKINSON of Gates's staff quoted to William ALEXANDER (Lord Stirling) a phrase purportedly from this letter, and Alexander repeated it to Washington, who sent the quotation to Gates without comment Gates wrote an elaborate defensive reply and sent it to Washington through Congress Public opinion supported Washington, and the plot—if such it was—came to nothing As it turned out, the much-quoted phrase was not in Conway's letter at all, and his name has been unfairly used to designate the cloudy scheme

Conway of Allington, William Martin Conway, 1st Baron, 1856-1937, English explorer, art historian, and writer Conway filled several university positions and in 1918-31 represented the combined English universities as Conservative member in the House of Commons He began mountain climbing at 16 and conducted expeditions of exploration in Spitsbergen (1896-97) and the Bolivian Andes (1898) His numerous books on art and exploration include *Mountain Memories* (1920), *Art Treasures of Soviet Russia* (1925), and *Giorgione as a Landscape Painter* (1929)

Conwell, Russell Herman, 1843-1925, American Baptist minister and lecturer, b Worthington, Mass After practicing law, he was ordained (1879) and went to Philadelphia as a minister He was founder and first president of Temple Univ, a college for working people that opened in 1884 For over 60 years Conwell was active as a lecturer See biography by A R Burr (1917)

cony see CONEY

Cooch Behar (kōōch bīhār'), former princely state, now part of West Bengal state, E India It lies in a low, poorly drained plain Rice, tobacco, and jute are grown Big-game hunting is practiced The chief town, Cooch Behar (1971 pop 53,734), is a district administrative center and market town

Cook, David J, 1840-1907, American law enforcement officer, b near La Porte, Ind He moved (1855) with his family to Kansas, went (1859) to the Colorado gold fields, and returned to enlist (1861) in the Union army in the Civil War Army service as a sort of military policeman led him to found the volunteer Rocky Mountain Detective Association to suppress outlawry in Colorado, and he had a long career as marshal, sheriff, and police chief, mostly around Denver He brought many train, bank, and express-company robbers to justice, helped to quell the Ute Indian revolt of 1878, and was arbitrator in the mine strike at Leadville in 1880 See his reminiscences (new ed 1958), biography by W R Collier and E V Westrate (1936)

Cook, Ebenezer, fl 1708, American author Virtually nothing is known about his life He is the author of *The Sot-Weed Factor* (1708), a satirical poem concerning an Englishman's visit to Maryland *Sotweed Redivivus* (1730), a treatise on tobacco production, is also attributed to him Cook is the central character in *The Sot-Weed Factor* (1960), a novel by John BARTH

Cook, Frederick Albert, 1865-1940, American explorer and physician, b Sullivan co, NY Cook early became interested in the arctic and accompanied the expedition of Robert E PEARY in 1891-92 as surgeon Later he accompanied the Belgian expedition (1897-99) to Antarctica and made other polar voyages In 1906, after unsuccessful attempts to reach the summit of Mt McKinley, Cook remained behind when most of the party returned He later announced that he and a companion had successfully scaled the peak, this assertion was afterward proved to be fraudulent In 1907 he set out with an expedition for the arctic, and on Sept 1, 1909, he emerged into civilization again, claiming that he had reached the North Pole in April, 1908 A few days later Peary announced that he had reached the pole in April, 1909, and accused Cook of fraud The argument was sensational Cook was deprived of some of the hon-

ors that had been accorded him and disappeared from the public eye for a time Later he was involved in an oil-field promotion scheme in Texas and served five years (1925-30) of a 14-year sentence for having used the mails to defraud To the end of his life, however, and in the face of a generally hostile public, Cook fought for vindication of his polar and Mt McKinley claims and even filed several libel suits He was supported by some well-known explorers as well as some ardent admirers Cook defended his claims in *My Attainment of the Pole* (1911) and *Return from the Pole* (ed by F J Pohl, 1951) See Theon Wright, *The Big Nail* (1970), Hugh Eames, *Winner Lose All* (1973)

Cook, George Cram: see GLASPELL, SUSAN

Cook, James, 1728-79, English explorer and navigator After an apprenticeship to a firm of shipowners at Whitby, he joined (1755) the royal navy He surveyed the St Lawrence Channel (1760) and the coasts of Newfoundland and Labrador (1763-67) Cook was commissioned a lieutenant in command of the *Endeavour* and sailed (1768) on an expedition to chart the transit of Venus, he returned to England in 1771, having also circumnavigated the globe and explored the coast of New Zealand, which he accurately charted for the first time, and the coast of E Australia He commanded (1772-75) an expedition to the South Pacific of two ships, the *Resolution* and the *Adventure* On this expedition he disproved the rumor of a great southern continent, explored the Antarctic Ocean and the New Hebrides, discovered New Caledonia, and by the observance of strict dietary and hygienic rules prevented scurvy, heretofore the scourge of long voyages Capt Cook sailed again in 1776 and, after a year in the South Pacific, rediscovered the Sandwich Islands and unsuccessfully searched the northwest coast of North America for a passage to the Atlantic On the return voyage he was killed by natives on the Hawaiian Islands See definitive edition of his journals, ed by J C Beaglehole (Vol I-III, 1955-67, Vol IV in prep), selections from journals, ed by A G Price (1958, repr 1969), biographies by Christopher Lloyd (1952, repr 1957), Alan Villiers (1967), and J C Beaglehole (1974), Alan Moorehead, *The Fatal Impact* (1966), bibliography by Maurice Holmes (1968)

Cook, Sir Joseph, 1860-1947, Australian statesman, b England A leader of the Free Trade party, he served as prime minister (1913-14) and later as minister of the navy (1917-21) and high commissioner to London (1921-27) He was Australian representative at the Paris Peace Conference and a delegate (1922-26) to the League of Nations

Cook, Thomas, 1808-92, English travel agent In Leicester in 1841 he founded the travel agency that bears his name The idea of the guided tour met with quick success, and by 1852 Cook had moved his office to London Shortly thereafter he set up (1856) his Circular Tour of Europe, and 10 years later he was arranging tours of the United States His most spectacular achievement was the transportation of an entire expeditionary force (18,000 men) up the Nile for the attempted relief of Gen Charles George GORDON in 1884

Cook, Mount, 12,349 ft (3,764 m) high, on South Island, New Zealand, in the Southern Alps, highest peak of New Zealand Tasman Glacier is on the southeastern side of Mt Cook

Cooke, Jay, 1821-1905, American financier, b Sandusky, Ohio He founded Jay Cooke & Company, which marketed the huge Civil War loans of the Federal government He later turned to railroad bonds and in 1870 undertook to raise \$100 million for the Northern Pacific and financed construction to Bismarck, N Dak The burden proved to be too great and continuing the financing became impossible In 1873, Cooke's New York branch closed its doors and helped to precipitate the Panic of 1873 See biographies by E P Oberholtzer (1907, repr 1968) and Henrietta M Larson (1936, repr 1968), Meade Minnigerode, *Certain Rich Men* (1927, repr 1970)

Cooke, Terence James, 1921-, American Roman Catholic clergyman, b New York City He was ordained in 1945 after earning a B A from St Joseph's Seminary in Yonkers, NY In 1957, Cooke was named secretary to Francis Cardinal Spellman and then became vice chancellor of the archdiocese of New York (1958), chancellor (1961), and auxiliary bishop (1965) Appointed cardinal and archbishop of New York (1968), Cooke led a campaign in the United States against legalized abortion

Cookeville, city (1970 pop 14,270), seat of Putnam co, N central Tenn, inc 1854 It is a farm trade cen-

ter with plants making filters, automobile accessories, brushes, clothing, and heating elements Tennessee Technological Univ is there

Cook Islands, group (1970 est pop 22,000), 90 sq mi (234 sq km), South Pacific, SE of Samoa It comprises two main groups, the Lower Cook islands (RAROTONGA, Mangaia, Atiu, Aitutaki, Mauke, Mitiaro, and Manuae and Te-Au-o-tu) and the Northern Cook islands (Nassau, Palmerston, Penrhyn, MANIHiki, Rakahanga, Pukapuka, and Suvarrow) Avarua on Rarotonga is the administrative center of the group Fruit juices, citrus fruits, clothing, copra, tomatoes, pearl shell, handicrafts, and jewelry are the principal exports Most imports come from New Zealand The Cook islands are Maoris, a branch of the Polynesian race, they generally work their own land The southern islands were probably occupied by the Polynesians c 1,500 years ago Spaniards visited the islands in the late 16th and early 17th cent Capt James COOK sighted some of the islands in 1773, others were not discovered until the 1920s The London Missionary Society was a powerful influence in the southern islands during the 19th cent The group was proclaimed a British protectorate in 1888 and was annexed by New Zealand in 1901 Although under New Zealand sovereignty, the Cook Islands achieved internal self-government in 1965 The government consists of a prime minister, a cabinet, a 22-member elected legislature, and a 15-member House of Arikis (hereditary chiefs) The latter is a purely consultative body whose members are appointed by the New Zealand High Commissioner for one-year terms New Zealand remains responsible for foreign affairs and defense, and the Cook islands are citizens of New Zealand The islands were formerly called the Hervey Islands

Cook Strait, channel, c 15 mi (24 km) wide, between North Island and South Island, New Zealand It was discovered in 1770 by Capt James Cook

Cooley, Charles Horton, 1864-1929, American sociologist, b Ann Arbor, Mich, grad Univ of Michigan (B A, 1887, Ph D, 1894), son of Thomas M. Cooley He taught in the sociology department at the Univ of Michigan after 1892, although his degree was in economics Cooley's major contribution to the field of sociology was his conceptualization of the "looking-glass self" (a concept that emphasizes the social determination of the self) and primary groups—e g, the family, the play group, or the neighborhood He wrote *Human Nature and the Social Order* (1902, rev ed 1922), *Social Organization* (1909), *Social Process* (1918), and *Sociological Theory and Social Research* (1930)

Cooley, Thomas McIntyre, 1824-98, American jurist, b near Attica, N Y He was a judge (1864-85) of the supreme court of Michigan and was the first chairman (1887-91) of the Interstate Commerce Commission His best-known work is *A Treatise on the Constitutional Limitations Which Rest upon the Legislative Power of the States* (1868, 8th ed 1927) Cooley argued that the U S Constitution contained not only direct limitations on the power of the states (e g, the prohibition in Article I, Section 10, against a state's impairing the obligations of contract) but also implied limitations that could be deduced from the political theory underlying the Constitution For example, from the division of American governments into executive, legislative, and judicial branches he inferred the freedom of the judiciary from legislative interference Cooley's study was highly influential in the early interpretation of the due process clause of the FOURTEENTH AMENDMENT to the Constitution He also wrote extensively on the law of torts and taxation See C E Jacobs, *Law Writers and the Courts* (1954, repr 1973)

Coolgardie, Australia see EAST COOLGARDIE GOLD FIELD, KALGOORIE

Coolidge, Calvin, 1872-1933, 30th President of the United States (1923-1929), b Plymouth, Vt John Calvin Coolidge was a graduate of Amherst College and was admitted to the bar in 1897 He practiced (1897-1919) law in Northampton, Mass, entered state politics as a Republican, and rose steadily in the party He served (1910-11) as mayor of Northampton, was a member of the Massachusetts state senate from 1912 to 1915 (its president after 1914), and was (1916-19) lieutenant governor before serving (1919-21) as governor Coolidge rose to national prominence when he used the militia to end the Boston police strike in 1919 In 1920 he was nominated as Republican candidate for the vice presidency and was elected with Warren G Harding After Harding died, Coolidge took (Aug 3, 1923) the oath of office as President Untouched by the scan-

dals of the Harding administration, he was easily elected to a full term in 1924 His personal honesty and New England simplicity appealed to the American people, and his unquestioning faith in the conservative business values of laissez faire reflected the national mood Coolidge's policies were aggressively pro-business Through his appointees he transformed the Federal Trade Commission from an agency intended to regulate corporations into one dominated by big business He twice vetoed (1927, 1928) the McNary-Haugen bill to aid agriculture and pocket-vetoed (1928) a bill for government operation of the Muscle Shoals hydroelectric plant The presence in his cabinet of Herbert C Hoover and Andrew W Mellon added to the business tone of his administration, and Coolidge supported Mellon's program of tax cuts and economy in government Through his public statements he encouraged the reckless stock market speculation of the late 1920s and left the nation unprepared for the economic collapse that followed Coolidge chose not to seek renomination in 1928 After leaving office he retired to Northampton to write newspaper and magazine articles and his autobiography (1929) As first lady, his wife, Grace A Goodhue Coolidge, was much admired for her poise and charm A selection of his press conferences was edited by H H Quint and R H Ferrell (1964) See biographies by C M Fuess (1940), D R McCoy (1967), Jules Abels (1969), and W A White (1938, repr 1973)

Coolidge, William Augustus Brevoort, 1850-1926, American mountaineer and historian of the Alps, b New York City A graduate of Exeter College, Oxford, and life fellow and later modern history tutor at Magdalen College, he ascended nearly all the highest Alpine peaks He spent most of his life in England and Switzerland His books include *The Alps in Nature and History* (1908)

Coolidge, William David, 1873-1975, American physical chemist, b Hudson, Mass, grad Massachusetts Institute of Technology, 1896 He joined the General Electric Company in 1905 and served as director of its research laboratory (1932-40) and as vice president and director of research (1940-44) He made special studies of X rays, invented an X-ray tube, and invented and developed ductile tungsten

Coolidge Dam, 249 ft (76 m) high, 920 ft (280 m) long, on the Gila River, SE Ariz, built 1927-28 It irrigates c 100,000 acres (40,470 hectares), half of which are Indian lands in San Carlos Reservation San Carlos Reservoir, formed behind the dam, lies above old Indian burial grounds and the former camp of Geronimo

coolie labor, term applied to unskilled laborers from Asia, especially from India and China With the discontinuance of slavery, the use of Chinese and Indian contract labor in British and French colonies increased Indenture of Indian coolies was usually for a term of five years, in return for wages, certain benefits, and the cost of passage, the terms were enforceable by penal sanctions At the expiration of their terms, the laborers were free to reindenture or to seek other employment They frequently became peasant proprietors, although they were entitled to return passage to India The practice was discontinued by the British Indian government, which in 1922 prohibited assisting the emigration of unskilled laborers, except to a few countries Emigration of Chinese coolies began c 1845, although it was nominally prohibited before 1859 Between these dates the conditions were notoriously bad, the victims were shipped mainly to Cuba and Peru, where they died by the thousands In 1859, Britain arranged with Canton for legal emigration to the British West Indies and elsewhere on five-year contracts In 1860 an Anglo-Chinese convention sanctioned such emigration to British territory, and the regulations were agreed to by the other powers in similar conventions The British Chinese Passenger Act of 1885 regulated British ships in the trade and resulted in the traffic's falling mainly into the hands of the Portuguese, under whom it resembled the African slave trade In 1904, Great Britain arranged with China the hiring of 50,000 Chinese laborers to work the Transvaal gold mines In the 19th cent large numbers of Chinese laborers went to California and Australia Opposition in Australia to this influx of cheap labor resulted in the passage of the Emigration Restriction Act for the gradual elimination of Asians from Australia, by providing that no one should be permitted to enter the country who failed to write 50 words in any prescribed language Coolie labor was important in building the first U S transcontinental railroad, but this type of immigration into the United States was practically

ended by the Chinese Exclusion Act of 1888 and by stringent Federal laws against contract laborers In 1904, Canada began to exclude coolie labor by charging a head tax of \$500 See P C Campbell, *Chinese Coolie Emigration to Countries within the British Empire* (1923, repr 1971)

cooling system, type of heat exchanger commonly incorporated in engines to reduce the heat generated by friction and by combustion of the fuel Engines of the internal-combustion type generate heat in the cylinders to such an extent that, if they are not cooled, the lubricating oil will be burned and serious damage will be done to the various parts through unevenness of expansion Most internal-combustion engines are either water- or air-cooled Around each cylinder and cylinder head of a water-cooled engine is a hollow jacket through which water is circulated to draw heat from the engine The heated water is passed into a radiator connected to the jackets The radiator transfers heat to the atmosphere from its large surface area, over which air is drawn by a fan and also, in a motor vehicle, by the vehicle's motion The cooled water then returns to the jackets around the engine In order to speed the initial warmup of the engine, thermostatic valves prevent water from entering the radiator until the engine reaches its correct operating temperature In very cold weather the water may freeze, cracking the radiator To prevent this, the water is mixed with certain chemicals (see ANTIFREEZE) In air-cooled engines a large cooling surface is provided by means of a number of fins which, as part of the cylinders and the cylinder heads, help to dissipate the heat Air is caused to flow over the fins by the motion of the engine, if on a motor vehicle, or by a fan, or by both Sometimes the heated water from the jackets of internal combustion engines or from other sources is cooled in a cooling tower The water is sprayed into the tower where it mixes with air, heat being dissipated when some of the water evaporates The rest of the water is recirculated Large sources of waste heat such as power plants use cooling towers to avoid thermally polluting lakes and rivers by sending hot water into them Rapidly moving machinery is frequently kept cool, as well as being lubricated, by running it in an oil bath In a rocket engine the exit nozzle is sometimes cooled by the fuel passing through coils around it to the combustion chamber Cooling systems in buildings are so devised as to purify the air and regulate its water content as well as to cool it (see AIR CONDITIONING) See also VENTILATION

Coomaraswamy, Ananda Kentish (a "nānda" kēn'-īsh kōōma'raswā'mē), 1877-1947, art historian, b Ceylon (now Sri Lanka) Coomaraswamy was active in educational movements in India After 1917 he became keeper of Indian and Islamic arts in the Museum of Fine Arts, Boston He is credited with having built up the museum's great Far Eastern collection He was critical of Western institutions and sought, as in his *Am I My Brother's Keeper?* (1947), to apply to them standards derived from Oriental philosophy and history Among his other books are *Dance of Siva* (1918), *History of Indian and Indonesian Art* (1927), *Elements of Buddhist Iconography* (1935), and *The Transformation of Nature in Art* (3d ed 1956) See the bibliography of his writings in I K Bharatha, ed, *Art and Thought* (1947), study by R F Livingston (1962)

Coon, Carleton Stevens, 1904-, American anthropologist, archaeologist, and educator, b Wakefield, Mass, grad Harvard 1925, Ph D 1928 From 1925 to 1939 he was engaged in fieldwork and anthropological research in Arabia, the Balkans, and N Africa, where he discovered (1939) the remains of a Neanderthal man He taught (1934-48) at Harvard and in 1948 became professor of anthropology at the Univ of Pennsylvania and curator of ethnology at the University Museum there Coon became a controversial figure with the publication of *The Origin of Races* (1962), in which he argued that certain races had reached the *Homo sapiens* stage of evolution before others, he said this would explain why different races achieved different levels of civilization His other writings include *The Seven Caves* (1957), *The Story of Man* (2d ed 1962), *The Living Races of Man* (1965), and *The Hunting Peoples* (1971)

coon: see RACCOON

coon cat, name for a breed of large domestic CATS (also called Maine cats), for the COATIMUNDI, and for the CACOMISTLE

coonhound, black-and-tan, breed of large HOUND developed in the United States It stands from 23 to 27 in (58-69 cm) high at the shoulder and weighs from 70 to 85 lb (32-38 kg) The dense, short coat is

coal black with tan markings above the eyes and on the muzzle, chest, and legs. The black-and-tan is descended from the old Virginia (American) foxhound and is bred especially for proficiency in hunting raccoons and opossums. It is a slow but methodical trailer, scenting with its nose to the ground much like a bloodhound. Once it has treed its quarry it gives voice until the hunter arrives. There are other varieties of coonhound closely related to the black-and-tan and also originally descended from the foxhound, e.g., the Walker, Trigg, redbone, bluetick, and Plott, but only the black-and-tan is recognized as a separate breed by the American Kennel Club. See DOG.

Coon Rapids, city (1970 pop. 30,505), Anoka co., SE Minn., on the Mississippi River, inc. 1952. It is a suburb of Minneapolis-St. Paul. It has an aerospace research facility and plastic and metallurgical industries. A junior college is there.

Cooper, Alexander. see under COOPER, SAMUEL.

Cooper, Alfred Duff, 1st Viscount Norwich of Aldwick, 1890-1954, British statesman and diplomat. Elected to Parliament as a Conservative (Unionist) in 1924, he served as secretary of state for war (1935-37) in the coalition cabinet and was first lord of the admiralty in 1938 when he resigned in protest against the Munich Pact. He returned to the cabinet as minister of information (1940-41) under Winston Churchill. Appointed resident minister of Far Eastern affairs in Singapore in Dec. 1941, he was recalled the following month, shortly before Singapore fell to the Japanese. From 1944 to 1947 he served as ambassador to France. He was raised to the peerage in 1952. Among his writings is an autobiography, *Old Men Forget* (1953).

Cooper, Anthony Ashley: see SHAFTESBURY, ANTHONY ASHLEY COOPER, 1ST EARL OF.

Cooper, Gary (Frank James Cooper), 1901-61, American film actor, b. Helena, Mont. His first important starring role in *A Farewell to Arms* (1933) was followed by such films as *Mr. Deeds Goes to Town* (1936), *Pride of the Yankees* (1942), *For Whom the Bell Tolls* (1943), and *Saratoga Trunk* (1944). Best known to his public as the shy, lanky man of the West, he won Academy Awards for his performances in *Sergeant York* (1941) and *High Noon* (1952). His later films include *Vera Cruz* (1954), *Friendly Persuasion* (1956), and *They Came to Cordura* (1959).

Cooper, James Fenimore, 1789-1851, American novelist, b. Burlington, N.J. He was the first important American writer to draw on the subjects and landscape of his native land in order to create a vivid myth of frontier life. In 1790 Cooper's family moved to Cooperstown, N.Y., a frontier settlement founded by his father near Otsego Lake. Sent to Yale at 13, Cooper was dismissed for a disciplinary reason in his third year. Soon after he went to sea, commissioned as a U.S. midshipman, he served until 1811, at which time he married and settled as a gentleman farmer. Cooper's literary career, which covers a period of 30 years and includes more than 50 publications, began in 1820 with the appearance of *Precaution*. Imitative of the English novel of manners, this book failed to gain an audience, but his next work, *The Spy* (1821), a patriotic story of the American Revolution, was an immediate success. With *The Pioneers* (1823), the first of the famous *Leatherstocking Tales*, and *The Pilot* (1823), an adventure of the high seas, Cooper's reputation as the first major American novelist was established. In 1826 he went to France, nominally as American consul at Lyons. He spent several years abroad, publishing such novels as *The Red Rover* (1827), *The Wept of Wish-ton-Wish* (1829), and *The Water-Witch* (1830), romances of American life on land and sea. In *Notions of the Americans* (1828) he defended his country to European critics, but upon his return home, repelled by what he saw as the abuses of American democracy, Cooper became the staunch social critic of American society. Such works as *The American Democrat* (1838) and the fictional *Home-ward Bound* and its sequel, *Home as Found* (both 1838), express the conservative, aristocratic social views that made him quite unpopular; his later life was filled with many quarrels and lawsuits over his works. In his most important novels, the group comprising the *Leatherstocking Tales*—which in order of the narrative are *The Deerslayer* (1841), *The Last of the Mohicans* (1826), *The Pathfinder* (1840), *The Pioneers* (1823), and *The Prairie* (1827)—Cooper skillfully dramatized the clash between the frontier wilderness and the encroaching civilization. Named for their chief character, the forthright frontiersman Natty Bumppo, nicknamed Leatherstocking, the

Leatherstocking Tales are notable for their descriptive power, their mastery of native background, and their romanticized portrayal of the American Indian. His later works include the novels *Atfloat and Ashore* and its sequel, *Miles Wallingford* (both 1844), and the Littlepage trilogy—*Satanstoe* (1845), *The Chainbearer* (1845), and *The Redskins* (1846)—a study of the conflict between the landholding and the propertyless classes in New York state, in which Cooper shows himself a traditional defender of the rights of property. Although Cooper has been criticized for his extravagant plots, his conventional characters, and his stilted dialogue, he nevertheless remains the first great American novelist, a vital and original writer of romances of the wilderness and of the sea and an astute critic of the growing and stumbling American democracy. See his correspondence (ed. by his grandson, J. F. Cooper, 2 vol., 1922, repr. 1971), biographical and critical studies by James Grossman (1949), R. E. Spiller (1931, repr. 1963), George Dekker (1967), T. R. Lounsbury (1882, repr. 1968), and J. P. McWilliams, Jr. (1972), bibliography by R. E. Spiller and P. C. Blackburn (1934, repr. 1969).

Cooper, Myles, 1737?-1785, 2d president of King's College (now Columbia Univ.), b. England, educated at Oxford. He was ordained a priest in 1761 and went to King's College (1762) as professor of moral philosophy and assistant to the president. In 1763 he was made president, succeeding Samuel Johnson. Although his early administration was marked by the founding of a grammar school, a medical school, and a hospital, with changes in the curriculum and great increase in prestige, the college experienced hardships during the American Revolution. Cooper was an active and vocal Loyalist, and in 1775 he was forced to flee before the patriots' hatred to a British warship in New York harbor. He returned to Oxford and lived out his life in England.

Cooper, Peter, 1791-1883, American inventor, industrialist, and philanthropist, b. New York City. After achieving success in the glue business, Cooper, with two partners, erected (1829) the Canton Iron Works in Baltimore. There he constructed the *Tom Thumb*, one of the earliest locomotives built in the United States. His success in trials on the Baltimore & Ohio RR probably saved that pioneer line from bankruptcy. During the next 20 years, Cooper expanded his holdings, becoming a leader in the American iron industry, and in 1870 he was awarded the Bessemer gold medal for rolling the first iron for fireproof buildings. Cooper invented and patented other practical devices and processes. His faith in the success of the Atlantic cable led him to invest heavily in the New York, Newfoundland, and London Telegraph Company after banks refused to finance the operation. He was president of this company for 20 years while he headed the North American Telegraph Company, which controlled more than half of the telegraph lines in the country. An outstanding leader in the civic affairs of New York City, Cooper led the successful fight to secure a public school system and did much to improve several of the municipal departments. His lasting monument is COOPER UNION in New York City, built after his own plans to provide for education for the working classes. He supported the GREENBACK PARTY in national politics, and in 1876 he was the party's presidential candidate, polling over 80,000 votes. Many of his addresses were collected in *Ideas for a Science of Good Government* (1883, repr. 1971). Abram S. HEWITT was his son-in-law, Peter Cooper Hewitt his grandson. See biographies by R. W. Raymond (1901), Allan Nevins (1935, repr. 1967), and E. C. Mack (1949).

Cooper, Samuel, 1609-72, one of the greatest English miniaturists. A student of Hoskins, he worked in London from c. 1642. He painted portraits of numerous celebrated Englishmen. His draftsmanship and unusual use of lighting made his vellum-on-card head-and-shoulder paintings remarkable. Specimens of his work are to be found at Windsor Castle, in the collections of the duke of Buccleuch and the duke of Devonshire (the latter containing the famous portrait of Cromwell familiar through engravings), in the Victoria and Albert Museum, London, in the Rijks Museum, and in the Metropolitan Museum of Art. His brother, Alexander Cooper, d. 1660, was for many years miniature painter at the court of Queen Christina of Sweden.

Cooper, Thomas, 1759-1839, American scientist, educator, and political philosopher, b. London, educated at Oxford. His important works include *Political Essays* (1799), the appendixes to the *Memoirs of Dr. Joseph Priestley* (2 vol., 1806), in which he reviews Priestley's life and works at length, *Lectures*

on the *Elements of Political Economy* (1826), *Treatise on the Law of Libel* (1830), and (as editor) *The Statutes at Large of South Carolina* (5 vol., 1836-39). Cooper emigrated to the United States in 1794 and, settling near his friend Joseph Priestley in Northumberland, Pa., was his partner in scientific research. As a supporter of the Jeffersonian opposition to the Federalists, he wrote many political pamphlets, especially against the Alien and Sedition Acts of 1798. Convicted under the acts, he was imprisoned and fined \$400, after his death this fine was repaid to his heirs. He taught at Dickinson College and the Univ. of Pennsylvania and was president (1820-33) of South Carolina College (now the Univ. of South Carolina). See Dumas Malone, *The Public Life of Thomas Cooper* (1926), J. N. Ireland, *A Memoir of the Professional Life of Thomas Abthorpe Cooper* (repr. 1970).

Co-operative Commonwealth Federation see NEW DEMOCRATIC PARTY.

Cooperative Extension Service, in the United States, publicly supported, informal adult education and development organization. Established in 1914, it consists of three levels of organization—Federal, state, and county. Its overall objective is to plan, execute, and evaluate learning experiences that will help people acquire the understanding, the abilities and capabilities, attitudes, and skills essential for solving farm, home, and community problems. This objective is met through educational programs that make use of research findings emanating primarily from the U.S. Dept. of Agriculture and the state land-grant colleges and universities.

cooperative movement, series of organized activities that began in the 19th cent. in Great Britain and later spread to most countries of the world, whereby people organize themselves around a common goal, usually economic. The term usually refers more specifically to the formation of nonprofit economic enterprises for the benefit of those using their services. An old and widespread form is the consumers' co-operative, in which people organize for wholesale or retail distribution, usually of agricultural or other staple products. Traditionally, membership is open, and anyone may buy stock. Goods are sold to the public as well as to members, usually at prevailing market prices, and any surplus above expenses is turned back to the members. Money is saved through direct channeling of goods from producer to consumer. Producers' cooperatives are manufacturing and distributive organizations, commonly owned and managed by the workers. Another development in such cooperatives has been the acquisition of failing manufacturing plants by labor unions, who run them on a cooperative basis. Agricultural cooperatives usually involve cooperation in the processing and marketing of produce and in the purchase of equipment and supplies. Actual ownership of land is usually not affected, and in this way the agricultural cooperative differs from the COLLECTIVE FARM. Agricultural cooperatives are often linked with cooperative banks and CREDIT UNIONS, which constitute another important type of cooperative. There is also cooperative activity in insurance, medical services, housing, and other fields. The origin of cooperative philosophy is found in the writings and activities of Robert OWEN, Louis Blanc, Charles FOURIER, and others. Its early character was revolutionary, but under the impact of such movements as Christian Socialism this aspect diminished. After some early 19th cent. experiments, consumers' cooperation took permanent form with the establishment (1844) of the ROCHDALE SOCIETY OF EQUITABLE PIONEERS in England. The cooperative movement has since had considerable growth throughout Great Britain and the Commonwealth, where local cooperatives have been federated into national wholesale and retail distributive enterprises and where a large proportion of the population has membership. Foods are the chief products handled, with insurance and banking activities next in importance. Outstanding examples of cooperative organization are found in the Scandinavian countries, Israel, the People's Republic of China, the Soviet Union, and France. In 1918, the Scandinavian Cooperative Wholesale Society was founded to allow these countries the opportunity to buy food products from other countries jointly. Throughout rural and urban Scandinavia, marketing and consumer cooperatives are common. In Israel, more than 50% of the rural population is organized into agricultural cooperatives. After the successful Communist revolution in China in 1949, large-scale efforts toward cooperative organization were begun, by the mid-1950s more than 90% of all craftsmen were in coop-

eratives, and by 1958 all agriculture was cooperatively organized. The Soviet Union, which organized its economy along cooperative lines earlier than China, did not achieve the rapid success of the Chinese. France, with a long history of cooperative attempts for both consumers and producers, has gained the most success with agricultural cooperatives (e.g., over 80% of all French grain is sold through cooperatives). The cooperative movement began in the United States in the 19th cent., first among workers and then among farmers. The National Grange, a farmers cooperative was founded in 1867 and later exercised considerable political influence (see GRANGER MOVEMENT). Today the major types of cooperatives include those of farmers, wholesalers, and consumers, as well as insurance, banking and credit, and rural electrification cooperatives (the growth of the latter two facilitated by loans from the Federal government). Although cooperatives are more prevalent in the rural areas of the United States, by the early 1970s a large increase in cooperative apartment buildings and supermarkets in urban areas was evident. An international alliance for the dissemination of cooperative information was founded in 1895. Since then there has been increasing international collaboration among the various kinds of cooperatives and a growing trend toward the establishment of international cooperative distribution. See Laszlo Valko, *International Handbook of Cooperative Legislation* (1954); International Labor Organization, *Cooperative Management and Administration* (1960); H. J. Voorhis, *American Cooperatives* (1961); F. C. Helm, *The Economics of Co-operative Enterprise* (1968); E. P. Roy, *Cooperatives, Today and Tomorrow* (1969).

Cooperstown, residential village (1970 pop. 2,403), seat of Otsego co., E central N.Y., on the Susquehanna River and Otsego Lake, inc. 1807. It was founded by William Cooper, who brought his family there in 1787. His son, James Fenimore Cooper, made his home in Cooperstown after his return from abroad in 1833, and the region is described in his *Leatherstocking Tales*. Fenimore House is the headquarters of the New York State Historical Association. Other museums include Cooperstown Indian Museum, Farmers' Museum, and the National Baseball Hall of Fame and Museum, commemorating the founding (1839) of baseball there by Abner Doubleday. Glimmerglass State Park is nearby.

Cooper Union, accredited institution of higher education, in New York City, coeducational, chartered and opened in 1859. Founded by Peter Cooper, it pioneered in evening engineering and art schools, day schools were added in 1900. Today it includes the School of Engineering and Science, the School of Art and Architecture, and the Division of Adult Education. There are no tuition, application, matriculation, or graduation fees for U.S. residents. The Cooper-Hewitt Museum of decorative art and design was founded in 1897 as part of Cooper Union by Sarah, Eleanor, and Amy Hewitt, granddaughters of Peter Cooper. In 1967 the museum, still located in New York City, became an independent division of the Smithsonian Institution.

Coorg (kōōrg), former state, 1,593 sq mi (4,126 sq km), Karnataka state, SW India. Macara was the capital. Situated mainly in the hilly Western Ghats, the Coorg region produces coffee and timber, rice is the principal lowland crop. An independent Hindu dynasty ruled Coorg from the late 16th cent. until it was annexed by the British in 1834. It was administered by a British chief commissioner until India became independent in 1947.

Coornhert, Dirck Volckertszoon (dūrk vōl'kə-rtzōn kōrn'hārt), 1522-90, Dutch humanist. His translation (1561) of the first 12 books of the *Odyssey* is considered the first major poetic work of the Dutch Renaissance. Coornhert also translated Cicero, Boccaccio, Seneca, and Boethius. His comedies, morality plays, and a philosophical treatise (1586) express his stoic and humanistic ideas. Coornhert, who had witnessed the methods of the Inquisition, was an active supporter of religious tolerance, his pamphlet (1585) on this subject led to his imprisonment and exile. He eventually returned to Holland and died at Gonda.

Coos (kō ōs), island in the Aegean Sea, the present-day Kōs. Acts 21:1.

Coosa (kōō'sā), river, 286 mi (460 km) long, rising in NV Ga. and flowing SW through E Ala., joining the Tallapoosa near Montgomery, Ala., to form the Alabama River. Locks and dams make the river navigable for barges to Rome, Ga. Jordan, Lay, and Mitchell dams on the river generate electricity.

Coos Bay (kōōs), city (1970 pop. 13,466), Coos co., SW Oregon, a port of entry on Coos Bay, founded 1854 as Marshfield, inc. 1874, renamed 1944. Lumbering, shipping, tourism, fishing, and canning are important industries. Coos Bay is one of the world's largest lumber-shipping ports. A junior college is in the city.

coot, common name for a marsh bird related to the rail and the gallinule and found in North America and Europe. The American coot (*Fulica americana*), or mud hen, is sooty gray with a white bill, black head and neck, and white wing edgings and tail patch. It has lobed toes and is a skillful swimmer and diver but takes flight awkwardly, pattering the water to gain impetus. It eats aquatic plants. Some scoter ducks are called coots. The European species inhabits the northern regions, there are seven species in South America alone. The horned coot is found high in the Andes. Coots are classified in the phylum CHORDATA, subphylum Vertebrata, class Aves, order Gruiformes, family Rallidae.

copaiba (kōpā'ba, -pī'-), oleoresin (see RESIN) obtained from several species of tropical South American trees of the genus *Copaifera*. The thick, transparent exudate varies in color from light gold to dark brown, depending on the ratio of resin to essential oil. Copaiba is used in making varnishes and lacquers.

copal (kō'pal), RESIN produced by certain trees of tropical and subtropical regions. It is procured chiefly in fossil and semifossil form, but some is also obtained from living trees. Most copals come from leguminous trees of the PULSE family, e.g., the Congo copal and other African types (mostly of the *Copaifera* species) and the South American copals (chiefly *Hymenaea courbaril*). East Indian or Manila copal is extracted from a pine (*Agathis alba*). A source of hard-surfaced lacquers and varnishes, copals are no longer widely used commercially.

Copān (kōpān'), ruined city of the MAYA, W Honduras, near the village of Copan. Noted for fine sculptured stelae and in particular for the Hieroglyphic Stairway (containing nearly 2,000 glyphs), Copan was, perhaps, the center of knowledge where Mayan astronomical learning, as applied to chronology, achieved its most accurate expression.

Cope, Edward Drinker, 1840-97, American paleontologist and comparative anatomist, b. Philadelphia, studied at the Academy of Natural Sciences, Philadelphia, and at the Smithsonian Institution. His large collection of fossil mammals is now at the American Museum of Natural History. His many published works include *The Vertebrata of the Tertiary Formations of the West* (1883), a report on the F. V. Hayden survey in which he served as geologist and paleontologist. Cope believed that evolution arose from an organism's inner urge to attain a higher state of being. See biography by H. F. Osborn and H. A. Warren (1931).

Copeau, Jacques (zhak kōpō'), 1879-1949, French theatrical producer and critic. A founder (1909) and editor (1912-14) of the *Nouvelle Revue française*, he established the experimental Théâtre du Vieux Colombier in Paris (1913-24) in order to produce poetic drama of artistic worth. Copeau, an influential figure in the modern theater, encouraged many young dramatists and actors and also introduced the use of symbolic scene design. See Wallace Fowlie, *Dionysus in Paris* (1960).

Copenhagen (kō'panhā'gən), Dan. *København*, city (1971 pop. 625,678), capital of Denmark and of Copenhagen co., E Denmark, on E Sjælland and N Amager islands and on the Øresund. It is a major commercial, fishing, and naval port and is Denmark's chief commercial, industrial, and cultural center. It is also a rail hub. Manufactures include pharmaceuticals, processed food, beer, textiles, plastics, marine engines, furniture, and the celebrated COPENHAGEN WARE. There are also iron foundries and large shipyards. Copenhagen was a trading and fishing center by the early 11th cent. It was fortified (1167) by Archbishop Absalon and was chartered (1254) by the bishop of Roskilde. The city was twice destroyed by the Hanseatic League but successfully resisted (1428) a third attack. Copenhagen replaced Roskilde as the Danish capital in 1443. The city exacted tolls from all ships passing through the Øresund until 1857. Having resisted (1658-59) a Swedish siege, Copenhagen was relieved by the Dutch. In 1660 peace between Denmark and Sweden was negotiated there. The city had expanded considerably in the 16th and 17th cent. as its trade grew, and it continued to develop in the 18th cent. as industries such as textile making and tobacco processing brought added prosperity. Copenhagen

became involved in the war between Napoleonic France and England in the early 19th cent. The news that Denmark, by a secret convention, was about to join Napoleon's CONTINENTAL SYSTEM and to join in the war on England led the British government to decide to send an expeditionary force to seize the Danish fleet, which already had been mauled (1801) in the battle of Copenhagen. When the Danes refused to surrender, the British landed troops in 1807 and severely damaged Copenhagen by bombarding it. However, the city recovered quickly after the Napoleonic Wars, and its industrial base grew rapidly in the 19th cent. In World War II, Copenhagen was occupied (1940-45) by the Germans, and its shipyards were bombed by the Allies. The city itself was only slightly damaged, and it retained the charm and design that had resulted in its being called "the Paris of the North." The inner harbor of Copenhagen is the channel that divides Sjælland and Amager islands. From the harbor extends a narrow arm, the Nyhavn [new harbor], lined with picturesque old houses and closed off by Kongens Nytorv, an irregular square from which the main arteries of the city radiate. The Charlottenborg Palace (17th cent.) and the royal theater (opened 1874) are on Kongens Nytorv. Other famous landmarks of the city include Amalienborg Square, enclosed by four 18th-century palaces, one of which has been the royal residence since 1794, the citadel (c. 1662), the city hall (1894-1905), the famous round tower, which the astronomer Tycho Brahe (1546-1601) used as an observatory, and the Cathedral of Our Lady (c. 1209, rebuilt in the early 19th cent.), with sculptures by Albert 8 Thorvaldsen (1768-1844). The island of Slotsholmen, surrounded by a moat on three sides and by the harbor on the fourth, supports an impressive complex of buildings, notably Christiansborg Palace (18th cent., restored 1916), erected on the site of Archbishop Absalon's original castle and now housing the Danish parliament, supreme court, and foreign office, the Thorvaldsen Museum (opened 1848), and the stock exchange (17th cent.). Favorite spots in the city include the Tivoli amusement park (opened 1843) and the waterfront Langelinie Promenade, near which is the famous statue of Hans Christian Andersen's *Little Mermaid*. Copenhagen is the seat of a university (founded 1479), a technical university (1829), an engineering college, and a college of veterinary science and agriculture. Frederiksberg and Gentofte are Copenhagen's largest suburbs and, although independent municipalities, are intimately tied to the life of the city. Frederiksberg is the seat of the Royal Copenhagen Porcelain factory (established 1651).

Copenhagen, battle of, 1801, an important incident of the FRENCH REVOLUTIONARY WARS. In Dec., 1800, Denmark joined Russia, Sweden, and Prussia in declaring the armed neutrality of the northern powers in the French Revolutionary Wars and in announcing that they would not comply with the British rules on neutral navigation. England considered this a threat and, without declaring war, sent a fleet under admirals Sir Hyde PARKER and Horatio NELSON into the Baltic. On April 2, 1801, Nelson attacked the Danish fleet at the roadsteads of Copenhagen. During the battle he deliberately fixed the telescope to his blind eye, thus ignoring Parker's signal to discontinue action, and destroyed the Danish fleet after a hard battle.

Copenhagen ware, several types of pottery, both underglaze and overglaze, produced in Copenhagen since c. 1760. At that time a Frenchman, Louis Fournier, made soft-paste chinaware in the French style. Hard porcelain was introduced in 1775, when pieces with classical figures were in high favor. The Royal Copenhagen Porcelain factory and other factories have produced especially fine tableware and fluted porcelain of the blue Danish pattern. The modern white underglaze porcelain was first made by Arnold Krog in the late 19th cent. and was found to be well adapted to animal and figure sculptures.

copepod: see CRUSTACEAN

Copernican system, first modern European theory of planetary motion that was heliocentric, i.e., that placed the sun motionless at the center of the solar system with all the planets, including the earth, revolving around it. Copernicus developed his theory in the early 16th cent. from a study of ancient astronomical records. He retained the ancient belief that the planets move in perfect circles and therefore, like Ptolemy, he was forced to utilize epicycles to explain deviations from uniform motion (see PTOLEMAIC SYSTEM). Thus, the Copernican system was technically only a slight improvement over the Ptolemaic system. However, making the solar system

heliocentric removed the largest epicycle and explained retrograde motion in a natural way. By liberating astronomy from a geocentric viewpoint, Copernicus paved the way for KEPLER'S LAWS of planetary motion and Newton's embracing theory of universal GRAVITATION, which describes the force that holds the planets in their orbits.

Copernicus, Nicholas (kōpūr'nikās), Pol *Mikotaj Kopernik*, 1473–1543, Polish astronomer. After studying astronomy at the Univ of Krakow, he spent a number of years in Italy studying various subjects, including medicine and canon law. He lectured c 1500 in Rome on mathematics and astronomy, in 1512 he settled in Frauenburg, East Prussia, where he had been nominated canon of the cathedral. There he performed his canonical duties and also practiced medicine. But the work that immortalized him is *De revolutionibus orbium coelestium*, in which he set forth his beliefs concerning the universe, known as the COPERNICAN SYSTEM. That treatise, which was dedicated to Pope Paul III, was probably completed by 1530 but was not published until 1543, when Copernicus was on his deathbed. Modern astronomy was built upon the foundation of the Copernican system. See his complete works, ed by Edward Rosen (Vol. I, 1973), *Three Copernican Treatises*, ed by Edward Rosen (3d ed 1971), studies by S. P. Mizwa (1943, repr 1969), Angus Armitage (1938, repr 1971), and Fred Hoyle (1973), Barbara Bienkowska, ed., *The Scientific World of Copernicus* (1973).

Copi, Irving Marmer (kōp'ē), 1917–, American philosopher, b Duluth, Minn., grad Univ of Mich., 1938, Ph.D. 1948. He was a philosophy professor at the Univ of Illinois (1947–48) and the Univ of Michigan (1948–69) before going to the Univ of Hawaii (1969). Primarily interested in logic, he is the author of *The Theory of Logical Types* (1971), *Introduction to Logic* (4th ed 1972), and *Symbolic Logic* (4th ed 1973).

Copiague (kō'pāg'), uninc. residential town (1970 pop 19,578), Suffolk co., SE N.Y., on the south shore of Long Island.

Copiapó (kōpyapó'), city (1970 pop 51,809), capital of Atacama prov., N central Chile, on the Copiapo River. An industrial city at the southern edge of the Desert of Atacama, Copiapo has industries that ship and process the copper, gold, and silver of the surrounding region. The city was founded in 1540 by Pedro de VALDIVIA, the Spanish conqueror of Chile.

Copland, Aaron (kōp'lənd), 1900–, American composer, b Brooklyn, N.Y. Copland was a pupil of Rubin Goldmark and of Nadia Boulanger, who introduced his work to the United States when she played his *Symphony for Organ and Orchestra* in 1925. Although his earliest works show European influences, the American character of the greater part of his compositions is evident in his use of jazz and of American folk tunes, as in the short piece for chamber orchestra, *John Henry* (1940). Copland's many ballets include *Billy the Kid* (1938), *Rodeo* (1942), and *Appalachian Spring* (1944). He composed music for the films *Of Mice and Men* (1939), *Our Town* (1940), *The Red Pony* (1948), and *The Heiress* (1949). His major orchestral works are *El Salón Mexico* (1936) and the *Third Symphony* (1946). Copland wrote a song cycle, *12 Poems of Emily Dickinson*, and a quartet for piano and strings (both 1950), *Canticle of Freedom* for chorus and orchestra (1955), and a tone poem *Inscape* (1967). With Roger Sessions he founded the Copland-Sessions Concerts (1928–31) and in 1932 organized the American Festivals of Contemporary Music at Yaddo, Saratoga Springs, N.Y. He has lectured extensively and received many awards. His writings include *What to Listen for in Music* (1939, rev ed 1957), *Copland on Music* (1960), and *The New Music 1900–1960* (rev ed 1968). See biographies by Arthur Berger (1953) and Arnold Dobrin (1967), study by J. F. Smith (1955).

Copley, John Singleton (kōp'lē), 1738–1815, American portrait painter, b Boston. Copley is considered the greatest of the American old masters. He studied with his stepfather, Peter Pelham, and undoubtedly frequented the studios of Smibert and Feke. At 20 he was already a successful portrait painter with a mature style remarkable for its brilliance, clarity, and forthright characterization. In 1766 his *Boy with the Squirrel* was exhibited in London and won the admiration of Benjamin West, who urged him to come to England. However, he remained for eight years longer in America and worked in New York City and Philadelphia as well as in Boston. In 1774 he visited Italy and then settled in London, where he spent the remainder of his life, enjoying many honors and the

patronage of a distinguished clientele. In England his style gained in subtlety and polish but lost most of the vigor and individuality of his early work. He continued to paint portraits but enlarged his repertoire to include the enormous historical paintings which constituted the chief basis of his fame abroad. His large historical painting *The Death of Lord Chatham* (Tate Gall., London) gained him admittance to the Royal Academy. His rendering of a contemporary disaster, *Brook Watson and the Shark* (Mus. of Fine Arts, Boston), stands as a unique forerunner of romantic horror painting. However, his reputation today rests largely upon his early American portraits which are treasured not only for their splendid pictorial qualities but also as the most powerful graphic record of their time and place. Portraits such as those of Nicholas Boylston and Mrs. Thomas Boylston (Harvard Univ.), Daniel Hubbard (Art Inst., Chicago), Governor Mifflin and Mrs. Mifflin (Historical Society of Pennsylvania, Philadelphia), and Paul Revere (Mus. of Fine Arts, Boston) are priceless documents in which the life of a whole society seems mirrored. Among his finest later portraits are the curiously distorted image of Samuel Adams (Mus. of Fine Arts, Boston) and the group portrait of the Copley family (privately owned). The Museum of Fine Arts, Boston, has an excellent collection of his works. Copley's son became Baron Lyndhurst in 1827. See catalog with biography by J. D. Prown (1966), biographies by J. T. Flexner (rev ed, 1948) and A. V. Frankenstein (1970).

Copley, John Singleton (1772–1863) see LYNDHURST, JOHN SINGLETON COPLEY, BARON

copolymer: see POLYMER

Coppard, Alfred Edgar, 1878–1957, English author. Almost entirely self-educated, he worked at several clerical positions. His tales, written in a poetic and fanciful vein, include *Adam and Eve and Pinch Me* (1921), *Nixey's Harlequin* (1931), and *Dark-eyed Lady* (1947). He also wrote lyric verse that includes *Hips and Haws* (1922), *Pelagea* (1926), and *Cherry Ripe* (1935). See his collected tales (1948).

Coppee, François (fran'swā' kōpā'), 1842–1908, French poet and dramatist. He won fame with the one-act comedy *Le Passant* (1869, tr 1881), in which Sarah Bernhardt made her first successful appearance. His early verse, as in *Le Reliquaire* (1866), linked him with the PARNASSIANS; his later work, as in *Les Humbles* (1872), is sentimental and tells of the sorrows of the poor. *La Bonne Souffrance* (1898), a religious novel, was written after his return to Catholicism.

Copper, river, c 300 mi (480 km) long, rising in the Wrangell Mts., SE Alaska, and flowing S through the Chugach Mts. to the Gulf of Alaska. The Indians obtained copper from the deposits near the upper river, these deposits attracted the attention of the Russians and later the Americans, but exploration was difficult because of the river's currents and the glaciers near its mouth. The great Kennecott mine (discovered 1898) was finally developed and was reached by the building (1908–11) of the Copper River and Northwestern RR from Cordova, following the river along part of its lower valley. The mine was abandoned in 1938.

copper, metallic chemical element, symbol Cu [Lat *cuprum* = copper], at no 29, at wt 63.54, m.p. 1083°C, b.p. 2595°C, sp. gr. 8.96 at 20°C, valence +1 or +2. Copper is a reddish metal with a face-centered cubic crystalline structure. It is malleable, ductile, and an extremely good conductor of both heat and electricity. It is softer than iron but harder than zinc and can be polished to a bright finish. It is found in group 1b of the PERIODIC TABLE, together with silver and gold. Copper has low chemical reactivity. In moist air it slowly forms a greenish surface film (usually a mixture of carbonate, sulfate, hydroxide, and oxide) called PATINA; this coating protects the metal from further attack. Copper dissolves in hot concentrated hydrochloric or sulfuric acid but is little affected by cold solutions of these acids; it also dissolves in nitric acid. Salt water corrodes copper, forming a chloride. The chief commercial use of copper is based on its electrical conductivity (second only to that of silver), about half the total annual output of copper is employed in the manufacture of electrical apparatus and wire. Copper is also used extensively as roofing, in making copper utensils, and for coins and metalwork. Copper tubing is used in plumbing, and, because of its high heat conductivity, in heat-exchanging devices such as refrigerator and air-conditioner coils. Powdered copper is sometimes used as a pigment in paints. An important use of copper is in alloys such as BRASS, BRONZE, GUN METAL, MONEL METAL, and GERMAN SILVER.

The most important chemical compound of copper is COPPER SULFATE pentahydrate, also called bluestone or blue vitriol. Other compounds include PARIS GREEN, BORDEAUX MIXTURE, a cyanide, a chloride, oxides, and a basic carbonate. Verdigris is basic copper acetate. Compounds of copper are widely used as insecticides and fungicides, as pigments in paints, as mordants in dyeing, and in electroplating. Small amounts of copper are found uncombined, particularly near Lake Superior in Michigan. Copper ores are found in various parts of the world. In the United States (the chief producer of copper) ores are mined in Arizona, Utah, Montana, New Mexico, Nevada, and Michigan. Copper ores are also found in Canada, South America (in Chile and Peru), S. central Africa, the Soviet Union (in the Ural Mts.), and to a limited extent in Europe and the British Isles. The principal ore of copper is CHALCOPYRITE, a sulfide of copper and iron, also called copper pyrite. Other important ores are chalcocite, or copper glance, a shiny lead-gray copper sulfide, bornite, a lustrous reddish-brown sulfide of copper and iron, cuprite, a red cuprous oxide ore, and MALACHITE, a bright green carbonate ore. AZURITE is a blue crystalline basic carbonate of copper found with other copper ores. Chrysocolla is a bluish-green copper silicate ore. Copper metal is prepared commercially in various ways. Copper sulfide ores, usually containing only 1% to 2% copper, are concentrated to 20% to 40% copper by the FLOTATION PROCESS. They are then usually roasted to remove some of the sulfur and other impurities, and then smelted with iron oxide in either a blast furnace or a reverberatory furnace to produce copper matte, a molten solution of copper sulfide mixed with small amounts of iron sulfide. The matte is transferred to a converter, where it is treated by blowing air through it to remove the sulfur (as sulfur dioxide, a gas) and the iron (as a slag of ferrous oxide). The resulting copper is 98% to 99% pure; it is called blister copper because its surface is blistered by escaping gases when it solidifies during casting. Most copper is further purified by ELECTROLYSIS. The blister copper is refined in a furnace and cast into anodes. Thin sheets of pure copper are used as cathodes. A solution of copper sulfate and sulfuric acid is used as the electrolyte. When the anode and cathode are immersed in the electrolyte and an electric current is passed, the anode is dissolved in the electrolyte and pure copper metal is deposited on the cathode. Soluble impurities, usually nickel and arsenic, remain dissolved in the electrolyte. Insoluble impurities, often including silver, gold, and other valuable metals, settle out of the electrolyte; they may be collected and purified. Copper oxide ores are usually treated by a different process, called leaching, in which the copper in the ore is dissolved in a leaching solution (usually dilute sulfuric acid); pure copper is recovered by electrolysis. Alternatively, the solution is treated with iron to precipitate the so-called cement copper, which is impure. Another important source of copper is secondary (scrap) copper, which is produced from discarded copper and copper alloys. Copper is present in minute amounts in the animal body and is essential to normal metabolism. It is a component of hemocyanin, the blue, oxygen-carrying blood pigment of lobsters and other large crustaceans. It is needed in the synthesis of hemoglobin, the red, oxygen-carrying pigment found in the blood of humans, although it is not a component of hemoglobin. Copper and some of its alloys have been known to man since the BRONZE AGE. One of the first metals known to man, free copper was probably mined in the Tigris-Euphrates valley as long ago as the 5th cent. B.C. Cyprus, from which the metal's name ultimately comes, was the primary source of copper in the ancient world.

Copper Age: see BRONZE AGE

copperas: the heptahydrate of FERROUS SULFATE

Copperas Cove (kōp'āras), town (1970 pop 10,818), Coryell co., central Texas. A farm and ranch center, it grew with the establishment of nearby U.S. Fort Hood.

Copperbelt, mining region, N central Zambia, central Africa. A natural extension of the mineral-rich region of SHABA, the Copperbelt is one of the richest sources of copper in the world. Cobalt, selenium, silver, and gold are also produced.

copperhead, poisonous snake, *Ancistrodon conortrix*, of the E. United States. Like its close relative, the water moccasin, the copperhead is a member of the PIT VIPER family, and detects its warm-blooded prey by means of a heat-sensitive organ behind the nostril. The body, which may reach a length of 4 ft

(120 cm), is hazel brown with chestnut-colored crossbands above and pinkish white with dark spots below. The head is a pale copper color. Copperheads inhabit rocky areas with thick underbrush, even in heavily populated regions. They feed chiefly on small mammals, but will also capture large insects, frogs, and other snakes. They are most active in late afternoon and early evening. The young are born alive. Copperheads are not aggressive and usually attempt escape when threatened, but they strike swiftly if startled or attacked. The bite causes severe pain and illness in humans but is seldom fatal. Copperheads are classified in the phylum CHORDATA, subphylum Vertebrata, class Reptilia, order Squamata, family Crotalidae.

Copperheads, in the American Civil War, a reproachful term for those Northerners sympathetic to the South, mostly Democrats outspoken in their opposition to the Lincoln administration. They were especially strong in Illinois, Indiana, and Ohio, where Clement L. VALLANDIGHAM was their leader. The KNIGHTS OF THE GOLDEN CIRCLE was a Copperhead secret society. The term was often applied indiscriminately to all Democrats who opposed the administration. It afforded an opportunity for impugning the loyalty of those who opposed Lincoln's policies, either military or civil (e.g., the suspension of habeas corpus), and it was not until years after the Civil War that the Democratic party succeeded in living down the association. See Wood Gray, *The Hidden Civil War* (1942), F. L. Clement, *The Copperheads in the Middle West* (1960).

Coppermine, river, 525 mi (845 km) long, rising in Lac de Gras, central Mackenzie dist., Northwest Territories, Canada, and winding northwest to enter the Arctic Ocean at Coronation Gulf. Its many falls gives it great hydroelectric power potential. Coppermine, a trading post, is at its mouth.

copper pyrites. see CHALCOPYRITE

copper sulfate, common name for the blue crystalline heptahydrate of **CUPRIC SULFATE**, in which copper has valence +2. It may also refer to cuprous sulfate (Cu_2SO_4), in which copper has valence +1.

Coppet (kôpâr'), village, Vaud canton, SW Switzerland, on the Lake of Geneva. It is noted for its châteaueau, once the residence of Jacques Necker and his daughter, Mme de Staël.

copra* see COCONUT

Copt (kôpt), member of the native Christian minority (5%-10%) of Egypt. Copts are not ethnically distinct; they are a cultural remnant, i.e., the Christians who have not been converted to Islam in the 14 centuries since the Muslim invasion. The Coptic language, now extinct, was the form of the ancient Egyptian language spoken in early Christian times, by the 12th cent. it was superseded by Arabic. Most Copts belong to the Coptic Church, an autonomous Christian sect that officially adheres to MONOPHYSITISM, which was declared (451) a heresy by the Council of Chalcedon. The church is in communion with the Jacobite Church (also Monophysite), but a traditionally close relationship to the Church of Ethiopia was dissolved in 1961 when it declared itself independent of the Coptic patriarch. In rites and customs the Coptic Church resembles other Oriental churches, however, Copts circumcise their infants before baptism and observe certain Mosaic dietary laws. Coptic, Greek, and Arabic languages are all used ceremonially. The chief bishop, the patriarch of Alexandria, is in direct succession to the 5th-century patriarchs who embraced Monophysitism. Among the Copts a small minority are in communion with the pope, these "Catholic Copts" have their own organization and churches but share the rites and practices of the Coptic Church. This community began to develop in the 18th cent. Protestant missions have had some success among the Copts. Besides Copts there are Orthodox communities in Egypt, mainly Greek and Syrian, the Orthodox patriarch of Alexandria traces his succession to the Catholic patriarchs of the 5th cent. There are also many Catholic Syrians, mainly Melchites and Maronites. See Donald Attwater, *The Christian Churches of the East* (2 vol., 1947-48), Edward Wakin, *A Lonely Minority: The Story of Egypt's Copts* (1963), Murâd Kâmil, *Coptic Egypt* (1968), O. F. A. Meindarus, *Christian Egypt, Faith and Life* (1970).

Coptic art, Christian art in the upper Nile valley of Egypt. Reaching its mature phase in the late 5th and 6th cent., the development of Coptic art was interrupted by the Arab conquest of Egypt between 640 and 642. Its subsequent course was marked by the influence of Islamic art and a repetition of earlier forms. In contrast with the aristocratic taste prevailing in cosmopolitan Alexandria, which was in close

touch with the leading artistic centers of the Roman Empire, older and deeply ingrained traditions remained in force in the upper Nile valley, where an intensely religious culture drew its following chiefly from the lower classes. Coptic art is characterized by a high degree of stylization verging on abstraction. Forms are flattened out, and individual motifs acquire bold simplicity and decorative character. Subject matter represents both Christian and Roman sources. Remains of wall paintings reveal scenes from the Old and New Testaments and images of the Mother and Child. Some of the archaeological sites are El-Bagawat, Oxyrhynchus, Sakkara, Bawit, and Antinoe. Representative examples of Coptic art are in sculpture, textiles, ivory, and illumination. Coptic architecture, as shown in the 5th-century White and Red monasteries near Sohag, showed traces of local Egyptian traditions. See K. Wessel, *Coptic Art: The Early Christian Art of Egypt* (1965).

Coptos (kôp'tas, -tôs) or **Coptus** (kôp'tas), ancient city of Egypt, on the right bank of the Nile, c. 27 mi (43 km) N of modern Luxor. Remains of the Temple of Min, patron god of Coptos, have been found there as well as relics from the time of Ramses II and Thutmose III. The town was of importance in Hellenistic times, when it was the terminus of a caravan route to Berenice on the Red Sea. It was built up by Augustus, fell to the Blemmyes in the 3d cent. A.D., and was almost destroyed by Diocletian in A.D. 292. The present-day village of Qift is on the site.

copying processes* see PRINTING, PHOTOCOPYING

copyright, right granted by statute to the author or originator of certain literary, artistic, and musical productions whereby for a limited period of time he controls the use of the product. He may reproduce the work himself or license another to do so. He receives royalties (payments) on each performance of his work or each copy that is sold. Except for limited measures taken in Roman times, protection of rights in literary property did not appear necessary in Europe before the invention of printing from movable type in the 15th cent. The sovereign asserted his control over printing by issuing patents or privileges to individuals or by organizing publishers' guilds with monopoly rights. Through such devices the state was able to censor heresy and sedition, while at the same time fostering literature. The guilds kept order among their members and were supposed to prevent pirating. In England this function was assigned to the Stationers' Company (chartered 1556), comprising a hundred or so printers and booksellers. The only protection that the common law extended to the author was against publication of his work without his permission, once he allowed publication, the work passed completely out of his control. The first English copyright act (1710), while not abolishing the common-law right, allowed the author to copyright his work for 14 years (with a like period of renewal) and required deposition of copies and a notice that the work was copyrighted. That law was the model for the earliest American copyright statute, passed in 1790 pursuant to Article 1, Section 8 of the U.S. Constitution. The American statute in force today was passed in 1909. It provides for a term of 28 years and a single renewal of the term. Material for copyright must be deposited with the Library of Congress. Literary matter, periodicals, maps, photographs, works of art, textile and other designs, sound recordings, musical compositions, and photoplays may be copyrighted. In the United States prior to 1891, when a special foreign copyright law was passed, it was almost impossible for books by foreign authors to be copyrighted. The most popular British books were published in cheap unauthorized editions, and the writers often received no royalties. After 1891 material in foreign languages was easily copyrighted in the United States, material in English, however, could not be copyrighted if it was imported, unless, in addition, type was set and material printed and bound in the United States. Most of the major countries of the world, with the exception of the United States, however, adhered to the Bern Convention, effective in 1887 and since modified. It provides that literary material copyrighted in any signatory country automatically enjoys copyright in all the signatory countries. The Universal Copyright Convention (UCC), which had as one main purpose bringing the United States into a general system of international copyright, was signed at Geneva on Sept. 6, 1952. It was accepted by the United States in 1954 and came into effect Sept. 16, 1955. The U.S. copyright law was modified to conform to the convention, notably by elimination of procedural steps for the establishment of U.S. copyright in works published in other signatory countries and of the requirement that

works in the English language by foreign authors must be manufactured in the United States to obtain U.S. copyright protection. Other countries accept the U.S. principle of formal notice of copyright. The United Nations Educational, Scientific, and Cultural Organization played a leading part in the negotiations for the UCC. Most of the Western nations and many of the Asian nations subscribe to it. The Soviet Union signed in 1973. See Margaret Nicholson, *A Manual of Copyright Practice for Writers, Publishers, and Agents* (2d ed. 1956, repr. 1970), Richard Wincor, *How to Secure Copyright* (rev. ed. 1957), A. J. Clark, *The Movement for International Copyright in 19th Century America* (1960), L. R. Patterson, *Copyright in Historical Perspective* (1968), H. F. Pipel and M. D. Goldberg, *Copyright Guide* (4th ed. 1969).

Coquelin, Benoît Constant (bânwa' kôNstaN' kôk-lân'), 1841-1909, French actor, known as Coquelin aîné [the elder]. He made his debut at the Comédie française in 1860 and achieved fame in classic comic roles, such as the valets in Molière's plays and Beaumarchais's *Figaro*. He made an extensive tour of Europe and America in 1886. In 1897 he created his greatest characterization, the title role in Rostand's *Cyrano de Bergerac*, at the Théâtre de la Porte-Saint-Martin, which he also managed. In 1900 he toured the United States with Sarah Bernhardt and returned to Paris to play opposite her in Rostand's *L'Aiglon*. Highly critical and analytical toward his art, and believing in simulated rather than real emotions, he wrote *L'Art et le comédien* (1880) and *Les Comédiens, par un comédien* (1882), his approach led to an interesting debate with Sir Henry Irving on techniques of acting. His brother, Ernest Alexandre Honore Coquelin, 1848-1909, known as Coquelin cadet [the younger], acted at the Comédie française after 1868. At his best in secondary comic roles, he was also popular for his monologues and several amusing books written under the pseudonym Pirouette.

Coquerel, Athanase Laurent Charles (atanaz' lôraN' shârî kôkrêl'), 1795-1868, French Protestant clergyman, noted for his eloquence as a preacher. From 1832 he was pastor of the Reformed Church in Paris. He founded and edited liberal periodicals. Among his publications are *Biographie sacrée* (1825-26), *L'Orthodoxie moderne* (1842), and *Christologie* (1858). His son Athanase Josue Coquerel, 1820-75, was also a well-known Protestant minister in Paris. From 1849 to 1870 he edited the *Lien*. In 1852 he helped to found the *Nouvelle Revue de théologie*. Among his works are *Jean Calas et sa famille* (1857) and *Histoire de l'Eglise réformée de Paris* (1860).

Coques or Cocx, Gonzales (gônza'lê's kôks), 1614-84, Flemish portrait painter, active in Antwerp and England. He excelled in painting diminutive portraits and family groups of the aristocracy with meticulously executed backgrounds. The elegance of his paintings won him the title "the little Van Dyck." Coques is represented in the galleries of Berlin, Dresden, Paris, London, Vienna, and Philadelphia.

Coquilhatville, Zaire. see MBANDAKA

coquilla nut (kôkê'yâ, kôkêl'yâ), [Span. = little coconut], fruit of a Brazilian PALM (*Attalea funifera*), closely related to the coconut palm. Its fruit, 3 to 4 in (7.6-10.2 cm) long, is very hard, of a richly streaked brown, and capable of taking a fine polish, it is used in cabinetwork and for such turned articles as bellpulls, umbrella handles, and walking-stick knobs. A stiff, wiry, bright chocolate-colored leaf fiber, called piassava or piassaba, obtained from this and similar palms, is exported. It is used in making brooms and rope. The nut is also a source of palm oil. Coquilla nuts are classified in the division MAGNOLIOPHYTA, class Liliatae, order Arecales, family Palmae.

Coquimbo (kôkêm'bô), city (1970 pop. 55,360), N central Chile. On a beautiful sheltered bay of the Pacific, it is the port for LA SERENA. Exports are chiefly agricultural produce and minerals. In 1922, Coquimbo was severely damaged by a tidal wave following an earthquake.

coral, small, sedentary, marine animal, related to the sea anemone, but characterized by a skeleton of horny or calcareous material. The skeleton itself is also called coral. Although most corals form colonies by budding, there are some solitary corals, in both types the individual animals, called polyps, resemble the sea anemone in form. In the large group known as stony corals, or true corals (*Madreporaria*), each polyp secretes a cup-shaped skeleton, the theca, around itself. Some solitary corals of that group may reach a diameter of 10 in (25 cm), in the

The key to pronunciation appears on page xi

colonial forms the individual polyps are usually under $\frac{1}{8}$ in (3 mm) long, but the colonies may be enormous. The body of each polyp is saclike, consisting of a wall of jellylike material surrounding a digestive cavity, with a single opening, the mouth, at the unattached end. The mouth is surrounded by tentacles used to capture small prey, and is invaginated to form a pharynx leading into the body cavity. Thin sheets of tissue (mesenteries) extend radially from the wall to the pharynx, dividing the cavity. A second set of radial divisions is created by folds (septa) of the outer skeleton and body wall, which extend upward from the floor of the body cavity. Reproduction occurs both sexually and by budding. Sexual reproduction is by means of eggs and sperm that are produced in the mesenteries and shed into the water. Fertilization results in a free-swimming larva, which attaches to a surface and secretes a skeleton, becoming (in colonial forms) the parent of a new colony. As new polyps are produced by budding they remain attached to each other by thin sheets of living tissue as well as by newly secreted skeletal material. The great variety in the form of various colonial corals, which may be treelike and branching, or rounded and compact, depends chiefly on the method of budding of the particular species. In the brain corals, for example, each theca merges with the one next to it on either side, forming long rows of polyps separated by deep channels. In some of the branching corals the polyps occupy small, discrete pits on the surface of the skeleton. As a colonial coral produces more polyps the lower members die, and new layers are built up on the old skeleton, forming a large mass. In tropical and subtropical regions, these massive corals, along with other plants and animals, may form a CORAL REEF. Most of the reef-forming corals belong to the stony coral group. The soft corals (Alcyonaria) are a group of soft, often feathery forms, with skeletons composed of calcareous or horny particles imbedded in the body wall. Each polyp of a soft coral has eight tentacles. Among the well-known soft corals are the SEA PEN, SEA PANSY, whip coral, and organpipe coral. The precious red coral (*Corallium*) of the Mediterranean Sea, used for jewelry, also belongs to that group. The spicules of its skeleton are fused together. Although corals grow in both warm and temperate climates, they are most abundant in warm, shallow water, over 200 coral species are found in the Great Barrier Reef of Australia. In many shallow-water species the polyps contain unicellular plants, which may provide the high oxygen concentration required by such corals. Stony and soft corals are classified in the phylum CNIDARIA, class Anthozoa.

coral bells see SAXIFRAGE

Coral Gables, city (1970 pop. 42,494), Dade co., SE Fla., on Biscayne Bay, inc. 1925. Founded at the height of the Florida land boom, Coral Gables is mainly residential and is a splendid example of a planned city. Electronic equipment, processed meat, and furniture are among its products. Coral Gables is the headquarters for various Inter-American business organizations. The Univ. of Miami is in the city.

coralline algae see RHODOPHYTA

coral reefs, limestone formations produced by living organisms, found in shallow, tropical marine waters. In most reefs, the predominant organisms are stony CORALS, colonial cnidarians that secrete an exoskeleton of calcium carbonate (limestone). The accumulation of skeletal material, broken and piled up by wave action, produces a massive calcareous formation that supports the living corals and a great variety of other animal and plant life. Although corals are found both in temperate and tropical waters, reefs are formed only in a zone extending at most from 30°N to 30°S of the equator, the reef-forming corals do not grow at depths of over 100 ft (30 m) or where the water temperature falls below 72°F (22°C). Corals are not the only, and in some cases not even the major, reef-forming organisms. Calcium carbonate is also deposited by coralline algae, the protozoan FORAMINIFERANS, some mollusks, echinoderms, and tube-building annelid worms. However, any reef formed by a biological community is usually called a coral reef. Geologically, coral reefs are classified into three main types. Fringing reefs are coral platforms that are more or less continuous with the shore and exposed at low tide. Barrier reefs are separated from the shore by a wide, deep lagoon or surround a lagoon that has a central island. An atoll is a reef surrounding a lagoon that has no central island, with passages through the reef to the sea. It is generally believed that fringing reefs formed as a result of upward and outward growth of corals

that became established on rocks near shore, there is disagreement about the nature of barrier reef and atoll formation. Charles Darwin postulated a progression from fringing reef to barrier reef to atoll, as a result of a slow, steady sinking of the sea floor that creates a lagoon and a simultaneous upward and outward growth of coral. Where entire volcanic islands sink, only the reef remains above water, forming an atoll. Not all scientists accept Darwin's proposal, but most current theories involve subsidence of the sea floor. Changes of the ocean level may also be involved. Sediments accumulate on the lagoon side of atolls and support vegetation, in time the entire lagoon may fill, creating an island. Many such atolls and islands, common in the Pacific and Indian oceans, are inhabited. The Great Barrier Reef of NE Australia is the largest known complex of coral reefs. It is 10 to 90 mi (16-145 km) wide and about 1250 mi (2010 km) long, and is separated from the shore by a lagoon 10 to 150 mi (16-240 km) wide. See Robert Silverberg, *The World of Coral* (1965).

coral-root see ORCHID

Coral Sea, southwest arm of the Pacific Ocean, between Australia, New Guinea, and the New Hebrides. The Great Barrier Reef lies along its western edge. During World War II it was the scene of a major U.S. victory against the Japanese in 1942, the battle, fought by aircraft near the Louisiade Archipelago, checked the southward expansion of the Japanese.

coral snake, name for poisonous New World snakes of the same family as the Old World COBRAS. About 30 species inhabit Mexico, Central America, and N. South America, two are found in the United States. The Eastern coral snake (*Micrurus fulvius*), or harlequin snake, is found in the SE United States and N. Mexico. It is a burrowing snake with a small, blunt head and a cylindrical body, averaging 2½ ft (75 cm) in length. The body is ringed with bands of black, red, and yellow, the tail has yellow and black rings only. The Sonoran, or Western, coral snake (*Micruroides euryxanthus*) is a rather rare species found in the SW United States and NW Mexico. It is about 18 in. (45 cm) long and has much broader bands of yellow than those of the Eastern species. Coral snakes can be distinguished from a number of similarly colored harmless snakes by the fact that they are the only ones with red bands touching yellow ones. The venom of coral snakes, like that of cobras, acts on the nervous system and causes paralysis, the mortality rate among humans who are bitten is high. However, coral snakes are infrequently encountered because of their burrowing habits, and they seldom bite unless handled. They feed on other snakes and on lizards. Coral snakes are classified in the phylum CHORDATA, subphylum Vertebrata, class Reptilia, order Squamata, family Elapidae.

Coram, Thomas (kôr'am), 1668?-1751, English philanthropist and colonizer. He lived for some years in Massachusetts, working as a shipbuilder. On his return to England he became (1732) a trustee of James Oglethorpe's Georgia colony and sponsored (1735) a colony in Nova Scotia for unemployed artisans. He established the London Foundling Hospital (1739), a pioneer institution of its kind. See biography by Herbert Compston (1918).

Corbett, James John, 1866-1933, American boxer, b. San Francisco. "Gentleman Jim" Corbett won (1892) the heavyweight boxing championship from John L. SULLIVAN at New Orleans and lost (1897) the title to Robert L. FITZSIMMONS at Carson City, Nev. He failed (1900, 1903) to regain the title in fights with James J. Jeffries. Corbett also appeared on the stage and in films and wrote *The Roar of the Crowd* (1925).

Corbiere, Tristan (trêstān' kôrbîyēr'), 1845-75, French poet, born Édouard Joachim Corbiere. He spent most of his life on the coast of Brittany, living a Bohemian existence and suffering chronic illness. His passion for the sea is expressed in his early poems *Gens de mer* [men of the sea], which were collected in *Les Amours jaunes* (1873, tr. 1954). Corbiere's style combines vernacular elements with complex, intimate emotion and constantly reflects his internal pain. Verlaine brought his work to the attention of the literary world, and, in the 20th cent., the surrealist writers claimed him as an ancestor.

Corbin, Margaret, 1751-1800, American Revolutionary heroine, b. Franklin co., Pa. Upon the death of her husband in the attack on Fort Washington (Nov. 16, 1776), she commanded his cannon until she was seriously wounded. She was the first woman to be pensioned (1779) by the government. In 1916 her remains were moved from Highland

Falls, N.Y., to West Point, where a monument was erected in her honor.

corbina (kôrbē'nā) see CROAKER

Corby, urban district (1971 pop. 47,716), Northamptonshire, central England. Situated over one of the world's largest ironstone fields, Corby has grown rapidly since the 1930s, when new techniques of steel production were developed. The manufacture of steel tubing is the chief industry.

Corcoran, William Wilson (kôr'karən), 1798-1888, American financier, philanthropist, and art collector, b. Georgetown, D.C. After becoming a successful banker, he retired in 1854 and devoted himself to his philanthropic activities, which included gifts to many educational and religious institutions, as well as the founding of the Louise Home for Women in Washington. His chief gift was the Corcoran Gallery of Art, in Washington, which had as its nucleus Corcoran's art collection. The present marble building, designed by Ernest Flagg, was opened in 1897. The gallery has collections of paintings, sculpture, and ceramics, as well as an art school.

Corcoran Gallery of Art: see under CORCORAN, WILLIAM WILSON

Corcyra: see KÉRKIRA, Greece

cordage, collective name for rope and other flexible lines. It is used for such purposes as wrapping, hauling, lifting, and power transmission. Early man used strips of hide, animal hair, and plant materials. Hemp and flax were formerly standard in Europe and America but were largely replaced in the 19th cent. by hard fibers, especially Manila hemp and sisal. In the 20th cent. the natural fibers have been replaced in many applications by synthetic fibers such as nylon and polyester. The fibers are straightened, usually by combing, then spun into yarn. Twine, which is sometimes called cord, is formed by wrapping two or more yarns together. By twisting together a number of yarns, a strand is formed. By twisting together three or more strands, a rope is produced. A cable-laid rope is formed from three or more ropes. In general a synthetic fiber rope lasts much longer and is much stronger than a natural fiber rope. Steel wire, often with a fiber core, is also used for rope.

Corday, Charlotte (Marie Anne Charlotte Corday d'Armont) (kôrdā', marē' an sharlôt', dârmôn'), 1768-93, assassin of Jean Paul MARAT. Although of aristocratic background, she sympathized with the GIRONDISTS in the French Revolution and felt that Marat, in his persecution of the Girondists, was acting as the evil genius of France. She resolved to emulate the action of Brutus and destroy the "tyrant." Leaving her native Normandy for Paris, she gained an audience with Marat by promising to betray the Girondists of Caen and stabbed him (July 13, 1793) in his bath. She was guillotined. See Austin Dobson, *Four Frenchwomen* (1923), Joseph Shearman (pseud. of G. M. V. C. Long), *The Angel of the Assassination* (1935).

Cordele (kôrdēl'), city (1970 pop. 10,733), seat of Crisp co., S. central Ga., on a branch of the Flint River, founded and inc. 1888. It is a shipping, commercial, and processing center located in a timber and farm area. Watermelons, cotton, peanuts, corn, and cantaloupes are grown there.

Cordeliers (kôrdēlyä'), political club of the French Revolution. Founded (1790) as the Society of the Friends of the Rights of Man and of the Citizen, it was called after its original meeting place, the suppressed monastery of the Cordeliers (Franciscan Recollects). In 1792-93 the club was instrumental in the destruction of the GIRONDISTS, or moderates. Its early leaders, such as Georges DANTON, having withdrawn, the club drifted to the extreme left under the influence of Jean Paul MARAT and Jacques René HÉBERT. Controlling the Paris commune, the extremists, or Hebertists, were a threat to the power of Maximilien ROBESPIERRE, who had them executed during the REIGN OF TERROR. The club dissolved after Hebert was executed (March, 1794).

cordial see LIQUEUR

Cordier, Andrew Wellington, 1901-, American educator and public official, b. Canton, Ohio. He studied at Manchester College in Indiana, where he later taught (1923-44). He also studied at the Univ. of Chicago and at the Graduate Institute of International Studies in Geneva. After working briefly for the U.S. Dept. of State (1944-46) he began a long association with the United Nations, where he was until 1962 executive assistant to the UN secretaries general. He was a chief negotiator for the United Nations in the Congo in 1960. In 1962 he became dean of the School of International Affairs (SIA) at Columbia. When Grayson Kirk resigned, he served

as acting president (1968-69) and then as president (1969-70) of Columbia, subsequently returning to his post at SIA until 1972

Cordilleras (kōrdil'əraz, Span kōrdēyā'ras) [Span, originally=little string], general name for the entire chain of mountain systems of W North America, extending from N Alaska to Nicaragua. The Cordilleras include the Rocky Mts, the ranges of the Great Basin, the Sierra Nevada, the Coast Ranges, and the Sierra Madre. The name Cordilleras was first applied to the similar systems of W South America, where the mountains stretching from Panama to Cape Horn are known locally as the Cordillera de los Andes (Andes Mts). Some geographers use the term *cordillera* for any extensive group of mountain systems

cordite: see POWDER

Cordoba, Francisco Fernández de: see FERNÁNDEZ DE CÓRDOBA, FRANCISCO

Córdoba, Gonzalo Fernández de: see FERNÁNDEZ DE CÓRDOBA, GONZALO

Córdoba (kōr'dōvā), city (1970 pop 798,663), capital of Córdoba prov, central Argentina, on the Rio Primero. It is the third largest city of Argentina and a cultural and commercial center. Near the city on the Primero is one of the most important dams in South America. Irrigation has transformed the surrounding countryside, formerly devoted to cattle ranches, into orchards, grain fields, and vineyards. Córdoba exports wheat, cattle, lumber, and minerals, and there are some small industries. The city is also a popular tourist and health resort. Córdoba was founded in 1573 and prospered during colonial times as a link on the commercial route between Buenos Aires and Chile. The advent of the railroad in the 19th cent increased prosperity. Many buildings in the city date from colonial times. Most notable are the cathedral and the former city hall (now a police headquarters). The university (founded 1613) made Córdoba an early intellectual center of South America. The city also has an observatory and several museums

Córdoba, city (1970 pop 60,944), Veracruz state, E central Mexico. It is the commercial and processing center of a fertile coffee, sugarcane, and tropical fruit region. Sugar milling is the chief industry. The city is also a popular tourist spot. Córdoba was founded in 1617. The Spanish viceroy O'Donoju and the Mexican revolutionary Agustín de Iturbide signed a treaty there in 1821 that established Mexico's independence

Cordoba or Cordova, city (1970 pop 235,632), capital of Córdoba prov, S Spain, in Andalusia, on the Guadalquivir River. Modern industries in the city include brewing, distilling, textile manufacturing, and metallurgy. Of Iberian origin, Córdoba flourished under the Romans, then passed to the Visigoths (572) and the Moors (711). Under the Umayyad dynasty it became the seat (756-1031) of an independent emirate, later called caliphate, which included most of Muslim Spain. The city was then one of the greatest and wealthiest in Europe, renowned as a center of Muslim and Jewish culture and admired for its architectural glories—notably, the great mosque, begun in the 8th cent, which is one of the finest of all Muslim monuments, and for its gold, silver, silk, and leather work. The city reached its zenith under Abd ar-Rahman III but declined after the fall of the Umayyads and became subject to Seville in 1078. Ferdinand III of Castile conquered it in 1236, in 1238 the great mosque became a cathedral. Córdoba never recovered its former splendor, but remained famous for its work in gold, silver, and leather. It was sacked by the French in 1808 and sided with Franco early (1936) in the civil war. The Senecas, Lucan, Averroës, and Maimonides were born in Córdoba. There is a university in the city

Cordova, Spain: see CÓRDOBA

corduroy, a cut filling-pile fabric with lengthwise ridges, or wales, that may vary from fine (pinwale) to wide. Extra filling yarns float over a number of warp yarns that form either a plain-weave or twill-weave ground. After the fabric is woven the floating yarns are cut, and the pile is brushed and singed to produce a clear cord effect. Originally a cotton fabric, it may also be made of man-made fibers such as rayon, polyester, or acrylic. Among its uses are in the manufacture of trousers, coats, and slip covers

Core (kō'rē), variant of KORAH

Corelli, Arcangelo (ärkän'jälō kōrē'l'jē), 1653-1713, Italian composer and violinist. Famed for his virtuosity and his elegant style of composition, he spent most of his life in Rome, where he was court violinist to Cardinal Ottoboni. His violin technique was perpetuated by his many students and in his sonatas

for violin with harpsichord, among which is the well-known set of variations on the air *La Follia*. He also helped to establish the typical form of the concerto grosso (see CONCERTO). See Marc Pincherle, *Corelli: His Life, His Work* (tr., 1956)

Corelli, Franco (frāng'kō), 1923?- , Italian tenor. He made his debut at Spoleto in 1952 as Don Jose in Bizet's *Carmen*. In 1961 he made his debut with the Metropolitan Opera, singing Manrico in Verdi's *Il Trovatore*. Since then he has been a leading tenor with the Metropolitan, extraordinarily popular, and famed for the great volume of his voice. He is particularly noted for his performances as Calaf in Puccini's *Turandot* and as Cavaradossi in *Tosca*

Corelli, Marie (kōrē'l'ē), pseud of Mary Mackay, 1855-1924, English novelist. Her popular, highly moralistic books, written in flamboyant, pretentious prose, include *A Romance of Two Worlds* (1886), *Thelma* (1887), *Barabbas* (1893), and *The Sorrows of Satan* (1895). She was Queen Victoria's favorite novelist. See biographies by Eileen Bigland (1953) and W S Scott (1955)

coreopsis (kōrēōp'sis), or **tickseed**, names for species of *Coreopsis*, a chiefly North American genus of the family Compositae (COMPOSITE family). They are easily cultivated annuals or perennials with daisylike heads of flowers in various colors—commonly yellow or variegated. Garden kinds are sometimes called calliopsis. *Coreopsis* is classified in the division MAGNOLIOPHYTA, class Magnoliopsida, order Asterales, family Compositae

Corfu, Greece: see KÉRKIRA

corgi: see CARDIGAN WELSH CORGI, PEMBROKE WELSH CORGI

Cori, Carl Ferdinand (kōr'ē), 1896- , and his first wife, **Gerty Theresa (Radnitz) Cori**, 1896-1957, American biochemists. They were both born in Czechoslovakia and received M.D. degrees (1920) from German Univ of Prague. In 1920 they were married, and in 1922 they came to the United States, where they later (1928) were naturalized. Carl Cori was professor of pharmacology and biochemistry (1931-66) at the school of medicine at Washington Univ., St. Louis, and Gerty Cori was professor of biological chemistry at the same institution (from 1947), with which she also had been associated from 1931. For their contributions to biochemistry, especially their research on carbohydrate metabolism and enzymes, the Coris shared with B. A. Housay the 1947 Nobel Prize in Physiology and Medicine. Since 1966, Carl Cori has served as visiting lecturer at Massachusetts General Hospital, Boston

coriander (kōr'ēän'dər), strong-smelling Old World annual herb (*Coriandrum sativum*) of the family Umbelliferae (CARROT family), cultivated for its fruits. Dried coriander seed contains an aromatic oil used as a flavoring, as a medicine, and in liqueurs. The seed itself is used as a spice similarly to that of the related caraway and cumin. Coriander is classified in the division MAGNOLIOPHYTA, class Magnoliopsida, order Umbellales, family Umbelliferae

Corinna (kōrin'a), fl. c 500? B.C., Greek poet of Tanagra. The 4th-century spelling of her text has caused some scholars to identify her as Hellenistic. Her verse, fragments of which remain, dealt with mythological themes and was written in Boeotian dialect

Corinth, Louis (lō'vēs kō'rīnt), 1858-1925, German painter and graphic artist. He studied in Paris and Munich, joined the Berlin secession group, and later succeeded Max Liebermann as president. His early work was naturalistic in approach. Corinth was antagonistic toward the expressionist movement, although after a stroke in 1911 his style loosened and took on many expressionistic qualities. His colors became more vibrant, and he created portraits and landscapes of extraordinary vitality and power. A self-portrait is in the Museum of Modern Art, New York City. See catalog by the New York Gallery of Modern Art (1964)

Corinth (kōr'īnth) or **Kórinthos** (kō'rīnthōs), city (1971 pop 20,733), capital of Corinth prefecture, S Greece, in the NE Peloponnesus, on the Gulf of Corinth. It is a port and major transportation center trading in olives, tobacco, raisins, and wine. Founded in 1858 after the destruction of Old Corinth by an earthquake, it was rebuilt after another earthquake in 1928. It formerly was known as New Corinth. Old Corinth, just southwest of modern Corinth, is now a village. Strategically situated on the Isthmus of Corinth and protected by the fortifications on the ACROCORINTHUS, Corinth was one of the largest, wealthiest, most powerful, and oldest cities of ancient Greece. Dating from Homeric times, it was conquered by the Dorians. In the 7th

and 6th cent. B.C., under the tyrants Cypselus, his son Periander, and their successors, it became a flourishing maritime power. Syracuse, Kerkira, Potidaea, and Apollonia were among its colonies. The natural rival of Athens, Corinth was traditionally allied with Sparta. Athenian assistance to the rebellious Corinthian colonies was a direct cause of the PELOPONNESIAN WAR (431-404 B.C.). During the Corinthian War (395-387 B.C.), however, Corinth joined with Athens against the tyrannical rule of Sparta. After the battle of Chaeronea (338 B.C.) Corinth was garrisoned by Macedonian troops. It became (224 B.C.) a leading member of the ACHAean LEAGUE and in 146 B.C. was destroyed by the victorious Romans. Julius Caesar restored it (46 B.C.) and also reestablished the ISTHMIAN GAMES. Corinth was again laid waste by the invading Goths (A.D. 395) and by an earthquake in 521. Early in the 13th cent., Corinth was conquered by Geoffroi I de Villehardouin as a sequel to the Fourth Crusade. It was taken by the Ottoman Turks in 1458, and in 1687 was seized by Venice, which lost it to the Turks in 1715. In 1822 it was captured by Greek insurgents. Ancient ruins at Old Corinth include the market place, fountains, the temple of Apollo, and a Roman amphitheater. Paul preached here, and wrote two epistles to the infant Corinthian church

Corinth, city (1970 pop 11,581), seat of Alcorn co., extreme NE Miss., near the Tenn. line, in a livestock and farm area, founded c 1855. Manufactures include telephone equipment, textiles, clothing, and dairy products. During the Civil War, Corinth was a strategic railroad center, abandoned to Gen. H. W. Halleck's Union army in May, 1862, after the battle of Shiloh. General Rosecrans repulsed the Confederates under generals Earl Van Doren and Sterling Price in heavy fighting there, Oct. 3-4, 1862. Corinth National Cemetery (est. 1866) has 6,000 graves

Corinth, Gulf of, inlet of the Ionian Sea, c 80 mi (130 km) long and from 3 to 20 mi (4.8-32 km) wide, indenting central Greece and separating the Peloponnesus from the Greek mainland. It is connected with the Saronic Gulf by the 4-mi (6.4-km) Corinth Canal (which cuts across the Isthmus of Corinth at sea level), and with the Gulf of Patrai by the Rion Strait. The city of Corinth lies on the gulf's south-eastern shore

Corinth, Isthmus of, c 20 mi (32 km) long and 4-8 mi (6.4-12.9 km) wide, connecting central Greece (Attica and Boeotia) with the Peloponnesus, between the Gulf of Corinth and the Saronic Gulf. It is crossed by the Corinth Canal, built between 1881 and 1893, which connects the Aegean and the Adriatic seas. Parallel to the canal are ruins of the ancient Isthmian Wall, which was restored (3rd-6th cent. A.D.) by Byzantine emperors to defend the Peloponnesus. Near the eastern end of the wall are ruins of the sanctuary of Poseidon where the ISTHMIAN GAMES were played

Corinthian order, most ornate of the classic orders of architecture. It was also the latest, not arriving at full development until the middle of the 4th cent. B.C. The oldest known example, however, is found in the temple of Apollo at Bassae (c 420 B.C.). The Greeks made little use of the order, the chief example is the circular structure at Athens known as the CHORAGIC MONUMENT of Lysicrates (335 B.C.). The temple of Zeus at Athens (started in the 2d cent. B.C. and completed by Emperor Hadrian in the 2d cent. A.D.) was perhaps the most notable of the Corinthian temples. The Greek Corinthian, aside from its distinctive capital, is similar to the Ionic but the column is somewhat more slender. The capital, which may have been especially devised for circular structures, is of uncertain origin. Callimachus is the legendary originator of the design. The delicate foliated details make plausible an original in metalwork. The Romans used the Corinthian order in numerous monumental works of imperial architecture. They gave it a special base, made carved additions to the cornice, and created numerous capital variations, utilizing florid leafage and sometimes human and animal figures. The prevailing form of Roman Corinthian is seen in the Pantheon and the Maison Carree, and it was embodied in the order as later systematized by the Italian writers of the Renaissance (e.g., Vignola). The capital joined acanthus leaves and volutes, scroll-shaped forms, in an intricate combination and Renaissance sculptors and metalworkers, especially in Italy, France, and Spain, found in its complexity a medium for their full virtuosity. The volutes either became mere light scrolls or were replaced by birds, rams' heads, or grotesque figures. The composite order, so named by the 16th-century codifiers, is actually only a vari-

ation of the Corinthian, devised by the Romans as early as the 1st cent. A.D. by forming a capital in which were combined both Corinthian foliage and the volutes and echinus, or rounded molding, of the four-cornered type of Ionic. For the other Greek orders see DORIC ORDER and IONIC ORDER.

Corinthians (kôrĭn'thēanz), two epistles of the New Testament, the seventh and eighth books in the usual order. They were written to the church at Corinth by St. PAUL. First Corinthians, written probably at Ephesus early in A.D. 55, is one of the longest and most important epistles. The first main part (1:10-4:21) attacks factionalism at Corinth, giving as its remedy the mystery of the Cross (1:18-3:4) and showing the true nature of Christian ministry (3:5-4:5). St. Paul then condemns several practices—incest (5), litigation among Christians (6:1-11), and fornication (6:12-20). He answers questions on marriage and celibacy (7), on the scandal involved in eating meat previously offered in pagan sacrifices (8, 10), and on the veiling of women in church (11:3-16). The rest of the epistle contains five famous passages—the institution of the Eucharist (11:20-34), the doctrine of the mystical body of Christ, i.e., Christian believers conceived as a unity (12), an eloquent panegyric on Christian love (13), the functions of prophecy among Christians (14), and a splendid chapter on Christ's resurrection (15). The epistle closes with a discussion of practical plans (16). Second Corinthians is shorter, it was written perhaps within a year of the other, probably from Macedonia. Its burden is Paul's apostleship, his authority, and his motives. After particulars of his relations with the Corinthians (1:15-2:17), there follow statements about the Christian ministry (3:4-6) and about Paul's motives rooted in personal union with Jesus (4:7-6:10), these lead to an exhortation (6:11-7:16). A digression (8-9) follows about collection of alms for poor Christians of Jerusalem. The last portion of the epistle contains a magnificent defense of the apostle's mission, citing his authority (10) and recounting his behavior (11-12:13). The announcement of an impending visit of the apostle to Corinth ends the book. Many critics consider the epistle (on internal evidence) to represent the accidental combination of two letters, the last four chapters being then separate from the rest. See Walter Schmithals, *Gnosticism in Corinth* (tr. 1971), John Reuf, *Paul's First Letter to Corinth* (1972).

Corinthian War (395 B.C.–86 B.C.), armed conflict between Corinth, Argos, Thebes, and Athens on one side and Sparta on the other. Angered by Sparta's tyrannical overlordship in Greece after the Peloponnesian War, several Greek states took advantage of Sparta's involvement in war with Persia to challenge Spartan supremacy. With Persian aid, Athens was able to build a fleet, refortify its port, and eventually recover the islands of Lemnos (now Limnos), Scyros (now Skiros), and Imbros (now Imroz). Unable to fight a war on two fronts, Sparta withdrew its forces from Asia Minor. Meanwhile, Antalcidas, the Spartan agent in Persia, attempted to bring about peace with Persia and halt Persian support to the rebellious Greek states. He persuaded Artaxerxes II to agree to the so-called King's Peace, or Peace of Antalcidas, but the terms were those of the Persian king. Cyprus and the Greek city-states in Asia Minor were returned to Persia, the Athenians were forced to give up their conquests except Lemnos, Imbros, and Scyros, and the Greek city-states (except those in Asia Minor) were to be independent, thus eliminating combinations such as the Theban-dominated Boeotian League, which had fought against Sparta. Sparta interpreted the terms of peace to justify interference in the Greek states, which eventually revolted against its domination, thus bringing about the Spartan defeat by Thebes at LEUCTRA in 371 B.C.

Corinto (kôrĭn'tō), town (1970 est. pop. 12,985), NW Nicaragua, on the Pacific Ocean. It is a railroad terminus and Nicaragua's leading port. Coffee, sugar, hides, and woods are exported. U.S. Marines landed in Corinto in 1912, and it has a U.S. naval base.

Coriolanus (Gnaeus Marcius Coriolanus) (kôr'ē-ā-lā'nās), Roman patrician. He is said to have derived his name from the capture of the Volscian city Corioli. According to legend he was expelled from Rome because he demanded the abolition of the people's tribunate in return for distributing state grain to the starving plebeians. He joined the Volscians and led (491? B.C.) them in an attack on Rome. Only the tears of his wife and his mother caused him to spare the city. The angry and frustrated Volscians put him to death. Plutarch tells the story, and Shakespeare's *Coriolanus* is based on Plutarch.

coriolis effect [for G. G. Coriolis], tendency for any moving body on or above the earth's surface, e.g.,

an ocean current or an artillery round, to drift sideways from its course because of the earth's rotation. In the Northern Hemisphere the deflection is to the right of the motion, in the Southern Hemisphere it is to the left. The coriolis deflection of a body moving toward the north or south results from the fact that the earth's surface is rotating eastward at greater speed near the equator than near the poles, since a point on the equator traces out a larger circle per day than a point on another latitude nearer either pole. A body traveling toward the equator with the slower rotational speed of higher latitudes tends to fall behind or veer to the west relative to the more rapidly rotating earth below it at lower latitudes. Similarly, a body traveling toward either pole veers eastward because it retains the greater eastward rotational speed of the lower latitudes as it passes over the more slowly rotating earth closer to the pole. The coriolis effect on a body traveling east or west results from the fact that centrifugal force due to rotation acts directly outward at right angles to the axis of rotation and thus has a horizontal component relative to the earth's surface at all points other than those on the equator. A body traveling eastward relative to the earth's surface has an eastward rotational speed equal to the sum of the earth's speed and its own speed, it therefore experiences a greater centrifugal force, whose horizontal component deflects it toward the south. A body traveling westward relative to the earth's surface has an eastward rotational speed equal to the difference of the earth's speed and its own speed, it experiences a smaller centrifugal force than the earth below it and thus tends to fall inward toward the axis of rotation. The horizontal component of this deflection is toward the north. In most man-operated vehicles continuous course adjustments mask the coriolis effect so that it is generally ignored in these cases. It is, however, extremely important to account for the coriolis effect when considering projectile trajectories, terrestrial wind systems, and ocean currents.

Cork, Richard Boyle, 1st earl of: see BOYLE RICHARD, 1ST EARL OF CORK.

Cork, county (1971 pop. 351,735), 2,881 sq mi (7,462 sq km), SW Republic of Ireland. CORK is the county town. Largest of the Irish counties, it has a rocky and much-indented coast line (Bantry, Dunmanus, Roaringwater, Courtmarsherry, Clonakilty, and Youghal bays, and Kinsale and Cork harbors). The interior has wild rugged mountains rising as high as 2,239 ft (682 m) and fertile valleys (notably of the Bride, the Blackwater, the Lee, and the Bandon). The main occupations are farming (dairying, raising livestock, and growing grains and sugarbeets) and fishing. Manufacturing is centered around the city of Cork. CORK is an important transatlantic harbor. There are prehistoric remains (dolmens and stone circles) and ruins of medieval abbeys and churches.

Cork, county borough (1971 pop. 128,235), county town of Co. Cork, S. Republic of Ireland, on the Lee River near its mouth on Cork Harbour. The oldest part of the town is on an island between the north and south branches of the Lee, now crossed by numerous bridges. Exports are largely farm produce (dairy products, grain, livestock), cloth, and fish. Imports include coal, raw materials, fertilizers, grain, machinery, and automobile parts. Automobiles, rubber, leather, cotton, and woolen goods, paint, processed foods, flour, and whiskey are manufactured. St. Finbarr is supposed to have founded an abbey on the site early in the 7th cent. In the 9th cent. the Danes occupied Cork and walled it. Dermot MacCarthy ousted the Danes and in 1172 swore allegiance to Henry II of England. Oliver Cromwell occupied Cork in 1649, and the duke of Marlborough in 1690. Many public buildings were destroyed in the nationalist disturbances of 1920, and the SINN FEIN lord mayor was murdered by the constabulary. Terence MacSwiney succeeded him and died in jail in London after a hunger strike. Educational institutions include University College (constituent college of the National Univ. of Ireland) and a school of art. The Protestant St. Finbarr's Cathedral (designed by William Burges), the Roman Catholic cathedral, the Church of St. Ann, and the Carnegie library are noteworthy.

cork, protective, waterproof outer covering of the stems and roots of woody plants. Cork is a specialized secondary tissue produced by the cork cambium of the plant (see MERISTEM). The regularly arranged walls of cork cells are impregnated with a waxy material, called suberin, that is almost impermeable to water or gases. Cork is buoyant in water because of the presence of trapped air in the cavities of the waterproof dead cells. It is also resilient,

light, chemically inert, and, because of the suction cup action of the cut cells, adhesive. These qualities make cork valuable for bottle stoppers, insulating materials, linoleum, and many household and industrial items. See CORK OAK.

cork oak, name for an evergreen species of the oak genus (*Quercus*) of the family Fagaceae (BEECH family). The cork oak (*Q. suber*) is native to the Mediterranean region, where most of the world's commercial supply of CORK is obtained. It is cultivated elsewhere as an ornamental and has been introduced into warmer regions of the United States because of its economic value. The bark of the tree is stripped off (about every 10 years) and then processed for shipment as commercial cork. There is a cork layer in all trees but it is not as extensive or valuable as in the cork oak. Cork oak is classified in the division MAGNOLIOPHYTES, class Magnoliopsida, order Fagales, family Fagaceae.

corkwood. see BOMBAX.

corm, short, thickened underground stem, usually covered with papery leaves. A corm grows vertically, producing buds at the upper nodes and roots from the lower surface. Corms serve as organs of food storage and in some plants (e.g., crocus and gladiolus) of asexual reproduction, they are often mistakenly called bulbs.

Cormenin, Louis Marie de La Haye, vicomte de (lŭē marē' də la ā vĕkōnĭt' də kōrmānē'), 1788-1868, French politician, jurist, and pamphleteer. He held minor offices under Napoleon, and after 1828 he sat almost continuously in the chamber of deputies. Under the pseudonym Timon he wrote numerous pamphlets against the government of Louis Philippe and in favor of liberal reforms. After the 1848 Revolution, Cormenin was influential in drawing up the new republican constitution. His works include the legal compilation *Questions de droit administratif* (1822), *Le Livre des orateurs* (1836), and *Entretiens de village* (1846).

cormorant (kôr'marant), common name for large aquatic birds, related to the gannet and the pelican, and found chiefly in temperate and tropical regions, usually on the sea but also on inland waters. Cormorants are 2 to 3 ft (61-92 cm) long, with thick, generally dark plumage and green eyes. The feet are webbed, and the bill is long with the upper mandible terminally hooked. Expert swimmers, cormorants pursue fish under water. In the Orient they are used by fishermen who collar the leashed birds to prevent them from swallowing the catch. The double-crested cormorant of the Atlantic coast, Brandt's cormorant of the Pacific coast, and the red-faced cormorant, *Phalacrocorax urile*, are common forms. The glossy black European cormorant is widely distributed in the Northern Hemisphere. A South American cormorant is a source of guano. The great cormorant nests high in trees or, as in other species, on steep, rocky sea cliffs. Two to six eggs per clutch are laid by the female. The young are born blind, and the parents feed the nestlings with half-digested food which is dropped into the nests. Later, the young birds poke their heads into the gullet of the adults to feed. Cormorants are long-lived, a banded one was observed after 18 years. Cormorants are classified in the phylum CHORDATA, subphylum Vertebrata, class Aves, order Pelecaniformes, family Phalacrocoracidae.

corn, in botany. The name corn is given to the leading cereal crop of any major region. In England, corn means wheat, in Scotland and Ireland, oats. The grain called corn in America is Indian corn or maize (*Zea mays*). The plant is a GRASS that was domesticated and cultivated in America long before Europeans reached the New World. It is so changed from the ancestral wild grass that this has not been identified with certainty, and it has been so adapted to cultivation that it never reverts to a wild state, it requires the care of man. It is probably a complex hybrid of several related New World grasses, e.g., teosinte (*Euchlaena mexicana*), a tropical American fodder plant in which the seeds are not united in a cob. The Indians had many varieties of corn, e.g., sweet corn, popcorn, and corn for corn meal. White, yellow, red, and blue corn were grown as distinct strains. The easily produced and readily identifiable strains of corn have made it a favorite subject for experimental genetics. The development of hybrid corn seed, now the basis of an independent, large-scale business, was an early (beginning of the 20th cent.) and revolutionary introduction of the principles of theoretical science into practical agriculture. At first ridiculed, the scientifically developed hybrids now represent almost all commercially grown corn types. They have resulted in higher

yields, increased sugar and lowered starch content, and uniform plants bred to specification for mechanical harvesting. As human food, corn is eaten fresh or ground for meal. It is the basic starch plant of Central and Andean South America, where it is still hand ground on metates to be made into tamales, tortillas, and other staple dishes. In the United States it is familiar as hominy, mush, and grits. Starch, sugar, and oil are also extracted for many products, but corn's chief use is as animal fodder. It is the primary feed grain of the United States (the world's largest producer), where more than half the annual crop is so used. In Europe this is almost the only use of corn. Corn was introduced by 17th-century explorers to all parts of the Old World, where it is now an important agricultural item. The part of the United States where most of the corn is grown, including Ohio, Illinois, Indiana, Missouri, Kansas, Iowa, and Nebraska, is known as the Corn Belt. The corn plant has a pithy noded stalk supported by prop roots. The staminate (male) flowers form the tassel at the top of the plant. The pistillate (female) flowers are the kernels on the cob, which is enclosed by a leafy husk beyond which extend thread-like styles and stigmas (the silk), which catch the pollen. The corn plant with its ornamental tassel and ears has been a motif of American art since prehistoric times. See H. A. Wallace and W. L. Brown, *Corn and Its Early Fathers* (1956); H. T. Walden, *Native Inheritance: The Story of Corn in America* (1966); G. E. Inglett, *Corn* (1970).

Cornaro, Caterina (katāre'na kōrā'rō), 1454-1510, queen of Cyprus. A celebrated Venetian beauty, she was married in 1472 to James II of Cyprus, who was eager to secure Venetian support. Venice was in turn interested in intervening in the affairs of the island. James II died in 1473, and his infant son, James III, in 1474. Caterina reigned amidst diplomatic intrigue and hostilities of native anti-Venetian factions until Venice forced her to abdicate (1489) and took Cyprus. Caterina returned to Venice and retired to Asolo. There she held a small but brilliant court, depicted by Pietro Bembo in his Platonic dialogue, *Gli Asolani*. A famous portrait of her by Titian is in the Uffizi.

Corn Belt, major agricultural region of the U.S. Midwest where corn acreage exceeds that of any other crop. Located in the north central plains, it is centered in Iowa and Illinois and extends into S Minnesota, SE South Dakota, E Nebraska, NE Kansas, N Missouri, Indiana, and W Ohio. Large-scale commercial and mechanized farming prevails in this region of deep, fertile, well-drained soils and long, hot, humid summers. The belt produces more than half of the U.S. corn crop. Corn is raised mainly as feed for livestock, especially hogs, which are the main source of cash income. Winter wheat, soybeans, and alfalfa are also important crops in the area.

corn borer or European corn borer, common name for the larva of a moth of the family Pyralidae, introduced from S Europe into the Boston area in 1917. The corn borer, *Ostrinia nubilalis*, has steadily spread southward into the Gulf States and northward and westward across the continent to the Rocky Mts. It also still occurs in most of Europe and parts of Asia. The full-grown larva is about 1 in. (2.5 cm) long, with a dark brown head and pinkish body. It is a major pest of all types of corn, its host preference, but also attacks many other cultivated crops, (e.g., sorghum, soybeans, and potatoes) and flower plants (e.g., dahlias, asters, and gladioli). The newly hatched yellowish larvae cause damage by feeding on the leaves of the host plant, older larvae bore into the stalk thereby severely weakening the plant and causing ear damage, which results in a loss in yield and reduction of quality. The full-grown larvae overwinter in cornstalks, corn cobs, and debris on the ground. Adults emerge in the spring and are brownish with zigzag streaks across the tips of the forewings. There are sometimes more than one generation per year depending on an increased length of the host's growing season. Control of these pests is complicated by the fact that the larvae also infest common weeds and wild grasses growing near the cornfields. For insecticidal control, see bulletins of the U.S. Dept. of Agriculture. Corn borers are classified in the phylum ARTHROPODA, class Insecta, order Lepidoptera, family Pyralidae.

Cornbury, Edward Hyde, Viscount, 1661-1723, colonial governor of New York and New Jersey (1702-8). He deserted the army of James II and ingratiated himself with William of Orange (William III). Appointed governor by William, he became extremely unpopular, and his administration was a pe-

riod of turmoil in both provinces. After his removal, he was imprisoned for debt in New York, but upon becoming 3d earl of Clarendon in 1709 he was able to free himself and return to England. See Herbert L. Osgood, *The American Colonies in the Eighteenth Century*, Vol. II (1924).

cornea: see EYE

corn earworm or cotton bollworm, destructive larva of a moth, *Heliothis zea*. Also known as tomato fruitworm, the larva attacks a variety of crops, boring into and feeding on the developing fruits—tomatoes, corn kernels, or cotton bolls. The adult moth is pale yellow. It is classified in the phylum ARTHROPODA, class Insecta, order Lepidoptera, family Noctuidae.

Cornille (Cornelis van Beverloo) (kōrnā'ya), 1922-, Belgian painter. Cornille was a member of CoBrA, the European group allied with ABSTRACT EXPRESSIONISM. His work is characterized by linear, weblike configurations that often form broken representational elements.

Cornille, Pierre (pyēr kōrnā'ya), 1606-84, French dramatist, ranking with Racine as a master of French classical tragedy. Educated by Jesuits, he practiced law briefly in his native Rouen and moved to Paris after the favorable reception of his first play, *Mélite* (1629), a comedy. His first tragedy, *Medée* (1635), was followed by *Le Cid* (1637). This masterpiece, based on a Spanish play about the Cid, took Paris by storm, "beautiful as the Cid" became a French proverb. However, Jean Chapelain composed a paper for the newly founded French Academy that attacked the play as plagiaristic and faulty in construction, and thereafter Cornille adhered to classical rules. Among the finest of his score of tragedies that followed are *Horace* (1640), *Cinna* (1640), and *Polyeucte* (1643). The comedy *Le Menteur* (1643) had great success. Cornille's tragedies exalt the will at the expense of the emotions, his tragic heroes and heroines display almost superhuman strength in subordinating passion to duty. At his best, Cornille was a master of the grand style, powerful and majestic. His last plays are marred by monotonous declamation. Cornille's old age was embittered by the rise of Racine, who replaced him in popular favor. See study by D. A. Collins (1966).

cornel: see DOGWOOD

Cornelia, fl. 2d cent. B.C., Roman matron, daughter of Scipio Africanus Major. She was the wife of Tiberius Sempronius Gracchus and mother of the GRACCHI. She refused to remarry after her husband's death, devoting herself to her children, whom she educated well and inspired with a sense of civic duty and a desire for glory. When a wealthy patrician woman spoke of her jewels, Cornelia pointed to her two sons, saying, "These are my jewels!" Whether she supported the revolutionary tendencies of her sons or tempered them is debated by historians.

cornelian: see CARNELIAN

cornelian cherry: see DOGWOOD

Cornelius, Saint, d. 253, pope (251-253), successor of St. Fabian. His rule was marked by the support of St. Cyprian and the opposition of the antipope NOVATIAN, and by the problem of readmitting to the church Christians who apostatized during persecution. Cornelius was martyred under Gallus. He was succeeded by St. Lucius I. He is mentioned in the Canon of the Mass. Feast: Sept. 16.

Cornelius, centurion of an Italian cohort stationed at Caesarea, one of the first Gentile converts and traditionally first bishop of Caesarea. Acts 10.

Cornelius, Peter (pā'tēr kōrnā'lēōs), 1824-74, German composer and poet, follower of Liszt and Wagner. He wrote music criticism, songs, and poetry but is best known for his operas *Der Barbier von Bagdad* (1858) and *Der Cid* (1865).

Cornelius, Peter von, 1783-1867, German painter. He studied at Dusseldorf and in Rome, where he joined the German NAZARENE group and collaborated with other members in the decoration of the Casa Bartoldy. In 1820 he was commissioned by Louis I of Bavaria to paint the fresco decorations in the Glyptothek, Munich. *The Last Judgment* was one of his fresco decorations for the Ludwigskirche, Munich. Cornelius believed that art should express noble ideals, and he disdained to work from nature. His favorite themes were religious or philosophical. In addition to his painting, Cornelius produced illustrations for *Faust* and the *Nibelungenlied* and designs for the decoration of the royal mausoleum, done for Frederick William II of Prussia.

Cornelius Nepos: see NEPOS, CORNELIUS

Cornell, Alonzo B. (kōrnē'l'), 1832-1904, American businessman and politician, b. Ithaca, N.Y. Cornell

was a director (1868-99) and vice president (1870-76) of the Western Union Telegraph Company, founded by his father, Ezra Cornell. A supporter of Senator Roscoe CONKLING, he was surveyor of customs (1869-73) at the port of New York, chairman (1870-78) of the Republican state central committee, and speaker (1873) of the New York assembly. President Grant, just before leaving office, appointed him naval officer in the New York customhouse. President Hayes, in an attempt to wrest control of the port of New York customhouse from the Conkling machine, brought pressure upon him to resign because of his official party connection. Cornell refused, and though strongly supported by Conkling, he and Chester A. Arthur, the collector of the port of New York, were removed in 1878. Cornell was promptly chosen governor of New York for the term 1880-83. He modernized the state finances, made good appointments, and vetoed much extravagant legislation. By not taking sides in the patronage fight between President Garfield and Conkling in 1881, he contributed to Conkling's defeat in the legislature and was himself defeated for renomination as governor. He wrote a biography of his father (1884). See his public papers (3 vol., 1880-82).

Cornell, Ezra, 1807-74, American financier and founder of CORNELL UNIVERSITY, b. Westchester Landing, N.Y. Cornell, who began life as a laborer, was of an ingenious mechanical bent and had a shrewd business mind. He aided in constructing (1844) the telegraph line between Baltimore and Washington, D.C., over which Samuel F. B. Morse sent the first test message. Having devised the method of stringing wires on poles, he entered into line construction in the East and the Midwest. He was founder, director, and for a time the largest stockholder of the Western Union Telegraph Company, which was formed in 1855 to end cutthroat competition in the field. His interest in agricultural education led to his association in the New York senate with Andrew Dickson WHITE, and together they mapped and secured legislation for founding (1865) Cornell Univ., with a charter embracing many of Cornell's ideas. He made many gifts to the university, including an initial \$500,000, and was responsible for the successful financial returns on the university's Federal land grant. See biographies by his son, Alonzo Cornell (1884), and Philip Dorf (1952, abr. ed. 1965).

Cornell, Joseph, American artist, 1903-73, b. Nyack, N.Y. Cornell is best known for his surrealist-influenced shadow boxes. These are small constructions, within glass-fronted, shallow boxes or frames, made of found objects, maps, photographs, and engravings. Their selection and arrangement are nostalgic and personally symbolic. Cornell's *Hôtel du Nord* (c. 1953, Whitney Mus., New York City) is a representative work.

Cornell, Katharine, 1898-1974, American actress, b. Berlin. Cornell made her debut in 1916 with the Washington Square Players. In 1921 she married Guthrie McClintic, a producer-director. From their first production together, *The Green Hat* in 1925, they proved to be a successful team, with such productions as *The Barretts of Wimpole Street* (1931, repeated on television, 1956), *Saint Joan* (1936), *Candida* (1937), *The Doctor's Dilemma* (1941), and *The Three Sisters* (1942). She was among the first major American performers to form a repertory company, she took several entire New York casts and productions on the road. Cornell played Mrs. Patrick Campbell in *Dear Liar* on Broadway in 1960. After McClintic's death in 1961, Cornell retired from the theater. See her autobiography (1939), Guthrie McClintic, *Me and Kit* (1955).

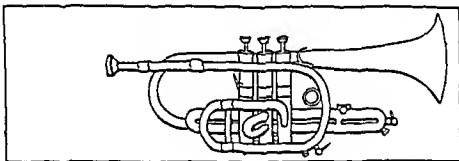
Cornell University, mainly at Ithaca, N.Y., with land-grant, state, and private support, coeducational, chartered 1865, opened 1868. It was named for Ezra CORNELL, who donated \$500,000 and a tract of land. With the help of state senator Andrew D. WHITE, who became Cornell's first president, it was made the state land-grant institution. Cornell University Medical College, affiliated with New York Hospital, Bellevue Hospital, and the Memorial Center for Cancer and Allied Diseases, is in New York City. The university operates an aeronautical laboratory at Buffalo, the New York Agricultural Experiment Station (Geneva), and the Cornell Agricultural Experiment Station (Ithaca), and is affiliated with the Brookhaven National Laboratories (Long Island). Of note on Cornell's campus are the U.S. plant, soil, and nutrition laboratory, the Savage school of nutrition, and the laboratory of nuclear physics, which includes a reactor and a synchrotron. In Puerto Rico the university operates a large radar station for investigations of the upper atmosphere and outer space. The colleges of agriculture, home economics,

veterinary medicine, and the school of industrial and labor relations are divisions of the State University of New York. See M. G. Bishop, *A History of Cornell* (1962), K. C. Parsons, *The Cornell Campus* (1968), R. F. Howes, *A Cornell Notebook* (1971).

corner, securing of all or nearly all the supply of any commodity or stock so that its buyers are forced to pay exorbitant prices. Corners may be planned deliberately or may be brought about unintentionally, as through a fight for controlling interest in a corporation's stock. In the first type the operator acquires control of the particular commodity or shares and then induces other operators to promise to sell the commodity or stock by raising the market price to an unusually high level. The cornerer purchases such promises to sell. When the cornerer thinks he can make the biggest profit, he withdraws all his shares from the market, and those who have promised to sell find themselves "cornered", that is, they have to buy stock from the cornerer at his own price to fulfill their contracts. The cornerer sets the price just low enough to keep the dealers from repudiating their contracts. To be successful, cornerers must have enough money to buy the necessary amount of shares or commodity. The Bible describes Joseph's corner of the grain in Egypt. A famous deliberate corner was Jim Fisk's and Jay Gould's corner of the U.S. gold supply in 1869; the move was frustrated when the Federal government placed its own gold supply on sale. A notable illustration of the unintentional corner was that on the stock of the NORTHERN PACIFIC RAILWAY in 1901. Deliberate corners and other forms of price manipulation on the various stock and commodity exchanges are now illegal in the United States. The Securities and Exchange Commission, the New York Stock Exchange, and the Dept. of Agriculture seek to prevent corners.

Corner Brook, city (1971 pop. 26,309), W. central N.F., Canada, on the Humber River. It is Newfoundland's second largest city and has a large pulp and paper mill. Nearby is Gros Morne National Park.

cornet, brass wind musical instrument, created in France about 1830 by adding valves to the post horn. It is usually in B flat and is the same size as the B flat trumpet, but has a more conical bore. The cornet, a TRANSPOSING INSTRUMENT, has a less brilliant tone but greater agility than the trumpet. It has long been a



Cornet

standard instrument in bands. In the orchestra, especially in France, the cornet is used with the trumpet. It should not be confused with the cornett, an instrument of the Middle Ages and Renaissance, which used a cup mouthpiece on a wooden or ivory body supplied with fingerholes similar to those on woodwinds. A bass cornet, the serpent, so called because of its twisted shape, was used until the early 19th cent.

cornflower, common herb (*Centaurea cyanus*) of the family Compositae (COMPOSITE family). It is a garden flower in the United States but a weed in the grainfields of Europe. It is called bluebottle or bluet in England and bluebonnet in Scotland; in North America the cornflower shares with other plants the names ragged robin, bachelor's-button, or ragged sailor. The long-stemmed blue heads of the flowers, having radiating bottle- or vase-shaped florets, yield a juice which, mixed with alum, has been used as a dye. Cornflowers are classified in the division MAGNOLIOPHYTES, class Magnoliopsida, order Asterales, family Compositae.

cornice (kôr'nīs), molded or decorated projection that forms the crowning feature at the top of a building wall or other architectural element, specifically, the uppermost of the three principal members of the classic ENTABLATURE, hence by extension any similar crowning and projecting element in the decorative arts. The term is also employed for any projection on a wall that is provided to throw rainwater off the face of the building. The cornice undoubtedly had its origin in the primitive eave projection the Greek Doric and Ionic cornices recall early wooden roof forms, and the Egyptian cavetto and fillet cornice is a derivation of the overhanging papyrus stalks that formed the eaves of primitive shelters. The cornice early lost its structural significance and became a stylized decorative element, in

the Greek and Roman eras it assumed firmly standardized forms in the classical orders that were retained, with variations, through the Renaissance and later periods. As an element in the classical entablature the cornice is composed of the cymatium, or crown molding, above the corona, the projecting flat member, which casts the principal shadow, in this shadow, and supporting the corona, are a group of moldings called the bed molds, which may be elaborated with dentils. The Corinthian and Composite cornices are further embellished with modillions, or brackets, under the corona, the soffit of the Doric corona is decorated with square, flat projections called mutules, having guttae, or small knobs, hanging from their lower surfaces.

Corning, city (1970 pop. 15,792), Steuben co., S. N.Y., on the Chemung River, in a dairy and vineyard region, settled 1788, inc. as a city 1890. The glass industry, for which the city is famous, began there in 1868, and the Corning glass museum is a major tourist attraction today. A junior college and a museum of western art are located in the city, and a number of state parks are in the area. In 1972, in the wake of Hurricane Agnes, the city was heavily damaged by floodwaters from the Chemung River.

Cornish, dead language belonging to the Brythonic group of the Celtic subfamily of the Indo-European family of languages. See CELTIC LANGUAGES.

Cornish hen or **Cornish chicken**, breed of POULTRY that originated in Cornwall, England, but gained prominence only after it was established in the United States. Its body shape is quite different from that of other chickens. Both males and females have short legs and broad muscular breasts. Although relatively slow-growing, the Cornish hen has excellent meat qualities and is used extensively in breeding programs today. Its cross with the fast-growing PLYMOUTH ROCK CHICKEN is responsible for most of the broiler and fryer types currently on the market. An increasingly popular form of Cornish poultry, marketed for its delicious meat, is the Rock Cornish game hen. This is actually a standard meat-type chicken packaged at a smaller size.

Cornish literature. The literature of the Celtic language of Cornwall, which disappeared before 1800, consists largely of a few MIRACLE PLAYS, mostly of the 15th cent. With the exception of the *Life of St. Meriasek*, they are usually on biblical subjects. The plays closely resemble Breton drama. Also surviving is the Middle Cornish narrative poem *The Passion of Our Lord*. See R. M. Longworth, *The Cornish Ordinalia* (1967), Edwin Norris, ed., *Ancient Cornish Drama* (2 vol., 1859, repr. 1968).

corn laws, regulations restricting the export and import of grain, particularly in England. As early as 1361 export was forbidden in order to keep English grain cheap. Subsequent laws, numerous and complex, forbade export unless the domestic price was low and forbade import unless it was high. The purpose of the laws was to assure a stable and sufficient supply of grain from domestic sources, eliminating undue dependence on foreign supplies, yet allowing for imports in time of scarcity. The corn law of 1815 was designed to maintain high prices and prevent an agricultural depression after the Napoleonic Wars. Consumers and laborers objected, but it was the criticism of manufacturers that the laws hampered industrialization by subsidizing agriculture that proved most effective. Following a campaign by the ANTI CORN LAW LEAGUE, the corn laws were repealed by the Conservative government of Sir Robert Peel in 1846, despite the opposition of many of his own party, led by Lord George Bentinck and Benjamin Disraeli. With the revival of protectionism in the 20th cent., new grain restriction laws have been passed, but they have not been as extensive as those of earlier times. See D. G. Barnes, *A History of English Corn Laws from 1660 to 1846* (1930, repr. 1965).

Corno, Monte (môn'tā kôr'nō), highest peak of the Apennines, c. 9,560 ft (2,910 m) high, in the Gran Sasso d'Italia range, Abruzzi, central Italy. It is snow-capped for most of the year.

Cornouaille (kôr'nwī'), district of Brittany, NW France, comprising parts of Finistère, Côtes-du-Nord, and Morbihan depts. The name was probably brought by Britons who fled Cornwall at the time of the Anglo-Saxon invasions (c. 500).

Cornplanter, c. 1740-1836, chief of the Seneca Indians. The son of an Indian woman and a white father, he acquired great influence among the Seneca Indians and in the American Revolution led war parties for the British against the colonial forces, particularly against Gen. John Sullivan in New York. He later favored friendship with the whites and

signed the Treaty of Fort Stanwix (1784). He was given a grant of land on the Allegheny River, where he lived to a very old age. His views were opposed by the energetic RED JACKET but supported by HANDSOME LAKE (Cornplanter's half brother).

corns and calluses, thickenings of the outer layer of SKIN where there is irritation or constant pressure. Corns are cone-shaped with their points protruding into the dermis, or inner layer of skin. They usually have hard, shiny surfaces surrounded by red, painful areas. Soft-surfaced corns sometimes develop between overlapping toes where there is an accumulation of moisture. Treatment of corns is directed at the relief of irritation or pressure, e.g., wearing properly fitted shoes; they can also be softened by pastes and ointments or removed by a physician. Calluses typically involve only the outermost layers of skin and are not usually painful; they tend to disappear once the source of irritation has been removed. See BUNION.

cornstarch, material made by pulverizing the ground, dried residue of corn grains after preparatory soaking and the removal of the embryo and the outer covering. It is used as laundry starch, in sizing paper, in making adhesives, and in cooking. DEXTRIN, corn syrup, and corn sugar are produced by the hydrolysis of cornstarch. See STARCH.

Cornu, Marie Alfred (marē' alfrēd' kôrnu'), 1841-1902, French physicist. From 1867 he was professor at the École polytechnique, Paris. He measured the velocity of light and made important contributions to spectrum analysis, astronomy, and optics. Cornu's spiral, a curve for calculating light intensities in Fresnel diffraction, is named for him.

cornucopia (kôr'nyōōkō'pēā), in Greek mythology, a magnificent horn that filled itself with whatever meat or drink its owner requested. Some legends designate it as a horn of the river god Achelous, others as a horn of the goat Amalthaea. It is often represented as filled with fruits and flowers and has become the symbol of plenty.

Cornwall, Barry, pseud. of Bryan Waller Procter, 1787-1874, English author. His sentimental songs were much in vogue during his lifetime. Included among Cornwall's longer works are *Dramatic Scenes* (1819) and *Mirandola* (1821), a tragedy. He enjoyed the friendship of many of the notable men of his time, including Charles Lamb, of whom he wrote a biography which appeared in 1866. He was the father of the poet Adelaide Procter. See his *Literary Recollections* (ed. by R. W. Armour, 1936), biography by R. W. Armour (1935).

Cornwall, county (1971 pop. 379,892), SW England. The county town is BODMIN. Cornwall is a peninsula bounded seaward by the English Channel and the Atlantic Ocean and landward by Devonshire. It terminates in the west with the rugged promontory of Lands End. The region is a low-lying plateau, rising to its greatest height at Brown Willy (1,375 ft/419 m) in Bodmin Moor. The principal rivers are the Tamar, which forms most of the border with Devonshire, the Fowey, the Fal, and the Camel. In the beautiful river valleys are productive vegetable and dairy farms. The uplands are used for sheep and cattle pasturage. The climate is mild and moist, with subtropical vegetation along the southern coast. Cornwall is an important source of china clay. Various types of fish are caught, including pilchard, which are not plentiful elsewhere in Britain. Cornwall has produced many of Britain's finest sailors. Engineering, ship repairing, and rock quarrying are the only industries. Cornish tin and copper mines were known to ancient Greek traders, and during World War II the old mines were reworked. Cornwall's climate, the picturesque coastal towns (Penzance, Falmouth, and St. Ives), and the romance of its past, interwoven with Arthurian legend and tales of piracy, have made the region popular with tourists. Cornwall's history has been somewhat distinct from that of the rest of England. The Cornish language, related to the Welsh and Breton tongues, did not die out until the 18th cent. The county long resisted Saxon penetration. It was organized in the 14th cent. as a duchy. (The monarch's eldest son is the Duke of Cornwall.) Cornwall was slow to accept the Reformation. In 1549 thousands of Cornishmen marched to defend the Roman Catholic Church service. In the 18th cent. the Wesleyan movement took a firm hold in Cornwall, which has remained predominantly Methodist until the present day. In 1974, Cornwall was reorganized as a nonmetropolitan county.

Cornwall, manufacturing city (1971 pop. 47,116), SE Ont., Canada, on the St. Lawrence River. Its principal manufactures are cotton and rayon textiles, pa-

per, chemicals, and electronic equipment. The headquarters of the Canadian St Lawrence Seaway Authority are in Cornwall. The historical Indian village of St Regis is across the river on the Quebec-New York boundary.

Cornwallis, Charles Cornwallis, 1st Marquess, 1738-1805, English general and statesman. He was commissioned an ensign in the British army in 1756 and saw service in Europe in the Seven Years War. As a member of Parliament (which he entered in 1760), he opposed the tax measures that helped bring on the AMERICAN REVOLUTION. When the war came, however, he placed himself at the king's service and was sent (1776) to America. He served under Gen. William Howe at the battle of Long Island, in the New Jersey campaigns, and at the battle of Brandywine, acquitting himself with credit in all the engagements. In 1778, Cornwallis became second in command to Sir Henry CLINTON, British commander in America. Two years later Cornwallis began the fateful CAROLINA CAMPAIGN, which led directly to the YORKTOWN CAMPAIGN and the major British defeat that in 1781 ended the fighting. Cornwallis was not held responsible for the disaster and in 1786 became governor general of India. There he reformed the civil service and the judiciary and distinguished himself in the campaigns against TIPPOO SAHIB of Mysore. He was created a marquess in 1792 and returned to England in 1794. In 1798, Cornwallis was sent to Ireland as viceroy and commander in chief, and he was stern in repressing the rebellion there in the same year. He worked to achieve the Act of Union (1800), which initiated the unhappy experiment of uniting the Irish and British parliaments, but he resigned (1801) with William Pitt when George III refused to accept CATHOLIC EMANCIPATION. Cornwallis was then commissioned British minister plenipotentiary and helped to draw up the Treaty of Amiens (1802), which temporarily halted the war with Napoleonic France. In 1805 he was again appointed governor general of India, but he died two months after his arrival there. See his correspondence (ed. by Charles Ross, 3 vol., 1859), Arthur Aspinall, *Cornwallis in Bengal* (1931), Frank and Mary Wickwire, *Cornwallis the American Adventure* (1970).

Coro (kō'rō), city (1970 est. pop. 56,000), capital of Falcon state, NW Venezuela, 7 mi (11.3 km) from the Caribbean Sea, and at the base of the Paraguaná peninsula. The development of the oil industry on the peninsula stimulated rapid expansion of the city. Coffee, hardwoods, hides, and tobacco are exported through its port of La Vela. Founded in 1527, Coro became the base for Spanish explorations into the interior. From 1528 to 1546 it was mortgaged by the Spanish to a German banking house, and during this time German adventurers explored the region.

corolla, see PETAL.

corollary: see THEOREM.

Coromandel Coast (kōrōmān'dāl), east coast of Tamil Nadu and Andhra Pradesh states, SE India, stretching more than 400 mi (644 km) from Point Calimere, opposite the northern tip of Sri Lanka to the delta of the Krishna River. Its major cities, Nagapattinam, Pondicherry, and Madras, are ports. The inland coastal plain is bounded by the Eastern Ghats and includes the valleys of the Krishna, Pennar, and Cauvery rivers. The name probably stems from Cholomandalam, i.e., land of the Cholas, an empire that ruled the region from the 9th to the 12th cent.

Corona (kōrō'nā), city (1970 pop. 27,519), Riverside co., S Calif., inc. 1896. Citrus fruits are processed and castings, plywood paneling, fiberglass insulation, pipes, valves, and mobile homes are manufactured in the city. Cleveland National Forest is on Corona's western boundary.

corona, luminous envelope surrounding the SUN, outside the chromosphere. The corona is visible only at the time of totality during a total eclipse of the sun. It then appears as a halo of light with an irregular outer edge, radiating from the sun's surface and contrasting with the dark lunar disk that it borders. It is divided into the inner corona, a ring of pale-yellow light against which crimson prominences are outlined, and the outer corona, a pearly white halo that extends far out into space. Scientists are nearly in accord in believing that it consists of extremely fine particles of matter and that its luminosity results partly from sunlight reflected by the particles and partly from its own light. By means of the CORONAGRAPH, the corona can be studied and photographed in full daylight. At its base, the corona has a temperature of 1,000,000°C and is completely ionized. Studies have shown that the corona extends throughout the solar system. Just above the

chromosphere, the corona is almost static, rising very slowly. Its velocity increases with increasing distance from the sun, near the earth it is moving with supersonic speed and is known as the SOLAR WIND.

Corona Borealis (bōrēāl'ās) [Lat., =the northern crown], northern CONSTELLATION lying between Hercules and Boötes. Its name derives from the crown Bacchus gave Ariadne when she was deserted by Theseus. The constellation is a small arc of bright stars, of which the brightest is Alphecca (Alpha Corona Borealis). Corona Borealis reaches its highest point in the evening sky in early July.

Coronado, Francisco Vázquez de (franthes'kō vās'kāth dā kōrōnā'thō), c. 1510-1554, Spanish explorer in the Southwest. He went to Mexico with Viceroy Antonio de Mendoza and in 1538 was made governor of Nueva Galicia. The viceroy, dazzled by the report of Fray MARCOS DE NIZA of the great wealth of the Seven Cities of Cibola to the north, organized an elaborate expedition to explore by sea (see ALARCÓN, HERNANDO DE) and by land. Coronado, made captain general, set out in 1540 from Compostela, crossed modern Sonora and SE Arizona, and reached Cibola itself—the Zuñi country of New Mexico. He found neither splendor nor wealth in the Indian pueblos. Nevertheless he sent out his lieutenants. Pedro de Tovar visited the Hopi villages in N Arizona, García López de Cardenas discovered the Grand Canyon, and Hernando de Alvarado struck out eastward and visited Acoma and the pueblos of the Rio Grande and the Pecos. Alvarado came upon a Plains Indian nicknamed the Turk, who told fanciful tales of the wealthy kingdom of QUIVIRA to the east. Coronado, still hopeful, spent a winter on the Rio Grande not far from the modern Santa Fe, waged needless warfare with the Indians, then set out in 1541 to find the promised land of Quivira under the lying guidance of the Turk. Just where the party went is not absolutely certain, but it is generally thought they journeyed in the Texas Panhandle, reached Palo Duro Canyon (near Canyon, Texas), then turned N through Oklahoma and into Kansas. They reached Quivira, which turned out to be no more than Indian villages (probably of the Wichita), innocently empty of gold, silver, and jewels. The Spanish turned back in disillusion and spent the winter of 1541-42 on the Rio Grande, then in 1542 left the northern country to go ingloriously back to Nueva Galicia and into the terrors of the MIXTÓN WAR. In 1544, Coronado was dismissed from his governorship and lived the rest of his life in peaceful obscurity in Mexico City. He had found no cities of gold, no El Dorado, yet his expedition had acquainted the Spanish with the PUEBLO INDIANS and had opened the Southwest. Subsidiary expeditions from Nueva Galicia to S Arizona and Lower California make the scope of Coronado's achievement even more astonishing. See F. W. Hodge and T. Hays Lewis, ed., *Spanish Explorers in the Southern United States*, Vol. II (1907), G. P. Hammond and Agapito Rey, ed., *Narratives of the Coronado Expedition* (1940), A. Grove Day, *Coronado's Quest* (1940, repr. 1964), Herbert E. Bolton, *Coronado on the Turquoise Trail* (1949).

Coronado (kōr'ōnā'dō), city (1970 pop. 20,910), San Diego co., S Calif., on a peninsula on the west side of San Diego Bay, inc. 1890. It is a well-known beach resort. Adjacent to the city are a large U.S. naval air station and a naval amphibious base. Points of interest include the Hotel del Coronado, a state historical monument.

Coronado National Memorial: see NATIONAL PARKS AND MONUMENTS (table).

coronagraph (kōr'ōnagrāf), device invented by the French astronomer B. Lyot (1931) for the purpose of observing the CORONA of the sun and solar prominences occurring in the CHROMOSPHERE. Because of the intense light of the sun, the PHOTOSPHERE, corona, and chromosphere can ordinarily be seen only during a total ECLIPSE. The coronagraph consists of two refracting telescopes in tandem. A solid disk placed in front of the prime focus of the first telescope plays the part of the moon and eclipses the sun's image in the telescope so that only the outer layers of the sun's atmosphere are focused by the second telescope onto photographic film. A monochromatic filter is also used to improve optical clarity and remove chromatic aberration.

coronary artery disease, condition that results when the coronary arteries are narrowed or occluded, most commonly by atherosclerotic deposits of fibrous and fatty tissue. A coronary thrombosis (heart attack) is precipitated when the lumen of an artery, usually already narrowed by atherosclerosis, is completely blocked by a thrombus (blood clot).

Coronary artery disease is the commonest underlying cause of cardiovascular disability and death. Men are affected about four times as frequently as women, before the age of 40 the ratio is eight to one. Other predisposing factors are hypertension, diabetes, high cholesterol levels, and heavy cigarette smoking. The primary symptom of the condition is ANGINA PECTORIS, a pain that radiates in the upper left quadrant of the body.

coronary heart disease, see CORONARY ARTERY DISEASE.

coronation, ceremony of crowning and anointing a sovereign on his or her accession to the throne. Although a public ceremony inaugurating a new king or chief had long existed, a new religious service was added when Europe became Christianized. The service, derived from Old Testament accounts of the anointing of Saul and David by Samuel, helped to alter the concept of kingship, because anointment was thought to endow a prince with divine blessing and some degree of priestly (possibly even divine) character. In England, from the coronation (973) of Edgar, the ceremony included a coronation oath, anointment, investiture, enthronement, and homage. The pageantry of the English coronation, which since 1066 has taken place in Westminster Abbey, is still that of medieval times. In France, Pepin the Short, first king of the Carolingian line, was twice anointed by popes, partly to legitimize his supersession of the Merovingian dynasty. Later the French coronation came to resemble the English form, which was probably introduced into France in the 10th cent. The custom whereby the Holy Roman emperor was crowned by the pope dates from the coronation of Charlemagne on Christmas Day, 800. The anointing of the emperor by the pope was instituted by Louis I in 816. In 1804, Napoleon I brought Pope Pius VII to Paris to crown him in Notre Dame cathedral, but, in a famous episode, he seized the crown from the pope's hands and crowned himself.

Coronel (kōrōnēl'), city (1970 pop. 73,568), S central Chile, a port on the Pacific Ocean. It is a major coal-iron station and a shipping point for the coal from nearby mines. In a naval engagement off Coronel on Nov. 1, 1914, during World War I, German Admiral Graf von Spee defeated a British squadron under Sir Christopher Cradock, a triumph offset later by the battle of the Falklands.

coroner, judicial officer responsible for investigating deaths occurring through violence or under suspicious circumstances. The office has been traced to the late 12th cent. Originally the coroner's duties were primarily to maintain records of criminal justice and to take custody of all royal property. In England this second function persists in his jurisdiction over TREASURE-TROVE. In his present-day work of determining cause of death, the coroner proceeds by means of the INQUEST whenever there is doubt. In several of the United States the coroner has been replaced by the medical examiner, who can only conduct POST-MORTEM EXAMINATIONS, and who works in cooperation with the public prosecutor.

coronet (kōr'anēt, kōrānēt'), head attire of a noble of high rank, worn on state occasions. It is inferior to the crown. British peers wear their coronets at the coronation of their sovereign. Although dukes wore coronets to mark their rank by the 14th cent., it was in the reign of Elizabeth I that individual patterns were adopted for other peers, and barons received distinguishing insignia in 1661. The coronet of a duke is bordered by 8 strawberry leaves, that of a marquess, by 4 strawberry leaves alternating with 4 silver balls (sometimes called pearls) on low points, that of an earl, by 8 strawberry leaves alternating with 8 silver balls on high points, that of a viscount, by 16 silver balls on the rim, that of a baron, by 6 silver balls on the gold rim.

Corot, Jean-Baptiste Camille (zhaN-batēst' kamē'yā kōrō'), 1796-1875, French landscape painter, b. Paris. Corot was one of the most influential of 19th-century painters. The son of shopkeepers, he worked in textile shops until 1822, when he began to study painting. The classical landscape painters Michallon and Bertin were his teachers. In 1825 he made his first trip to Italy, during which he painted calm, solid, and exquisitely composed groups of Roman buildings (e.g., *View of the Farnese Gardens*, 1826, Phillips Coll., Washington, D.C.). Upon his return to France he lived mostly in the Ville d'Avray, which formed the subject of many of his celebrated paintings, including two in the Metropolitan Museum. He worked in Italy again in 1834 and 1843, and traveled in Switzerland, Holland, and England. Corot exhibited regularly at the Salon from 1827. His work lay outside the contemporary controversy con-

cerning classicism and romanticism and, indeed, outside the theories of the Barbizon school, with which his name is often linked. Corot's landscapes celebrate the countryside without idealizing the peasant or romanticizing farm labor. He used sketches made directly from nature to aid his studio compositions, sometimes painting entire landscapes outdoors. In Rome he created works notable for their simplicity of form and clarity of lighting, such as the *Coliseum* and the *Forum* (both Louvre). His later landscapes, more lyrical in tone and painted primarily in shades of gray and green, were more popular. His delicate handling of light is especially evident in *Femme à la Perle* (Louvre) and *Interrupted Reading* (Art Inst., Chicago). Today Corot's work is highly valued, his figure studies and portraits being particularly sought after. His work is represented in most of the prominent galleries of England, France, and the United States. See studies by Jean Leymarie (tr 1966) and Yvon Taillandier (tr 1967).

corporal punishment, physical chastisement of an offender. It may include the death penalty (see CAPITAL PUNISHMENT), but the term usually refers to such practices as flogging, mutilation, branding, and confinement in the pillory or stocks. Until c1800 most crimes were punished thus (rather than by imprisonment) in many parts of the world. Flogging was especially prevalent, being used also to keep order among the institutionalized insane and in the schools as well as in armed forces. A movement against the use of corporal punishment was led in the late 17th cent by American Quakers who achieved local reforms in Pennsylvania and New Jersey. The 18th cent saw a reaction against the whole concept of violent punishment and the substitution of what were considered more humane methods. The effectiveness of corporal punishment has been questioned by modern criminologists and educators. Flogging, however, is still used in some countries, including the Republic of South Africa, and is used, often unofficially, to maintain discipline within some British and American prisons. Corporal punishment, usually caning or spanking, is also common in the schools of many areas of the United States and Great Britain, although the practice appears to be declining.

corporation, in law, organization enjoying legal personality for the purpose of carrying on certain activities. Most corporations are businesses for profit; they are usually organized by three or more subscribers who raise capital for the corporate activities by selling shares of stock, which represent ownership and are transferable. Besides business corporations, there are also charitable, cooperative, municipal, and religious corporations, all with distinctive features. In the United States all governmental units smaller than a state (e.g., counties, cities) are municipal corporations. Certain religious functionaries (e.g., Roman Catholic archbishops) legally are corporations sole. The legal personality of a corporation is symbolized by its seal and its distinctive name. As a legal person, the corporation continues in existence when the organizers lose their connection with it. In most cases its liability is limited to the assets it possesses and creditors may not seize property of persons associated with the corporation as stockholders or otherwise. Legal personality gives the corporation many of the capacities of a natural person, e.g., it can hold property and can even commit crimes (for which it may be fined and its directors imprisoned). The corporate form was known in Rome, although the notion of its personality was not fully developed. In Norman England and on the Continent in medieval times, municipal and ecclesiastical corporations were common. In the overseas trade expansion of the 16th and 17th cent, associates bought shares in a ship, or its cargo, and divided the profits while spreading the risk. The Muscovy Company (chartered 1555) and the Dutch East India Company (chartered 1602) were perhaps the earliest trading companies with what came later to be called permanent capital. The initial British colonization of America and the appropriation of India were basically achieved through the use of government-chartered trading corporations. The failure of the MISSISSIPPI SCHEME and the SOUTH SEA BUBBLE, both in 1720, led to reforms and stricter fiscal regulation of corporations. New corporations were created in the Industrial Revolution to finance larger economic units, such as railways and steam-driven machinery in factories. Until 1844 incorporation in England continued to be a matter of special grant by the king or Parliament. In general, the history of corporations in America has been marked by the abdication of state control over corporations. The modern con-

cept of corporate power is that the rights of the participants as well as the conduct of the enterprise must be the subject of managerial discretion. The salient characteristic of the modern corporation is the separation of management from ownership. In the United States the state legislatures became the chief authorities to grant charters to corporations, although the Federal government incorporates in a limited field. Federal charters were granted to both of the Banks of the United States, to certain railroads after the Civil War, and to the Communications Satellite Corporation (Comsat). Corporations owned by the Federal government and financed by government appropriations include the Federal Deposit Insurance Corporation, the Community Credit Corporation, and various corporations established to meet emergencies and later liquidated. At first states passed a special act for each incorporation, but in 1811, New York state enacted a general incorporation law enabling the secretary of state to give charters. Since the DARTMOUTH COLLEGE CASE of 1819, when a charter was held to be a binding contract between a state and a corporation, unalterable and unamendable by the state without the corporation's consent, fewer perpetual charters have been granted, the right of the legislature to alter or annul being specifically reserved in the charter. Variability in state incorporation laws and the ability of corporations incorporated in one state to do business in all other states have allowed corporations to incorporate in the state or states having the most lenient incorporation laws—formerly New Jersey but, since 1913, Delaware, Maryland, and Maine. A more recent type of corporation is the holding company, organized to buy a controlling interest in other corporations. The amount of cash needed to control a concern is lessened by pyramiding holding companies. This is done by creating a company to hold a voting control of one or more operating companies. A third company is created to hold a controlling interest in the second, and so on. The control of the last holding company is sufficient to control all, and such control, because of the scattering of stock among many small holders, may need the ownership of only 10% or 20% of the stock available. The large business corporation has strongly influenced the control of property in the modern world. Approximately 100 corporations are thought to own half of the total corporate wealth of the United States; they are typically controlled by a small minority of the stockholders. There are several methods employed by small groups of stockholders to gain control of large corporations. These include pooling of the majority of stock in the hands of trustees having the power to vote it and the use of proxies (agents for the actual stockholders pledged to vote for particular candidates for managerial positions). Proxies are generally successfully used because stockholders rarely attend meetings or name proxies other than those suggested to them by management. See also TRUST. See A. A. Berle and G. C. Means, *The Modern Corporation and Private Property* (1932, rev. ed. 1968); E. S. Mason, ed., *The Corporation in Modern Society* (1960, repr. 1966); W. L. Warner, *The Corporation in the Emergent American Society* (1962); P. F. Drucker, *The Concept of the Corporation* (rev. ed. 1972); Herman Kahn, ed., *The Future of the Corporation* (1974).

corporation tax, imposts levied by federal, state, or local governments against corporations, their income, or their peculiar attributes, such as charters, capitalization, dividends, and franchises. In the United States such taxes were brought about by the difficulty of taxing corporate bonds and stocks and by the growth of corporations beyond state bounds, with consequent difficulty of assessment and taxation. Such special state corporation taxes now include fees and licenses for incorporation or for an increase in capitalization or for filing the corporation's charter in another state, taxes on gross earnings, taxes on tonnage and financial instruments or transactions, franchise taxes, capital stock taxes, and net income taxes. In 1909 the Federal government imposed an excise tax on net incomes of U.S. corporations. That tax was superseded by a corporation INCOME TAX after the Sixteenth Amendment (1913). In Great Britain in 1920 a tax was levied on corporations, including foreign companies of limited liability doing business in the United Kingdom, but exempting the profits of corporations receiving income from other corporations already taxed. In both the United States and Great Britain, EXCESS PROFITS TAX has generally been imposed only during wartime. See Sean Reamonn, *The Philosophy of the Corporate Tax* (1970); B. I. Brittker, *Federal Income Taxation of Corporations and Shareholders* (3d ed.

1971); Hugo Nurnburg, *Cash Movements Analysis of the Accounting for Corporate Income Taxes* (1971). **corporative state**, economic system inaugurated by the Fascist regime of Benito Mussolini in Italy. It was adapted in modified form under other European dictatorships, among them Adolf Hitler's National Socialist regime in Germany and the Spanish regime of Francisco Franco. Although the Italian system was based upon unlimited government control of economic life, it still preserved the framework of capitalism. Legislation of 1926 and later years set up 22 guilds, or associations, of employees and employers to administer various sectors of the national economy. These were represented in the national council of corporations. The corporations were generally weighted by the state in favor of the wealthy classes, and they served to combat socialism and syndicalism by absorbing the trade union movement. The Italian corporative state aimed in general at reduced consumption in the interest of militarization. See Roland Sarti, *Fascism and the Industrial Leadership in Italy, 1919-1940* (1971).

corpulent, see SAINT ELMO'S FIRE.

corpus callosum, see BRAIN.

Corpus Christi (kōr'pəs krīs'tē), city (1970 pop. 204,525), seat of Nueces co., S Texas, inc. 1852. It is a busy port of entry on Corpus Christi Bay at the entrance to Nueces Bay (an inlet at the mouth of the Nueces River), the main cargoes handled are cotton, oil, grain, and chemicals. The city is a petroleum and natural gas center, with much heavy industry. It has oil refineries, smelting plants, chemical works, and food-processing establishments, as well as a large shrimp fleet and an important fishing industry. Excellent sports-fishing facilities, beaches, and a mild climate make Corpus Christi a well-known tourist center. It is the gateway to Padre Island National Seashore. Tradition holds that the bay was named by the Spanish explorer Alonzo Alvarez de Pineda who discovered it on Corpus Christi Day in 1519, but there is evidence that it was named instead by the first settlers, who arrived from the lower Rio Grande valley in the 1760s. In 1839, Col. H. L. Kinney founded a trading post there, and traders, adventurers, and ne'er-do-wells collected in a raffish colony on land claimed by both Texas and Mexico. The small port and terminus for overland wagon-train traffic boomed during the Mexican War. It was briefly captured by the U.S. navy in the Civil War and later served as a supply and shipping point for sheep and cattle. It developed industrially after the discovery of oil in the area and the completion (1926) of a deepwater channel past Mustang Island. Its remarkable growth is evidenced by a spectacular bridge (235 ft/72 m high, completed 1959) over the harbor entrance and by a large dam on the Nueces River that has increased the city's water supply. The city has many historical points of interest and is the seat of a junior college and of the Univ. of Corpus Christi. A huge naval air-training station, also containing a major U.S. army helicopter maintenance facility, is on the southern shore of the bay. The city has suffered from occasional hurricanes; it is now partially protected from flooding by a sea wall 12,300 ft (3,749 m) long, built between 1939 and 1941 to a height 14 ft (4 m) beyond the high-water mark of a devastating 1919 hurricane.

Corpus Christi [Latin, = body of Christ], feast of the Western Church, observed on the Thursday after Trinity Sunday (or on the following Sunday). It commemorates the founding of the sacrament of the Eucharist, supplementing the anniversary on MAUNDY THURSDAY. The feast was established generally in 1264, with an office by St. Thomas Aquinas, which includes the splendid hymn PANGE LINGUA. In medieval times it was celebrated with pageants and the performance of MIRACLE PLAYS.

Corpus Juris Civilis (kōr'pəs jōō'rīs sīv'īlīs), most comprehensive code of ROMAN LAW and the basic document of all modern CIVIL LAW. Compiled by order of Byzantine Emperor Justinian I, the first three parts appeared between 529 and 535 and were the work of a commission of 17 jurists presided over by the eminent jurist Tribonian. The *Corpus Juris* was an attempt to systematize Roman law, to reduce it to order after over 1,000 years of development. The resulting work was more comprehensive, systematic, and thorough than any previous work of that nature, including the THEODOSIAN CODE. The four parts of the *Corpus Juris* are the Institutes, a general introduction to the work and a general survey of the whole field of Roman law, the Digest or Pandects, by far the most important part, intended for practitioners and judges and containing the law in concrete form plus selections from 39 noted classical

jurists such as Gaius, Paulus, Ulpian, Modestinus, and Papinian, the *Codex* or *Code*, a collection of imperial legislation since the time of Hadrian, and the *Novels* or *Novellae*, compilations of later imperial legislation issued between 535 and 565 but never officially collected. Because it was published in numerous editions, copies of this written body of Roman law survived the collapse of the Roman empire and avoided the fate of earlier legal texts—notably those of the great Roman jurist Gaius. With the revival of interest in Roman law (especially at Bologna) in the 11th cent., the *Corpus Juris* was studied and commented on exhaustively by such scholars as IRRERIUS. Jurists and scholars trained in this Roman law played a leading role in the creation of national legal systems throughout Europe, and the *Corpus Juris Civilis* thus became the ultimate model and inspiration for the legal system of virtually every continental European nation. The name *Corpus Juris Civilis* was first applied to the collection by the 16th-century jurist Denys Godefroi. See H. F. Jolowicz, *Historical Introduction to the Study of Roman Law* (2d ed. 1952) and *Roman Foundations of Modern Law* (1957), A. T. Von Mehren, *The Civil Law System* (1957).

Correggio (kärē'ō), c. 1494–1534, Italian painter, whose real name was Antonio Allegri, called Correggio for his birthplace. He learned the rudiments of art from his uncle Lorenzo Allegri. His early works were greatly influenced by the divergent styles of Mantegna and Leonardo da Vinci, as evidenced in the *Marriage of St. Catherine* (National Gall. of Art, Washington, D.C.) and *Madonna of St. Francis* (Dresden). Correggio's first important commission (1518) was the decoration of the convent of San Paolo at Parma. He handled the erudite allegorical program with exuberance. Depicting an impressive array of gods in the lunettes, he added a group of capricious putti (male infants) to the dome. Correggio painted many other mythological scenes including the sensual *Jo* (Vienna), *Danae* (Borghese Gall., Rome), and *Antiope* (Louvre). In 1520 he began to fresco the dome of St. John the Evangelist, Parma, with the *Ascension of Christ*. A few years later he was working on his most famous project, *Assumption of the Virgin*, in the dome of the cathedral in Parma. The Virgin is encircled by an elaborate network of apostles, patriarchs, and saints, all emerging from the clouds. Correggio used daring foreshortening in his execution of the figures. His illusionistic ceiling decorations were widely imitated in the 17th cent. Pervaded by a sense of grace and tenderness, his paintings are characterized by their soft play of light and color. Other famous works are *Madonna of St. Jerome* (Parma), *Adoration of the Child* (Uffizi), and *Madonna and Saints* (Philadelphia Mus.). See his frescoes, ed. by A. Q. Ghidiglia (1964), biography by C. Ricci (1930), studies by A. E. Popham (1957) and E. Panofsky (1961).

Correggio (kōr-rēd'jō), town (1971 pop. 20,301), in Emilia-Romagna, N. central Italy. It is an agricultural market and a cheese-manufacturing center. It was the seat of a small principality of the Da Correggio family (12th–17th cent.), whose palace is a good example of 16th-century architecture. The painter Antonio Allegri was born there (1494) and was called Correggio after the town.

Corregidor (kärē'gīdōr'), historic fortified island (c. 2 sq mi/5 sq km), at the entrance to Manila Bay, just off Bataan peninsula of Luzon island, the Philippines. From the days of the Spanish, Corregidor and its tiny neighboring islets—El Fraile, Caballo, and Carabao—guarded the entrance to Manila Bay, serving as an outpost for the defense of Manila. The Spanish also maintained a penal colony on Corregidor. When the Americans acquired the Philippine Islands after the Spanish-American War (1898), they elaborately strengthened those defenses. Corregidor was honeycombed with tunnels to serve as ammunition depots, and Fort Mills and Kindley Field were established. Fort Drum was built on El Fraile, Fort Hughes on Caballo, and Fort Frank on Carabao. The new fortifications were deemed so formidable that Corregidor became known as the Gibraltar of the East, or "the Rock." In the early phase of World War II, Corregidor's batteries guarded the entrance to Manila Bay—denying that splendid harbor to the Japanese for five months—and protected the flank of the large U.S.-Filipino army concentrated on Bataan peninsula. During those months Corregidor was subjected to one of the most intense continuous bombardments of the entire war. Its surface was churned to rubble, and the garrison was forced into the caves and tunnels. After the fall of Bataan, about 10,000 U.S. and Filipino troops under Lt. Gen. Jona-

than M. Wainwright fought gallantly on for a month. They were hopelessly cut off from all supplies and aid. Corregidor was finally invaded early in May, 1942, and the garrison was forced to surrender. The island was recaptured in March, 1945, by U.S. paratroopers and shore landing parties. It is now a national shrine. See James and William Belote, *Corregidor: The Saga of a Fortress* (1967).

correspondence principle, physical principle, enunciated by Niels Bohr in 1923, according to which the predictions of the QUANTUM THEORY must correspond to the predictions of the classical theories of physics when the quantum theory is used to describe the behavior of systems that can be successfully described by classical theories. Technically this principle means that the results of a quantum theory analysis of a problem that involves the use of very large quantum numbers must agree with the results of a classical physics analysis. Such correspondence is known as the classical limit of the quantum theory. Ordinarily the quantum theory is used to describe the behavior of bodies that are so small that they cannot be seen under an optical microscope, while the theories of classical physics are used to analyze the behavior of large-scale bodies. The correspondence principle provided an important theoretical basis for the development of a detailed correlation between the newer quantum theory and the classical physics that preceded it.

Corrèze (kōrēz'), department (1968 pop. 237,858), S. central France, in LIMOUSIN. TULLE is the capital.

Corrib, Lough (lōkh kōr'ib), lake, 68 sq mi (176 sq km), Counties Galway and Mayo, W. Republic of Ireland. The irregularly shaped lake, which is 27 mi (43 km) long, drains into Galway Bay through the Corrib River. It is connected by a partly subterranean channel with Lough Mask to the north. Lough Corrib is an important transportation route, it is also a major brown-trout fishery.

Corrientes, city (1970 pop. 137,823), capital of Corrientes prov., NE Argentina, a port on the Paraná River. It is the commercial center of a rich pastoral and agricultural region. The city exports the cattle, timber, and agricultural products of the province. An important cultural center, it has several institutions of higher education, museums, and historical monuments. Corrientes was founded in 1588 and survived fierce Indian attacks during the late 16th and early 17th cent. In 1762 an uprising of the *comuneros* [townspeople] against the colonial governor foreshadowed the wars of independence from Spain. The city and province were among the first to rebel (1844) against Juan Manuel de Rosas.

Corrievekin or Corryveckan (both kōr'ēvrēkən), whirlpool in Corrievekin passage N. of Jura island, Argyllshire, W. Scotland.

corrosion, atmospheric oxidation of metals (see OXIDATION AND REDUCTION). By far the most important form of corrosion is the rusting of IRON. Rusting is essentially a process of oxidation in which iron combines with water and oxygen to form rust, the reddish-brown crust that forms on the surface of the iron. Rust, a chemical compound, is a hydrated ferric oxide $\text{Fe}_2\text{O}_3 \cdot n\text{H}_2\text{O}$, where n is usually $1\frac{1}{2}$. The chemical mechanism of rusting is not fully known, but is thought to involve oxidation of metallic iron to ferrous ion (Fe^{++}) and reaction of the ferrous ion with oxygen and water to form rust. The reaction is catalyzed by water, acids, and metals (e.g., copper and tin) below iron in the ELECTROMOTIVE SERIES. Because iron is so widely used, e.g., in building construction and in tools, its protection against rusting is important. Although metals (e.g., aluminum, chromium, and zinc) above iron in the electromotive series corrode more readily than iron, their oxides form a tenuous coating that protects the metal from further attack. Rust is brittle and flakes off the surface of the iron, continually exposing a fresh surface. Rusting can be prevented by excluding air and water from the iron surface, e.g., by painting, oiling, or greasing, or by plating the iron with a protective coating of another metal. Metals used for plating include chromium, nickel, tin, and zinc. Zinc plating is called galvanizing. Many alloys of iron are resistant to corrosion. Stainless steels are alloys of iron with such metals as chromium and nickel; they do not corrode because the added metals help form a hard, adherent oxide coating that resists further attack. The iron hulls of ships can be protected against rusting by attaching magnesium strips to the underside of the vessel. An electric current is generated, with the magnesium and iron acting as electrodes and seawater acting as the electrolyte. Because magnesium is above iron in the electromotive series, it serves as a "sacrificial anode" and is oxidized in

preference to the iron. This is called cathodic protection, since the iron serves as the cathode and thus escapes oxidation. This method is also used to protect the pipes of electric generating plants where salt water is used as a coolant.

corrosive sublimate: see MERCURIC CHLORIDE

corrupt practices, in politics, fraud connected with elections. The term also refers to various offenses by public officials, including bribery, the sale of offices, granting of public contracts to favored firms or individuals, and granting of land or franchises in return for monetary rewards. Election fraud may consist of efforts to influence or intimidate the voter or to tamper with the official BALLOT or election count. To eliminate these practices nearly all democratic nations have passed laws that attempt to safeguard the honesty of political campaigns and elections. In Great Britain the Acts of 1883 and 1918, frequently amended, define election abuses and limit political spending by or on behalf of candidates for Parliament. In the United States individual states have their own election laws, and they preceded Congress in enacting corrupt practices acts. In large cities of the United States election fraud has historically been associated with political machines (see BOSSISM), while in the S. United States it was historically used to deprive the Negro of political power. On the Federal level, the Corrupt Practices Act of 1925, the Hatch Act of 1940, parts of the Taft-Hartley Act of 1947, and the campaign financing legislation of 1974 have all tried to regulate campaign finances by limiting amounts spent and the size and source of campaign gifts, by requiring disclosure of expenditure, and by public financing of presidential elections. In 1968, in the wake of several scandals, both the Senate and the House established ethics committees and adopted codes of conduct that required members to file reports on their income and campaign contributions. In 1972, Congress passed legislation limiting the amount of money presidential and congressional candidates could spend in their campaigns, the law also required that all contributions and expenditures exceeding \$100 be publicly reported. Revelations of political sabotage and espionage financed through secret campaign funds during the 1972 presidential election (see WATERGATE AFFAIR) led to renewed efforts on the state and Federal levels to regulate campaign finances. The most immediate result was the 1974 law limiting the amount that can be spent in campaigns and providing for a measure of public financing of national elections. The term has also been applied to businesses and labor unions, in the former case for price fixing, and in the latter for misappropriation of funds or the rigging of union elections. See Alexander Heard, *The Cost of Democracy* (1960, repr. 1967), H. E. Alexander, *Regulation of Political Finance* (1966) and *Money in Politics* (1972), E. M. Epstein, *Corporations, Contributions, and Political Campaigns* (1968), George Thayer, *Who Shakes the Money Tree? American Campaign Financing Practices from 1789 to the Present* (1973).

Corryveckan, whirlpool see CORRIEVEKIN, Scotland.

corsair: see PIRACY

corset, article of dress designed to support or modify the figure. Greek and Roman women sometimes wrapped broad bands about the body. In the Middle Ages a short, close-fitting, laced outer bodice or waist was worn. By the 16th cent. it had become a tight inner bodice, sometimes of leather, stiffened with whalebone, wooden splints, or steel, fashion demanded the slenderest possible waist in contrast with the enormous farthingales and stuffed breeches that were worn. Stays and tight lacing were made for both men and women from the 17th through the 19th cent., except for a brief period following the French Revolution. By 1900 the corset had become primarily a female garment, and it was gradually modified to conform to the natural lines of the body. Today the garment that most closely resembles the corset is termed a girdle.

Corsica (kōr'sīka), Fr. Corse, island (1968 pop. 269,831), 3,367 sq mi (8,721 sq km), a department of metropolitan France, SE of France and N of Sardinia, in the Mediterranean Sea. AJACCIO, the capital, and BASTIA are the chief towns and ports. The island is largely mountainous, culminating in Monte Cinto (8,891 ft/2,710 m). Principal rivers are the Golo, Tavignano, Liamone, Gravone, Tarova, and Profiano. Olive oil, wine, and timber are the main exports. Much wheat and cheese are produced, and sheep are raised. Communications are poor. Much of the island is wild, covered by undergrowth, or maquis, the flowers of the maquis produce a fragrance that

carries far out to sea and has earned for Corsica the name "the scented isle." The maquis long provided ideal hideouts for bandits, and banditry was not fully suppressed until the 1930s. Blood feuds between clans also persisted into modern times. Most Corsicans speak a dialect akin to Italian. After having belonged to the Romans (3d cent B C–5th cent A D), the Vandals, the Byzantines, and the Lombards, the island was granted (late 8th cent.) by the Franks to the papacy. It was threatened by the Arabs from c. 800 to 1100. In 1077, Pope Gregory VII ceded Corsica to Pisa. Pisa and Genoa and later Genoa and Aragon battled for Corsica. In the mid-15th cent. the actual administration of the island was taken up by the Bank of San Giorgio in Genoa. Genoese rule was harsh and unpopular. Later unrest was typified by the episode of "King" Theodore I (see NEUHOF, THEODOR, BARON VON). In 1755, Pasquale PAOLI headed a rebellion against Genoa, but its success resulted only in the cession (1768) of Corsica to France. One consequence of the transfer was the French citizenship of Napoleon I, who was born in 1769 at Ajaccio. With British support PAOLI expelled the French in 1793, and in 1794 Corsica voted its union with the British crown. The French (under Napoleon) recovered it, however, in 1796, and French possession was guaranteed at the Congress of Vienna (1815). French rule brought education and relative order, but economic life remained agrarian and primitive. In World War II, Corsica was occupied by Italian and German troops. Late in 1943 the population revolted, and, with the assistance of a Free French task force, the Axis forces were driven out. A postwar exodus of population caused the French government to announce a program of economic development in the 1950s. The island has developed a tourist industry. In 1958 a right-wing coup similar to that in Algiers contributed to the return to power of Charles de Gaulle in France.

Corsicana (kōrsīkā'nə), city (1970 pop. 19,972), seat of Navarro co., E central Texas, inc. 1848. It is an oil center with wells and refineries and additional industries that depend on the cotton, small grains, and Hereford cattle produced in the surrounding blackland farm area. The discovery of oil when a city water well was being dug (1894) caused dismay at first but led to the drilling (1895) of the first commercial oil well W of the Mississippi and the building (1898) of the first refinery in Texas. In Corsicana are a junior college and Pioneer Village, a complex of restored log structures.

Cort, Henry, 1740–1800, English inventor. He revolutionized the British iron industry with his use of grooved rollers to finish iron, replacing the process of hammering, and through his invention of the puddling process. This process involved stirring the molten pig iron in a reverberatory furnace until the decarburizing action of the air produced a loop of pure metal.

Cortazar, Julio (hōō'lyō kōr'ta'zar), 1914–, Argentine novelist, poet, essayist, and short-story writer, b. Brussels. A student of SURREALISM, he creates a cruel and despairing world full of fantasy and satire. Life is often depicted as a maze or game from which man must extricate himself. His works include *Final del juego* (1956, tr. *End of the Game*, 1967), *Historias de cronopios y de famas* (1962, tr. *Cronopios and Famas*, 1969), *Rayuela* (1963, tr. *Hopscotch*, 1966), *Sixty-two*, *A Model Kit* (1972, tr. 1972), and *All Fires the Fire and Other Stories* (tr. 1973).

Cortelyou, George Bruce (kōr'talyōō), 1862–1940, American public official and business executive, b. New York City. He taught school, and after learning stenography, he became secretary to several New York City and Federal officials. Appointed (1895) stenographer to President Cleveland, Cortelyou became secretary to Presidents McKinley (1900) and Theodore Roosevelt (1901). He also served under Roosevelt as Secretary of Commerce and Labor (1903–4), Postmaster General (1905–7), and Secretary of the Treasury (1907–9). He then left government service and became prominent as an executive of public-utility companies.

Corte Real or Corte-Real, Gaspar (gashpar' kōr'ta réal'), c. 1450–1501?, Portuguese explorer. Sent by King Manuel I to search for the Northwest Passage, he is said to have discovered Greenland in 1500 and may have touched on the North American coast. He made a second voyage with his brother Miguel in 1501. He then sent Miguel home and continued his exploration, sailing southwest along the present U.S. coast. Gaspar Corte Real was lost. In 1502 Miguel Corte Real went in search of him but was also lost. The brothers certainly reached Newfoundland and made sweeping discoveries, but the results were in-

conclusive. See H. P. Biggar, *Voyages of the Cabots and the Corte-Reals* (1903).

Cortes, Hernan, or Hernando Cortez (kōrtēz', Span. ārnan', ārnan'dō kōrtās'), 1485–1547, Spanish CONQUISTADOR, conqueror of Mexico. He went to Hispaniola (1504) and later (1511) accompanied Diego de VELAZQUEZ to Cuba. In 1518 he was chosen to lead an expedition to Mexico. Although Velazquez later sought to recall his commission, Cortes sailed in Feb., 1519. In Yucatan he rescued a Spaniard who had learned the Mayan language, after a victory over Indians in Tabasco, Cortes acquired the services of a female slave Malinche—baptized Marina—who knew both Maya and Aztec. Having proceeded up the coast, Cortes founded Villa Rica de la Vera Cruz and was chosen captain general by the cabildo, thus he discarded Velazquez's authority and became responsible only to Charles V. Cortés, learning that the Aztec empire of MONTUZUMA was honeycombed with dissension, assumed the role of deliverer and rallied the coastal Totonacs to his standard, he also began negotiations with Montezuma. Scuttling his ships to prevent the return of any Velazquez sympathizers to Cuba, he began his famous march to Tenochtitlan (modern Mexico city), capital of the Aztec empire. He defeated the Tlaxcalan warriors, then formed an alliance with the so-called republic of Tlaxcala, practically destroyed CHOLULA, and arrived at Tenochtitlan in Nov., 1519. There the superstitious Montezuma received the Spanish as descendants of the god Quetzalcoatl. Cortes seized his opportunity, took Montezuma as a hostage, and attempted to govern through him. In the spring of 1520, Cortes went to the coast, where he defeated a force under Panfilo de NARVAEZ. Pedro de ALVARADO, left in command, impetuously massacred many Aztecs, and soon after Cortes's return the Aztecs besieged the Spanish. In the ensuing battle, Montezuma was killed. The Spanish, seeking safety in flight, fought their way out of the city with heavy loss on the *noche triste* [sad night] (June 30, 1520). Still in retreat, they defeated an Aztec army at Otumba and retired to Tlaxcala. The next year Cortes attacked the capital, and after a three-month siege Tenochtitlan fell (Aug. 13, 1521). With it fell the Aztec empire. As captain general, Cortes extended the conquest by sending expeditions over most of Mexico and into N. Central America. In 1524–26, Cortes himself went to Honduras, killing CUAUHTÉMOC, the Aztec emperor, on the expedition. In Cortes's absence his enemies gradually triumphed, and after his return his power was made more fictitious than real by the audiencia. Although on his visit to Spain (1528–30) Cortes was made marqués del Valle de Oaxaca, Charles V. refused to name him governor. Returning to Mexico, he vainly sent out maritime expeditions, frustrated more than once by Nuño de GUZMAN. Subsequently he quarreled with the viceroy, Antonio de MENDOZA, and in 1540 he again sought justice in Spain. There, neglected by the court, he died. The best-known contemporary account of the conquest is that of Bernal Díaz del Castillo. See the letters of Cortes (Eng. ed. by F. A. MacNutt, 1908), W. H. Prescott, *Conquest of Mexico* (1937), studies by Salvador de Madariaga (1942, repr. 1969) and H. R. Wagner (1944, repr. 1969).

Cortes (kōrtēz, Span. kōrtās), representative assembly in Spain. The institution originated (12th–13th cent.) in various Spanish regions with the Christian reconquest, until the 19th cent. the local cortes of Leon, Castile, Aragon, Catalonia, Navarre, Valencia, and other states met separately. The three estates—clergy, nobility, and burghers—voted the taxes, recognized the kings upon their accession, and indirectly exercised some legislative influence. The cortes of Aragon and Catalonia were particularly powerful. After the consolidation of the royal power (15th cent.) and the unification of Spain, the cortes were seldom convoked except to pay homage, and their powers were curtailed. The first national Cortes of Spain met at Cadiz in 1810 in the Peninsular War, the Spanish war of liberation from Napoleonic rule. They voted (1812) a liberal constitution, later (1814) revoked by Ferdinand VII. Thereafter the status of the Cortes frequently changed in its struggle for power with the king. At the fall of the monarchy in 1931, a constituent Cortes promulgated a republican constitution, and the Cortes was the parliament of Spain until 1939. Under Francisco Franco's dictatorship a Cortes was preserved but stripped of effective legislative power. Under the Portuguese monarchy various legislative bodies were known as cortes.

cortex, in botany, term generally applied to the soft tissues of the leaves, stems, and roots of plants. Cortical cells of the leaves and outer layers of the stems

of nonwoody plants contain chloroplasts, and are modified for food storage (usually in the form of starch) in roots and the inner layers of stems and seeds. Because of the combination of its soft texture (especially after cooking) and its role as a food storage tissue, the cortex is the predominant plant tissue eaten by man and other animals.

Cortez, Hernando. see CORTÉS, HERNAN

corticosteroid drug (kōr'təkōstēr'oid), any one of several synthetic or naturally occurring substances with the general chemical structure of STEROIDS. They are used therapeutically to mimic or augment the effects of the naturally occurring corticosteroids, which are produced in the cortex of the ADRENAL GLAND. Corticosteroids are very powerful drugs affecting the entire system, even corticosteroids used on large areas of skin for long periods are absorbed in sufficient quantity to cause systemic effects. Corticosteroids, as well as ADRENOCORTICOTROPIC HORMONE (ACTH), the pituitary gland substance that stimulates the adrenal cortex, have modifying effects on many diseases. Some corticosteroid derivatives mimic the action of the naturally occurring steroid hormone ALDOSTERONE, causing increased sodium retention and potassium excretion. Others have the same effects as the naturally occurring steroids CORTISONE and CORTISOL, which are classed as glucocorticoids, these affect carbohydrate and fat metabolism, reduce tissue inflammation, and suppress the body's immune defense mechanisms. Cortisone and hydrocortisone are used to treat ADDISON'S DISEASE, a disorder caused by underproduction of the adrenal cortex hormones. These and synthetic steroids are extensively used to treat arthritis and other rheumatoid diseases including rheumatic heart disease. They are also used in some cases of autoimmune diseases such as systemic lupus erythematosus, in severe allergic conditions such as asthma, in allergic and inflammatory eye disorders, in some respiratory diseases, and in some leukemias and cancers. The anti-inflammatory, itch-suppressing, and vasoconstrictive properties of steroids make them useful when applied to the skin to relieve diseases such as eczema, psoriasis, and insect bites. Because corticosteroids lower the resistance to infection, patients on steroid therapy cannot be vaccinated for smallpox or immunized. The administration of corticosteroids also causes underproduction of the natural hormones by the adrenal cortex, and so ACTH or corticosteroid therapy must always be withdrawn gradually. In addition, when used in large doses for long periods of time, the drugs can cause atrophy of the adrenal cortex. Side effects of steroid therapy include glaucoma, excess hair growth, and imbalance of many substances, including calcium, nitrogen, potassium, and sodium. Many of the synthetic corticosteroids, such as prednisone, prednisolone, triamcinolone, and beta methasone, are more potent than the naturally occurring compounds.

corticosterone (kōr'təkōstēr'ōn), steroid HORMONE secreted by the outer layer, or cortex, of the ADRENAL GLAND. Classed as a glucocorticoid, corticosterone helps regulate the conversion of amino acids into carbohydrates and glycogen by the liver, and helps stimulate glycogen formation in the tissues. Corticosterone is similar in structure, although somewhat less potent, than the other glucocorticoids CORTISOL and CORTISONE. It is produced in response to stimulation by the pituitary substance ADRENOCORTICOTROPIC HORMONE (ACTH). In some species, but not in humans, corticosterone is the predominant glucocorticoid secreted by the adrenal. It is a precursor in the synthesis of ALDOSTERONE, another adrenal cortical steroid.

corticotropin (kōr'təkōtrōp'ən) see ADRENOCORTICOTROPIC HORMONE

Cortina d'Ampezzo (kōrtē'na dampēd'zō), town (1971 pop. 8,574), in Venetia, NE Italy, in the heart of the DOLOMITES. It is an international winter sports center. The 1956 winter Olympic games were held there.

cortisol (kōr'tīsōl'), or hydrocortisone, steroid HORMONE that in humans is the major circulating hormone of the cortex, or outer layer, of the ADRENAL GLAND. Like CORTISONE, cortisol is classed as a glucocorticoid, it stimulates liver glycogen formation while it decreases the rate of glucose utilization in body cells. A main effect of cortisol is to reduce the reserves of protein in all body cells except cells of the liver and gastrointestinal tract. It also makes fatty acids available for metabolic use. Cortisol is synthesized and secreted by the adrenal cortex in response to the stimulating substance ADRENOCORTICOTROPIC HORMONE (ACTH). In turn, cortisol is the major regu-

lator of ACTH production in the pituitary gland, it acts by negative feedback inhibition, i.e., a rise in the level of cortisol in the blood inhibits ACTH secretion by the pituitary. Cortisol is more potent than cortisone with respect to metabolic and anti-inflammatory effects.

cortisone (kôr'tisôn'), steroid HORMONE whose main physiological effect is on carbohydrate metabolism. It is synthesized from CHOLESTEROL in the outer layer, or cortex, of the ADRENAL GLAND under the stimulation of ADRENOCORTICOTROPIC HORMONE (ACTH). Cortisone is classed as a glucocorticoid with CORTISOL and CORTICOSTERONE, its effects include increased glucose release from the liver, increased liver glycogen synthesis, and decreased utilization of glucose by the tissues. These actions tend to counter the effects of INSULIN and may aggravate or mimic diabetes in sufficiently high doses. Cortisone also exerts an effect on salt retention in the kidneys similar to that of ALDOSTERONE, although it is not as potent. The hormone causes increased breakdown of proteins and decreased protein synthesis, and large doses given over a long period of time may result in inhibited growth in children or weakening of bones and wasting of muscles in adults. The principal medical use of cortisone comes from its anti-inflammatory and anti-allergic effects, it is extremely useful in the treatment of innumerable diseases including asthma and other allergic reactions, arthritis, and various skin diseases. Cortisone is necessary to maintain life and enable the organism to respond to stress, failure of the adrenal glands to synthesize cortisone (Addison's disease) or surgical removal of the adrenals is fatal unless cortisone is given as replacement therapy. Although less cortisone is manufactured in the body than either cortisol or corticosterone and although cortisone is less potent than cortisol, the term cortisone is often used collectively to include the other glucocorticoids, both the naturally occurring and the synthetic compounds such as prednisone. Small quantities of cortisone were first isolated from animal adrenals in 1935-36. A method of manufacture, involving laboratory synthesis from an acid of BILE, was developed, and in 1949 cortisone was first offered commercially. The specific mechanisms by which cortisone and similar compounds act are still poorly understood.

Cortisoz, Royal (kôr'tē'sōz), 1869-1948, American critic and lecturer on art. He was the New York *Herald Tribune* art critic from 1891 and was noted for his lectures at the Metropolitan Museum and at other museums throughout the United States. He wrote biographies of Augustus Saint-Gaudens (1907), John La Farge (1911), and Whitelaw Reid (1921), as well as *Art and Common Sense* (1913), *American Artists* (1923), *Personalities in Art* (1925), and *The Painter's Craft* (1930).

Cortland, city (1970 pop. 19,621), seat of Cortland co., central N.Y., in a fertile farm area, settled 1791, inc. as a city 1900. Fish line, metal products, and automotive and aircraft parts are among the manufactures. The State Univ. College at Cortland is a major employer, and a junior college is in nearby Groton.

Cortona, Pietro Berrettini da (pyä'trô bär-rêt-tē'nē dā kôrtô'nä), 1596-1669, Italian baroque painter and architect, b. Cortona. The Barberini family commissioned him to paint frescoes for the vast ceiling of their palace in Rome, which resulted in the exuberant *Allegory of Divine Providence and Barberini Power* (1633-39). The work, filled with swirling clouds and figures, was one of the most influential of baroque decorative schemes. It is a paramount example of baroque ILLUSIONISM. In Florence he executed frescoes of the Four Ages and the rich ceiling decoration in the Pitti Palace, the *Allegories of the Virtues and Planets*. In these seven rooms the ceilings are unified with the structure of the rooms by stucco ornamentation. Pietro's pupil, *Ciro Ferri* (1634-89) completed the work in the Pitti Palace. Almost equally ornate were Pietro's early architectural designs, such as that for the church of *S. Martina e Luca* (1635-50) in Rome, which Pietro finished at his own expense. Later he turned to a greater simplification and massiveness in the *facades of Santa Maria della Pace* (1656-57) and *Santa Maria in Via Lata* (1658-62). His architectural works are among the most significant of the baroque period.

Cortona (kôrtô'nä), town (1971 pop. 22,377), Tuscany, central Italy. It is an agricultural and tourist center. One of the 12 important Etruscan cities, Cortona later (310 B.C.) united with Rome. The town passed to Florence in the early 15th cent. Landmarks include the Romanesque cathedral (remodeled dur-

ing the Renaissance), the Palazzo Pretorio (13th cent.), and the Church of San Francesco (begun 1245). The Diocesan Museum contains paintings by Luca Signorelli (who was born in Cortona), Fra Angelico, and others.

Cortot, Alfred Denis (älf'réd' dané' kôrtô'), 1877-1962, French pianist and conductor. Among his appearances as a conductor were those at Bayreuth from 1898 to 1901. He joined the faculty of the Paris Conservatory in 1907 and in 1919 founded the *École normale de Musique, Paris*. For many years he played trios with Jacques Thibaud and Pablo Casals.

Çorum (chôrôom'), city (1970 pop. 55,890), capital of Çorum prov., N central Turkey. It is the trade center for a farm region where grains, fruits, sheep, and goats are raised. The city's manufactures include copper and leather goods. Important Hittite remains have been found there.

Corumba (kôörôombä'), city (1970 pop. 81,838), Mato Grosso state, SW Brazil, on the Paraguay River. A river port and a junction point on the railroad to Bolivia, it is a trade center for a large pastoral region. Corumba exports leather and meat products and has varied light industries. Founded as a military outpost and colony in 1778, it became strategically important with the opening of the Paraguay River to international trade after the Paraguayan War (1865-70). Nearby are the buttes of Morro do Urucum, which contain vast iron and manganese deposits.

Coruña, La (lä kôroö'nyä), city (1970 pop. 189,654), capital of La Coruña prov., NW Spain, in Galicia. It is a busy Atlantic port, a distribution center for the surrounding farm area, and a summer resort spot. It has shipyards, metalworks, and an important fishing industry. La Coruña reached its height as a port and a textile center in the late Middle Ages. The *Armada* sailed from its harbor in 1588. The city was sacked by Sir Francis Drake in 1598. In the Peninsular War it was the scene of the battle (1809) in which Sir John Moore was killed. The city was a focus of antimonarchist sentiment during the 19th cent. Chief landmarks are a 13th-century church and the Roman Torre de Hercules, now a lighthouse. Glazed window balconies, or *miradores*, are characteristic of La Coruña.

corundum (kärün'däm), mineral, aluminum oxide, Al₂O₃. The clear varieties are used as gems and the opaque as ABRASIVE materials. Corundum occurs in crystals of the hexagonal system and in masses. It is transparent to opaque and has a vitreous to adamantine luster. The transparent gem varieties are colorless, pink, red, blue, green, yellow, and violet, the common varieties are blue-gray to brown. Emery is a common corundum, used as an abrasive and distinguished by its impurities of magnetite and hematite. The chief corundum gems are the RUBY (red) and the SAPPHIRE (blue). Yellow, pink, green, and white stones are also called yellow, pink, green, and white sapphires. Corundum gems are also made synthetically. The chief sources of natural corundum are Burma, Sri Lanka (formerly Ceylon), India, Thailand, Republic of South Africa, Tanzania, and the United States (North Carolina, Georgia, and Montana). Most of the emery is mined in Naxos and the other Cyclades and in Asia Minor.

Corvallis (kôrväl'is), city (1970 pop. 35,153), seat of Benton co., NW Oregon, on the Willamette River, inc. 1857. It is a food-processing hub in the heart of the fertile Willamette valley. It is also a research center, especially in forestry. Corvallis is the seat of Oregon State Univ. and the headquarters for Siuslaw National Forest. Nearby are a junior college, a state game farm, and a national wildlife refuge.

corvée (kôrvä'), under the feudal system, compulsory, unpaid labor demanded by a lord or king and the system of such labor in general. There were national and local variations, but in broad terms the corvée proper included work on the lord's portion of the manorial property and many attendant duties. Military service also came under the general terms of the corvée. The corvée included both regular and exceptional demands. "Real" corvée referred to the duties attached to the ownership or tillage of certain lands, "personal" corvée referred to the duties of specific individuals. Highly developed during the feudalization of the late Roman Empire, the corvée system was an integral part of the nonmoneyed social and economic system of the Middle Ages, but towns and all individuals who were able liberated themselves when possible by money payment instead of services. In France the royal corvée, compulsory work on public roads, was introduced in the 18th cent. Both the royal and the seigniorial corvée bore heavily and almost exclusively upon the peasants and helped cause the French Revolution. Aus-

tria abolished the last European corvée system in 1848.

corvette, small warship, classed between a frigate and a sloop-of-war. Corvettes usually were flush-decked and carried fewer than 28 guns. They were widely employed in escorting convoys and attacking merchant ships during the great naval wars of the late 18th and early 19th cent., but corvettes passed from use with the transition from sail to steam. At the beginning of World War II the term was reintroduced to designate a small vessel of about 1,000 tons displacement, armed with depth charges and a single 4-in. (10.2-cm) gun. In the early years of the war, large numbers of these vessels were employed by the British and Canadian navies as convoy escorts in the North Atlantic, later they were supplanted by the larger, faster, and better-armed frigates.

Corvinus, Matthias: see MATTHIAS CORVINUS

Corvo, Baron: see ROLFE, FREDERICK WILLIAM

Corwin, Thomas, 1794-1865, American politician, b. Bourbon co., Ky. A lawyer, he was an Ohio legislator in the 1820s, a U.S. Representative (1831-40), and governor of Ohio (1840-42). In the U.S. Senate (1845-50) Corwin, a Whig, violently opposed the Mexican War. He was Secretary of the Treasury (1850-53) under President Fillmore, and although not entirely approving of the Republican position on slavery, he reentered the House (1859-61) as a member of that party. He was minister to Mexico from 1861 to 1864. See biography by Josiah Morrow (1896).

Cory, William Johnson, 1823-92, English poet and classicist. He was assistant master at Eton from 1845 to 1872. His verse, of which *Ionica* (1858) is the best known, consists primarily of imitations and translations of the Greek and Latin poets. See his *Letters and Journals* (ed. by F. W. Cornish, 1897).

Coryate, Thomas (kôr'ēät), 1577?-1617, English traveler. Grotesque in appearance, he became part of the household of Henry, the oldest son of James I, where he was a sort of unofficial court jester. In 1608 he went on a journey that covered much of Europe and resulted in the publication of his *Crudities* (1611), a strange mixture of travel observations and poetry. In 1612 he set out again, voyaged in Asia Minor and Egypt, then back to Palestine and E to Persia and India, where he died in 1617. His letters from India were published in 1616 and 1618, some are reprinted in *Early Travels in India* (ed. by Sir William Foster, 1921). See biography by Michael Strachan (1962).

Cos, Greece: see KÓS

Cosa, Juan de la (hwän dā lä kô'sä), c. 1460-1510, Spanish navigator. He sailed with Columbus in 1492 (as pilot of the flagship *Santa Maria*) and again in 1498. After accompanying Alonso de Ojeda in 1499, he drew (1500) a world map (a manuscript copy exists in Madrid) that seems to be the first to question the identification with Asia of the new lands and to furnish evidence that the Cabots coasted farther S along the Atlantic shore than other documents reveal. In 1501 he was with BASTIDAS, and later (1504) he again explored the northern coast of South America. Securing for Ojeda a commission to colonize and explore that coast, Cosa accompanied him (1509) to the site of Cartagena and was there killed by the Indians.

Cosam (kô'säm), ancestor of St. Joseph, in Luke's genealogy. Luke 3:28.

Cosenza (kôzän'tsä), city (1971 pop. 101,908), capital of Cosenza prov., Calabria, S Italy, at the confluence of the Busento and Crati rivers. It is an agricultural and industrial center. Manufactures include textiles, furniture, and lumber. The chief city of the ancient Brutii, it was taken by the Romans in 204 B.C. According to tradition, Alaric I (c. 370-410 A.D.), the Visigothic king, was buried in the bed of the Busento at Cosenza. The city has suffered from numerous earthquakes. A castle built by Emperor Frederick II dominates the old part of the city.

Cosgrave, William Thomas (kôs'gräv), 1880-1965, Irish statesman. A member of SINN FEIN, he fought in the *Easter Rebellion of 1916* and was sentenced to life imprisonment. Freed a year later, he was elected to the British Parliament and joined in setting up the OAIL EIREANN in 1919. He became minister of local government in the revolutionary cabinet. Cosgrave supported the treaty (1921) that set up the Irish Free State (see IRELAND) and, after the deaths of Arthur Griffith and Michael Collins, he was elected president. In 1932, when the republicans won the election, Cosgrave became opposition leader. In 1944 he resigned the leadership of his Fine Gael, or United

Ireland, party. His son, **Liam Cosgrave**, 1920–, entered the Dail as a Fine Gael member in 1943 and served as minister of commerce and industry (1948–54) and of external affairs (1954–57). He became leader of the party in 1965, and in March, 1973, following the general election, he was made prime minister. In the face of continuing deterioration of the political situation in Northern Ireland, Cosgrave supported the British government in its establishment of a coalition executive there and its plans for a Council of Ireland to link the governments of the republic and the North.

Coshocton (kashōk'tan), city (1970 pop. 13,747), seat of Coshocton co., central Ohio, where the Tuscarawas and Walhonding rivers meet to form the Muskingum, inc. 1833. A warlike tribe of Delawareans had a village there of the same name, in 1764 the expedition of Col. Henry Bouquet freed a number of white prisoners and established a peace treaty. Of interest is the Roscoe Village, a restored canal town on the Ohio-Erie Canal.

Cosimo de' Medici. see **MEDICI, COSIMO DE'**

cosine, in trigonometry, relation defined in a right triangle for one of the acute angles (A) as the ratio of the length of the side adjacent to that angle (b) to the length of the hypotenuse (c), or $\cos A = b/c$. The concept may be extended to any plane triangle, in which case the Law of Cosines is found to hold: $a^2 = b^2 + c^2 - 2bc \cos A$, where a , b , and c are the lengths of the sides and A is the angle opposite side a , analogous relationships hold for angles B and C opposite sides b and c respectively. In general, the cosine function $\cos x$ may be expressed as an infinite series, $\cos x = 1 - x^2/2! + x^4/4! - x^6/6! + \dots$, where $n! = 1 \cdot 2 \cdot 3 \cdot \dots n$. See **TRIGONOMETRY**.

Cosmat work: see **MOSAIC**

cosmetics, preparations externally applied to change or enhance the beauty of skin, hair, nails, lips, and eyes. The use of body paint for ornamental and religious purposes has been common among primitive peoples from prehistoric times (see **BODY-MARKING**). Ointments, balms, powders, and hair dyes have also been used from ancient times. Many cosmetics originated in the Orient, but their ingredients and use are first recorded in Egypt; ancient tombs have yielded cosmetic jars (called kohl pots) and applicators (called cosmetic spoons). The Egyptians used kohl to darken their eyes, a crude paint was used on the face, and fingers were often dyed with henna. Greek women used charcoal pencils and rouge sticks of alkanet and coated their faces with powder, which often contained dangerous lead compounds. Beauty aids reached a peak in imperial Rome—especially chalk for the face and a rouge called fucus—and ladies required the services of slaves adept in their use. Many cosmetics survived the Middle Ages, and Crusaders brought back rare Eastern oils and perfumes. In the Renaissance, cosmetics, usually white-lead powder and vermilion, were used extravagantly. From the 17th cent. recipes and books on the toilette abounded. Professional cosmetologists began to appear, and luxurious prescriptions often included a bath in wine or milk. At its height by 1760, the use of cosmetics virtually disappeared with the advent of the French Revolution. The year 1900 saw a revival of their use, accompanied by the manufacture of beauty aids on a scientific basis in France. Since then the industry has grown to tremendous proportions with products manufactured for every conceivable use. In the United States, cosmetics intended for interstate commerce are controlled under the Federal Food, Drug, and Cosmetic Act of 1938.

cosmic rays, radiation of very high energy reaching the earth from outer space. Primary cosmic rays consist mostly of protons (nuclei of hydrogen atoms), some alpha particles (helium nuclei), and lesser amounts of nuclei of carbon, nitrogen, oxygen, and heavier atoms. These nuclei collide with nuclei in the upper atmosphere, producing secondary cosmic rays of protons, neutrons, mesons, electrons, and gamma rays of high energy, which in turn hit nuclei lower in the atmosphere to produce more particles (see **ELEMENTARY PARTICLES**). These cascade processes continue until all the energy of the primary particle is dissipated. The secondary particles shower down through the atmosphere in diminishing intensity to the earth's surface and even penetrate beneath it. The size of the shower indicates the energy of the primary ray, which may be as high as 10^{11} billion electron volts (Bev) or more, almost a billion times higher than the highest energy yet produced in a man-made particle accelerator, however, cosmic rays of lower energy predominate. Cosmic rays have long been used as a source of high-energy

particles in the study of nuclear reactions. The positron, the MUON, the PION (or pi MESON), and some of the so-called strange particles were initially discovered in studies of this radiation. Cosmic rays were first found to be of extraterrestrial origin by V. F. Hess c. 1911, they were so named in 1925 by R. A. Millikan, who did extensive research on them. Since then much more pertinent information has been collected, but the origin of cosmic rays remains unknown. It is believed that some cosmic rays are produced in solar flares, however, the majority seem to come from interstellar space, probably from within our GALAXY, the MILKY WAY system. The nature of the acceleration processes by which the primary particles achieve great velocities (very nearly the speed of light) is still highly speculative but may be uncovered in the future from information gathered from spacecraft. See J. E. Hooper and Morton Scharff, *Cosmic Radiation* (1958); B. B. Rossi, *Cosmic Rays* (1964).

cosmology, area of science that aims at a comprehensive theory of the creation, evolution, and present structure of the entire physical UNIVERSE. The earliest theories (see **PTOLEMAIC SYSTEM**) assumed that the earth was the center of the universe. With the acceptance of the heliocentric, or sun-centered, theory (see **COPERNICAN SYSTEM**), the nature and extent of the solar system began to be realized. In the 18th cent. William Herschel and other astronomers showed that the bright, nebulous band of light called the MILKY WAY is composed of a vast collection of STARS separated by enormous distances. This system of stars came to be called a galaxy and was thought to constitute the entire universe with the sun at or near its center. By studying the distribution of globular STAR CLUSTERS the American astronomer Harlow Shapley was able to give the first reliable indication of the size of the galaxy and the position of the sun within it. Modern estimates show it to have a diameter of about 100,000 LIGHT-YEARS with the sun at the edge of the disk, about 30,000 light-years from the center. During the first two decades of the 20th cent. astronomers came to realize that some of the faint hazy patches in the sky, called NEBULAE, are not within our own galaxy, but are separate galaxies at great distances from the Milky Way. After studying the red shifts (see **DOPPLER EFFECT**) in the spectral lines of the distant galaxies, the American astronomers Edwin Hubble and M. L. Humason concluded that the universe is expanding with the galaxies flying away from each other at great speeds. According to HUBBLE'S LAW, the expansion of the universe is approximately uniform. The greater the distance between any two galaxies, the greater their relative speed of separation. Today the most widely accepted picture of the universe is a system of billions of galaxies, most of them clustered in groups of hundreds or thousands, spread over a volume with a diameter of at least 10 billion light-years, and all receding from each other with the speeds of the most widely separated galaxies approaching the speed of light. On a more detailed level there is great diversity of opinion, and cosmology remains a highly speculative and controversial science. Present models of the universe hold two fundamental premises: the cosmological principle and the dominant role of GRAVITATION. The cosmological principle states that if a large enough sample of galaxies is considered, the universe looks the same from all positions and in all directions in space. The second point of agreement is that gravitation is the most important force in shaping the universe. However, on the vast scale of the entire universe, Newton's law of universal gravitation, which served science for nearly 300 years, has proved inadequate. According to Einstein's general theory of RELATIVITY, which is a geometric interpretation of gravitation, matter produces gravitational effects by actually distorting the space about it, the curvature of space is described by a form of NON-EUCLIDEAN GEOMETRY. A number of cosmological theories satisfy both the cosmological principle and general relativity. The two general types of theories are the big-bang hypothesis and the steady-state hypothesis, with many variations on each basic approach. According to big-bang theories, at the beginning of time all of the matter and energy in the universe was concentrated in a very small volume that exploded, and the resultant expansion continues today. This explosion is dated between 8 and 13 billion years ago. The original temperature of the universe was as high as 10 billion degrees, and the original composition was pure hydrogen. In the primeval fireball (the violent initial stages of expansion lasting only a few hours), some of the hydrogen was converted into helium by fusion, the relative abun-

dance of hydrogen and helium in the oldest stars is being used as a test of the theory. After many millions of years the expanding universe, at first a very hot gas, thinned and cooled enough to condense into individual galaxies and then stars. In one widely held version of the big-bang theory, the universe is oscillating. The pull of gravitation tends to slow its expansion, eventually halting and then reversing it, this leads to a collapse back to the initial, ultrahigh-density conditions followed by another explosion. According to the steady-state theories, the universe expands, but new matter is continuously created at all points in space left by the receding galaxies. The theories imply that the universe has always expanded, with no beginning or end, at a uniform rate and that it always will expand and maintain a constant density. The continuous creation of matter violates one of the central and best-established laws of physics, the conservation of energy (see **CONSERVATION LAWS**, in physics). For meeting this objection to the steady-state theory, proponents suggest that the laws of physics, which were discovered by experiments in terrestrial laboratories, may not hold true for the universe at large. They also claim that the constants of physics are not really fixed but change slowly over very long periods of time as the universe evolves. Several spectacular discoveries since 1950, owing largely to the development of RADIO ASTRONOMY, have shed new light on the problem. This branch of astronomy studies the radio waves emitted by stars and galaxies rather than their visible light. Optical and radio astronomy complemented each other in the discovery of the quasars and the radio galaxies. Quasars are starlike objects and radio galaxies are star systems, both of which radiate prodigious amounts of energy as radio waves and hence are detectable at very great distances. It is believed that the energy reaching us now from some of these objects was emitted as long as 8 billion years ago, not long after the creation of the universe, if the big-bang theory is correct. Evidence that the radio galaxies and quasars were more numerous and more intense in the remote past supports the big-bang hypothesis and makes the steady-state theory untenable in its original form. Further evidence for the big-bang theory was the discovery in the 1960s that feeble radio noise is received from every part of the sky. This background radiation has the same intensity and distribution of frequencies in all directions and thus is not associated with any individual celestial object. Rather, all space is believed to be uniformly filled with the background radiation in much the same way as an oven is filled with thermal energy (heat). The radiation filling space has a BLACK BODY temperature of three degrees above absolute zero and is interpreted as the electromagnetic remnants of the primordial fireball, stretched to long wavelengths by the expansion of the universe. However, some recent evidence may support a modified version of the steady-state cosmology. The centers of certain galaxies eject huge amounts of matter and infrared radiation in sudden bursts, this process may require new energy sources. This intense activity suggests the continuous occurrence of "little big bangs" at certain points in space, creating new galaxies that could maintain a steady-state universe. See George Gamow, *Matter, Earth and Sky* (2d ed. 1965); J. E. Chalon, *Cosmology* (tr. 1970); D. W. Sciama, *Modern Cosmology* (1971).

cosmonaut: see **ASTRONAUT**

cosmos (kōz'mos), any plant of the tropical American genus *Cosmos* of the family Compositae (COMPOSITE family). *C. bipinnatus*, of Mexico, and others are cultivated in many varieties for their showy flowers in shades of red, yellow, and white. *Cosmos* is classified in the division MAGNOLIOPHYTES, class Magnoliopsida, order Asterales, family Compositae.

cosmotron: see **PARTICLE ACCELERATOR**

Cossa, Baldassarre (baldās-sār'rā kōs'sa), c. 1370–1419, Neapolitan churchman, antipope (1410–15, see **SCHISM, GREAT**) with the name John XXIII. He had a military career before entering the service of the church. He was made a cardinal by Boniface IX (1402) and proved himself able, especially in financial matters. In 1408 he deserted Gregory XII and helped to bring about the Council of Pisa (see **PISA, COUNCIL OF**) to end the schism between the Roman and the Avignon popes. The council, declaring both Gregory XII and Benedict XIII deposed, set up a third claimant, Alexander V. On Alexander's death a year later, Cardinal Cossa was elected. Of the three rival "popes," John had by far the greatest following. He immediately sought the aid of SIGISMUND and helped elect Sigismund Holy Roman emperor. John

allied himself with LOUIS II of Anjou (later king of Naples) to make war on LANCELOT of Naples and his ally Gregory XII. An ineffective council at Rome (1412-13) was followed by the Council of Constance (see CONSTANCE, COUNCIL OF), which John convened under pressure from Sigismund. At the opening of the council he reluctantly promised (1415) to abdicate if his rivals would do so. Then, surreptitiously, he fled to the lands of his ally Frederick of Hapsburg. He was forced to return. The council formally deposed him, and he submitted. He was held prisoner in Germany until released by Martin V in 1418; he returned to Italy. He died cardinal bishop of Tusculum. In his lifetime he had a reputation for unscrupulousness and self-aggrandizement.

Cossa, Francesco, or **Francesco del Cossa** (frānchēs'kō dēl kōs'sā), c 1435-1477?, Italian painter. He was a leading representative of the Ferrarese school and was regarded, with Ercole de'Roberti, as the founder of the Bolognese school. His principal works include *The Glorification of March, April, and May*, frescoes in the Schifanoia Palace, Ferrara, some admirable portraits of the artist's contemporaries, *Madonna Enthroned* (Bologna), *Madonna and Child with Angels*, *St. Liberal*, and *St. Lucy* (National Gall. of Art, Washington, D.C.), and an altarpiece representing scenes from the life of St. Vincent Ferrer (National Gall., London, and the Vatican). See Benedict Nicolson, *The Painters of Ferrara* (1950).

Cossacks (kōs'āks, -aks), Rus. *Kazaki*, Ukr. *Kozaky*, peasant-soldiers in the Ukraine and in several regions of the former Russian Empire who, until 1918, held certain privileges in return for rendering military service. The first Cossack companies were formed in the 15th cent., when the Ukraine, then part of the unified Polish-Lithuanian state, took independent measures to defend itself against the devastating Tatar raids. The Ukrainian Cossacks, of heterogeneous background, were chiefly Russians and Poles and included many runaway serfs. By the 16th cent. they had settled along the lower and middle Dnepr River (for their history to 1775, see ZAPO-ROZHYE). Similar communities grew up on the Don (see DON COSSACKS) and its tributaries. They were all organized on principles of political and social equality, and originally were virtually autonomous. Each community elected an ataman as its head, while an assembly of all the Cossacks chose the hetman. The Cossacks gave shelter to refugees from Poland and Russia and took part in peasant revolts in the Ukraine and Russia in the 17th and 18th cent. Open struggle ensued between the Cossacks and the Polish and Russian governments. By the late 18th cent. the Cossacks had lost most of their political autonomy and had been made the privileged military class, integrated with the Russian military forces. Under the last czars they were often used to quell strikes and other disturbances. The primary unit of Cossack organization, the village, was largely self-governed until 1918. Land was held in common by the village. But an 1869 law, which allowed officers and civil servants to own land as personal property, contributed to the breakup of the traditional cohesiveness of Cossack village life. In the 19th cent. the Russian government began to organize new Cossack units so that by the early 20th cent. there were 11 Cossack communities, each named for its location—Don, Kuban, Terek, Astrakhan, Ural, Orenburg, Siberia, Semirechensk, Transbaikalia, Amur, and Ussuri. Following the Bolshevik Revolution (1917), the majority of the Cossacks fought against the Soviet armies in the civil war of 1918-20. In 1920 the Soviet government abolished all their privileges and between 1928 and 1933 the Cossack communities were forcibly collectivized. In 1936, however, the Cossack party regained status, being allowed to form several cavalry divisions in the Russian army. Although the Cossack communities were incorporated into the Soviet administrative system, their traditions and customs continue to survive, notably on the Don and Kuban rivers. See studies by P. J. Huxley-Blythe (1964), Philip Longworth (1969), and V. G. Glazkov (1972).

Cossimbazar (kōsim'bāzār'), town (1971 pop. 6,306), West Bengal state, E central India. It was one of the chief overseas ports of Bengal from the 16th to the 18th cent., when Calcutta surpassed it.

Costa, Isaac da (ē'sā-āk dā kō'stā), 1798-1860, Dutch poet and historian, b. Amsterdam, of an aristocratic Sephardic Jewish family. Deeply influenced by Bilderdyk, he entered (1822) the Reformed Church, and much of his poetry is fervently Christian. Da Costa's period of poetic maturity is placed between the publication of his political poem *Vijf-en-twintig jaren* [twenty-five years] in 1849, which

revealed unusual social consciousness, and the appearance of the narrative poem *De Slag bij Nieuwpoort* [the battle of Nieuport] in 1859. He was a distinguished scholar in Protestant biblical theology and the classics. His work on Jewish history was translated into English as *Israel and the Gentiles* (1855).

Costa, Lorenzo (lōrēn'sō kō'stā), 1460-1535, Italian painter of the Ferrarese and Bolognese schools. Trained in the manner of such painters as Tura and Cossa, he modified the strident Ferrarese style when he became a partner of Francia. His art became softer and more symmetrical. Among his paintings are the *Madonna and Child with the Bentivoglio Family* and the *Triumphs of Petrarch* in San Giacomo Maggiore, the *Madonna with Saints* in San Petronio, and the *Madonna* in San Giovanni in Monte, all in Bologna. His *Three Saints* is in the Metropolitan Museum.

Costa, Lúcio (lō'syōō kō'stā), 1902-, Brazilian architect. As the principal designer of the city of Brasília (1957), Costa is known for his use of reinforced concrete in designs that combine traditional and modern forms. In Rio de Janeiro, the block of apartments in Guinle Park (1948-54) typifies his streamlined work. The Ministry of Education and Health (1937-42) exhibits his understanding of the effect of climatic considerations on architectural design.

Costa Brava (kō'stā brā'vā), a strip of coast, Gerona prov., NE Spain, in Catalonia, near the French border on the Mediterranean. The area has enjoyed a booming tourist industry since the end of World War II.

cost accounting see ACCOUNTING

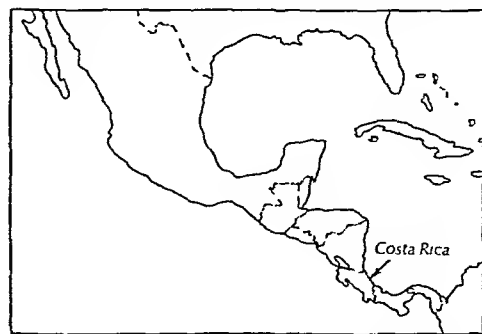
Costa e Silva, Artur da (ärtōōr' dā kōsh'tā ē sēl'vā), 1902-69, president of Brazil (1967-69). An army general, he participated in the coup that deposed (1964) President Goulart. He served as war minister (1964-66) under President Castelo Branco and succeeded him in office. He attempted to introduce social and economic reforms, but political criticism of his military regime mounted. In Dec., 1968, he dismissed congress, imposed news censorship, and proceeded to rule by decree. He was incapacitated by a cerebral hemorrhage in Aug., 1969, at which time a military triumvirate took over the government. He died in December of that year.

Costa i Llobera, Miquel (mēgēl' kō'stā ē lyōb'ā'ra), 1854-1922, Catalan poet and orator. In 1888 he was ordained a priest in Rome, where he developed a love of Latin literature. Costa i Llobera's works are serious and contemplative, and they exerted a strong influence on Catalan literature in general. His masterpiece is *Horacianes* [poems in the manner of Horace] (1906). Among his other works are *De l'agre de la terra* [from the bitterness of the earth] (1897) and *Tradicions i fantasies* [traditions and fantasies] (1903).

Costa Mesa (kō'stā mē'sā), city (1970 pop. 72,660), Orange co., S Calif., inc. 1953. Boatbuilding and the manufacture of electronic equipment and tools are the major industries; there are also research laboratories. Orange Coast College and Southern California College are in the city, and the Univ. of California at Irvine is adjacent.

Costa Rica (kō'stā rē'kā), republic (1970 pop. 1,710,083), 19,575 sq mi (50,700 sq km), Central America. The capital is SAN JOSÉ, other important cities are ALAJUELA, HEREDIA, PUNTARENAS (the Pacific port), and CARTAGO. Costa Rica is bounded on the N by Nicaragua, on the E by the Caribbean Sea, on the SE by Panama, and on the S and W by the Pacific Ocean. One of the most stable countries in Latin America, Costa Rica has a long democratic tradition, a literacy rate of over 90%, and no army. The coastal plains are low, hot, and heavily forested. Bananas, cocoa, and sugarcane are cultivated there. In the northwest is the Nicoya peninsula, a semiarid plain where cattle and grain are raised. A massive cordillera, with peaks over 12,000 ft (3,658 m) high, cuts the country from northwest to southeast. Within it, under the shadow of volcanoes such as Irazu, lies the central plateau (meseta central), with a perennially spring-like climate. This plateau is the heart of the country, where coffee is cultivated and most of the population and market facilities are located. Costa Rica is an agricultural country. Coffee, bananas, cocoa, and sugar are exported, and machinery, chemicals, foodstuffs, and fuels are imported. The population is largely of Spanish descent. The country is governed under the 1949 constitution. The president, a strong executive, serves a four-year term and may not be immediately reelected. The unicameral legislature is also elected for four years. There is universal adult suffrage, and voting is compulsory.

History Although Columbus skirted the Costa Rican coast in 1502, the Spanish conquest did not begin until 1563, when Cartago was founded. The region



was administered as part of the captaincy general of Guatemala. Few of the native Indians survived, and the colonists, unable to establish a hacienda system based on Indian labor, generally became small landowners. From Cartago, westward expansion into the plateau began in the 18th cent. Costa Rica became independent from Spain in 1821. From 1822 to 1823 it was part of the Mexican Empire of Augustín de Iturbide. It then became part of the CENTRAL AMERICAN FEDERATION until 1838, when the sovereign republic of Costa Rica was proclaimed. In 1857, Costa Rica participated in the defeat of the filibuster William WALKER, who had taken over Nicaragua. The cultivation of coffee, introduced in the 19th cent., led to the creation of a landed oligarchy that dominated the country until the administration of Tomás GUARDIA (1870-82). In 1874, Minor Cooper KEITH founded LIMÓN and introduced banana cultivation. Keith also started the United Fruit Company. Later many tracts had to be abandoned because of leaf blight, and, after World War II, United Fruit started new plantations on the Pacific coast, these have been worked by Negroes from Jamaica. Costa Rica's history of orderly, democratic government began in the late 19th cent. The pattern was broken in 1917, when Federico Tinoco overthrew the elected president, Alfredo Gonzalez. The United States opposed Tinoco, and he was deposed in 1919. Costa Rica cooperated with the United States during World War II and after the war joined the United Nations and other international organizations. In 1948 there was a second breakdown of the political system. In a close presidential election Otilio Ulate appeared to have defeated the former president, Dr. Rafael Calderón. But the incumbent, Teodoro Picado, accused Ulate's supporters of fraud and obtained a congressional invalidation of the election. A six-week civil war ensued, at the conclusion of which a junta led by José Figueres Ferrer, a backer of Ulate, assumed power. Picado was exiled. Forces from Nicaragua backed Picado, and the Organization of American States (OAS) was called upon to mediate between the two countries. In 1949 a new constitution was adopted, and the junta transferred power to Ulate as the elected president. Figueres was elected his successor in 1953. In UN-supervised elections in 1958, Mario Enchadi Jimenez defeated Figueres's candidate. Politics remained stable in the 1960s. In 1963, Costa Rica joined the Central American Common Market. Figueres was again elected president in 1970. The Irazu volcano erupted in 1963-64 and caused serious damage to agriculture. Another volcano, Arenal, erupted in 1968 for the first time in hundreds of years, killing many. In 1973 a serious drought led to a state of emergency. Daniel Oduber Quirós was elected president in 1974, but the ruling National Liberation Party lost its majority in the legislature for the first time in 25 years. See Ricardo Fernandez Guardia, *History of the Discovery and Conquest of Costa Rica* (1913), C. L. Jones, *Costa Rica and Civilization in the Caribbean* (1935, repr. 1967), D. G. Munro, *The Five Republics of Central America* (1918, repr. 1967), H. I. Blustein et al., *Area Handbook for Costa Rica* (1970), J. P. Bell, *Crisis in Costa Rica: The 1948 Revolution* (1971), C. F. Denton, *Patterns of Costa Rican Politics* (1971), B. H. English, *Liberación Nacional in Costa Rica* (1971).

Costa y Martínez, Joaquín (hwakēn' kō'stā ē märtē'nāth), 1846-1911, Spanish jurist, economist, and sociologist. He wrote works on Spanish law and economics and was the founder of modern Spanish sociology. Among the first to accurately criticize Spain's agrarian economy, he founded the Liga Nacional to promote agricultural reform. After the disaster of the Spanish-American War (1898), he entered politics and later joined the republicans. He

refused to sit in the Cortes when elected in 1904, declaring that Spain could recover prestige and prosperity only through a national revolution

Coster, Charles de see DE COSTER, CHARLES

Coster, Laurens Janszoon see KOSTER, LAURENS JANSZON

Costermansville see BUKAVU, Zaire

cost of living, amount of money needed to buy the goods and services necessary to maintain a specified standard of living. The cost of living is closely tied to rates of INFLATION and deflation. In estimating such costs, food, clothing, rent, fuel, lighting, furnishings, and miscellaneous items such as recreation, transportation, and medical services are included. Index numbers based on any norm of 100 are used to show changes in the cost of living, and any deviation from that norm demonstrates the rise or fall of the cost of living in a particular year as compared to the normal year or years used as a basis. The first attempt to gather data on the cost of living in the United States was made by the U.S. Bureau of Labor Statistics in 1890. During World War II and immediately following it, many employers established systems of wage changes based on changes in the cost of living, but such attempts were denounced by labor spokesmen as establishing a "fixed" standard of living. However, an agreement using the cost of living index as a basis for the determination of wage rates was signed in May, 1948, between General Motors and the United Automobile Workers of America. Since then many other unions, recognizing the security provided by a cost of living adjustment during times of rising prices, have also had such clauses included in their contracts. People living on social security and pension benefits are among those most affected by changes in the cost of living; their incomes are generally fixed and thus unable to adjust to changing prices. Since World War II the cost of living in most countries of the world has, except for minor interruptions, steadily increased. See bibliography under STANDARD OF LIVING.

costs, legal: see DAMAGES

costume, distinctive forms of clothing including official or ceremonial attire such as ecclesiastical VESTMENTS, coronation robes, academic gowns, ARMOR, and theatrical dress. The use of ornament preceded the use of protective garments, its purpose was to emphasize social position by a great display of trophies, charms, and other valuables and to enhance attractiveness. Superstition, caste distinction, and climatic necessity all have been influential in the evolution of dress. The ancient Egyptian costume for men was first a wrapped loincloth and later a kilt or skirt of pleated and starched white linen. Egyptian women first wore the *kalasiris*, a one-piece, narrow sheath of transparent linen, which was later adopted by men as the tunic. The Egyptian costume evolved into a highly decorative mode of dress characterized by the use of fluted linen, of jewelry (especially the beaded yoke COLLAR), and of COSMETICS and PERFUME, the wig was also worn. The basic Greek garment, noted for its simplicity and graceful draping, consisted of the chiton and girdle. Roman dress, influenced by that of the Greeks, was simple and dignified, the toga, which was worn over the tunic, was the distinctive garment of the Roman citizen. The change from ancient to medieval costume began (c. 400) with the disintegration of the Roman Empire. Roman dress, which had previously assimilated the elaborate features of Byzantine dress, was gradually affected by the austere costume of the barbaric invader. Both men and women wore a double tunic, the under tunic, or chemise, had long tight sleeves (a feature that remained until the 17th cent.) and a high neck, the girded wool overtunic, or robe, often had loose sleeves. A mantle, or indoor cloak, was also worn. After 1200 a great variety of fine fabrics from the East were available as a result of the Crusades, and the elegant dress of feudal Europe was evolved. With the introduction of various ways of cutting the basic garment, FASHION, or style, began. A long, girded tunic, then called the cote or cotte, continued to be worn over the chemise by both men and women, a surcote (sleeveless and with wide armholes) was often worn over it. At this time family crests, or coats of arms (see BLAZONRY, HERALDRY, CREST), became popular, and parti-colored garments came into vogue. Proper fit was increasingly emphasized, and by 1300 tailoring had become important and BUTTONS had become useful as well as ornamental. The belted cote-hardie, with a close-fitting body and short skirt, was worn over a tighter, long-sleeved doublet and a chemise. And, as men's legs were now exposed, HOSE were emphasized. The introduction (c. 1350) of the houppe-lande, or overcoat, marked the first real appearance

of the collar. Over a chemise and corset women wore a gown with a V neck and a long, flowing train, the front of the skirt was often tucked into the high-waisted belt. In its extreme, the style of the period was typified by profuse dagging (scalloped edges), exaggerated, hanging sleeves, pointed slippers, and fantastic headdresses (see HEADRESS and VEIL). After 1450 there was a reversal in fashion from the pointed Gothic look to the square look of the Renaissance. The style in its exaggerated form is best represented in Holbein's paintings of the English court of Henry VIII. Men's costume had wide, square shoulders with puffed sleeves, padded doublets, bombasted upperstocks, or trunk hose, short gowns (cloaks), and square-toed shoes. The doublet, now sleeveless, was worn over the shirt (formerly the chemise) and under the jerkin. Women wore a square-necked gown with the bodice laced up the front and attached to the gathered skirt at the hips, the front of the skirt was often open, to reveal decorative petticoats. These, together with a preference for rich, heavy materials, especially velvet, and a fad for profuse slashing and puffing of the under material seen through the slash, created a massive and bulky appearance. In Elizabethan England (c. 1550) the costume was stiffened, and the appearance was less bulky. Both men and women wore the characteristic "shoulder wings," pointed stomacher, and starched ruff and cuffs made of LACE. Materials were heavy and lustrous and considerable ornamentation was used. Men wore a short cape, and their trunk hose were unpadded, longer, and generally made in sections, or panned. Women wore exaggerated farthingales, or hoops. The early 17th-century English costume was less formal, with a softer line created by satin and silk materials. The period of the Cavalier and Puritan is captured in the court paintings of Van Dyck and in the early work of Rembrandt. Men characteristically wore pantaloons breeches (full trunk hose), high boots, a broad, falling lace or linen collar and cuffs, and a full cloak. In women's costume, the arms began to be displayed and necklines were lower. The bodice was finished with a wide, round collar, or bertha, at the neck, and a flared, pleated, or ruffled skirtlike section, or pepplum, was added at the waist. The apron was often a permanent part of the skirt. In England after 1660, the dress of the Restoration period became extravagantly decorative, using ribbons, flounces, and feathers. The dandies of the period wore petticoat breeches, full-sleeved cambric shirts, and bolero-like doublets. Sir Peter Lely's court paintings show excellent examples of such costume. In the 18th cent., France, under the rule of Louis XIV, became the costume center of the world, with Mme Pompadour, Mme du Barry, and Marie Antoinette successively dictating the fashions of the day, it was the age of the wig, of rococo settings, of delicate pastels and flower-patterned silks, and of EMBROIDERY. Early in the century, Rousseau's ideas affected style of dress. Women's costume became graceful and pastoral, the pointed bodice, tightly laced, was finished with a triangular scarf, or fichu, at the neck, and sleeves were ruffled at the elbow. The bell-shaped hoop appeared c. 1710, and c. 1735 side hoops, or panniers, were popular. Women's costume, which at this period became extremely formal, was gradually softened into a romantic look (as in portraits by Gainsborough) that anticipated the EMPIRE STYLE. The 18th-century man first wore a knee-length cassock that buttoned all the way down over an equally long waistcoat, and buckled knee breeches. As the century progressed, the waistcoat became shorter, the skirt of the coat began to form tails, the collar became higher, and the sleeves and breeches became tighter. The Empire style, associated in early 19th-century France with Josephine, was an attempt to recapture classic simplicity. Women wore a thin muslin dress with a high waist, a low round neck, and puffed short sleeves. Men wore a short-waisted cutaway coat with tails, a high collar, and large lapels and military boots, plain-colored wools became predominant. The whole male appearance was strikingly military. After 1815 women, emphasizing their fragility, achieved the hourglass shape with an extremely tight corset. Their dresses had wide collars, sloping shoulders, leg-of-mutton sleeves, and full skirts. Men wore the frock coat, which was fitted and had a skirt that reached the knees, and trousers were introduced and generally adopted. After 1840, Victorian women wore layers of decorative crinoline and, after 1855, the hoop, sleeves were bell-shaped, and waist and necklines were pointed. Though men still wore the tailcoat and frock coat, the sack coat, sometimes worn with-

out the vest, was becoming popular for everyday wear. In general, men's clothes were becoming looser and more tubular and were predominantly of somber broadcloth. After 1865 the bustle became fashionable for women, at this time, too, women first wore a tailored jacket with collar and lapels—the forerunner of the suit. The growing emphasis on sports, especially tennis and golf, was beginning to affect costume. Knee breeches, called knickerbockers or knickers, came into fashion for men, and sweaters became popular. After 1890 women most often wore the suit or the shirtwaist with balloon sleeves and wasp waist. The dress of the Gibson girl. Men's suits had square shoulders and straight waists and were usually of serge or tweed, the tuxedo was used for formal wear. After 1910, as women's feet and legs began to be exposed, shoes were colored to match the outfit. The nightgown, for women, gave way for a time to pajamas. The popularity of sportswear for men increased, the open-necked shirt was worn and trousers were cuffed and creased. Women's dress after 1914 was characterized by straight lines, e.g., the floor-length hobble skirt and the flapper's boyish, short-skirted costume and matching accessories were popular in the 1920s. The following decades produced radical changes in women's wear, from the flowing skirts of the 30s and the box-jacketed suits of the 40s to the sack dress of the early 60s. Since then the fluctuating hemline has been the predominant concern of fashion. The abbreviated miniskirt has vied for popularity with the full-length maxi and the calf-length midi in coats, skirts, and dresses. Women's clothing has become less restrictive and more casual than in previous eras. The pants suit currently leads in popularity for comfort and elegance. During the 1960s men's clothing underwent revolutionary changes in color and fabric, becoming flamboyant for the first time in the 20th cent. The flaring of trouser cuffs in the 1970s was a major modification in shape. Traditional national dress in Western European countries has generally given way to standardized modes, although traditional costume is still associated with national celebrations and pageantry. The typical costume—a gathered peasant skirt, a full blouse with puffed sleeves, and a laced bodice—is colorful and picturesque, often elaborately fashioned and embroidered, and augmented by kerchief, headdress, and apron. Costume in the Orient had until recently remained unchanged for centuries. In the Arab countries both men and women have for centuries wrapped themselves in voluminous flowing robes that indicate the tribe and status of the wearer by means of style, color, and richness. The people of Malaysia wrap themselves in a loose skirt, or sarong. Chinese dress has been distinguished by the use of magnificent textiles and embroidery and of pearls and jade—all symbolic of rank and wealth. Men and women of the Peoples' Republic of China wear dark-colored trouser suits, whereas in Nationalist China a sheath dress with mandarin collar and side slits in the skirt has become characteristic of women's clothing. Japanese men and women have widely adopted Western modes of dress but many women retain the characteristic kimono and tabi (socks) or geta (wooden clogs). India, too, has traditional costumes dictated by religion or caste. Women in general wear the long draped fabric, or sari, sandals, and profuse jewelry. Exquisite muslins and "painted" cottons have from antiquity been notable features of Indian garments. The term costume also includes accessories, such as the SHOE, HAT, GLOVE, PURSE, CORSET, HANDKERCHIEF, FAN, UMBRELLA, CANE, and JEWELRY, styles of wearing the hair (see HAIRDRESSING) and BEARD, and primitive methods of BODY-MARKING and attaching ornaments to the body. See table of fashion designers under FASHION. See Millia Davenport, *The Book of Costume* (2 vol. in 1, 1962), Blanche Payne, *History of Costume* (1965), James Laver, *The Concise History of Costume and Fashion* (1969), Geoffrey Squire, *Dress and Society* (1974).

Cosway, Richard (kōz'wā), 1740?-1821, English miniaturist. His work was elegant and modish and became highly popular in his day. There is a collection of his works in Windsor Castle. Perhaps best known is the portrait of Mme du Barry. A self-portrait is in the National Portrait Gallery, London. Cosway was married to the miniaturist Maria Hadfield. See biography by G. C. Williamson (1897).

Cotabato (kōtaba'tō), city (1970 est. pop. 51,900), Cotabato prov., W Mindanao, the Philippines, near the mouth of the Mindanao River on Moro Gulf. It has long been a Muslim center. Its port serves a vast, fertile farm area which, as the object of a government colonization program, has had a great popula-

tion increase since World War II Cotabato prov is a focus of coffee cultivation and has important pineapple and peanut crops Rubber is also produced, and lumbering is a major industry The provincial capital is Pagalungan

Côte-d'Or (kōt-dōr'), department (1968 pop 421,192), E France, largely in Burgundy, partly in Champagne DIJON is the capital

Cotentin (kōtaNtāN'), region of N France, in Normandy, roughly coinciding with the peninsula formed by Manche dept and extending into the English Channel CHERBOURG is the chief port, and there are numerous fishing ports The lambs of the Cotentin breed of sheep are highly esteemed for their meat Cattle are also raised in the region Much of the land is divided by hedgerows into small fields and apple orchards An old Norman county, Cotentin takes its name from its historic capital, Coutances

Côtes-du-Nord (kōt-dū-nōr'), department (1968 pop 506,102), NW France, in Brittany, on the English Channel Saint-Brieuc is the capital

Cotinga (kōtīng'ga), any of the New World tropical birds of the family Cotingidae Cotingas range from N Argentina to the southern border of the United States, most are forest species and inhabit the highest treetops Although there is great variation in appearance among these birds, all have broad bills with slightly hooked tips, rounded wings, and strong short legs Some species are dull-colored, with little difference between males and females, in many species, however, the males are brightly colored and have curiously modified wing and head features The umbrella birds (genus *Cephalopterus*), found from Central America to Argentina, have a black, umbrellalike crest, which is raised and expanded during courtship displays, and feathered throat wattles nearly as long as the bird itself The bellbirds (genus *Procnias*), found from Central America to Argentina, have a distinctive bell-like call, they are marked by feather-studded, fleshy protuberances drooping over their bills Both the male and the female cock-of-the-rock (genus *Rupicola*) are marked by a fan-shaped crest of feathers, which extends from bill tip to the top of the head There are two cock-of-the-rock species, in *R. rupicola*, of the Guianas, the male is golden-orange with black wings and tail, while in *R. peruviana*, of the Andes, the male is bright red with similar markings In both species the female is olive brown The cock-of-the-rock, a terrestrial bird, performs a communal mating ritual in which males go through stylized stances and acrobatics There are about 90 species of cotingas classified in 33 genera of the phylum CHORDATA, subphylum Vertebrata, class Aves, order Passeriformes, family Cotingidae

Cotman, John Sell, 1782-1842, English landscape painter and etcher He was a leading representative of the Norwich school Cotman studied in London and in 1806 settled in Norwich where he opened an art school He suffered periods of melancholia throughout his life He took up etching c 1810 and produced several series of etchings of English, and later French, antiquities His *Liber Studiorum* (1838) is an outstanding work in this medium For the last nine years of his life he was a drawing master at King's College, London Although Cotman's work was but little appreciated in his day, it is now highly prized for its fine color, decorative and structural qualities, and sustained poetic mood He is best known for his watercolors and drawings, of which the British Museum possesses many, including the famous Greta Bridge Cotman's oil paintings are in many British galleries See catalog by V G R Rie-naecker (1953), biography by S D Kitson (1937)

Cotonou (kōtōnō'), city (1970 est pop 111,000), capital of Atlantique dept, S Dahomey, on the Gulf of Guinea It is Dahomey's chief seaport and commercial center Cotonou's airport and road and rail connections also make it the transportation and communications hub of Dahomey The city has small-scale industries, manufactures include palm oil and cake, peanut oil, textiles, cement and other construction materials, aluminum sheet, beverages, and processed seafood Motor vehicles and bicycles are assembled, and there are sawmills in the city Cotonou is a distribution center for petroleum products Drilling for offshore oil is carried on nearby Cotonou was originally a small state that was dominated by the kingdom of DAHOMEY from the 18th cent In 1851 the French made a treaty with the Dahomean king Gezo that allowed them to establish a trading post at Cotonou In 1883 the French navy forcibly occupied the city to forestall British ambitions in the area Britain confirmed France's

right to Cotonou in 1885 The port was enlarged and modernized in the 1960s Cotonou has research institutes concerned with textiles, tropical agriculture, and geology

Cotopaxi (kōtōpāk'sē), active volcano, 19,347 ft (5,897 m) high, N central Ecuador A symmetrical snowcapped cone, it is one of the most beautiful peaks of the Andes and one of the highest volcanoes in the world It is continuously active, and frequent eruptions have caused severe damage Cotopaxi was first scaled by Wilhelm Reid in 1872

Cotrone: see CROTONA

Cotswold Hills, range, mainly in Gloucestershire, W England, extending c 50 mi (80 km) NE from Bath, Cleve Cloud (c 1,080 ft/330 m) is the highest point Its crest line forms the Thames-Severn watershed The region is famous for Cotswold sheep and for its picturesque stone houses Noteworthy are the many megalithic monuments and long barrows Among the ruins is Hailes Abbey, founded in 1246 The Cotswold Games were held there from the 17th to the 19th cent

Cotswold sheep, large, white-faced, homless breed with a broad, flat back, moderately deep body, heavy fleece, and long, coarse wool hanging in ringlets It was originated in the Cotswold Hills in England The Cotswold is often crossed with the Merino and Rambouillet breeds In the United States it is found mostly in the Northwest

cottage cheese, unripened soft cheese, also known as pot cheese, baker's cheese, Dutch cheese, or smearcase It is produced chiefly in the United States Cottage cheese is made of pasteurized skim milk, which is set with a starter of lactic acid bacteria The curd and whey are separated by low heat The curd is stirred and seasoned with salt, cream, and, in some localities, molasses or sugar The use of skim milk yields a cheese low in fat and vitamin A When sold commercially, it is sometimes mixed with bits of fruits or raw vegetables

Cottage Grove, village (1970 pop 13,419), Washington co, SE Minn, near the St Croix River, inc 1965 Machined-metal products are among the manufactures

cottage industry: see SWEATING SYSTEM

Cottbus or Kottbus (both kōt'bōōs), city (1970 pop 82,897), capital of Cottbus district, E East Germany, on the Spree River It is an industrial center and rail junction Manufactures include textiles, metal products, and processed food Cottbus developed as a market center in the late 12th cent and passed to Brandenburg in the mid-15th cent It was annexed, with the rest of LUSATIA, by Saxony in 1635 and was taken by Prussia in 1815

Cottreau, Jean: see CHOUANS

Cotton, Charles, 1630-87, English author He is chiefly remembered for his contribution to his friend Izaak Walton's *Compleat Angler* (5th ed 1676) His pleasant, unaffected verse includes "An Ode to Winter" and "The Retirement" He also wrote burlesques of Vergil (1664) and Lucian (1665) and a translation of Montaigne's *Essays* (1685-86)

Cotton, George Edward Lynch, 1813-66, English clergyman and educator, grad Trinity College, Cambridge, 1836 From 1837 until 1852 he was an assistant master at Rugby and is the "young master" in Thomas Hughes's *Tom Brown's School Days* He later became (1852) headmaster of Marlborough College and after 1858 served as bishop of Calcutta, where he did extensive missionary work and established numerous schools for Eurasian children See memoir by his wife (1871)

Cotton, John, 1584-1652, Puritan clergyman in England and Massachusetts, b Derbyshire, educated at Cambridge Imbued with Puritan doctrines, he won many followers during his 20 years as vicar of the rich and influential parish of St Botolph's Church, Boston, Lincolnshire He was summoned to appear before the High Court of Commission (1632), but instead of appearing he resigned and fled Some of his followers sailed (1633) with him to Massachusetts Bay, where the young city of Boston was so named primarily to honor him He and John Winthrop were the leading figures of the colony, and Cotton was chiefly responsible for the exile of Anne HUTCHINSON, because of her antinomian doctrines, and for the expulsion of Roger WILLIAMS He was one of the molders of the Congregational Church, and his arguments in such treatises as *The Keys of the Kingdom of Heaven* (1644), *The Way of the Churches of Christ in New England* (1645), and *The Way of the Congregational Churches Cleared* (1648) were influential in his day He was a firm believer in the right of the Congregational minister to dictate to the faithful, and thus he has been viewed as a strong

upholder of theocracy His *Milk for Babes* (1646) was a well-known catechism for children His daughter was the wife of Increase MATHER and the mother of Cotton MATHER See biographies by Larzer Ziff (1962) and Everett Emerson (1965)

Cotton, Sir Robert Bruce, 1571-1631, English antiquarian The Cottonian collection of books, manuscripts, coins, and antiquities became a part of the British Museum when it was founded in 1753 Cotton collected especially Hebrew and Greek manuscripts and Anglo-Saxon charters An unprinted classified catalog of the collection is in the Harleian MSS of the British Museum Cotton was an antiroyalist parliamentarian whose opinions brought him two terms in prison His magnificent library was sealed in 1630 and remained so until after his death

Cotton, Thomas Henry (Henry Cotton), 1907-, British golfer, b Cheshire, England Although a professional at 17, Cotton did not achieve international recognition until he won the British Open in 1934 He again won this title in 1937 and in 1948, in addition to three British Professional Golf Association crowns and many European championships Cotton played on three British Ryder Cup teams and twice was captain He wrote *The Game of Golf* (1949)

cotton, most important of the vegetable fibers Cotton has been spun, woven, and dyed since prehistoric times It formed the staple clothing of India, Egypt, and China Hundreds of years before the Christian era cotton textiles were woven in India with matchless skill, and their use spread to the Mediterranean countries In the 1st cent Arab traders brought fine MUSLIN and CALICO to Italy and Spain The Moors introduced the cultivation of cotton into Spain in the 9th cent Fustians and dimities were woven there and in the 14th cent in Venice and Milan, at first with a linen warp Little cotton cloth was imported to England before the 15th cent, although small amounts were obtained chiefly for candlewicks By the 17th cent the East India Company was bringing rare fabrics from India Before the arrival of the white man in the New World, cotton was skillfully spun and woven into fine garments and dyed tapestries Cotton fabrics found in Peruvian tombs are said to belong to a pre-Inca culture In colors and texture, the ancient Peruvian and Mexican textiles resemble those found in Egyptian tombs Cotton cultivation began in America in the Jamestown colony (1607) Since the early days of the republic, the United States has been the world's leading producer of cotton The invention (1793) of the cotton gin, a machine for separating seeds from fiber, and the mechanization of textile production marked the Industrial Revolution and suddenly brought cotton into world prominence to supersede flax and wool textiles The manufacture of cotton goods is a great industry, second only to that of Great Britain (where it centers about Lancashire) For some years American manufacture was chiefly in New England, today an increasing number of mills are located in the Southern cotton-producing states, the so-called Cotton Belt Cotton has played a significant historical role in world industry The reliance of British mills on imported cotton fiber influenced that country's accession to the Monroe Doctrine, and its need for the large African and Indian markets for cotton goods dictated much of its sea-domination policy as an imperial nation In the United States, cotton brought about the one-crop economy of the Deep South and was a principal economic cause of the Civil War The passing of slavery, always an adjunct of the cotton plantations, and the exhaustion of the soil pushed the Cotton Belt to the West Large cotton-producing countries such as Brazil, Egypt, and India (the second largest world producer) have used cotton exports to offset an unfavorable balance of trade China and the USSR rank after the United States and India in total annual production All cotton-producing nations have depended on an abundance of cheap labor, although mechanical cultivating and picking devices have long been known, they have been perfected for widespread use (especially in the United States) only since World War II The cotton plant belongs to the genus *Gossypium* of the family Malvaceae (MALLOW family) It is generally a shrubby plant having broad three-lobed leaves and seeds in capsules, or bolls, each seed is surrounded with downy fiber, white or creamy in color and easily spun The fibers flatten and twist naturally as they dry Cotton is of tropical origin but is most successfully cultivated in temperate climates with well-distributed rainfall In the United States nearly all the commercial cotton crop comes from varieties of upland cotton (*G. hirsutum*), but small quantities are

obtained from sea-island and American-Egyptian cotton (both belonging to the species *G. barbadense*). *G. arboreum* and *G. herbaceum* are the chief cultivated species in Asia. Cotton is planted annually by seed in furrows, the plants are thinned and weeded during the spring growing season. Diseases and insect pests are numerous, of these the most destructive is the BOLL WEEVIL, which causes enormous losses. Sea-island cotton, valued for its silky fibers, was the leading type before the advent of this insect, to which it is particularly susceptible. When mechanical pickers are employed, a chemical defoliant is used to make the leaves drop so that only the cotton bolls are left on the plant for stripping. In the ginhouse the cotton is separated from the seeds by a COTTON GIN and then baled. The usual plantation bale, weighing 500 lb (227 kg), is covered with jute and bound with iron hoops. The U.S. Dept. of Agriculture has established official standards for grades of cotton. The manufacture of cotton into cloth involves many processes—CARDING, COMBING, and SPINNING, which bring the raw fiber to a yarn or thread strong enough for weaving. Innumerable commodities are made from cotton. From the lint (the fiber separated from the seed) come the major products, chiefly TEXTILE and YARN goods, cordage, automobile-tire cord, and plastic reinforcing. The linters (short cut ends left on the seed after ginning and later removed by specialized processing) are a valuable source of CELLULOSE products. Cotton hulls are used for fertilizer, fuel, and packing, fiber from the stalk is used for pressed paper and cardboard. Production of the chief by-product, cottonseed oil, has assumed the importance of a separate industry since its establishment in the late 19th cent. The oil content of cotton seeds is about 20%. After being freed from the linters, the seeds are shelled and then crushed and pressed or treated with solvents to obtain the crude oil. In its highly refined state, cottonseed oil is employed as salad and cooking oil, for cosmetics, and especially in the manufacture of margarine and shortenings. Paint makers use it to some extent as a semidrying oil. Less refined grades are used in the manufacture of soap, candles, detergents, artificial leather, oilcloth, and many other commodities. The cottonseed oil industry is becoming increasingly important to cotton growers as cotton fiber finds greater competition in the cheaper and stronger synthetic fibers. Cotton is classified in the division MAGNOLIOPHYTES, class Magnoliopsida, order Malvales, family Malvaceae. See D. S. Hamby, ed., *The American Cotton Handbook* (2 vol., 3d ed. 1965-66), W. H. Fortenberry, *The Story of Cotton* (1967), Clifford Shaw and Frank Eckersley, *Cotton* (1967), J. L. Sinclair, *The Production, Marketing, and Consumption of Cotton* (1968).

Cotton Belt, major agricultural region of the SE United States where cotton is the main cash crop. Located on the Atlantic and Gulf coastal plains and on the Piedmont upland, it extends through North Carolina, South Carolina, Georgia, Alabama, Mississippi, West Tennessee, East Arkansas, Louisiana, East Texas, and South Oklahoma, and also into small areas of SE Missouri, SW Kentucky, Florida, and SE Virginia. The belt has the climatic conditions necessary for cotton to thrive—high temperatures, from 30 to 55 in (76.2–139.7 cm) annual rainfall, and a 200-day growing season. A modified plantation system exists there. The Cotton Belt, no longer continuous, is made up of many separate intensive production areas, corn, wheat, soybeans, peanuts, beans, and livestock are important in the intervening areas. Until the invention of the cotton gin in 1793, the Cotton Belt was confined to the coastal areas of South Carolina and Georgia, by the mid-1800s, it extended from South Virginia to East Texas. Post-Civil War reforms, soil depletion, and the boll weevil combined to push cotton west. Increasing amounts of irrigated cotton are grown in West Texas, South New Mexico, Arizona, and California, where aridity makes it easier to control insect pests. Texas, Mississippi, and Arkansas are the leading producers of cotton in the belt, California ranks after Texas nationally. See BLACK BELT, IMPERIAL VALLEY.

cotton gin, machine for separating cotton fibers from the seeds. The charkha, used in India from antiquity, consists of two revolving wooden rollers through which the fibers are drawn, leaving the seeds. A similar gin was early used in the SE United States for long-staple cotton. In the modern roller gin, rollers covered with rough leather draw out the fibers, which are cut off by a fixed knife pressed against the rollers. This type of gin cleans only about two bales per day, but it does not snarl or break the fibers. The saw gin, invented by the American inventor Eli Whitney in 1793 and patented in 1794, con-

sisted of a toothed cylinder revolving against a grate that enclosed the seed cotton. The teeth caught the fibers, pulling them from the seeds, the fibers were then removed from the cylinder by a revolving brush. This device, especially suited to short- and medium-staple cotton, has been mechanized and is used in commercial plants that are also called gins, where the fiber is conveyed from farm wagon to baler by air suction. Such plants have one or more gin stands, each with a series of from 70 to 80 circular saws set on a shaft. The fibers, freed from dirt and hulls, are pulled through a grid by the saw teeth to remove the seeds. The fibers are removed from the saw teeth by a revolving brush or by a blast of air (in more modern plants) and are then carried by air blast or suction to a condenser and finally to the baling apparatus.

cotton grass, common name for SEDGES of the genus *Eriophorum*.

cottonmouth. see WATER MOCCASIN

cottonseed oil: see COTTON

cottontail rabbit, animal of the order Lagomorpha, which includes the hares and rabbits, except for the domestic, or European, RABBIT, which is in a separate species. Members of the genus *Sylvilagus*, cottontails have large ears and short legs and move with a scurrying or scampering gait. Unlike the European rabbit, they do not dig their own burrows but make a nest in a depression in the ground. Unlike hares, they seek protection in hiding rather than in swift flight. The cottontail ranges from the southern border of Canada to North Argentina. There are six races. Cottontails are a common source of TULAREMIA, or rabbit fever. They are classified in the phylum CHORDATA, subphylum Vertebrata, class Mammalia, order Lagomorpha, family Leporidae.

cottonwood: see WILLOW

Cottrell, Leonard, 1913–, British author and archaeologist, grad. King Edward's Grammar School, Birmingham. He was a commentator, writer, and producer for the British Broadcasting Corporation until 1960, when he resigned to devote himself to writing. During World War II he was stationed in the Mediterranean with the Royal Air Force as a war correspondent. Among his many books are *The Bull of Minos* (1958), *The Great Invasion* (1958), *Realms of Gold* (1963), *Egypt* (1965), and *Lost Civilizations* (1974). He was the editor of the *Concise Encyclopedia of Archaeology* (1965).

Coty, René (ranā' kōtē'), 1882–1962, French president (1954–59). From 1923 to 1940 he served in the legislature, first as a deputy and then as a senator. In 1940, when France fell to the Germans, he voted to hand all power to Marshal Pétain. After a wartime spent in retirement, Coty returned to the legislature and in Dec., 1953, was elected president as a compromise candidate. In the crisis of May, 1958, he threatened resignation if Charles de Gaulle were not made premier, he left office with the creation (1959) of the Fifth Republic.

cotyledon (kōt'ālēd'ən), in botany, a leaf of the embryo of a SEED. The embryos of flowering plants, or ANGIOSPERMS, usually have either one cotyledon (the monocots) or two (the dicots). Seeds of gymnosperms, such as pines, may have numerous cotyledons. In some seeds the cotyledons are flat and leaf-like, in others, such as the bean, the cotyledons store the seed's food reserve for germination and are fleshy. In most plants the cotyledons emerge above the soil with the seedling as it grows.

couch grass, name for several grasses, among them QUACK GRASS.

Coucy, Robert de (rōbēr' də kōōsē'), d. 1311, French architect, celebrated for his part in the building of Rheims Cathedral, which he carried on as master of the works after the death of Hugues Libergier in 1263. Probably the Robert de Coucy traditionally known as the original architect of Rheims Cathedral, after the fire of 1211, was his father, their separate works on the cathedral have been confused.

Coude focus. see TELESCOPE

Coudert, Frederic René (kōōdār'), 1832–1903, American lawyer and public official, b. New York City. He practiced law in New York City and for many years was counsel in the United States for the French, Italian, and Spanish governments. He was (1880) a member of the international conference at Bern for the codification of the law of nations, served (1893–95) as counsel for the United States in the Bering Sea fur-seal arbitration at Paris, and was (1896–98) a member of the Venezuela Boundary Commission. He was active in political reform movements in New York City and was a trustee of many educational institutions.

Coué, Émile (āmēl' kwā), 1857–1926, French psychotherapist. He is remembered for his formula for curing by optimistic autosuggestion, "Day by day, in every way, I am getting better and better." His teaching achieved a vogue in England and the United States in the 1920s.

Coues, Elliott (kouz), 1842–99, American ornithologist, b. Portsmouth, N.H., grad. Columbian College, later Columbian Univ. and now George Washington Univ. (B.A., 1861, M.D., 1863, Ph.D., 1869). He served as an army surgeon in the Civil War and as naturalist on government surveys and taught (1877–87) at Columbian Univ. He was a founder of the American Society for Psychical Research and a leader in the theosophist movement. He wrote *Key to North American Birds* (1872), *Birds of the Northwest* (1847), *Fur-bearing Animals* (1877), and *Birds of the Colorado Valley* (1878), he edited the journals of Lewis and Clark (1893), Zebulon M. Pike (1895), and Alexander Henry and David Thompson (1897).

cough: see PUMA

cough, sudden forceful expiration of air from the lungs caused by an involuntary contraction of the muscles controlling the process of breathing. The cough is a response to some irritating condition such as inflammation or the presence of mucus (sputum) in the respiratory tract, as in infectious disease, or to heavy dust or industrial or tobacco smoke. Coughing may also be a reflex action to factors outside the respiratory tract, diseases that are not respiratory in nature (e.g., congestive heart failure or mitral valve disease) often bring on coughing. If there is mucus or a foreign substance in the respiratory tract, the cough should not be hindered since by this action the offending matter is expelled from the body. If, however, the cough becomes exhausting, sedation is indicated.

Coughlin, Charles Edward (kōg'lin), 1891–, Roman Catholic priest in the United States, b. Ontario, Canada, grad. Univ. of Toronto, 1916. After study at St. Michael's College, Toronto, he was ordained (1916) and became (1926) pastor of the Shrine of the Little Flower at Royal Oak, Mich. In the 1930s he made radio addresses in which he criticized such diverse groups as U.S. bankers, trade unionists, and Communists. In 1934 he organized the National Union for Social Justice, which denounced President Franklin Delano Roosevelt's New Deal policies and advocated such measures as silver inflation as well as the nationalizing of banks, utilities, and natural resources. Coughlin also published a magazine, *Social Justice*, in which he expressed pro-Nazi opinions and made increasingly anti-Semitic remarks directed especially at Jewish members of Wall Street. The magazine was barred from the mails by the U.S. government for violation of the Espionage Act and ceased publication in 1942. Father Coughlin was meanwhile silenced by his superiors but continued his parish duties.

Coulanges, Numa Denis Fustel de. see FUSTEL DE COULANGES, NUMA DENIS

Coulee Dam National Recreation Area. see NATIONAL PARKS AND MONUMENTS (table)

Coulomb, Charles Augustin de (kōō'lōm, kōōlōm', Fr. sharl' oōstān' də kōōlōn'), 1736–1806, French physicist. In 1789 he retired from his posts as military engineer and as superintendent of waters and fountains and devoted himself to continuing his scientific research. He was known for his work on electricity, magnetism, and friction, and he invented a magnetoscope, a magnetometer, and a torsion balance that he employed in determining torsional elasticity and in establishing COULOMB'S LAW. The unit of quantity of electric charge, the coulomb, is named in his honor. See study by C. S. Gilmor (1971).

coulomb (kōō'lōm), abbr. coul or C, unit of electric CHARGE. The absolute coulomb, the current U.S. legal standard, is the amount of charge transferred in 1 second by a current of 1 AMPERE, i.e., it is 1 ampere-second. The international coulomb, which was the legal standard before 1950 and upon which the definition of the ampere was formerly based, is defined as the amount of charge that, when passed through a water solution of silver nitrate under certain standard conditions, will cause the deposit of a certain mass (approximately 1.1 mg) of metallic silver, 1 international coul equals 0.999835 absolute coul.

Coulomb's law (kōō'lōmz), in physics, law stating that the electrostatic force between two charged bodies is proportional to the product of the amounts of charge on the bodies divided by the square of the distance between them. If the bodies are oppositely charged, one positive and one nega-

tive, they are attracted toward one another, if the bodies are similarly charged, both positive or both negative, the force between them is repulsive (see CHARGE, ELECTRIC) Coulomb's law applies exactly only when the charged bodies are much smaller than the distance separating them and therefore can be treated approximately as point charges When combined with principles of quantum physics, Coulomb's law helps describe the forces that bind electrons to an atomic nucleus, that bind atoms together into molecules, and that hold together solids and liquids The law was deduced in 1785 by C A de Coulomb from experimental measures of the forces between charged bodies, the experiments were made using his torsion balance

council, ecumenical (ĕk'yōōmĕn'ĭkəl) [Gr. = universal], in Christendom, council of church authorities accepted by the church as the official voice, also called general council The utterances of such a council are called canons, the first being usually a detailed statement of the common faith The acceptance of the canons is unequal, thus, Roman Catholics regard them as binding (canonical) only when a pope has subsequently ratified them, and many canons of several councils have never been accepted The following is the list of the general councils recognized by Roman Catholics (the numbering is the customary one, and the opening year is given) (1) 1 Nicaea, 325, (2) 1 Constantinople, 381, (3) Ephesus, 431, (4) Chalcedon, 451, (5) 2 Constantinople, 553, (6) 3 Constantinople, 680, (7) 2 Nicaea, 787, (8) 4 Constantinople, 869, (9) 1 Lateran, 1123, (10) 2 Lateran, 1139, (11) 3 Lateran, 1179, (12) 4 Lateran, 1215, (13) 1 Lyons, 1245, (14) 2 Lyons, 1274, (15) Vienne, 1311, (16) Constance, 1414, (17) Basel and Ferrara-Florence, 1431, 1438, (18) 5 Lateran, 1512, (19) Trent, 1545, (20) 1 Vatican, 1869, (21) 2 Vatican, 1962 (See separate article on each council, e.g., NICAEA, FIRST COUNCIL OF) The Orthodox Eastern Church recognizes the first seven and counts the Trullan Synod of 692 as an ecumenical extension of the Third Council of Constantinople The first council was the model for the rest The common purpose of the first eight councils was to determine whether specific theological novelties were orthodox or heretical (not orthodox) The rest of the councils, all held in Western Europe, have dealt chiefly with church discipline and morals Two of them, the Second Council of Lyons and the Council of Ferrara-Florence, were occupied with abortive attempts at reconciliation between East and West In the Great Schism arose the conciliar theory, which held that an ecumenical council is superior to the pope, that theory was in its heyday at the Council of Constance (see SCHISM, GREAT) The Council of Trent, convened to deal with the Protestant Reformation, was probably the most far-reaching in its effects The traditional opinion is that when the bishops of the world unite to define belief in the light of what they have received from their predecessors, God will protect them from error This is a manifestation of the infallibility of the teaching church, and papal infallibility is compared to it in the definition published by the First Vatican Council (see INFALLIBILITY) Two famous councils that claimed in vain to be ecumenical are the Robber Council of Ephesus (see EUTYCHES) and the Council of Pisa in the Great Schism Pope John XXIII established as one of the principal themes of the Second Vatican Council the reunion of all Christians with the Church of Rome Protestants, rejecting the teaching authority of the church, do not regard ecumenical councils and their canons as binding on the conscience Protestant observers, however, have officially attended the last two councils The ECUMENICAL MOVEMENT among Protestants is not to be confused with an ecumenical council, although they share a similar aim See studies by Lorenz Jaeger (tr 1961), Philip Hughes (1961), Francis Dvornik (1961), and E F Jacobs (rev ed 1963)

Council Bluffs, city (1970 pop. 60,348), seat of Pottawattamie co., SW Iowa, on and below bluffs overlooking the Missouri River, opposite Omaha, Nebr., inc. 1853 It was the site of an Indian trading post and of a Pottawattamie Indian mission before 1846, when it was settled by Mormons and named Kanesville When the Mormons departed in 1852, the settlement was renamed Council Bluffs An important supply point during the gold rush (1849-50), Council Bluffs was made the eastern terminus of the Union Pacific RR in 1863 The city is now an important trade and industrial center for a large agricultural area It has grain elevators, and its manufactures include processed foods, cast-iron pipes, farm equipment, electronic equipment, and fabricated metals Among the points of interest in the city are Dodge House, a national historic landmark and the

former home of Gen. G. M. Dodge, founder of the Union Pacific RR, the Lewis and Clark monument, which commemorates the meeting held near there in 1804 between U.S. explorers Lewis and Clark and the Indians, and the Lincoln monument, built in honor of Abraham Lincoln's visit to Council Bluffs in 1859 Iowa Western Community College is there, and Lake Manawa State Park lies entirely within the city limits An extensive levee system along the Missouri River protects the part of the city below the bluffs

Council for Mutual Economic Assistance (COMECON or CMEA), international governmental organization for the coordination of economic policy among certain Communist nations Its members include Albania (which has not participated since 1961), Bulgaria, Cuba, Czechoslovakia, East Germany, Hungary, Mongolia, Poland, Rumania, and the Soviet Union Yugoslavia participates in matters of mutual interest but is not a member First formed in 1949, the council was relatively dormant until 1954 In 1956 its activities were greatly expanded, and in 1959 a formal charter was ratified giving COMECON the same international status as the European Free Trade Association and the Common Market To meet the challenge of these Western associations, COMECON undertook large-scale measures for organization of industrial production and coordination of economic development by conducting a series of five-year plans (1956-60, 1961-65, 1966-70, and 1971-75) During the first 15 years of its existence, trade among COMECON countries and foreign trade increased by over 400% However, growth of both types of trade declined after that period

Council of Europe: see INTERNATIONAL GOVERNMENTAL ORGANIZATIONS

Council of Foreign Ministers, Council of Ten, etc.: see FOREIGN MINISTERS, COUNCIL OF, TEN, COUNCIL OF, etc

counselor at law. see ATTORNEY

counterfeiting, manufacturing spurious coins, paper money, or evidences of governmental obligation (e.g., bonds) in the semblance of the true There must be sufficient resemblance to the genuine article to deceive a person using ordinary caution The offense may be regarded as a special variety of FORGERY The crime affects property but was historically considered to be an interference with the administration of government Hence, under an early English statute (1350), counterfeiting the king's seal or his gold and silver coinage was a grave crime against the state amounting to high TREASON and was punishable by death The statute left unchanged the common-law misdemeanors of counterfeiting copper coinage and passing counterfeit foreign currency Other early statutes were directed against debasing the coinage by clipping or filing off the edges to sell the metal By the 19th cent. counterfeiting was considered a felony rather than a form of treason Article 1, Section 8, of the U.S. Constitution authorizes Congress to "provide for the punishment of counterfeiting the Securities and current Coin of the United States" Under that power, statutes have been enacted making criminal the counterfeiting of the currency and bonds of the United States, of the evidences of indebtedness (e.g., checks) of the Federal Reserve System, of postage stamps, and of foreign money used for exchange Under its powers to define and punish offenses of international law and its powers to control interstate and foreign commerce, Congress has passed legislation against the counterfeiting of foreign money and securities within the United States Nearly every state now has statutes against counterfeiting Since its establishment in 1865 the U.S. Secret Service has been the primary agency in the combating of counterfeiters in the United States To commit the crime of counterfeiting one does not necessarily have to make a whole coin or bill It may be accomplished by plating coins, by raising the amount of a bill, or by any other alteration calculated to deceive the recipients To retain counterfeit money or government obligations knowingly is also a criminal offense, regardless of how possession was acquired The knowing utterance (passing) of counterfeit currency or securities is also criminal For the further protection of the currency and of postage stamps, statutes forbid making certain types of photographs (e.g., in color) where there would be danger of deception See Lynn Glaser, *Counterfeiting in America* (1968)

counterglow. see GEGENSCHNEI

counterpoint, in music, the art of combining melodies each of which is independent though forming

part of a homogeneous texture The term derives from the Latin for "point against point," meaning note against note in referring to the notation of PLAINSONG The academic study of counterpoint was long based on *Gradus ad Parnassum* (1725, tr. 1943) by Johann Joseph Fux (1660-1741), an Austrian theorist and composer This work formulates the study of counterpoint into five species—note against note, two notes against one, four notes against one, syncopation, and florid counterpoint, which combines the other species Countless textbooks have followed this method, but since the early 20th cent. several theorists have based their courses in counterpoint on a direct study of 16th-century contrapuntal practice The early master composers of contrapuntal music include PALESTRINA, LASSO, and BYRD Polyphonic forms were later given a most brilliant and sophisticated expression during the BAROQUE era in the works of J. S. BACH See also POLYPHONY, IMITATION See Walter Piston, *Counterpoint* (1947), Humphrey Searle, *Twentieth Century Counterpoint* (1954), Kent Kennan, *Counterpoint* (2d ed. 1972)

Counter Reformation: see REFORMATION, CATHOLIC

countertenor, a male singing voice in the ALTO range Singing in this range requires a special vocal technique called falsetto Countertenor singers were required during the Renaissance and Baroque periods because social and religious conventions restricted women from public singing See also CASTRATO

country and western music, American popular music form originating in the Southeast (country music) and the Southwest and West (western music) The two regional styles coalesced in the 1920s when recorded material became available in rural areas, and they were further consolidated after musicians from various sections met and mixed during service in World War II The primary difference between the two styles is that country music is simpler and uses fewer instruments, relying on guitar, fiddle, banjo, and harmonica, whereas the music of the Southwest tends toward steel guitars and big bands whose style verges on swing (e.g., The Light Crust Doughboys) Country and western music is directly descended from the folk songs, ballads, and popular songs of the English, Scottish, and Irish settlers of the southeastern seaboard of the United States Its modern lyrics depict the emotion and experience of rural and (currently) urban poor whites, they often tell frankly of illicit love, crime, and prison life Over the last 50 years country and western music has gained a nationwide audience Since 1924 the "Grand Ole Opry," a Saturday night performance featuring country and western singers, has broadcast weekly from Nashville, Tenn. Many of the musicians have been influenced by black blues and GOSPEL MUSIC, but the performers and audience are almost all white Leading performers include Hank Williams, Jimmy Rogers, Johnny Cash, Tex Ritter, June Carter, the Carter family, Merle Haggard, Loretta Lynn, Jim Reeves, Tammy Wynette, Eddie Arnold, Charlie Pride (a black man), and Charlie Rich See Bill C. Malone, *Country Music USA* (1968), Paul Hemphill, *The Nashville Sound* (1971)

Counts, George Sylvester, 1889-1974, American educator, b. near Baldwin City, Kansas, grad. Baker Univ., 1911, Ph.D. Univ. of Chicago, 1916 He taught in the educational departments of several universities before joining the faculty of Teachers College, Columbia Univ., in 1927 A strong advocate of teachers' unions, he ran for public office on the American Labor party ticket and was president (1939-42) of the AMERICAN FEDERATION OF TEACHERS His works include *The American Road to Culture* (1930), *The Prospects of American Democracy* (1938), *The Challenge of Soviet Education* (1957), and *Education and the Foundations of Human Freedom* (1962) See study by G. L. Gutek (1971)

county [from Fr. *comté*, = domain of a count], division of LOCAL GOVERNMENT in the United States, Great Britain, and many Commonwealth countries The county developed in England from the shire, a unit of local government that originated in the Saxon settlements of the 5th cent. By the 11th cent. the shire system was fully established throughout most of England, with each shire being ruled by a shire-reeve, or sheriff, appointed by the crown By the 14th cent. the office of justice of the peace had developed, in each county a court of three or four justices, also appointed by the king, assisted the sheriff in the administration of local affairs With the passage of the Local Government Act of 1888, power passed from the king's appointed officials to the newly created county councils, elected by local residents The county system of government was

adopted in most of the nations settled by the British. Throughout the English-speaking world, for example, most courts are still organized by counties. In the United States there are approximately 3,000 counties, most of which are either rural or suburban. Louisiana, influenced by the French, has parishes, which are essentially similar to counties. The major functions of county government in the United States include law enforcement, the recording of deeds and other documents, and the provision and maintenance of public works such as roads and parks. See H. S. Duncombe, *County Government in America* (1966), J. C. Bollens, *American County Government* (1969).

coup (kōō) [Fr. = blow], among North American Indians of the Plains culture, a war honor, awarded for striking an enemy in such a way that it was considered an extreme act of bravery. Coups were awarded according to the degree of recklessness involved, the most reckless, such as striking an armed enemy with the bare hand, counted highest. Killing an enemy, wounding him, scalping him, or stealing his horse or gun—all these were coups of value. Recital of the deeds was an important social function, and a warrior with many coups held a high status and was honored at feasts, ceremonies, and in the tribe. After warfare had ceased, coups became transferable property, passing from the old men to the younger, who needed coups to acquire warrior status in the tribe.

Couper, James Hamilton (kōō'pär), 1794–1866, American planter of Georgia, grad. Yale, 1814. Influential in promoting agricultural research and experimentation, he was a pioneer in the cultivation of rice, long-staple cotton, and sugarcane and introduced new plants, including Bermuda grass.

Couperin, François (frāNswā' kōōpärāN'), 1668–1733, French harpsichordist and composer, called "le Grand" to distinguish him from the other musicians in his family. His harpsichord music, in its charm, delicacy, and graceful ornamentation, represents the culmination of French rococo. He published four books of harpsichord suites (1713–30), which generally consisted of short, highly ornamental pieces, with descriptive titles such as *Les Abeilles*, *Les Papillons*, *La Voluptueuse*, and *Le Rossignol en amour*. His style of harpsichord playing, formulated in *L'Art de toucher de clavecin* (1716), influenced the keyboard technique of Bach. Couperin also composed much religious and chamber music and works for the organ. He was organist (1685–1733) at St. Gervais, Paris, a position held by members of the Couperin family from c. 1650 until 1826. In 1693, Couperin was chosen by Louis XIV as one of the organists of the royal chapel, and later he was made music master of the royal family and harpsichordist at the royal court. The Couperin line of musicians had begun with three brothers—Louis (c. 1626–1661), an organist, violinist, and composer of harpsichord suites, which are characterized by a vigorous, frequently dissonant style, François (c. 1631–c. 1701), a harpsichordist and violinist, and Charles (1638–79), an organist, the father of Couperin le Grand. The line extended to the great-grandsons of François, the second brother—Pierre Louis (1755–89) and François Gervais (1759–1826), who were organists at St. Gervais. See biography by P. Brunold (1949).

Couperus, Louis Marie Anne (lōwē marē' an kōōpā'-rōōs), 1863–1923, Dutch novelist. In his early works he emphasized with graceful irony the determining forces of man's past and environment, this fatalism characterizes all his novels. Couperus is best known for the realistic family saga *De Boeken der kleine Zielen* (4 vol., 1901–3, tr. *The Book of the Small Souls*, 4 vol., 1914–18). Other works include symbolic fairy tales and verse.

Courbet, Gustave (gustav' kōōrbā'), 1819–77, French painter, b. Ornans. He studied in Paris, learning chiefly by copying masterpieces in the Louvre. An avowed realist, Courbet was always at odds with vested authority, aesthetic or political. In 1847 his *Wounded Man* (Louvre) was rejected by the Salon, although two of his earlier pictures had been accepted. He first won wide attention with his *After Dinner at Ornans* (Lille) in 1849. The next year he exhibited his famous *Funeral at Ornans* and *Stonebreakers* (both Louvre). For his choice of subjects from ordinary life, and more especially for his obstinacy and audacity, his work was reviled as offensive to prevailing politics and aesthetic taste. Enjoying the drama, Courbet rose to defend his work as the expression of his newfound political radicalism. His statements did nothing to recommend the work to his enemies. In 1855, Courbet exhibited the mam-

moth, self-congratulatory *Painter's Studio* (Louvre). Attacked by academic painters of every persuasion, he set up his own pavilion where he exhibited 40 of his paintings and issued a manifesto on realism. Within the next decade he triumphed as the leader of the realist school. His influence became enormous, reaching its height with his rejection of the cross of the Legion of Honor offered him by Napoleon III in 1872. Under the Commune, Courbet was elected to the chamber and in consequence was later held responsible, fined, and imprisoned for the destruction of the Vendôme column. In 1873 he fled to Switzerland, where he spent his few remaining years in poverty. Although his aesthetic theories were not destined to prevail, his painting is greatly admired for its frankness, vigor, and solid construction. Courbet is represented in galleries throughout France and the United States. The Metropolitan Museum has more than 20 of his works. See biography by Jack Lindsay (1974), study by T. J. Clark (1973).

Courbevoie (kōōrbvōv'), city (1968 pop. 58,283), Hauts-de-Seine dept., N. central France, on the Seine River. An industrial suburb of Paris, Courbevoie manufactures automobiles, bicycles, perfumes, and pharmaceuticals. There are also electrical industries, foundries, and copper works. The Avenue du Général de Gaulle, which runs through Courbevoie, is a continuation of the CHAMPS ÉLYSÉES of Paris.

Courcelle, Daniel Remy, sieur de (danyēl' rāmē' syor' də kōōrsēl'), d. 1698, governor of New France (1665–72). He arrived with the intendant Jean Talon, and together they inaugurated a period of peace and prosperity. Courcelle led (1666) an unsuccessful winter raid on the Mohawk Indians, but a campaign in Sept., 1666, under the marquis de Tracy and Courcelle induced the Iroquois to conclude a peace that was kept for a number of years. In 1671 he led to Lake Ontario an expedition that chose the site for a fort later established as Fort Frontenac. While governor, Courcelle instituted militia service for all males and supported the expeditions of Robert de La Salle and Louis Jolliet. Ill health led him to request his recall to France in 1672, and the comte de Frontenac took his place as governor. Courcelle was later appointed governor of Toulon, where he died.

coureurs de bois (kōōror' də bwā) [Fr. = woods runners], unlicensed traders during the French regime in Canada. Traders were required to be licensed, but to only a favored few were licenses granted. The *coureurs de bois* defied regulations and ventured into the Canadian wilderness. Although they stimulated the growth of the fur trade and the exploration of Canada, their defiance caused problems for the government of New France and contributed to poor relations with the Indians, to whom they sold liquor. Toward the end of the 17th cent. it was estimated that one third of the able-bodied men of the colony were *coureurs de bois*, although this may be an exaggeration.

Courier, Paul Louis (Paul Louis Courier de Mere) (pōl lwē kōōryā' də mārā'), 1772–1825, French political writer and classical scholar. His translation (1810) of the Greek text of *Daphnis and Chloe* is considered excellent. After the Bourbon restoration, which he opposed, he devoted himself to writing trenchant political pamphlets, the best known of which are *Simple Discours* (1821), for which he was jailed, and *Le Pamphlet des pamphlets* (1824), remarkable for its stylistic brilliance. His memoirs and letters (1828) have the same original charm that makes his literary works memorable. He was murdered, presumably by one of his servants.

courlan (kōōrlān) see LIMPKIN

Courland or **Kurland** (both kūr'lānd, Ger. kōōr'-lant), Lettish Kurzeme, historic region and former duchy, W. European USSR, in Latvia, between the Baltic Sea and the Western Dvina River. It is an agricultural and wooded lowland. Yelgava (Ger. *Mitau*), the historic capital, and Liepaya (Ger. *Libau*) and Ventspils (Ger. *Windau*), the Baltic seaports, are the chief cities. The early Baltic tribes—Letts and Kurs—who inhabited the region were subjected in the 13th cent. by the LIVONIAN BROTHERS OF THE SWORD. In 1561 the order disbanded and its grand master became the first duke of Courland, under Polish suzerainty. In the Northern War (1700–21), it was taken (1701) by Charles XII of Sweden. Empress Anna, who was, by marriage, duchess of Courland before her accession in Russia, forced (1737), the nobles of Courland to elect her favorite, Ernst Johann von Biron, their duke. Russian influence became paramount, and with the third partition of Poland (1795) the duchy passed to Russia. In 1918, Courland was incorporated into Latvia, except for a strip of the southern coast that went to Lithuania. In indepen-

dent LATVIA (1918–40), Courland was divided into two provinces, Kurzeme and Zemgale.

Courland Lagoon: see KURSKY ZALIV, USSR

Cournand, André Frederic (kōōr'nānd), 1895–, American physician and physiologist, b. France, B.A. Sorbonne, 1913, M.D. Univ. of Paris, 1930. He emigrated to the United States in 1930 and was naturalized in 1941. He was associated with the College of Physicians and Surgeons, Columbia, after 1935 and became a full professor in 1951. He shared with Werner Forssmann and Dickinson W. Richards the 1956 Nobel Prize in Physiology and Medicine for work in developing cardiac catheterization. This technique, whereby a catheter is inserted through a vein into the heart, facilitates study of both the diseased and healthy heart and, in many cases, aids in determining the advisability of heart surgery.

Cournot, Antoine Augustin (āntwān' ōgustān' kōōrnō'), 1801–77, French mathematician and economist. He developed mathematical theories of chance and probability and was one of the first to attempt the application of mathematics to economic problems. His writings include *Researches into the Mathematical Principles of the Theory of Wealth* (1838, tr. 1897).

Courrèges, André see under FASHION

Court, Antoine (āntwān' kōōr), 1696–1760, French Protestant preacher, called the Restorer of Protestantism in France. He was successful in reorganizing the remnants of the persecuted Calvinists in France. With a price on his head, he escaped to Lausanne in 1730, where he spent the remainder of his life directing the theological seminary that he founded.

Court, Margaret, 1942–, Australian tennis player. Playing tennis from age eight, she rose to prominence in the game in the early 1960s under her original name, Margaret Smith. Ranked first in world standings six times since 1962, she retired in 1966, but returned to the game after marriage in 1968, and in 1970 became the second woman (Maureen Connolly was the first) to win the grand slam. In 1973 she was defeated by Bobby RIGGS in a nationally televised match but went on to win her fifth U.S. Open championship later that year. See *The Margaret Smith Story* written with Don Lawrence (1965).

court, in law, official body charged with administering justice. The term is also applied to the judge or judges who fill the office and to the courtroom. Distinct courts originate when legal relations are no longer entirely a private matter. Thus, courts do not exist in a society governed by VENDETTA, and they are of little consequence in one where COMPOSITION for wrongs is the rule. The most ancient courts known, e.g., those of Egypt and Babylonia, were semiclerical institutions that used religious rituals in deciding issues. In Greece the functions of a court were chiefly undertaken by assemblies of the people that heard the arguments of orators. In Rome there was a clear evolution of the court system from priestly beginnings to a wholly secular, hierarchical organization staffed by professional jurists (see ROMAN LAW). Western Europe (after the collapse of Rome) and Anglo-Saxon England had mainly feudal courts of limited territorial authority, administering customary law, which differed in each locale. In England, after the Norman Conquest (1066), royal authority was gradually extended over the feudal lords, and by the early 13th cent., although purely local courts had not been abolished, there was established the supremacy of the central courts that had evolved from the Curia Regis [Lat. = king's court], namely, the Court of EXCHEQUER, the Court of Common Pleas, and King's Bench. The Court of Common Pleas heard cases between ordinary subjects of the king, while King's Bench acted as a court of appeals and heard cases involving persons of high rank. Soon itinerant royal courts were established to spare civil litigants the labor and expense of going to the capital at Westminster and to afford hearings to persons held on criminal charges in county jails. By the 14th cent. the principal function of the central courts was to hear appeals from the circuit courts. Unity was at least temporarily disrupted by the emergence (16th cent.) of EQUITY as a distinctive body of law administered by the chancery. The conflict of jurisdiction continued to some extent until 1875, when the Judicature Act of 1873 went into effect. It provided for a supreme court of judicature, comprising the high court of justice and the court of appeal. The high court of justice (with jurisdiction over England, Wales, and Northern Ireland) is divided, purely for administrative purposes, into three divisions: chancery, probate, divorce, and admiralty, and King's (or Queen's) Bench. Appeals may in some instances be taken from the court of

appeals to the House of Lords. The judicial committee of the privy council hears appeals from overseas territories still under British domain and from Commonwealth countries. In the United States there are two distinct systems of courts, Federal and state. Each is supreme in its own sphere, but if a matter simultaneously affects the states and the Federal government, the Federal courts have the decisive power. The district court is the lowest Federal court. Each state constitutes at least one district, and some of the more populous states contain as many as four districts. There are 10 circuit courts of appeals (each with jurisdiction over a definite territory) and a court of appeals for the District of Columbia, these hear appeals from the district courts. There are, in addition, various specialized Federal courts, including the Court of Tax Appeals and the Court of Claims. Heading the Federal court system is the U.S. SUPREME COURT. The court systems of the states vary to some degree. At the bottom of a typical structure are local courts that only have authority in specific jurisdiction (e.g., court of the justice of the peace, POLICE COURT, and court of PROBATE). County courts, or the equivalent, exercising general criminal and civil jurisdiction, are on the next level. All states have a highest court of appeals, and some also have intermediate appellate courts. In a few states separate courts of equity persist. In addition to law courts there are ecclesiastical courts, arbitral tribunals (e.g., for labor cases), administrative tribunals (e.g., of the Interstate Commerce Commission), and courts-martial (see MILITARY LAW). See CONFLICT OF LAWS. See Harold Potter, *Historical Introduction to English Law and Its Institutions* (4th ed. 1958, repr. 1969), Lewis Mayers, *The American Legal System* (rev. ed. 1964), R. M. Jackson, *The Machinery of Justice in England* (5th ed. 1967), H. J. Abraham, *The Judicial Process* (2d ed. 1968), Herbert Jacob, *Justice in America* (2d ed. 1972).

Courteline, Georges (zhôrzh kôor'talên'), 1858-1929, French writer. His prolific humorous and satirical works include sketches, plays, tales, and novels. Bourgeois attitudes are ridiculed in his comedy *Boubouroche* (1892, tr. 1961), official red tape is satirized in his sketches *Messieurs les ronds-de-cuir* (1893, tr. *The Bureaucrats*, 1928), and the pitfalls of justice in the courts are hilariously exposed in *Hortense, couche-toi* (1897, tr. *Hold on, Hortense*, 1961) and *L'Article 330* (1900, tr. 1961).

Courtenay, William (kôrt'nê), c.1342-1396, English prelate, archbishop of Canterbury (1381-96). He was important for his condemnation of the doctrines of Wyclif and for suppressing the Lollards.

courtly love, philosophy of love and code of love-making that flourished in France and England during the Middle Ages. Although its origins are obscure, it probably derived from the works of Ovid, various Oriental ideas popular at the time, and the songs of the troubadours. According to the code, a man falls passionately in love with a married woman of equal or higher rank. Before his love can be declared, he must suffer long months of silence, before it can be consummated, he must prove his devotion by noble service and daring exploits. The lovers eventually pledge themselves to secrecy and to remain faithful despite all obstacles. In reality, courtly love was little more than a set of rules for committing adultery. It was more important as a literary invention, expressed in such works as Chretien de Troyes's *Lancelot* (12th cent.), Guillaume de Lorris's *Roman de la Rose* (13th cent.), and Chaucer's *Troilus and Cnseyde* (14th cent.). In these works it was the subjective presentation of the lovers' passion for each other and their consideration for other people that transformed the code of courtly love into one of the most important literary influences in Western culture. See CHIVALRY. See Denis de Rougemont, *Love in the Western World* (tr. 1956), C. S. Lewis, *The Allegory of Love* (1936, repr. 1958).

court-martial: see MILITARY LAW

Court of Justice: see EUROPEAN COMMUNITY

Courtrai. See KORTRIJK, Belgium

courts of love: see CHIVALRY and COURTLY LOVE

court system in the United States, judicial branches of the Federal and state governments charged with the application and interpretation of the law. The U.S. court system is unique in that it is divided into two administratively separate systems, the Federal and the state, each of which is independent of the executive and legislative branches of government. Such a dual court system is a heritage of the colonial period. By the time the U.S. Constitution had first mandated (1789) the establishment of a Federal judiciary, each of the original Thirteen Colonies already had its own comprehensive court

system based on the English model. Thus, the two systems grew side by side and came to exercise exclusive jurisdiction in some areas and overlapping, or concurrent, jurisdiction in others. Of the two systems, the Federal is by far the less complicated. According to Article III of the Constitution, "The judicial Power of the United States, shall be vested in one supreme Court, and in such inferior Courts as the Congress may from time to time ordain and establish." In accordance with this directive, the Federal judiciary is divided into three main levels. At the bottom are the Federal district courts, which have original jurisdiction in most cases of Federal law. Made up of 91 districts, the Federal district court system has at least one bench in each of the 50 states, as well as one each in the District of Columbia and Puerto Rico. There are from 1 to 24 judges in each district, and, as with most Federal jurists, district court judges are appointed by the President and serve for life. Cases handled by the Federal district courts include those relating to alleged violations of the Constitution or other Federal laws, maritime disputes, cases directly involving a state or the Federal government, and cases in which foreign governments, citizens of foreign countries, or citizens of two or more different states are involved. Directly above the district courts are the United States courts of appeals, each made up of one or more district courts. Established by Congress in 1891, the court of appeals system is composed of 10 judicial circuits throughout the 50 states plus one in the District of Columbia. There are from three to nine judges in each circuit. In addition to hearing appeals from their respective district courts, the courts of appeals have original jurisdiction in cases involving a challenge to an order of a Federal regulatory agency, such as the Securities and Exchange Commission. The highest level court in the Federal system is the Supreme Court of the United States, the only Federal court explicitly mandated by the Constitution. Since 1869 it has been composed of one Chief Justice and eight Associate Justices. The Supreme Court sits in Washington, D.C., and has final jurisdiction on all cases that it hears. The high court may review decisions made by the U.S. courts of appeals, and it may also choose to hear appeals from state appellate courts if a Constitutional or other Federal issue is involved. The Supreme Court has original jurisdiction in a limited number of cases, including those that involve high-ranking diplomats of other nations. In addition the Federal judiciary maintains a group of courts that handle certain limited types of disputes. Included among such special Federal courts are the U.S. court of claims, which adjudicates claims against the U.S. government, and the U.S. customs court, which passes upon customs disputes. Special court judges, unlike those in the three main levels of the Federal judiciary, do not serve for life. The U.S. armed forces have courts-martial for cases involving military personnel (see MILITARY LAW). The system of state courts is quite diverse, virtually no two states have identical judiciaries. In general, however, the states, like the Federal government, have a hierarchically organized system of general courts along with a group of special courts. The lowest level of state courts, often known generically as the inferior courts, may include any of the following: magistrate court, municipal court, justice of the peace court, police court, traffic court, and county court. Such tribunals, often quite informal, handle only minor civil and criminal cases. More serious offenses are heard in superior court, also known as state district court, circuit court, and by a variety of other names. The superior courts, usually organized by counties, hear appeals from the inferior courts and have original jurisdiction over major civil suits and serious crimes such as grand larceny. It is here that most of the nation's jury trials occur. The highest state court, usually called either appellate court, state court of appeals, or state supreme court, generally hears appeals from the state superior courts and, in some instances, has original jurisdiction over particularly important cases. A number of the larger states, such as New York, also have appellate courts that are intermediate between the superior courts and the state's highest court. Additionally, a state may have any of a wide variety of special tribunals, usually on the inferior court level, including juvenile court, divorce court, probate court, family court, and small claims court. In all, there are more than 1,000 state courts of all different types, and their judges, who may be either appointed or elected, handle the overwhelming majority of trials held in the United States each year.

court tennis, indoor racket and net game of ancient origin. It is believed to have originated (about the 14th cent.) in medieval France and is the forerunner of most modern racket games. In its early days the sport was known as royal tennis because of the interest it held for French and English royalty. Enjoying varying degrees of popularity over the years, the sport was first played in the United States in 1876. Court tennis is played on an indoor, cement court 110 ft by 38 ft (33.53 m by 11.58 m), which is surrounded by four walls 30 ft (9.14 m) high. A player hits the ball—made of tightly wound cloth—with a 16-oz (45-kg), 27-in (68.5-cm) racket over the center net and plays the surface of the floor, the walls, and the ceiling to put the ball out of reach of the opponent. The scoring is intricate, and hitting the ball into wall openings also wins points. See Allison Danzig, *The Racquet Game* (1930).

Coushatta Indians: see ALABAMA INDIANS

Cousin, Jean (zhaN kôözän'), c.1490-c.1560, celebrated French painter, designer, and sculptor. To him have been attributed the designs for the windows of various churches of Sens and Paris and a painting, *Eva Prima Pandora* (Louvre). He also designed tapestries for the Cathedral of Langres. Much of his work has been confused with that of his son Jean Cousin, c.1522-c.1594, who also designed stained glass. He illustrated the *Livre de fortune* (1568), and engravings of Ovid's *Metamorphoses* (1570) have been attributed to him. The influence of mannerism is apparent in his principal surviving painting, *The Last Judgment* (Louvre).

Cousin, Victor (vêktôr'), 1792-1867, French educational leader and philosopher, founder of the eclectic school. He lectured at the Sorbonne from 1814 until 1821, when political reaction forced him to leave. Recalled to teaching in 1828, Cousin was named in 1830 to the council of public instruction and was made councillor of state. In 1832 he became a peer of France, and in 1840 he accepted the position of minister of public instruction. He became virtually the national arbiter of educational and philosophical matters. His chief works in education were the complete reorganization and centralization of the primary system and the establishment of a policy of philosophical freedom in the universities. As an eclectic, Cousin sought to develop a system that combined the psychological insights of Maine de Biran, the common sense of the Scottish school, and the idealism of Hegel and Schelling. He argued that each of these philosophies contains an element of truth that can be grasped by intuition. Cousin's approach to philosophy was historical, and he introduced the study of the history of philosophy into the French academic course. His works include *Fragments philosophiques* (1826), *Du vrai, du beau et du bien* (1836, tr. *Lectures on the True, the Beautiful, and the Good*, 1854), *Cours de l'histoire de la philosophie* (8 vol., 1815-29), various studies of educational systems, and a brilliant translation of Plato. See George Boas, *French Philosophies of the Romantic Period* (1925), W. V. Brewer, *Victor Cousin as a Comparative Educator* (1971).

Cousin-Montauban, Charles Guillaume Marie: see PALUKAO CHARLES GUILLAUME

Cousins, Samuel, 1801-87, English mezzotint engraver. He is famous for his interpretations in mezzotint of the work of Sir Thomas Lawrence, but his plates, over 200 in number, also include reproductions of the work of Thomas Gainsborough, Sir Joshua Reynolds, Sir John Millars, and Sir Edwin Landseer. See biography by Alfred Whitman (1904).

Cousteau, Jacques Yves (zhak êv kôöstô'), 1910-, French naval officer. In 1943, with Émil Gagnan, he invented the self-contained underwater breathing apparatus (scuba), or aqualung. He founded (1945) the French navy's undersea research group and in 1957 was made director of the oceanographic museum of Monaco. He also helped develop the bathyscaphe. Since 1951 he has gone on annual oceanographic expeditions and has written numerous books and made several documentary films recording his trips. His publications include *The Silent World* (with Frédéric Dumas, 1953), *The Living Sea* (with James Dugan, 1963), *World Without Sun* (ed. by James Dugan, 1965), *The Shark* (with Philippe Cousteau, 1970), *Life and Death in a Coral Sea* (with Philippe Diolé, 1971), and *The Whale* (with Philippe Diolé, 1972). Among his films are *World Without Sun* (1964), *Desert Whales* (1970), and *Tragedy of Red Salmon* (1970).

Coustou (kôöstô'), family of French sculptors. Nicolas Coustou, 1658-1733, studied with his uncle, Antoine Coysevox, with whom he later collaborated on the decorations at Marly and at Versailles. He

became rector and chancellor of the Académie royale. Among his best-known works are *La Seine et la Marne* (Tuileries Gardens) and the bas-relief, *Passage du Rhin* (Louvre). His brother, **Guillaume Cous-tou**, 1677-1746, also studied with Coysevox and in Rome. Returning to Paris, he worked at Versailles and at Marly. He is famous for his colossal group, *The Ocean and the Mediterranean*, at Marly, and above all for his exuberant *Horses of Marly* at the entrance of the Champs Élysées, Paris. His son **Guillaume Coustou**, the younger, 1716-77, was also a noted sculptor.

Cousy, Robert Joseph (kōō'zē), 1928-, American basketball player, b. New York City. He compiled an outstanding record with the Boston Celtics in the National Basketball Association (NBA). He was the league's finest backcourt player, a brilliant playmaker, and a leading scorer. He was chosen for the NBA all-star squad for 10 straight years and played in 12 all-star games. After his retirement in 1963 he was basketball coach at Boston College (1963-69) and then coach of the NBA's Cincinnati Royals (later the Kansas City-Omaha Kings, 1969-73).

Coutchiching (kōō'chiching') see PRECAMBRIAN ERA.

Couthon, Georges (zhōrzh kōōtōN'), 1755?-1794, French revolutionary. An able lawyer, he was elected to the Legislative Assembly (1791) and to the Convention (1792). He became (1793) an important member of the Committee of Public Safety, the dictatorial body that ruled France in 1793 and 1794 under Maximilien ROBESPIERRE. He generally supported Robespierre in the REIGN OF TERROR. Although partially paralyzed, he led the army that took (1793) Lyons from the counterrevolutionists. As commissioner there he proved most humane, in contrast with his successor Jean Marie Collot d'Herbois. Couthon fell with Robespierre in the coup d'état of 9 THERMIDOR (July 27, 1794) and was guillotined.

Couture, Thomas (tōmā' kōōtur'), 1815-1879, French academic painter. He was a pupil of Gros and Delacroix. He achieved fame with his vast orgy painting, *Romans in the Decadence of the Empire* (1847, Louvre). Acquiring a great reputation as a teacher, he wrote two treatises on painting. Puvion de Chavannes, Manet, and Fantin-Latour worked in his studio at various times.

couvade (kōōvad'), imitation by the father of many of the concomitants of childbirth, at the time of his wife's parturition. The father may go to bed, retire into seclusion, and observe taboos and restrictions. Among the theories that have been advanced to account for the couvade is that during this period, the father has to be cautious to avoid an injury that could be transmitted to the baby by sympathetic magic. Another is that the father asserts his paternity by appearing to take part in the delivery. A third explanation is that the father simulates the wife's activities in order to get evil spirits to focus on him rather than her. In extreme form, men may mimic the pain and process of childbirth. The practice of couvade has been noted since antiquity into modern times and in such widely dispersed places as Africa, China, Japan, India, and among the Indians of both North and South America.

Couve de Murville, Maurice (mōrēs' kōōv də mūrvel'), 1907-, French politician and diplomat. An expert in public finance, he entered the diplomatic service after World War II, serving as ambassador to Egypt, the United States, and West Germany. As minister of foreign affairs in Charles de Gaulle's administration (1958-68), he pursued the Gaullist policy of keeping France out of NATO military operations and preventing Great Britain from becoming a member of the Common Market. He served briefly as finance minister (May-July, 1968) and then as premier until June, 1969.

Couzens, James (kūz'anz), 1872-1936, U.S. Senator, industrialist, and philanthropist, b. Ontario, Canada. He moved (1887) to Detroit, and after he entered (1903) into partnership with Henry Ford, he became vice president and general manager of the Ford Motor Company. In 1919 he sold his interests to the Fords for \$35 million. As mayor (1919-22) of Detroit, Couzens installed municipal street railways. Serving (1922-36) in the U.S. Senate, he acted with the Progressive Republicans, advocating such measures as high, graduated income taxes and public ownership of utilities. He established the Children's Fund of Michigan with \$10 million, gave \$1 million for relief in Detroit, and began a loan fund for the physically handicapped. His support of the New Deal cost him (1936) the senatorial renomination. See biography by Harry Barnard (1958).

Covadonga (kō'vathōn'ga), village, Oviedo prov., N Spain, in Asturias. A battle fought nearby sometime between 718 and 725 was the first victory of the Christians over the Moors, it had great symbolic significance in the Christian reconquest of Spain. The village attracts many tourists. Legend says that a cave near Covadonga was the refuge of King PELAYO. The cave's chapel dates from the 8th cent.

covalent bond (kō'vālānt) see CHEMICAL BOND.

Covarrubias, Miguel (mēgāl' kōvar-rōō'bēas), 1902-1957, American artist and writer, b. Mexico City. Largely self-taught, he went to New York City in 1923 and won prompt recognition as a brilliant illustrator, stage designer, and caricaturist. His drawings and caricatures for *Vanity Fair* and the *New Yorker* are superb examples of his early work. He also was a noted muralist and lithographer. In the late 1920s he became interested in ethnology. His first major book, *The Island of Bali*, appeared in 1937. He later wrote three excellent studies of the life and art of the American Indians, *Mexico South* (1946), *The Eagle, the Jaguar, and the Serpent* (1954), and *Indian Art of Mexico and Central America* (1957).

covenant (kūv'anant), agreement entered into voluntarily by two or more parties to do or refrain from doing certain acts. In the Bible and in theology the covenant is the agreement or engagement of God with man as revealed in the Scriptures. In law a covenant is a contract under seal or an agreement by deed. In Scottish history the various pacts among the religious opponents of episcopacy were called covenants, those who agreed to the pacts were the COVENANTERS. The idea of the covenant between God of Israel and His people is fundamental to the religion of the Old Testament. God promised man specific good if man gave God the obedience and love due Him. In the covenant of God and Noah, He agreed never again to destroy man by a flood and set the rainbow in the sky as the sign of the covenant. Gen. 9. The covenants with Abraham, Isaac, and Jacob established Israel as God's chosen people and promised Canaan to them. Gen. 17, 26:1-5, 28:10-15, 32:24-32. The culmination of God's covenants with Israel comes in His promises and delivery of the Law of Moses. This provides the theme of Exodus, Leviticus, Numbers, and Deuteronomy. The great covenant with Israel is called in Christian theology the Old Covenant, because Jesus is believed to have come to fulfill it and set up a new and better covenant. Mat. 5:17, 18, Gal. 4, Heb. 8-10. This theology is behind the conventional names of the two parts of the Bible, for testament in the expressions "Old Testament" and "New Testament" is derived from a Latin mistranslation of a Greek word used in the Septuagint for covenant. In Protestant theology the covenant is especially prominent in the teaching of Johannes COCCIEUS. In English common law, covenants are agreements entered into by deed. One of the parties promises to perform or not to perform certain acts, or states that something has or will be done, or has not or will not be done. Covenants are bound by the same rules as other contracts and are variously classified. There are affirmative, alternative, auxiliary, collateral, concurrent, declarative, dependent, executory, express, and independent covenants, and covenants in law are covenants for title, covenants of seizin, covenants of warranty, and others. The express promise contained in a covenant is its most characteristic feature and distinguishes it from a bond, which is a simple record of indebtedness. The sealing and delivery of a covenant is an essential element of its validity. The covenantor is the party bound to perform the stipulation of a covenant, the covenantee is the party in whose favor the covenant is made.

Covenanters (kāvānān'tarz), in Scottish history, groups of Presbyterians bound by oath to sustain each other in the defense of their religion. The first formal Covenant was signed in 1557, signaling the beginning of the Protestant effort to seize power in Scotland. It was renewed thereafter at times of crisis, most notably in the 17th cent. The National Covenant of 1638 aimed to unite the Scots in opposition to the episcopal innovations of King Charles I and William LAUD, especially the use of the English Book of Common Prayer. The Covenanters successfully resisted the king's armies in the BISHOPS' WARS (1639-40). In the ENGLISH CIVIL WAR they supported the parliamentary party only after the English Parliament had accepted (1643) the Solemn League and Covenant, which provided for the establishment of a Presbyterian state church in England and Ireland as well as in Scotland. After the first civil war, however, the Independents in the English army secured control of affairs and prevented implementation of the

Covenant. The Scots, therefore, concluded the agreement known as the "Engagement" with Charles I, by which the king agreed to establish Presbyterianism in England if restored to the throne. As a result, the Covenanters fought for Charles I in the second civil war and, after his execution (1649), they fought for Charles II, who also subscribed (1650) to the Solemn League and Covenant. They were subdued, however, by Oliver Cromwell's conquest of Scotland (1650-51). After the Restoration (1660), Charles II resumed his father's effort to impose episcopacy in Scotland. The Covenanters were subjected to alternate attempts to conciliate them and to hunt them down. The result was a series of new compacts of resistance among them and new attempts to suppress them. A rebellion in 1679, which culminated in a rout at Bothwell Bridge, was met with harsh repression, as was the resistance of Richard CAMERON and his followers, who issued the Sanquhar Declaration in 1680. The troubles ended with the Glorious Revolution of 1688, which restored the Presbyterian Church in Scotland. See studies by J. K. Hewison (1908) and J. D. Douglas (1964).

Covent Garden (kūv'ənt), area in London containing the city's principal fruit and garden market and the Royal Opera. The market was established in 1671 by Charles II on the site of the abbot of Westminster's convent garden, from which the present area's name is derived. In 1974 the entire market was removed to a new site at Nine Elms on the South Bank of the Thames near Vauxhall. The Royal Opera was erected on the site of the Theatre Royal built in 1732 by John RICH and later managed by the KEMBLE family. After being repaired and enlarged in 1787, the theater burned down in 1808 and was replaced, only to burn down again in 1856. It was rebuilt in 1858 to house opera and ballet. The Royal Ballet began performing at the Royal Opera in the spring of 1946. See studies by E. B. Chancellor (1930), Harold Rosenthal (1958), and Clemence Dane (1964).

Coventry (kōv'əntre), county borough (1971 pop. 334,839), Warwickshire, central England. It is an industrial center noted for automobile production, tractors, airplanes, machine tools, synthetic textiles, electrical equipment, and engineering products are also made. Lady GODIVA and her husband founded a Benedictine abbey in the town in 1043. By the 14th cent. Coventry, a flourishing market and textile-weaving town, was one of the five largest towns in England. The entire central portion of Coventry, including the 14th-century Cathedral of St. Michael, was destroyed in an 11-hour air raid in Nov., 1940. A new cathedral, alongside the ruins of the old one, was completed in 1962. Of interest are a statue of Lady Godiva, St. Mary's Hall (1340-42, with 15th-century additions), Holy Trinity Church (13th cent.), with a spire 237 ft (72 m) high, the spire (230 ft/70 m high) of Christ Church, and Ford's Hospital, a restored Tudor almshouse. Coventry's educational institutions include the Univ. of Warwick, Lancaster College of Technology, Coventry College—a teacher training school, and two old public schools. In 1974, Coventry became part of the new metropolitan county of West Midlands.

Coventry, town (1970 pop. 22,947), Kent co., W. R. I., settled 1643, set off from Warwick and inc. 1741. Formerly a noted lace center, it still has textile industries, but today glass, chemicals, and pharmaceuticals are also important. Coventry's many historic structures include the Payne house (1668) and Nathanael Greene's homestead (1770).

Coventry Plays: see MIRACLE PLAY.

cover crop, green temporary crop grown to prevent or reduce erosion and to improve the soil by building up its organic content. Green-manure crops are usually classed as cover crops. In orchards a cover crop is sometimes used to check the growth of some fruits when they reach maturity by supplying a plant that will compete with the tree for the nutrient in the soil. Cover crops are often the first means used to rehabilitate land that has become run down as the result of poor farming practices and neglect. Leguminous plants (e.g., clovers, vetches, and soybeans) and nonleguminous (e.g., rye, barley, wheat, and turnips) are used. See CATCH CROP.

Coverdale, Miles, 1488-1569, English translator of the Bible, educated at Cambridge. Coverdale was ordained (1514) and entered the house of Augustinian friars at Cambridge. He became an advocate of ecclesiastical reform, and his preaching against confession and images forced him to reside abroad. In 1535, Coverdale published an English translation of the entire Bible, probably largely with the aid of German versions, Tyndale's Pentateuch and New

Testament, and the Vulgate. He was a principal collaborator in the Great Bible (1539) and edited that of 1540, known as Cranmer's Bible. On the fall (1540) of Thomas Cromwell, Coverdale again went to the Continent, but he returned (1548) and enjoyed high favor under Edward VI, serving as bishop of Exeter from 1551 to 1553. On Mary's accession he lost his bishopric and again left England. After Elizabeth's succession, he resumed his life in England, where he was widely known for his eloquent sermons and addresses. Coverdale was rector of St Magnus, London Bridge, from 1563 to 1566. See his writings and letters (ed. by George Pearson, 2 vol., 1844-46), Henry Guppy, *Miles Coverdale and the English Bible* (1935).

covered wagon: see CONESTOGA WAGON, PRAIRIE SCHOONER

Covilhã (kõõvêlyãN'), town (1970 municipal pop. 60,768), E central Portugal, in Beira Baixa. It had a famous fair in medieval times and is still a trade center as well as a textile milling town.

Covina (kõvê'nã), city (1970 pop. 30,380), Los Angeles co., S Calif., inc. 1901. Citrus fruits are processed, and medical supplies and fabricated-metal products are made. The area was settled in 1842, citrus crops were introduced in 1886, and the citrus industry reached its peak in the 1930s when Covina was one of the world's largest producers.

Covington. 1 City (1970 pop. 10,267), seat of Newton co., N central Ga., inc. 1854. It is a processing and market center in a cotton area. Natural and synthetic textiles are manufactured in the city. Points of interest include antebellum homes spared by Sherman in his march (1864) to the sea. 2 City (1970 pop. 52,535), seat of Kenton co., N central Ky., at the confluence of the Ohio and Licking rivers, inc. 1815. It is an industrial center, connected by bridges with Cincinnati across the Ohio and Newton across the Licking. There are tobacco and meat-packing establishments and plants making a great variety of products, including paper, sheet metal, metal fabricators, machine tools, and electrical equipment. A ferry and a tavern were established there c. 1801, and the city was first settled in 1812. Among its points of interest are the suspension bridge to Cincinnati (designed by) A. Roebling), Devou Park, with a museum of natural history, Cathedral Basilica of the Assumption, the tiny Monte Casino chapel, the Garden of Hope, and the Carneal House (1815). Frank Duveneck was born in Covington, and the city has a museum devoted to his paintings. The artist and naturalist Daniel Carter Beard was also born in Covington and lived there. Thomas More College (formerly Villa Madonna College) is in nearby Fort Mitchell. The greater Cincinnati airport is also in the area. 3 City (1970 pop. 10,060), seat of Allegheny co. but politically independent, W central Va., near the W. Va. line, on the Jackson River in a valley surrounded by mountains, laid out 1819, inc. as a city 1952. Paper, furniture, chemical fibers, and film are manufactured in Covington. Nearby Humpback Bridge (built 1835, used until 1929) is the only covered bridge of its construction left in the United States. There is excellent hunting and fishing in the area, and a state park is nearby.

cow: see CATTLE DAIRYING

Cowansville, town (1971 pop. 11,920), S Que., Canada, on the Yamaska River, SE of Montreal. It is a manufacturing town producing textiles, furniture, electronic equipment, and chemicals.

Coward, Sir Noel, 1899-1973, English playwright, actor, composer, and director, b. Teddington. Onstage from the age of 12, Coward gained prominence in 1924 acting in his *Vortex*. His name soon became synonymous with urbanity, sophistication, incomparable wit, and a certain sentimentality. The characters in his 27 plays are usually rich, vain, spoiled, and snobbish couples, who express themselves with a brittle badinage that covers the suffering they undergo together or apart. Coward's success was such that five of his plays were hits in London in 1925. The best-known of his theater works include *Fallen Angels* (1925), *Hay Fever* (1925), *Easy Virtue* (1925), *Private Lives* (1930), *Cavalcade* (1931), *Design for Living* (1932), *Conversation Piece* (1934), and *Blithe Spirit* (1941). He also wrote revues, sketches, musical comedies, operettas, and 281 songs. His major films include the romantic masterpiece *Brief Encounter* (1946) and the patriotic film *In Which We Serve* (1942), for which he was director, actor, and producer. Coward wrote short stories and a novel, *Pomp and Circumstance* (1960), performed in cabaret, made recordings, and wrote three autobiographical works, *Present Indicative* (1937), *Middle East Diary* (1945), and *Future Indefi-*

nite (1954). His *Song at Twilight* (1966) is an autobiographical drama about the agony of an aging homosexual writer who has had to write dishonestly about himself. The play initiated a tremendous revival of interest in Coward's works. See biographies by Robert Greacen (1954), Sheridan Morley (1969), and Charles Castle (1973).

cowbird, New World bird of the blackbird and oriole (hangnest) family. The male eastern, or common, cowbird is glossy black, about 8 in. (20 cm) long, with a brown head and breast, the female is gray. Most cowbirds lay their eggs in the nests of smaller bird species, victimizing especially vireos, sparrows, and flycatchers. Sometimes the alien egg is ejected or buried under a new nest floor or the nest is abandoned, but usually the host bird incubates the egg and feeds the voracious intruder while its smaller offspring are starved or crowded out. Cowbirds eat seeds but feed chiefly on insects, following behind grazing cattle in order to capture the insects stirred up in this way—hence the name *cowbird* and the earlier name *buffalo bird*. Related birds are the bronzed, the California, the dwarf, the Nevada, and the red-eyed cowbirds. Cowbirds are classified in the phylum CHORDATA, subphylum Vertebrata, class Aves, order Passeriformes, family Icteridae.

cowboys, in American history. 1 Tory marauders, adherents to the British cause in the American Revolution, who fought in the contested area of Westchester co., N.Y. Their opposite numbers, who favored the Revolutionary cause and who operated in the same territory at the same period, were called *skinnners*. 2 Mounted men employed as herders on cattle ranches of the American West. They were more important and picturesque in the days before the vast ranches were fenced, when their duties consisted of driving cattle to pasture and water, branding them at the roundup, protecting them from wild animals and thieves, and driving them to the shipping point. See RODEO. See Emerson Hough, *The Story of the Cowboy* (1897, repr. 1970), J. B. Frantz and J. E. Choate, Jr., *The American Cowboy, the Myth and the Reality* (1955, repr. 1968), John A. Lomax and Alan Lomax, *Cowboy Songs and Other Frontier Ballads* (rev. ed. 1966).

Cowell, Henry Dixon, 1897-1965, American composer and pianist, b. Menlo Park, Calif., largely self-educated, studied musicology in Berlin (1931-32). He experimented with new musical resources, in his piano compositions he introduced the tone cluster, played with the arm or the fist, and wrote compositions to be played directly on the strings of the piano. Cowell founded (1927) *New Music*, a quarterly for the publication of music by contemporary American and European composers. In 1932, with the help of Leon Theremin, he invented the rhythmicon, a device that produces various rhythms and cross-rhythms mechanically, for which he wrote a concerto (1932). An interest in counterpoint produced the five *Hymns and Fuguing Tunes* (1941-45). He also wrote symphonies, piano pieces, band music, and vocal and chamber music, and edited *American Composers on American Music* (1933). See his *New Musical Resources* (1930, repr. 1969).

Cowes (kouz), urban district (1971 pop. 18,895), Isle of Wight, S England. A resort town with lovely promenades, it is also the main port of the island and the center for yachting in the British Isles. Cowes became the headquarters of the Royal Yacht Club in 1838, and fashionable regattas are held annually. Industries include shipbuilding and aircraft works. Queen Victoria died in Osborne House in East Cowes. In 1974, Cowes became part of the new nonmetropolitan county of Isle of Wight.

cowfish: see TRUNKFISH

Cowl, Jane, 1890-1950, American actress, playwright, and producer, b. Boston, Mass. Cowl's stage career began in 1903 with *Sweet Kitty Bellairs*. Between 1917 and 1935 she was a leading lady nearly every season, appearing in *The Road to Rome*, *Romeo and Juliet*, *Lilac Time*, and *Smilin' Through*, among others. Cowl coauthored six successful plays and performed on radio, in films (e.g., *The Garden of Lies*, 1915, and *Payment on Demand*, 1950), and on television.

Cowley, Abraham (kõd'le, kou'-), 1618-67, one of the English METAPHYSICAL POETS. He published his first volume of verse, *Poetical Blossoms* (1633), when he was 15. While a student at Cambridge, Cowley wrote three plays and began the scriptural epic *Davidis* (1656), in which he developed the use of the couplet as a vehicle for narrative verse. As a result of the Puritan uprising he left Cambridge and in 1656 went to France, where he served as secretary

and royalist agent for Queen Henrietta Maria. Cowley's principal works include *The Mistress* (1647), a love cycle written in the manner of John Donne, *Poems* (1656), including the Pindaric odes and the elegies on Richard Crashaw and William Hervey, and *Verses on Several Occasions* (1663), including "To the Royal Society," an ode recalling his earlier prose tract *Proposition for the Advancement of Experimental Philosophy* (1661). See Samuel Johnson's essay in *Lives of the English Poets* (1778), biographies by A. H. Nethercot (1931, repr. 1967) and J. G. Taaffe (1972), study by R. B. Hinman (1960).

Cowley, Hannah, 1743-1809, English poet and dramatist. One of the DELLA-CRUSCANS, she contributed under the name Alma Matilda sentimental verse to the *World*. Her most successful comedy was *The Belle's Stratagem* (produced in 1780).

Cowley, Malcolm (kou'le), 1898-, American critic and poet, b. Beltsville, Pa., grad. Harvard, 1920. He lived abroad in the 1920s and knew many writers of the "lost generation," about whom he wrote in *Exile's Return* (1934) and *Second Flowering* (1973). For many years he wrote a book-review column for the *New Republic*. His works include *The Blue Juniata* (1927) and *A Dry Season* (1942), poems, *The Literary Situation* (1954), a critical analysis, and *Many Windowed Houses: Collected Essays on Writers and Writing* (1970).

cow lily: see WATER LILY

Cowloon: see HONG KONG

cowpea, black-eyed pea, or black-eyed bean, annual leguminous plant (*Vigna sinensis*) of the family Leguminosae (PULSE family). Native to the Old World, it was introduced in the early 18th cent. to the United States, where it is now much used in Southern cooking and, especially, as a CATCH CROP and a major forage plant. The cowpea is also grown commercially in India and China and is sometimes called China bean. Cowpeas are classified in the division MAGNOLIOPHYTES, class Magnoliopsida, order Rosales, family Leguminosae.

Cowpens National Battlefield: see NATIONAL PARKS AND MONUMENTS (table)

Cowper, William (kõd'pär, kou'-), 1731-1800, English poet. Physically and emotionally unfit for the professional life, he was admitted to the bar but never practiced. After a battle with insanity, Cowper retired to the country, taking refuge with the family of Mrs. Mary Unwin, whose life-long devotion to him he celebrates in "To Mary." Most of his country life was spent at Olney, where he met John Newton, the ardent evangelical preacher. He contributed to Newton's *Olney Hymns* (1779) several poems, including the two commencing "Oh for a closer walk with God" and "God moves in a mysterious way." His hymns, while expressing the hope of the new humanitarian religious revival, often gave way to religious despair and self-distrust. After Newton left Olney, Cowper, having recovered from another period of insanity, turned to writing about simple homely subjects, producing his famous long poem, *The Task* (1785). Its descriptions of the sights and sounds of country life foreshadowed 19th-century romanticism. Cowper's sweet-tempered, playful moods found a way into many of his poems, the most notable being "The Diverting History of John Gilpin." He also made a relatively unsuccessful translation of Homer (1791). After the death of Mrs. Unwin in 1796, his old malady returned, and he wrote little except the anguished poem, "The Castaway." His letters are considered among the most brilliant in English literature. See his verse and letters selected by B. Spiller (1968), biography by D. Cecil (1947), study by J. A. Roy (1914, repr. 1972).

Cowper, William Cowper, 1st Earl (kõd'pär), 1664?-1723, English jurist. He became lord keeper of the great seal in 1705 and in 1706 took a leading part in negotiating the union of England with Scotland. He was the first lord chancellor of Great Britain (1707-10), and presided at the trial of Henry Sacheverell, though he disapproved the action. He was forced out of office with the Whigs in 1710. Cowper wrote (1714) a tract on political parties to convince George I that the Whigs alone were loyal to the Glorious Revolution and the Act of Settlement. He was lord chancellor again (1714-18) and contributed much to the modern system of equity.

Cowper's gland: see REPRODUCTIVE SYSTEM

cowpox, infectious disease of cows caused by a virus related to the virus of smallpox. Also called variola, it is characterized by pustular lesions on the teats and udder. Cowpox is transmitted by contact, inducing a mild infection of the hands in persons who milk infected cows. The fact that such persons

had immunity to smallpox led Edward JENNER to attempt VACCINATION with this virus, instead of using the dangerous method of vaccinating with material from the sores of smallpox. Jenner's method was successful and is the basis of the modern vaccination against smallpox. Horses and sheep may contract a similar disease.

cowrie or **cowry** (both kou'rê), common name applied to marine gastropods belonging to the family Cypraeidae, a well-developed family of marine snails found in the tropics. Cowries are abundant in the Indian Ocean, particularly in the East Indies and the Maldiv Islands. Species of cowries inhabit the waters around 5 California and the warm waters southward from the SE United States. They characteristically have massive, smooth, shiny shells with striking patterns and colors. The upper surface is round and the lower flat. When alive, the cowrie's shell is usually concealed by its large mantle, as the cowrie creeps along the ocean bottom, the mantle envelops the shell. As the body grows, the inner whorls of the shell are dissolved, and the dissolved lime is then used to enlarge the outer whorl of the shell. Some shells have been used for money, e.g., those of the money cowrie, *Cypraea moneta*. The shells of various species are used also for personal adornment and in some primitive cultures indicate the rank of the wearer. The smooth brown cowrie, *Cypraea spadicea*, inhabits the protected outer coast and mud flats in 5 California, often as far north as Newport, Calif. The most prized cowrie for a shell collector is the tiger cowrie, *Cypraea tigris*, which grows to 4 in. (10 cm) in length and whose shell is considered by some to be the most lustrous shell of the South Pacific. Having the appearance of a tiger skin, it is white with many brown spots. Cowries are classified in the phylum MOLLUSCA, class Gastropoda, order Mesogastropoda, family Cypraeidae.

cowslip, name for plants of the BORAGE, MARSH MARI-GOLD, and PRIMROSE families.

Cox, David, 1783-1859, English landscape painter, a follower of John Constable. He is best known for his watercolors of Welsh scenery, of which he produced a great number. Cox is well represented in the British and the Victoria and Albert museums and in the Birmingham Art Gallery. See biographies by N. N. Solly (1875) and William Hall (1881), study by F. G. Roe (1946).

Cox, Jacob Dolson, 1828-1900, Union general in the Civil War and American statesman, b. Montreal, of a New York City family. Admitted to the Ohio bar in 1853, he was active in organizing the new Republican party there and served (1859-61) in the state senate. Cox, made a brigadier general of volunteers early in the Civil War, served ably in the Kanawha valley and Antietam campaigns and commanded in West Virginia (1862-63) and Ohio (April-Dec., 1863). He later led a corps in the Atlanta campaign (1864), fought at Nashville (Dec., 1864), and finished his service with Sherman in North Carolina. He had risen to be a major general of volunteers and, returning home a hero, was elected governor of Ohio for the term 1866-68. Because he supported President Andrew Johnson on Reconstruction against the radical Republicans, he was not renominated. Nevertheless U. S. Grant, on assuming the presidency, made Cox his Secretary of the Interior. This was one of Grant's few good appointments. Cox, however, advocated and practiced civil service reform and opposed the President on other points, notably the move to annex Santo Domingo. The Republican spoilsman had long been hostile to him, and in Oct., 1870, Cox resigned from the cabinet and became identified with the Liberal Republicans. He later served one term in Congress (1877-79), was dean of the Cincinnati Law School for 16 years beginning in 1881, and also served as president of the Univ. of Cincinnati from 1885 to 1889. He wrote ably on military affairs. His books include *Atlanta* (1882), *The Battle of Franklin* (1897), *The March to the Sea* (1898), and *Military Reminiscences of the Civil War* (1900). Kenyon Cox was his son.

Cox, James Middleton, 1870-1957, American political leader and journalist, b. Butler co., Ohio. After serving on the editorial staff of the Cincinnati *Enquirer*, he bought the Dayton (Ohio) *Daily News* (1898) and subsequently acquired several other papers in different states. He served in the U. S. House of Representatives (1909-13). As governor of Ohio (1913-15, 1917-21) he became prominent as a supporter of President Wilson. Nominated in 1920 as presidential candidate by the Democratic party with Franklin Delano Roosevelt as his running mate, Cox, a staunch supporter of the League of Nations, was soundly defeated by Warren C. Harding. See his autobiography, *Journey through 44 Years* (1946).

Cox, Kenyon, 1856-1919, American painter, draftsman, and art critic, b. Warren, Ohio. He studied in Cincinnati, at the Pennsylvania Academy of the Fine Arts, and with Carolus-Duran and Gerôme in Paris. He worked in New York City, where he became an influential teacher at the Art Students League and the National Academy of Design. His portraits, figure pieces, and murals are academic in style. He painted murals for the Library of Congress, the state capitols of Iowa and Minnesota, and the public library of Winona, Minn. His portrait of Saint-Gaudens is in the Metropolitan Museum. Cox's writings on art include *Old Masters and New* (1905), *The Classic Point of View* (1911), and *Concerning Painting* (1917).

Cox, Samuel Sullivan, 1824-89, American statesman and legislator, b. Zanesville, Ohio. He traveled widely, practiced law, and was a newspaper editor before serving (1857-65) as a Congressman from Ohio. He moved (1865) to New York City and served again (1869-85) in the U. S. Congress. Cox argued for reforms in the civil service, worked to extend the scope of the census, and championed legislation for the development of the West. After serving (1885-86) as minister to Turkey, he again entered (1886) Congress. Among his books are *A Buckeye Abroad* (1852), *Puritanism in Politics* (1863), and *Three Decades of Federal Legislation* (1885). See biography by David Lindsey (1959).

Coxe, Tench, 1755-1824, American political economist, b. Philadelphia. He entered his father's mercantile business in 1776, but after 1790, when he became assistant to Alexander Hamilton, the Secretary of the Treasury, he remained in public office, although he never attained an important office. A firm believer in a balanced national economy, he supported Hamilton in his efforts to put the finances of the country on a sound basis. Politically, however, he was Anti-Federalist. He assisted Jefferson on two reports to Congress—one on fisheries, the other on foreign commerce. In *Coxe's Enquiry into the Principles on Which a Commercial System for the United States of America Should Be Founded* (1787), he first urged the necessity of an economy balanced between agriculture and manufacturing. He advocated especially the culture and manufacture of cotton. Many of his essays are collected in his *Views of the United States* (1794). His *Statement of the Arts and Manufactures of the United States of America* 1810 is an official digest of the census data collected in that year. See study by Harold Hutcheson (1938).

Coxetter, Louis Mitchell (kôk'səter), 1818-73, Confederate privateersman and blockade-runner, b. Nova Scotia. He settled in Charleston, S. C., and in the Civil War he captained the ship *Jefferson Davis*, which captured 10 prizes in 1861. When, because of the increasing effectiveness of the Union blockade, profiteering declined, Coxetter turned to blockade-running, at which he was equally successful.

Coxey, Jacob Sechler (kôk'sē), 1854-1951, American social reformer, b. Selinsgrove, Pa. He began his career as a stationary engineer, later turning to the scrap-iron business and then to sandstone quarrying in Massillon, Ohio. Interested in the problem of the unemployed, he advocated public works, financed by fiat money, as a remedy. He was Republican mayor (1931-33) of Massillon but was an unsuccessful candidate for many major public offices, including the presidency in 1932 and 1936. He was most famous, however, as the leader of *Coxey's Army*, a band of jobless men who marched to Washington, D. C., following the Panic of 1893, to petition Congress for measures that they hoped would relieve unemployment and distress. Coxey was aided by Carl Browne, a skilled agitator with curious religious notions. By wide advertising Coxey gathered more than 100 men and left Massillon with them on Easter Sunday, 1894, intending to reach Washington for a May Day demonstration. The "army," named the Commonwealth of Christ by Browne, was met by crowds in every city through which it passed. It had an anticlimactic and ineffectual ending when, reaching Washington with c. 500 men instead of the proclaimed 100,000, its leaders were arrested for walking on the Capitol lawn. Coxey's was only one of several industrial "armies" that in those months started from different sections of the country for the capital. See D. L. McMurry, *Coxey's Army* (1929, repr. 1970).

Coyoacan* see MEXICO, city

coyote (kî'ôt, kî'ô'tē) or **prairie wolf**, small, swift wolf, *Canis latrans*, native to W. North America. It is found in deserts, prairies, open woodlands, and brush country, it is also called brush wolf. The coy-

ote resembles a medium-sized dog, with a narrow, pointed face, long, thick, tawny fur and a black-tipped bushy tail. Adult males have a head and body length of about 35 in. (89 cm), with a 14-in. (36-cm) tail, they stand 21 in. (53 cm) at the shoulder and usually weigh about 30 lb (14 kg). The cry of the coyote, heard in the early evening, is a series of high-pitched yelps. Coyotes live in pairs, and both parents care for the young, they make their dens in roots of trees, rock crevices, or in ground burrows made by other animals. They are largely nocturnal, but are also seen in the day. They hunt alone, in pairs, or in small groups. Omnivorous feeders, they prey on a variety of small animals, sometimes cooperating to attack larger mammals, they also eat plant matter, carrion, and garbage. They can maintain a speed of 35 mi (56 km) per hour while chasing prey. Coyotes are responsible for destroying some domestic livestock, but they are valuable scavengers and destroyers of rodents. There has almost always been a bounty on coyotes somewhere in the United States, and many thousands are killed each year. Despite this, coyotes have not been reduced in number, and their range has actually increased in the past century. Common in the central and W. United States, they range N to Alaska, S to Central America, and E to the Great Lakes, they are occasionally seen even in New England. They are classified in the phylum CHORDATA, subphylum Vertebrata, class Mammalia, order Carnivora, family Canidae.

Coyppel (kwəp'ēl), family of French painters. Noel Coyppel, 1628-1707, director of the Académie de France à Rome and later of the Académie royale de peinture et de sculpture in Paris, was employed on the decorations of the palaces of the Louvre, Tuileries, Fontainebleau, and Versailles. One of his best-known paintings is the *Martyrdom of St. James* (Notre-Dame de Paris). He was succeeded as director of the Académie royale by his son, **Antoine Coyppel**, 1661-1722, who was made court painter in 1716. His Aeneid series, painted for the Palais-Royal, are among the foremost expressions of high baroque decoration in France. His work combined the pedantry of classical taste with the melodrama of baroque trompe-l'œil (illusionistic) effects. He was also an accomplished etcher.

coyppu* see NUTRIA

Coysevox, Antoine (āntwan' kwəzvō'), 1640-1720, French sculptor. He enjoyed the patronage of Louis XIV and produced a great part of the sculpture at Versailles. His *Winged Horses*, at the entrance to the Tuileries gardens, and his portrait and memorial sculptures show free, vigorous, and original treatment. The bust of Conde (Le Havre), that of Colbert (Versailles), and the tomb of Mazarin (Louvre) are notable works.

Coz (kōz), Judahite. 1 Chron. 4:8.

Cozbi (kōz'bī), Midianite woman whom Phinehas killed Num. 25:6-18.

Cozens, Alexander (kūz'ənz), c. 1717-1786, English draftsman and writer, b. Russia. Cozens is thought to have been the first principal English master to work entirely with landscape subjects. He invented a system of "blot" drawings using accidental blots on drawing paper to aid his imagination by suggesting a landscape that could be further developed. In the 1950s his work was exhibited as that of a precursor of the ABSTRACT EXPRESSIONISTS. He expounded his blot system in his treatise, *A New Method of Assisting the Invention in Drawing Original Compositions of Landscape* (c. 1785). His son, John Robert Cozens, 1752-97, English watercolor landscape artist, is best known for his poetic paintings of the Alps and Italy. His work had an influence on both Turner and Girtin. Examples of his watercolors are in the Victoria and Albert Museum, the Tate Gallery, and the British Museum (all London). See A. P. Oppe, *Alexander and John Robert Cozens* (1953).

Cozzens, James Gould, 1903-, American novelist, b. Chicago. His novels usually concern upper-middle-class professional men who are faced with moral dilemmas that require partial compromise with their ideals. All Cozzens's works are characterized by meticulous craftsmanship and an objective, almost clinical style. Among his important novels are *The Last Adam* (1933), *The Just and the Unjust* (1942), *Guard of Honor* (1948, Pulitzer Prize), *By Love Possessed* (1957), and *Morning, Noon, and Night* (1968).

Cr, chemical symbol of the element CHROMIUM.

crab, CRUSTACEAN with an enlarged cephalothorax covered by a broad, flat shell called the carapace. Extending from the cephalothorax are the various appendages: five pairs of legs, the first pair bearing claws (or pincers), are attached at the sides, two

eyes on short, movable stalks, two short antennules, two longer antennae, and numerous mouthparts are attached at the front, at the rear the tiny abdomen is bent under the cephalothorax. Crabs are chiefly marine, but some are terrestrial for long periods. They are omnivorous, some are scavengers and others predators. The abdomen of the female, wider and flatter than that of the male, forms an apronlike structure that continuously circulates water over the eggs that are carried on her underside. The free-swimming larva, which hatches in about two weeks, is easily recognized by the large spine that projects from its carapace. After several molts, the young crab settles to the bottom and begins to take on adult features. Crabs tend to move sideways, although they are capable of locomotion in all directions. Swimming crabs have the last pair of legs flattened to form paddles, of these the BLUE CRAB of the Atlantic coast of the United States is much used for food. It is marketed as a soft-shelled crab after it has molted and before the new shell has hardened. Females of the oyster and mussel crabs live inside the shells of bivalve mollusks. Often seen scurrying about near their burrows in muddy banks are the FIDDLER CRABS, the males of which have one much enlarged claw used in defense and in courtship rituals. The sand, or ghost, crabs build burrows high up on the sand into which they seem to vanish. The sluggish, long-legged spider crabs are often disguised by the algae, barnacles, and sea anemones that attach themselves to the carapace. The giant spider crab of Japan, the largest living arthropod, has legs about 4 ft (22 cm) long and a carapace over 1 ft (30 cm) wide. The closely related kelp crabs are found in kelp beds in the Pacific. The name king crab is applied to the largest (up to 15 lb/6.8 kg) of the edible crabs, found in the N Pacific and marketed canned or frozen, and also to the HORSESHOE CRAB, which is not a crustacean. True crabs are classified in the phylum ARTHROPODA, class Crustacea, order Decapoda. See also HERMIT CRAB.

Crab, The, English name for CANCER, a CONSTELLATION.

crabapple: see APPLE.

Crabb, George, 1778–1851, English writer and philologist. He is known for his *Dictionary of English Synonyms* (1816) and his *History of English Law* (1829).

Crabbe, George, 1754–1832, English poet, b. Aldeburgh, Suffolk. After practicing medicine for a short time, he went to London in 1780, hoping to earn money by his writing. He was befriended by Edmund Burke, whose generous assistance aided in the publication of *The Library* (1781). He took orders in 1781 and held various livings, becoming rector at Trowbridge in 1814. *The Village* (1783), his most famous work, is a grim picture of rustic life, written partly in reply to Goldsmith's nostalgic *Deserted Village*. His bleak, realistic descriptions of life led Byron to call him "nature's sternest painter, yet the best." His other works include *The Parish Register* (1807), *The Borough* (1810), *Tales* (1812), and *Tales of the Hall* (1819). See biographies by his son (ed. by E. M. Forster, 1932, repr. 1949) and R. L. Chamberlain (1965), study by Arthur Pollard (1972).

crabgrass, name for any of several GRASS species of the genus *Digitaria*, and especially the species *D. sanguinalis*. Crabgrass is a common lawn weed, especially in the S and E United States. The grass has branching stems that may reach a length of 3 ft (91 cm) and flowers borne on purple spikes. It is sometimes cut for hay.

Crab Nebula, diffuse gaseous NEBULA in the constellation Taurus, cataloged as M1 or NGC 1952. It is the remnant of a SUPERNOVA observed in 1054 by the Chinese and Japanese. The nebula is a strong emitter of radio waves and X rays. At its center is an optical PULSAR.

Crabtree, Lotta, 1847–1924, American actress, b. New York City. A protégée of Lola MONTEZ, she became, while still a child, a favorite in California mining camps with her sprightly singing, dancing, and reciting. In 1867 she scored her first success in New York City in a dramatization of Dickens's *Old Curiosity Shop*, and thereafter she performed in burlesque and comic pieces, captivating large audiences. She retired in 1891. See biography by David Dempsey (1968).

cracking of petroleum: see PETROLEUM.

Craddock, Charles Egbert, pseud. of Mary Noailles Murfree, 1850–1922, American novelist, b. near Murfreesboro, Tenn. She wrote her best works about the mountain people of Tennessee, most notably *The Prophet of the Great Smoky Mountains* (1885). Her novels combined romantic

descriptions of landscape with realistic rendering of local dialect. She also wrote a series of Southern historical novels, including *Where the Battle Was Fought* (1884). See biography by E. W. Parks (1941), study by Richard Cary (1971).

Craddock, town (1970 pop. 22,329), Cape Province, SE South Africa, on the Great Fish River, founded as a frontier outpost in 1811. It is a trade and distribution center. Craddock's Dutch Reformed church was built (1868) as a replica of St. Martin's-in-the-Fields in London. Olive Schreiner, the South African author and feminist, lived in Craddock and is buried outside the town.

crafts: see ARTS AND CRAFTS.

Craig, Edward Gordon, 1872–1966, English scene designer, producer, and actor. The son of Ellen Terry, Gordon Craig began acting with Henry Irving's Lyceum company (1885–97). Feeling that the realism in vogue was too limiting, he turned to scene design and developed new theories. He strove for the poetic and suggestive in his designs in order to capture the essential spirit of the play. His ideas gave new freedom to scene design, although many were impractical in execution. Among his notable productions were *The Vikings* and *Much Ado about Nothing* (both in 1903 for Ellen Terry) and *Hamlet* (with the Moscow Art Theatre in 1912). At Florence, Italy, he founded (1913) the Gordon Craig School for the Art of the Theatre, he also edited a magazine, *The Mask* (1908–29). He wrote *On the Art of the Theatre* (1911, rev. ed. 1957), *The Theatre Advancing* (1921), *Scene* (1923), and biographies of Henry Irving (1930) and Ellen Terry (1931). See his memoirs (1957), biographies by his son Edward Craig (1968) and by Denis Babelt (1966).

Craig, James: see CRAIGAVON, JAMES CRAIG 1ST VISCOUNT.

Craig, Sir James Henry, 1748–1812, British soldier, governor of Canada (1807–11), b. Gibraltar. He served in the British army from 1763, fighting in the American Revolution and later holding posts in Africa and India. In 1807 he was appointed governor of Canada and lieutenant governor of Lower Canada (Quebec). His lack of sympathy with representative government and with the French Canadians found expression in his dissolution (1809) of the assembly of Lower Canada and in the imprisonment of the sponsors of the newly established journal *Le Canadien*. His arbitrary methods served only to consolidate the position of the French Canadians. Craig was replaced for reasons of health by Sir George Prevost.

Craig, John, 1512?–1600, Scottish minister of the Reformation. He joined the Dominican order, but through reading the *Institutes* of Calvin, he adopted Protestantism. Imprisoned at Rome for heresy, he escaped (1559) and went to Vienna, where he preached before Archduke Maximilian. Returning to Scotland in 1560, he shortly became the colleague of John Knox in Edinburgh. Chaplain to James VI after 1579, he was the author of the *King's Confession* (1581), upon which was based the National Covenant of 1638. See Craig's Short Summe of the Whole Catechisme (1581, ed. by T. G. Law, 1883).

Craigavon, James Craig, 1st Viscount (krägvä'vən), 1871–1940, Irish statesman. He worked with Edward CARSON in rousing the Protestants of Ulster against HOME RULE in the crisis preceding World War I. He organized the Ulster Volunteers to resist any attempt to enforce Home Rule. In 1921 he became prime minister of the newly established government of Northern Ireland, a position he held until his death. He was created a viscount in 1927. See biography by St. John Ervine (1949).

Craigavon, urban district (1971 pop. 12,594), Co. Armagh, S. central Northern Ireland. Craigavon was designated one of the NEW TOWNS in 1962, primarily to stimulate economic growth. Rubber products are made there.

Craigie, Sir William A., 1867–1957, British lexicographer, b. Dundee, Scotland. Educated at the Univ. of St. Andrews, Craigie studied Scandinavian languages at Copenhagen before beginning in 1893 his career as lecturer at St. Andrews and as lecturer and professor at Oxford. Generally considered the foremost lexicographer of his time, he was engaged on the *New English Dictionary* (commonly called the *Oxford Dictionary*) after 1897 and was joint editor from 1901 to 1933. Craigie was persuaded to come to the United States and was the chief editor of *A Dictionary of American English on Historical Principles* (issued in parts after 1936, published as 4 vol., 1938–43). He also edited other dictionaries, made critical editions of texts, and wrote monographs and textbooks on the English language.

Craik, Dinah Maria Mulock (kräk), 1826–87, English author. She is best known for the moralistic novel *John Halifax, Gentleman* (1856) and for the children's classics *The Adventures of a Brownie* (1872) and *The Little Lame Prince* (1875).

Craiova (kräyö'vā), city (1970 est. pop. 175,000), SW Rumania, in Walachia, on the Jiu River, a tributary of the Danube. It is the administrative and industrial center of the agricultural and mineral-rich Oltenia region and is an important market for grain. Machine building, food processing, and the manufacture of electrical equipment are the chief industries. Built on the site of a Roman settlement, Craiova became the capital of Oltenia in 1492. It was destroyed by an earthquake in 1790 and burnt by the Turks in 1802. An agreement signed in the city in 1940 returned S. Dobruja to Bulgaria. Craiova has a university (est. 1966) and other institutions of higher learning, a state philharmonic orchestra, and several museums containing prehistoric and Roman relics. The 17th-century St. Demetrius church (restored 18th cent.) and the 19th-century palace are also of interest.

crake: see RAIL.

Cram, Ralph Adams, 1863–1942, American architect, b. Hampton Falls, N.H. An ardent exponent of Gothic architecture, Cram produced many collegiate and ecclesiastical works in a neo-Gothic style. Among these are part of the reconstruction of the Cathedral of St. John the Divine in New York City, the graduate school and chapel at Princeton, and buildings at Williams, Phillips Exeter Academy, Rice Univ., and the U.S. Military Academy at West Point. After the withdrawal of B. G. GOODHUE in 1914, the architectural firm with which he was associated was known as Cram and Ferguson.

Cramer, Johann Baptist (yöhan' bäptist' kräm'är), 1771–1858, German pianist and piano teacher. He studied (1779–81) with Clementi in London. From 1788 he toured as a pianist, achieving international distinction. After teaching (1832–45) in Munich and Paris, he returned to London. He wrote many sonatas and several piano concertos, but he is remembered for 84 technical studies (1804).

cramp, painful uncontrollable contraction of a muscle or group of muscles. The type that results from cold, strain, or disturbance of circulation (as experienced by swimmers) is eased by massage and the application of heat. Cramp in the abdominal or skeletal muscles brought on by hard physical exertion in extremely high temperatures (e.g., in miners, stokers, or firemen) because of loss of salt from the body during profuse perspiration can last for hours or days if untreated. Such cramps are considered to be a type of HEAT EXHAUSTION. A cool atmosphere and the replacement of salt and water orally or intravenously is required, and application of heat is not recommended. Heat cramps in persons who do heavy labor can be prevented by the addition of salt to drinking water or by taking salt tablets. Contraction of muscles in a hollow organ is known as COLIC. A stitch in the side is due to a cramp in the muscles between the ribs.

Cranach or Kranach, Lucas (both löö'käs krä'näkh), the Elder, 1472–1553, German painter and engraver. He settled in Wittenberg c. 1504 and was court painter successively under three electors of Saxony. There he maintained a flourishing workshop and was twice burgomaster. Cranach was a friend of Luther, whose doctrine he upheld in numerous paintings and woodcuts, and he has been called the painter of the Reformation. He was a rapid and prolific painter, and the work turned out by his studio is uneven in excellence. Naïve and fanciful, often awkward in draftsmanship, it has, nonetheless, freshness and originality and a warm, rich color. His portraits are particularly successful. Among his best-known works are *Repose in Egypt* (Gemäldgalerie, Staatliche Mus., Berlin-Dahlem), *Judgment of Paris* (Staatliche Kunsthalle, Karlsruhe); *Adam and Eve* (Courtauld Inst., London), and *Crucifixion* (Weimar). This last contains figures of Luther and Cranach. His many famous portraits include those of Elector John Frederick and *Self-Portrait* (Uffizi). Cranach was also an accomplished miniaturist. He produced a few copperplates and designs for woodcuts. See study ed. by E. Ruhmer (1963). His son and pupil Lucas Cranach, the Younger, 1515–86, continued the tradition of his father whose workshop, signature, and popularity he inherited. Their work is often indistinguishable.

cranberry, name for low creeping evergreen BOG plants of the genus *Oxycoccus* of the family Ericaceae (HEATH family). Cranberries are considered by some botanists to be species of the blueberry genus

Vaccinium The tart red berries are used for sauces, jellies, pies, and beverages. The European or small cranberry is found in North America, but the cranberry of commercial cultivation is the native American or large cranberry (*O. v. macrocarpus*). This cranberry has been in cultivation since c 1840, chiefly in New Jersey, Massachusetts, and Wisconsin bogs that are especially prepared for annual flooding. The cranberry is prevalent on Cape Cod and is the chief export crop of Massachusetts. The serving of cranberry sauce with the Thanksgiving turkey is traditional in the United States. Other species of the genus are also called cranberry, but are of less importance. The unrelated high-bush cranberry or cranberry tree belongs to the family *Caprifoliaceae* (*Honeysuckle* family). Cranberries of the heath family are classified in the division *Magnoliophyta*, class *Magnoliopsida*, order *Ericales*, family *Ericaceae*. The family *Caprifoliaceae* is in the order *Dipsacales*.

Cranbrook, city (1971 pop. 12,000), SE British Columbia, Canada. It is a lumbering center.

Cranbrook Foundation, at Bloomfield Hills, Mich., est. and endowed by George G. and Ellen Booth in 1927. It includes a noted academy of art, an institute of science, Christ Church (Episcopal), Brookside School (elementary, coeducational), Cranbrook School (preparatory, for boys, 1927), Kingswood School (preparatory, for girls, 1931). Most of the buildings were designed by Eliel Saarinen, many statues by Carl Milles are also there.

Crandell, Prudence, 1803-89, American educator and abolitionist, b. Hopkinton, RI. In 1831 she opened a school for girls in Canterbury, Conn. Her decision to admit a Negro was protested, and in 1833 she decided to devote the school entirely to the education of Negro girls. She was arrested and tried, the judgment against her being reversed on appeal in 1834. In that year she gave up her work, married the Rev. Calvin Philleo, and moved to the Middle West.

Crane, Hart (Harold Hart Crane), 1899-1932, American poet, b. Garrettsville, Ohio. He published only two volumes of poetry during his lifetime, but those works established Crane as one of the most original and vital American poets of the 20th cent. His extraordinarily complex poetry, with its rich imagery, verbal ingenuity, and meticulous craftsmanship, curiously combines ecstatic optimism with a sense of haunted alienation. *White Buildings* (1926), his first collection of poems, was inspired by his experience of New York City. His most ambitious work is *The Bridge* (1930), a series of closely related long poems on the United States in which the Brooklyn Bridge serves as a mystical unifying symbol of civilization's evolution. Crane's personal life was anguished and turbulent. After an unhappy childhood during which he was torn between estranged parents, he held a variety of uninteresting jobs, always, however, returning to New York City and his writing. An alcoholic and a homosexual, he was constantly plagued by money problems and was often a severe trial to friends who tried to help him. In 1931 he won a Guggenheim Fellowship and went to Mexico to work on a long poem about Latin America, a year later, returning to the U.S., the poem not even started, he jumped overboard from his ship and was drowned. His collected poems were published in 1933. See his letters ed. by T. S. W. Lewis (1974), biographies by Philip Horton (new ed. 1957) and John Unterecker (1969), studies by H. A. Leibowitz (1968) and M. D. Uroff (1974).

Crane, Stephen, 1871-1900, American novelist, poet, and short-story writer, b. Newark, N.J. Often designated the first modern American writer, Crane is ranked among the authors who introduced realism into American literature. The 14th child of a Methodist minister, he grew up in Port Jervis, N.Y., and briefly attended Lafayette College and Syracuse Univ. He moved to New York City in 1890 and for five years lived in poverty as a free-lance writer. His first novel, *Maggie: A Girl of the Streets* (1893), a grimly realistic story of slum life, was unpopular but gained the young writer the friendship of Hamlin Garland and William Dean Howells. Crane's next novel, *The Red Badge of Courage* (1895), brought him wide and deserved fame. Set during the Civil War, the novel traces the development of a young recruit, Henry Fleming, through fear, illusion, panic, and cowardice, to a quiet, humble heroism. This remarkable account of the emotions of a soldier under fire is all the more amazing since Crane had never been in battle. On the strength of the novel he served as a foreign correspondent in Cuba and in Greece. Around 1897 he married Cora Taylor, who

ran a brothel in Florida, this marriage, coupled with Crane's unorthodox personality, aroused scandalous rumors including those that he was a drug addict and a satanist. Because of this unfair slander Crane spent his last years abroad, he died of tuberculosis in Germany at the age of 28. Crane was a superb literary stylist who emphasized irony and paradox and made innovative use of imagery and symbolism. Thus, although realistic, his works are highly individual. In addition to his novels he wrote superb short stories and poems. The title stories of *The Open Boat and Other Tales* (1896) and *The Monster and Other Stories* (1899) are considered among the finest stories in English. His two books of epigrammatic free verse, *The Black Rider* (1895) and *War Is Kind* (1899), anticipated several strains of 20th-century poetry. Crane's collected works were published in 12 volumes (1925-26). See his letters, ed. by R. W. Stallman and Lillian Gilkes (1960), biographies by John Berryman (1950) and R. W. Stallman (1968), studies by D. G. Hoffman (1957), Eric Solomon (1966), Milne Holton (1972), and R. M. Weatherford, ed. (1973), bibliography by R. W. Stallman (1972).

Crane, Walter, 1845-1915, English designer, illustrator, and painter. As a painter he is grouped with the later Pre-Raphaelites, but he is better known for his illustrations of the works of Spenser and of Hawthorne's *Wonder Book* and Grimm's *Fairy Tales*. Seeking with William Morris to ally art with everyday life, he designed textiles, glass windows, tapestries, and house decorations. Crane's interest in socialism is expressed in his cartoons for *Commonweal* and *Justice*. In 1888 he founded the Arts and Crafts Exhibition Society of London. See his memoirs, *An Artist's Reminiscences* (1907), study by P. G. Konody (1902).

crane, large wading bird found in marshes in the Northern Hemisphere and in Africa. Although sometimes confused with herons, cranes are more closely related to rails and limpkins. Cranes are known for their loud trumpeting call that can be heard for miles and for the rhythmic dances they perform during mating season, when both males and females can be seen jumping high into the air. They eat small animals, grain, and other vegetable matter. The North American whooping crane, a white bird almost 5 ft (152 cm) tall, is nearly extinct, partly because the population increases slowly, even in protected environments, the female crane lays only two eggs per year. The sandhill crane, about 4 ft (122 cm) tall with gray plumage, is becoming rare; it winters W of the Mississippi River. The little brown crane breeds mainly in N and W North America. The Florida crane is brownish gray with a reddish, warty head. Cranes are classified in the phylum *CHORDATA*, subphylum *Vertebrata*, class *Aves*, order *Gruiformes*, family *Gruidae*.

crane, hoisting machine for lifting heavy loads and transferring them from one place to another, ordinarily over distances of not more than 200 ft (60 m). For longer distances a truck or trailer is apt to prove more economical, the chief advantages of a crane are its long reach and the great heights to which it can lift loads. Cranes actuated by either manual or animal power have been in use from early times. Modern cranes are of varied types and sizes, they may be actuated by steam, electricity, diesel, or hydraulic power as well as by manual power, and they are indispensable in industries where heavy materials are handled constantly. The overhead traveling crane, a type of bridge crane, is used inside buildings or in outdoor storage yards. Two or more parallel girders span its working area. Another girder, called the bridge, stretches between them and rolls along them on wheels; this girder, in turn, supports a carriage from which a lifting attachment is lowered by pulleys. On a stacking crane the pulleys are replaced by a stiff, rotating column on which a pair of forks ride up and down. The gantry crane, another type of bridge crane, has a bridge supported by vertical structures that move along tracks. Ganties are used on piers or in shipyards. The jib crane has a horizontal load-supporting boom fastened to a rotating vertical column, either attached to a wall or extending from floor to ceiling, when the column is held only at the bottom it is called a pillar crane. The derrick is a crane equipped either with a vertical mast held by struts, as on barges, or with guy wires, as in building construction. The boom is attached to the bottom of the mast by a pivot and is raised and lowered by a cable reaching from the top of the mast to the end of the boom. A crawler crane is a self-propelled crane that moves on caterpillar treads.

crane fly, true FLY resembling a mosquito, often called daddy longlegs because of its six long, delicate legs (The *HARVESTMAN*, also called daddy long-legs, belongs to an unrelated order.) Most species of crane flies have a single pair of wings and slender bodies. They feed upon plant substances and frequent damp places in pastures and meadows. Crane flies belong to the phylum *ARTHROPODA*, class *Insecta*, order *Diptera*, family *Tipulidae*.

crane's-bill: see *GERANIUM*

cranial index: see *CEPHALIC INDEX*

cranium: see *SKULL*

crank, mechanical linkage consisting of a bar attached to a pivot at one of its ends in such a way that it is capable of rotating through a complete circle about the pivot. One of the principal uses of a crank is to turn reciprocating, or back and forth, motion into rotary motion or vice versa. A bell crank is one designed to change the direction of a linear motion.

Cranmer, Thomas (krän'mər), 1489-1556, English churchman under HENRY VIII, archbishop of Canterbury. A lecturer in divinity at Jesus College, Cambridge, he is said to have come to the attention of the king in 1529 by suggesting that Henry might further his efforts to achieve a divorce from KATHARINE OF ARAGON by collecting opinions in his favor from the universities. Cranmer went (1530) to Rome to argue the king's case and was (1532) an ambassador to Holy Roman Emperor Charles V. In 1533, Henry named him archbishop of Canterbury, and as soon as the appointment was confirmed by the pope, Cranmer proclaimed that Henry's marriage to Katharine was invalid. A few days later he crowned Anne BOLEYN as Henry's queen. Completely subservient to the king's will, Cranmer declared Anne's marriage invalid in 1536. He promoted Henry's marriage (1540) to Anne of Cleves and the divorce from her, and was later (1542) one of the accusers of Catherine Howard. Cranmer was strongly influenced by the German Reformation. With his friend Thomas CROMWELL, he endorsed the translation of the Bible into English and was influential in procuring a royal proclamation (1538) providing for a copy in every parish church. However, as long as Henry VIII lived, the archbishop could promote no significant doctrinal changes. The situation changed with the accession (1547) of the young EDWARD VI, and Cranmer shaped the doctrinal and liturgical transformation of the Church of England during Edward's reign. He was responsible for much of the first *BOOK OF COMMON PRAYER* (1549) and compiled the revised prayer book of 1552, which contains the most famous examples of Cranmer's sonorous prose, with the aid of prominent reformers from the Continent. His Forty-two Articles (1553), though never formally adopted, formed the basis of the Thirty-nine Articles (see *CRED 5*). Cranmer supported the claims of Lady Jane GREY after Edward's death. Upon the accession (1553) of the Roman Catholic Queen Mary I, he was tried for treason, then convicted of heresy, stripped of his preferments, and condemned. A few days before his death he recanted, but when asked to repeat the recantation in public at the stake, he refused and thrust the hand that had written it into the fire. See biographies and studies by F. C. Hutchinson (1951, repr. 1966), Theodore Maynard (1956), and J. G. Ridley (1962, repr. 1966).

crannog: see *LAKE DWELLING*

Cranon, Greece: see *LAMIA*

Cranston, industrial city (1970 pop. 73,037), Providence co., central R.I., a residential suburb of Providence, inc. as a town 1754, as a city 1910. Its manufactures include machinery, chemicals, textiles, and beer. The city was named for Samuel Cranston, a colonial governor of Rhode Island. In the 19th cent. Cranston was an important textile center. The Friends Meeting House (1729) and several pre-Revolutionary buildings remain standing.

crape: see *CREPE*

crape myrtle: see *LOOSESTRIPE*

crappie: see *SUNFISH*

craps: see *DICE*

Crapsey, Adelaide (krăp'sē), 1878-1914, American poet, b. Brooklyn, N.Y., grad. Vassar, 1901, daughter of Algernon Sidney Crapsey. After teaching in girls' schools she became an instructor at Smith College. A slender volume, *Verse*, which won high praise from critics, appeared a year after her early death from tuberculosis, a new edition with 20 additional poems was issued in 1934. Her special contribution to verse form is the cinquain—a compressed five-line verse resembling the Japanese haiku in its fragile precision and expressive delicacy. See biography by M. E. Osborn (1933).

Crapsey, Algernon Sidney, 1847-1927, American Episcopal clergyman, b. Fairmont, Ohio. In 1879 he became rector of St. Andrew's Church, Rochester, N.Y., which under his administration was known for its social work. In 1906 he was expelled from the ministry for heresy because of beliefs concerning the physical being and life of Christ. His books include *Religion and Politics* (1905), *The Rise of the Working Class* (1914), *The Ways of the Gods* (1920), and the autobiographical *Last of the Heretics* (1924).

craquelure (kräklōō'), hairline surface cracking of paintings into characteristic patterns determined by age, climatic conditions, and the materials used in the work. Cracking was so common in works by 18th-century English painters that it became known as *craquelure anglaise*. Forgers and restorers often imitate craquelure to enhance the look of authenticity in their works.

Crashaw, Richard (krāsh'ō), 1612?-1649, one of the English METAPHYSICAL POETS. He was graduated from Cambridge in 1634 and remained there as a fellow at Peterhouse until the Puritan uprising, when he fled to the Continent (1643). Though he was the son of an ardent Puritan clergyman, by 1646 he had converted to Roman Catholicism. He served for several years as an attendant to Cardinal Palotto, who finally procured him a minor post at the shrine of Loreto, Italy, in April, 1649. Four months later Crashaw died of a fever. Although he wrote secular poetry in Latin and Greek as well as English, his fame rests on his intense religious poetry. His strange mixture of sensuality and mysticism is unusual in English literature and has been compared to the baroque art of Italy and Spain. The principal volume of his work is *Steps to the Temple* (1646), enlarged to include *Delights of the Muses* (1648). See his complete poems ed. by G. W. Williams (1972), studies by Austin Warren (1957), G. W. Williams (1963), and M. F. Bertolasco (1971).

Crassus (krās'ēs), ancient Roman family, of the plebeian Lucian gens. It produced men who achieved great note in the 2d cent. and 1st cent. B.C. One of the well-known members was **Lucius Licinius Crassus**, d. 91 B.C., a noted orator and lawyer (much admired by Cicero). He was a strict follower of constitutional forms, and he and Scaevola as consuls in 95 B.C. proposed a law—called the Lucian Law, the Lex Lucina, or the Lex Licinia Mucia—to banish from Rome Latins who had gained Roman citizenship by illegal means (or what the law set as illegal means). This greatly aggravated anti-Roman sentiment among the allies and helped bring on the Social War. **Publius Licinius Crassus**, d. 87 B.C., was consul in 97. He was the financial backer of the Roman colony of Narbo (modern Narbonne) in Gaul and achieved fame by his victories in Spain after his consulship. He was a partisan of SULLA and, after being proscribed by the followers of Marius, committed suicide. His son, **Marcus Licinius Crassus**, d. 53 B.C., was the best-known member of the family. He was a man of considerable charm and almost unbounded avarice and ambition. He was a partisan of Sulla and commanded some of Sulla's forces. He was also a highly successful dealer in real estate, and bought property that was confiscated or deserted in the period of the bloody Sullan proscriptions. He became the principal landowner in Rome by organizing his private fire brigade, buying burning houses cheap, and then putting out the fire. He gained immense prestige—along with POMPEY—for suppressing the uprising of SPARTACUS. They were both consuls together in 70 B.C., and Crassus' rivalry and jealousy of Pompey grew. He was involved in plotting against Catiline, apparently secretly encouraging the conspiracy but not directly participating in it. He and Julius CAESAR drew closer together, Crassus hoping to use Caesar's ability, Caesar (deep in debt) hoping to use Crassus' money. Caesar, seeing that he needed stronger support than Crassus, created (60 B.C.) the First Triumvirate—Crassus, Pompey, and Caesar. With Crassus' envy of Pompey and Pompey's scorn of Crassus, the arrangement worked only because of Caesar's consummate ability in handling men. Crassus seems to have backed the political maneuvers of the notorious Clodius, and trouble was stirred up between Crassus and Pompey. Caesar called both of them to Lucca, where in 56 B.C. a conference reaffirmed the alliance. Crassus and Pompey were again consuls together in 55. Crassus managed to get Syria assigned for his proconsular service in 54. Avid for military glory, he left even before his term as consul was up to undertake a campaign against the Parthians. His ambition outran his ability. After early successes, his army was completely routed at Carrhae (modern Haran) by Parthian archers in 53 B.C. Crassus in this disgrace

was treacherously murdered, and Caius Cassius Longinus had difficulty in saving even the remnants of the army.

crater, circular, bowl-shaped depression on the earth's surface. (For a discussion of lunar craters, see MOON.) Many of the largest craters are formed by the impact of meteorites. Impacting at speeds in excess of 10 mi/sec (16 km/sec), a meteorite creates pressures on the order of millions of atmospheres, creating shock waves that blast out a circular hole and often destroy the meteorite. Berringer Crater, Arizona, c. 3/4 mi (1 1/2 km) in diameter and 600 ft (180 m) deep, is probably the best-known crater of this type. Others include Chubb Crater, Quebec, Lake Bosumtwi, Ghana, and Brent Crater, Ontario. Two major impact events have occurred in the 20th cent., both in Siberia. In 1908 near Lake Baykal one occurred that caused vast destruction of timber from its blast, and the other in 1947 at Sikhote-Alin also caused great damage. Craters are also commonly formed at the surface opening, or vent, of erupting volcanoes, particularly of the type called cinder cones, where the lava is extruded rather explosively. Virtually all volcanoes display a crater, called a sink, around the vent that is believed to be a collapse feature caused by molten lava subsiding as an eruption phase diminishes. Volcanic craters formed in these ways are relatively small, usually less than 1 mi (1.6 km) in diameter, and represent only a small fraction of the cone's diameter at the base. A caldera is a much larger crater, ranging from 3 to 18 mi (5-30 km) in diameter, and represents a considerable fraction of the volcano's basal diameter. Most calderas are formed by the collapse of the central part of a cone during great eruptions. A few small calderas have been formed by explosive eruptions in which the top of a volcano was blown out. Some volcanic craters are created by a combination of these events. Formed thousands of years ago, the caldera that contains Crater Lake, Oregon, is 6 mi (9.7 km) in diameter. In recent times, caldera-producing eruptions occurred at Krakatoa, Indonesia, in 1883 and Katmai, Alaska, in 1912. See ASTROBLEME, TEKITE, VOLCANO.

Crater Lake National Park, 160,290 acres (64,869 hectares), SW Oregon, in the Cascade Range, est. 1902. Crater Lake, 20 sq mi (52 sq km), lies in a huge pit that was created when the top of a prehistoric volcano was blown off by a violent eruption. The second-deepest lake (1,932 ft/589 m) in North America, Crater Lake is 6 mi (9.6 km) wide, lies 6,164 ft (1,879 m) above sea level, and is surrounded by cliffs that are from 500 to 2,000 ft (152-610 m) high. Having no inlet or outlet, the lake was formed by rain and snowfall, and its waters are maintained by precipitation. The lake was discovered in 1853 by prospectors, who called it Deep Blue Lake because of the intense blue of the water, it was renamed Crater Lake in 1869. A scenic highway follows the rim of the crater. Wizard Island, a cinder cone 776 ft (237 m) high, near the lake's western shore, was also formed by volcanic activity.

Craters of the Moon National Monument, 53,545 acres (21,665 hectares), S central Idaho, est. 1924. This region, composed of several closely grouped volcanoes, is suggestive of a telescopic view of the moon. Volcanic activity dating back c. 20,000 years has left behind cinder cones, tree molds, craters, and other interesting formations. At one time Indians used the lava caves.

Crates (krā'tēz), fl. 449 B.C., Athenian comic poet. He is said to have introduced into comedy themes other than those of personal satire, and he was one of the first to show the comic possibilities of the drunkard. Fragments of his plays survive.

Cratinus (krātī'nās), d. c. 419 B.C., Athenian comic poet. He won the prize at the Athenian drama contest when Aristophanes competed with *The Clouds* and was regarded with Aristophanes and Eupolis as one of the greatest comic poets. He attacked Pericles violently in his plays. Fragments of his plays survive.

craton (krā'tōn) see CONTINENT

Craven, Avery Odelle, 1886-, American historian, b. Randolph co., N.C. He received his Ph.D. at the Univ. of Chicago in 1923 and taught at several colleges in the Midwest before he returned in 1928 to Chicago, becoming professor of American history in 1929. Craven is a leader of that school of American historians that holds that the Civil War could have been avoided. His chief works are *Soil Exhaustion as a Factor in the Agricultural History of Virginia and Maryland, 1606-1860* (1926), *Edmund Ruffin, Southerner: a Study in Secession* (1932), *The Repressible Conflict, 1830-1861* (1939), *The Coming of the Civil*

War (1942, 2d ed. 1957), *The Rise of Southern Nationalism* (1953), *The Civil War in the Making 1815-1860* (1959), and *An Historian and the Civil War* (1964).

crawfish, see CRAYFISH

Crawford, Francis Marion, 1854-1909, American novelist, b. Bagni di Lucca, Italy, son of Thomas Crawford. He was educated in the United States and Europe and lived most of his adult life in Italy. The best of his romantic novels of Italy and other countries abroad include *Saracinesca* (1887), *Santi Ilario* (1889), and *Don Orsino* (1892). He also wrote romances set in the United States.

Crawford, Isabella Valancy, 1850-87, Canadian poet, b. Dublin, Ireland. The remote woodland region of her childhood in Upper Canada is depicted in her long, sentimental poem, "Malcolm's Katie." She died in poverty at age 37, and 20 years after her death her *Collected Poems* (1905) brought recognition of her talent.

Crawford, Joan, 1908-, American movie star, b. San Antonio, Texas, as Lucille Le Sueur. Crawford began her career as a Broadway chorus dancer, and in 1926 she began making films. In 1945 she won an Academy Award for her performance in *Mildred Pierce*. Crawford was a top box office attraction for many years. Her best-known films include *Grand Hotel* (1932), *The Women* (1939), and *Humoresque* (1954). Her later films, mostly in the horror genre, include *Berserk* (1967). See her autobiographies (1962 and 1972), study by L. J. Quirk (1970).

Crawford, Ralston, 1906-, American painter, b. St. Catherine's, Ont. Crawford's paintings are marked by precise detail, flat color, and the simplification of form. His works portray the American city and industrial machinery. *Steel Foundry* (1936) and *Grain Elevators from the Bridge* (1942) are in the Whitney Museum, New York City.

Crawford, Ruth, 1901-53, American composer, b. East Liverpool, Ohio. Crawford attended music schools in Jacksonville, Fla., and Chicago. Her most frequently performed composition is a string quartet (1931). She also collected and published American folk music with her husband, the musicologist and composer Charles Seeger, father of the folk singer Pete Seeger.

Crawford, Thomas, 1813-57, American sculptor, b. New York City. He was apprenticed to a wood carver and later worked for a firm of tombstone cutters. He achieved his first success with decorations for the Capitol at Washington, which include the figure above the dome entitled *Armed Freedom*, and the bronze doors and pediment statues for the Senate wing. He designed the Washington monument, Richmond, Va., for which he executed the equestrian figure and the figures of Patrick Henry and Jefferson. A pupil of Thorvaldsen, Crawford was a leading exponent of the Greek Revival movement. He lived and worked in Rome most of his life. He married Louise Cutter Ward, sister of Julia Ward Howe. The novelist Francis Marion Crawford was their youngest son.

Crawford, William Harris, 1772-1834, American statesman, b. Amherst co., Va. (his birthplace is now in Nelson co.). He moved with his parents to South Carolina and later to Georgia. After studying law he practiced at Lexington, Va., and served (1803-7) in the state legislature. In the stormy state political battles of the time, he was the leader of the upcountry forces and allied with the followers of James Jackson and later George M. Troup, leaders of the tide-water region. In a duel Crawford killed a partisan of John Clark, head of the opposite faction, and in another duel was wounded by Clark. In the U.S. Senate (1807-13), Crawford staunchly advocated rechartering the Bank of the United States. From 1813 to 1815 he was minister to France. He was then appointed Secretary of War by President Madison, but in 1816 he was made Secretary of the Treasury, a post he held through both of Monroe's administrations. He had strong support for the presidency in 1816 but disavowed his candidacy. In the presidential election of 1824, Crawford, a leading candidate, finished third in the voting. Since no candidate received a majority of the electoral votes, the election went to the House of Representatives, and John Quincy Adams was finally chosen. Crawford later served as a judge in Georgia. See biographies by P. J. Green (1965) and C. C. Mooney (1974).

Crawford Notch, water gap in the White Mts., N. central N.H., through which the Saco River flows. It is named for Abel Crawford, an early settler. The area is a state park (est. 1911).

Crawfordsvile, city (1970 pop. 13,842), seat of Montgomery co., W. central Ind., inc. 1866. It is the

trading center of an agricultural and dairy region. Major industries include printing and binding and the manufacture of nails and wire, plastic, and metal products. Wabash College and the Lew Wallace Study are in Crawfordsville.

Crawley, new town and urban district (1971 pop. 67,240), Sussex, SE England. Crawley was designated one of the NEW TOWNS in 1946 to alleviate overpopulation in London. There are many industries, including precision engineering. It is a regional retail shopping center. Crawley College of Further Education is there. In 1974, Crawley became part of the new nonmetropolitan county of West Sussex.

Crazer, Gaspar de (gas'par da kri'ar), c1584-1669, Flemish religious and portrait painter. He was greatly influenced by Rubens. While lacking the genius of Rubens, Crazer almost rivaled him in productivity and maintained a high standard of work. His paintings are to be seen in countless Flemish provincial churches and in the museums and churches of Brussels and Ghent.

crayfish or **crawfish**, freshwater CRUSTACEAN smaller than but structurally very similar to its marine relative the LOBSTER, and found in ponds and streams in most parts of the world except Africa. Crayfish grow some 3 to 4 in (7.6-10.2 cm) in length and are usually brownish green, some cave-dwelling forms are colorless and eyeless. They are scavengers, feeding on decayed organic matter and also on small fish. The swamp crayfish digs a burrow up to 3 ft (91 cm) deep with a water-filled cavity at the bottom in case of drought. The eggs develop while attached to the swimming legs of the female and look like miniature adults when hatched. Although crayfish are not eaten in most parts of the United States, they are consumed in areas in the Mississippi River basin and are used in the Louisiana area in a thick soup called crayfish bisque. They are agricultural pests in the Mississippi Delta area, where they feed on sprouting wheat and corn. A red-clawed species is considered a delicacy in Europe. Crayfish are classified in the phylum ARTHROPODA, class Crustacea, order Decapoda.

crayon, any drawing material available in stick form. The term includes charcoal, conte crayon, chalk, pastel, grease crayon, litho crayon, and children's wax colors. The pigment is often bound with gum tragacanth or wax, and the sticks are wrapped in paper or embedded in wood.

Crazy Horse, d. 1877, Indian chief of the Oglala SIOUX INDIANS. He was a prominent leader in the Sioux resistance to the encroachment of whites in the mineral-rich Black Hills. When Crazy Horse and his people refused to go on a reservation, troops attacked (March 17, 1876) their camp on Powder River. The great war chief was victorious in that battle as well as in his encounter with Gen. George CROOK on the Rosebud River (June 17). Crazy Horse joined SITTING BULL and GALL in defeating George Armstrong CUSTER at the battle of the Little Bighorn (June 25). In Jan., 1877, Gen. Nelson Appleton Miles attacked his camp, and Crazy Horse and his followers spent the remainder of the winter in a state of near starvation. The group, numbering about 1,000, finally surrendered at the Red Cloud agency in May. Imprisoned because of a rumor that he was planning a revolt, Crazy Horse was stabbed to death with a bayonet when attempting to escape. His bravery and skill were generally acknowledged, and he is revered by the Sioux as their greatest leader. See biographies by Mari Sandoz (1942, repr. 1955) and E. A. Brinninstool (1949).

crazyweed. see LOCOWEED

cream cup. see POPPY

creamery: see DAIRYING

cream of tartar, white crystalline powder. Chemically it is potassium hydrogen tartrate, $KHC_4H_4O_6$, the acidic potassium salt of TARTARIC ACID. It is used as the leavening agent in baking powders. An impure form, called tartar or argol, forms naturally during the fermentation of grape juice into wine and crystallizes in the wine casks.

Crébillon, Prosper Jolyot de (prôspër' zhôlyô' da kräbëyôn'), 1674-1762, French dramatist. His tragic melodramas, marked by violent plots, include *Idoménée* (1705), *Électre* (1708), and *Rhadamiste et Zénobie* (1711), which is considered his best. After a long retirement he was persuaded by Mme de Pompadour, who was seeking a rival to Voltaire, to write *Catiline* (1748), which was performed with great success. His son Claude Prosper Jolyot de Crébillon, 1707-77, wrote witty, ribald tales, notably *Les Égaréments du cœur et de l'esprit* (1736) and *Le Sopha* (1742).

crèche (krësh, krăsh), representation of the Infant Jesus in the manger, usually surrounded by figures of Mary, Joseph, shepherds, animals, and the Wise Men, also called Christmas Crib. The crèche has been displayed in churches during the period from Christmas Eve to Jan. 6 since the Middle Ages, especially after St. Francis of Assisi instituted the custom in 1223 at Greccio, Italy. It is a Christmas tradition in many homes. The term *crèche* is also applied to a DAY NURSERY.

Crecy (kräsë'), officially Crecy-en-Ponthieu (-a-N-pôNtyô'), village, Somme dept., N France. A nearby forest is popular for camping. At Crecy, on Aug. 26, 1346, Edward III of England defeated Philip VI of France in the HUNDRED YEARS WAR. The French forces were armed with crossbows and, although outnumbering the English troops, were overwhelmed by the English longbows. The victory enabled the English to reach Calais. Among the combatants were Edward the Black Prince of England and the blind John of Luxembourg, king of Bohemia, who, fighting for the French, died in the battle. Crecy is also known in English as Cressy.

Credi, Lorenzo di: see LORENZO DI CREDI

credit, granting of goods, services, or money in return for a promise of future payment. Most credit is accompanied by an INTEREST charge, which usually makes the future payment greater than an immediate payment would have been. The credit system is founded upon the lender's confidence in the borrower or in his COLLATERAL and general possessions. Credit may be classified according to the industry using it, its quality or liquidity, or the length of time for which it is extended. Basically there are two kinds, business and consumer. The chief function of business credit is the transference of capital from those who own it to those who can use it, in the expectation that the profit from its use will exceed the interest payable on the loan. Thus business credit increases the productive power of capital. Consumer credit permits the purchase of retail commodities without the use of cash or with the use of relatively little cash. It is estimated that some 90% of all wholesalers' and manufacturers' sales, and more than 30% of all retail sales are made on a credit basis. In the larger banks, credit-analysis departments determine the amount of credit that may safely be given to loan applicants. Data as to credit risk are supplied by agencies organized for that purpose. The chief agency in the United States is Dun and Bradstreet, formed by a merger (1933) of R. G. Dun & Company (1841) and the Bradstreet Company (1849). If more credit is granted than the community can liquidate, there is inflation, if too little is granted, there is deflation. A lack of business confidence may cause credit to dissolve, thereby contributing to economic crises, panics, and depressions. In BOOKKEEPING, the credit side is the side of the account on which payments are entered, hence, the term *credit* is sometimes applied to the payments themselves. See CREDIT CARD, DEBT, DEBT, PUBLIC, INSTALLMENT BUYING AND SELLING. See F. T. Juster, *Household Capital Formation and Financing, 1897-1962* (1966), W. E. Dunkman, *Money, Credit, and Banking* (1970).

credit, letter of, commercial instrument through which a bank or other financial institution instructs a correspondent institution to advance a specified sum of money to the bearer. The document is called a circular letter of credit when it is not addressed to any particular correspondent. In effect, a letter of credit is a DRAFT, save that the amount is merely stated as a maximum not to be exceeded. Letters of credit, mainly used by travelers, greatly simplify nonlocal business transactions. Those who issue such letters are usually so well known that any bank will honor the letter upon proper identification. Travelers' checks are a modified form of a letter of credit. They are issued in coupons, upon whose face a value is usually expressed in terms of the currency of a particular country. In the United States they are issued by express companies and banks. Circular letters of credit require that each payment, as it is made, be endorsed by the firm making payment so that other banks may know how much of the total credit has been used.

credit card, device used to obtain consumer credit at the time of purchasing an article or service. Credit cards may be issued by a local retailer, such as a department store, or a national retailer, such as one of the major oil companies. They may also be issued by third parties, such as a bank or group of banks, or an express or so-called travel and entertainment company. First popular in California, credit cards spread throughout the United States and much of

Western Europe during the late 1960s, between 1965 and 1970 the number of such cards grew from less than 5 million to more than 50 million. Through the revolving charge plan, card holders are able to postpone payment on their purchases by accepting a monthly interest charge. Consumers may also use the major bank cards to obtain short-term personal loans. Credit card issuers get revenue from fees paid by stores that accept their cards and from interest charged on unpaid credit balances. Concern has been voiced over widespread, sometimes unsolicited, distribution of bank credit cards, costly losses and theft of cards, and possible excessive encouragement of consumer debt at high interest rates.

Credit Mobilier of America (krë'dit möbilyä', krädë'), ephemeral construction company, connected with the building of the Union Pacific RR and involved in one of the major financial scandals in American history. Oakes Ames, Thomas C. DU RANT, and a few other influential stockholders of the Union Pacific organized the Credit Mobilier under an existing Pennsylvania charter, which they took over. Acting for both the Union Pacific and for their newly created construction company, they made contracts with themselves. Oakes Ames, as head of the Credit Mobilier, in 1867 assigned contracts to seven trustees to build the remaining 667 mi (1,074 km) of road for a total sum that brought profits variously estimated at from \$7 million to \$23 million. This process depleted generous congressional grants to the Union Pacific and left it under a heavy debt by the time of its completion in 1869. The scandal became political when Ames (a U.S. Representative), to forestall investigation or interference by Congress, sold or assigned shares of the Credit Mobilier stock to members of Congress at par, although the shares were worth twice as much at the time. He wrote to Henry S. McComb, an associate, that he had placed the stock "where it will produce the most good to us" and subsequently forwarded a list of Congressmen who had received or were to receive shares. Later friction between Ames and McComb facilitated the publication of these letters in Charles A. Dana's New York Sun in the midst of the presidential election campaign of 1872. A subsequent investigation by Congress badly smirched the political reputations of Vice President Schuyler Colfax, Senator James W. Patterson of New Hampshire, Representative James Brooks of New York, and others—most of all, of course, Ames himself. Ames and Brooks were censured by Congress, but there were no prosecutions. See study by J. B. Crawford (1880, repr. 1969).

credit union, cooperative financial institution that makes low-interest personal loans to its members. It is usually composed of persons from the same occupational group or the same local community. Funds for lending come from the sale of shares to members and from the members' savings deposits. Cooperative banking originated in Germany in the middle of the 19th cent.; it was developed by Hermann Schulze-Delitzsch and later was particularly adapted to rural communities by F. W. Raiffeisen. In the United States, the Credit Union National Association (founded 1934) has been instrumental in organizing credit unions. Credit unions are important because they provide loans to blue-collar workers and small farmers, who would otherwise have difficulty securing credit at reasonable interest rates. Under provisions of the Credit Union Act of 1934, U.S. credit unions are chartered by their respective states or by the Federal government. See R. F. Bergengren, *Credit Union, North America* (1940), Jack Dublin, *Credit Unions: Theory and Practice* (2d ed. 1971), J. C. Moody and G. C. Fite, *The Credit Union Movement* (1971).

creed [Lat. *credo*=I believe], summary of basic doctrines of faith. The following are historically important Christian creeds. 1 The Nicene Creed, beginning, "I believe in one God the Father Almighty, maker of heaven and earth, and of all things visible and invisible, and in one Lord Jesus Christ." It is usually described as a revision by the First Council of Constantinople (381) of the creed adopted at Nicaea in 325, although there are good grounds for the belief that it represents substantially a creed written or used by Eusebius of Caesarea. In the Western Church since the 9th cent. it has differed from the original by the addition of the *Filioque* clause "And in the Holy Ghost. Who proceedeth from the Father and the Son." ("qui ex Patre *Filioque* procedit.") Over this addition there has been a long controversy between the Orthodox Eastern and Roman Catholic churches. The Nicene Creed is an official creed of Orthodox Eastern, Roman Catholic, and some Protestant churches. 2 The ATHANASIAN

CREED, which is a partial statement of doctrine dealing especially with the Trinity and the Incarnation 3 The Apostles' Creed, beginning, "I believe in God the Father Almighty, Creator of heaven and earth And in Jesus Christ" It does not appear in its present form before 650, but its predecessors probably arose in Rome in the 2d or 3d cent It has two material differences from the Nicene Creed the phrase, "He descended into hell," is omitted in the Nicene, and the words "resurrection of the body" are changed to "resurrection of the dead" in the Nicene It is used by Roman Catholics at various daily services and at baptism, it is also much used by Protestants 4 The Augsburg Confession (1530), the official statement of the Lutheran churches It was mainly the work of Philip Melancthon and was endorsed by Martin Luther for the Diet of Augsburg 5 The Thirty-nine Articles, which are official in the Church of England They date in their present form from Elizabeth I's reign, when they were written by a group of bishops They are Calvinistic in theological emphasis and enounce clearly the royal supremacy in the Church of England They are included, with occasional modifications, in the prayer books of other churches of the Anglican Communion, including that of the Protestant Episcopal Church of the United States 6 The Westminster Confession (1645-47), the most celebrated pronouncement of English-speaking Calvinism It is official in the Church of Scotland, with occasional changes in most of its daughter churches (usually Presbyterian), and among Congregationalists See P T Fuhrmann, *Introduction to the Great Creeds of the Church* (1960), J H Leith, *Creeds of the Churches* (1963, repr 1973)

Cree Indians, North American Indians whose language belongs to the Algonquian branch of the Algonquian-Wakashan linguistic stock (see AMERICAN INDIAN LANGUAGES) They formerly inhabited Manitoba S of the Churchill River Members of one branch of the Cree, allying themselves with the Siouan Assiniboin Indians, moved southwestward into buffalo territory and became the Plains Cree It is probable that they introduced the method of hunting buffalo by driving them into enclosures, since the Woodland Cree used this method in hunting deer The culture and language of the Woodland Cree greatly resembles that of the Ojibwa Indians A warlike tribe, the Cree were nevertheless friendly toward French and English fur traders, and their history is closely connected with the activities of the Hudson's Bay and the North West companies They were powerful in the late 18th cent until smallpox drastically reduced their population See Leonard Mason, *The Swampy Cree* (1967)

Creek Indians, North American Indian confederacy The peoples forming it were mostly of the Muskogean branch of the Hoka-Siouan linguistic stock (see AMERICAN INDIAN LANGUAGES) The Creek received their name from early white traders because so many of their villages were located at rivers and creeks They lived primarily in Alabama and Georgia and were settled, agricultural people There were more than 50 towns, generally called tribes, in the confederacy, which was formed chiefly for protection against the tribes to the north Certain villages were set aside for war ceremonies, others for peace celebrations Each had its annual green corn dance This festival was a time for renewing social ties and was a period of amnesty for criminals, except murderers The Creek Confederacy was not ruled by a permanent central government The structure was a combination of democratic and communistic principles Decisions by the national council were not binding on towns or individuals who wished to dissent Nevertheless, civil strife was almost unknown among them Under this system there was no private ownership of land, although crops were privately owned to a degree Each owner was required to contribute a certain portion for public use The Creek impressed the early white men (Hernando De Soto saw them in 1540) by their height, their proud bearing, and their love of ornament They were hostile to the Spanish and therefore friendly to the British in colonial days, but, frightened by white encroachment and fired by the teachings of the Shawnee chief TECUMSEH, they rebelled in the Creek War of 1813-14 They massacred a large number of whites and blacks at Fort Mims, and Andrew Jackson won part of his reputation by defeating them at the battle of Horseshoe Bend By a treaty signed in 1814 the Creek ceded approximately two thirds of their land to the United States, and subsequent cessions further reduced their holdings Eventually they were moved to the Indian Territory, where they became one of the Five Civilized Tribes A treaty signed by

the confederacy in 1889 permitted white settlement of their lands, and there was great bitterness among the Creek By the early 1970s there were some 17,000 Creek, most of them living in Oklahoma See J R Swanton, *The Early History of the Creek Indians* (1922) and *Social Origins and Social Usages of the Indians of the Creek Confederacy* (1928, repr 1970), Grant Foreman, *The Five Civilized Tribes* (new ed 1953, repr 1966), D H Corkran, *The Creek Frontier, 1540-1783* (1967)

Creeley, Robert, 1926-, American poet, b Arlington, Mass He has lived and worked in Europe and Latin America and taught English at various universities in the United States For a time he was editor of the *Black Mountain Review* Creeley's poems have an effect of purity and elegance, with their intentional reticence, brevity of development, and spare lyricism His works include *The Island* (1963), a novel, *Poems 1950-1965* (1965), *Selected Writings* (1966), and *Pieces* (1969)

creeper, common name for members of a family of small, inconspicuous birds related to wrens and nuthatches They are found in wooded regions of the temperate Northern Hemisphere A creeper spirals up a tree trunk using its long, stiff tail as a prop and searches out minute insects with its long, downward-curved beak, it then swoops to the base of another tree to begin again The most widely distributed member of the family is the brown creeper, *Certhia familiaris*, found in North America and Eurasia It is S in (13 cm) long, brown above and white below Other North American creepers are the Rocky Mt, Sierra, and California creepers Some WARBLERS are also called creepers, e.g., the honey creeper Creepers are classified in the phylum CHORDATA, subphylum Vertebrata, class Aves, order Passeriformes, family Certhiidae

Creevey, Thomas (kré'vè), 1768-1838, English diarist His journals and letters record, from the viewpoint of a Whig member of Parliament and minor officeholder, the history and manners of the late Georgian period See the edition by John Gore (1948)

Creighton, Mandell (mān'dəl krī'tən), 1843-1901, British historian and churchman He was professor of ecclesiastical history at Cambridge from 1884 until his appointment (1891) as bishop of Peterborough In 1896 he was made bishop of London He was a founder of the *English Historical Review* and wrote biographies of Cardinal Wolsey, Queen Elizabeth I, and Simon de Montfort His masterwork was his *History of the Papacy during the Period of the Reformation* (5 vol, 1882-94, new ed, with title *History of the Papacy from the Great Schism to the Sack of Rome*, 6 vol, 1897, repr 1968) See biographies by his wife, Louise Creighton (2 vol, 1904), and W G Fallows (1964)

cremation, disposal of a corpse by fire It is an ancient and widespread practice, second only to BURIAL Although cremation was not practiced in ancient China or Egypt because of religious beliefs, it was noted in Greece as early as 1000 B C and was the predominant mode of disposition by the time of Homer Until the advent of Christianity as the dominant religion in the latter part of the Roman civilization, cremation was widely accepted Its use is often related to a belief in the properties of fire as a purifying agent Its object may also be to light the way of the deceased to another world, or to prevent the return of the dead More practical considerations include the fear of depredation by enemies and, in the modern world, the shortage of land in urban areas The earliest known method of cremation is the log pyre In more elaborate practices, pitch and gums are added to the wood In modern crematories the corpse is exposed not to flames but to intense heat that reduces the body to ashes Disposal of the ashes varies in different parts of the world Hindus, for whom cremation is the typical form of disposal, place them in urns or put them in a river, preferably the sacred Ganges Other methods include burial or scattering In the Western world the practice of cremation gained new favor with the rise of large cities and of the health hazard associated with crowded cemeteries In the late 19th cent the practice was legalized in several European countries and the first crematory in the United States was built Cremation is expressly forbidden by the Roman Catholic Church See SUTTEE For bibliography see FUNERAL CUSTOMS

Crémazie, (Joseph) Octave (zhōzé'f' òktāv' krāmāzé'), 1822-79, French Canadian poet, b Quebec, considered the father of French Canadian poetry With his brothers he was proprietor of a Quebec bookshop, the gathering place for a literary group that included such figures as F X GARNEAU

and H R CASGRAIN He and his friends founded a monthly magazine, *Les Soirées canadiennes*, devoted to the perpetuation of French Canadian folklore In 1855 his poem "Le Vieux Soldat canadien" appeared, bringing Crémazie instant fame His subsequent poems, which show the influence of French romanticism, are filled with patriotic feeling In 1862 the poet suffered business difficulties and fled to France, where he lived in poverty under an assumed name He wrote a journal of the siege of Paris (1870) and died at Le Havre See his *Œuvres complètes* (1883)

crème de menthe (krēm də mīnt, fr krēm də mānt), a mint-flavored LIQUEUR, either green or white, and often served with finely crushed ice

Cremer, Sir William Randal (krē'mər), 1828-1908, English pacifist At first active in trade unionism, he gradually expanded his work and interests, becoming one of the most active advocates of international arbitration In 1871 he became secretary of the Workmen's Peace Association, a position he held until his death For his efforts in the cause of international arbitration Cremer was awarded the 1903 Nobel Peace Prize He gave most of the stipend in trust to the International Arbitration League He was knighted in 1907 See biography by Howard Evans (1909, repr 1973)

Crémieux, (Isaac) Adolphe (ēsāk' ädōlf' krāmyō'), 1796-1880, Jewish-French statesman and political writer A lawyer, he served briefly as minister of justice in the provisional government of 1848 after the overthrow of King Louis Philippe He supported Louis Napoleon (later Napoleon III) for president, but opposed his coup d'état (Dec, 1851) and as a result was imprisoned temporarily in 1851 In 1870, after Napoleon III's fall, he became minister of justice in the government of national defense In this position he eliminated the death penalty for political offenders, abolished slavery in the colonies, and extended full French citizenship rights to the Jews of Algeria He was president (1876) of the Alliance Israélite Universelle, through which he advocated international Jewish emancipation and founded Jewish schools in Cairo and Alexandria

Cremin, Lawrence Arthur, 1925-, American educator and historian, b New York City He received his Ph D from Columbia in 1949 and began teaching at Teachers College, Columbia He became a member of the history department at Columbia in 1961 In that year Cremin also became Frederick A P Barnard professor of education at Teachers College, and in 1974 he was named president of the college An expert in the field of American educational history, he was commissioned by the U S Office of Education to write a comprehensive history of education in the United States The first volume, *American Education The Colonial Experience*, appeared in 1970 His other works include *Transformation of the School* (1961) and *The Genius of American Education* (1965)

Cremona (krīmō'nə, Ital krāmō'na), city (1971 pop 81,983), capital of Cremona prov, Lombardy, N Italy, on the Po River It is an agricultural market and an industrial center Originally (3d cent B C) a Roman colony, Cremona was in the Middle Ages an independent commune frequently at war with Milan until its surrender to that city in 1344 It was known in the Middle Ages as a center of learning, in the late Renaissance for a school of painting founded (16th cent.) by Giulio CAMPI, and later (17th-18th cent.) for the violins made by the AMATI, the GUARNERI, the STRADIVARI, and their successors The cathedral (12th-16th cent.), the tall campanile, the baptistery, the city hall (13th cent.), and the Soldiers' Loggia (13th cent.) adorn Cremona's impressive main square

creole (crē'ōl), Span criollo (crēōl'yō) [probably from crío=child], term originally applied in West Indies to the native-born descendants of the Spanish conquerors The term has since been applied to certain descendants in the West Indies and the American continents of French, Portuguese, and Spanish settlers The creoles were distinguished from the natives, the Negroes, and from people born in Europe A sharp distinction of interest always lay between the creoles, whose chief devotion was to the colony, and the foreign-born officials, whose devotion was to the mother country Never precise, the term acquired various meanings in different countries It has biological and cultural connotations The term was early adopted in the United States in Louisiana, where it is still used to distinguish the descendants of the original French settlers from the Cajuns, who are at least partially descended from the Acadian exiles The word is also commonly applied to things native to the New

World, such as creole cuisine and creole horses. The term is also used in places distant from the Americas, such as the island of Mauritius, but there it has lost much of its original meaning. The picturesque life of the Louisiana creoles has been ably depicted in the works of Lafcadio Hearn, George Washington Cable, and Grace King. See F. J. Woods, *Marginality and Identity* (1972).

creole language (krē'ōl'), any language that began as a PIDGIN but was later adopted as the mother tongue by a people in place of the original mother tongue or tongues. Examples are the GULLAH of South Carolina and Georgia (based on English), the creole of Haiti (based on French), and the Papiamentu of Curaçao (developed from pidgin Spanish and Portuguese).

Creon (krē'ōn), a name given to several minor legendary Greek kings. In the legend of Oedipus, Creon is the brother of Jocasta and after the death of Oedipus' sons becomes king of Thebes. In Euripides' *Medea*, Creon is the king of Corinth and is murdered by the vengeful Medea. Apollodorus portrays him as an early king of Thebes who purifies Amphitryon after the murder of his uncle.

creosote (krē'asōt), volatile, heavy, oily liquid obtained by the distillation of coal tar or wood tar. Creosote derived from beechwood tar has been used medicinally as an antiseptic and in the treatment of chronic bronchitis. Creosote obtained from coal tar is poisonous. It is used chiefly as a preservative for wood, e.g., in fence posts, railroad ties, and telephone poles, it provides protection against fungi, shipworms, and termites. Although wood may be treated by dipping it in hot creosote, greater protection is obtained if the creosote is forced into the wood under pressure.

crepe, thin fabric of crinkled texture, woven originally in silk but now available in all major fibers. There are two kinds of crepe. The hard-finished, typically dyed black and used for mourning (which tends to retain the old spelling *crape*), is made of hand-twisted silk yarn and finished by a rather complex trade process after weaving; the soft crepes include the Canton, or Oriental, weaves (crepes de Chine) in plain or damask weaves. Their crimped or wavy appearance results from the peculiar arrangement of the weft, which is formed of yarn from two different bobbins twisted together in opposite directions or uses alternately a right-twisted and a left-twisted thread.

crepe myrtle: see LOOSESTRIFE

Crépy, Treaty of (krāpē'), 1544, concluded by Holy Roman Emperor Charles V and King FRANCIS I of France at Crépy-en-Laonnois (formerly spelled Crespy), Aisne dept., N France. The emperor renounced his claim to the duchy of Burgundy and the king renounced his pretensions to Naples, Flanders, and Artois. In a secret treaty signed at the same time, Francis agreed to help the emperor suppress the German Protestants and to restore Geneva, where Calvin had established his state, to the duke of Savoy. He also agreed to support Charles against King Henry VIII.

Créquy or Créquy, François, chevalier de (frā'nsā' shavalyā' dā krākē'), c. 1629-87, marshal of France. Having fought in the Thirty Years War and on the government side in the Fronde, he conducted brilliant campaigns in the War of Devolution (1667-68) and conquered Lorraine in 1670. He refused (1672) to serve under Marshal Turenne in the third Dutch War (1672-78) and was exiled but soon submitted. In 1675, he was captured after his defeat at Konzer Brücke near Trier. Released shortly after, he achieved military renown in Alsace. In 1684, Créquy occupied Luxembourg.

Crerar, Henry Duncan Graham (krēr'ār), 1888-1965, Canadian general in World War II. He fought in World War I and later headed the Royal Military College. In 1940 he was made chief of the Canadian general staff. In 1941 he was given command of the Canadian 2d Division Overseas, in 1944 he became commander of the 1st Canadian Corps and was made a full general, serving with distinction during the campaigns in Europe. He retired in 1946.

Crerar, John (krēr'ār), 1827-89, American capitalist and philanthropist, b. New York City. Crerar was a manufacturer in Chicago, and gave liberally to many causes. He is remembered chiefly for the John Crerar Library, a scientific and technical reference library in Chicago, for which he provided in his will. The library has special collections on medicine, Chinese literature, Dutch history, floriculture, the history of the women's movement, trade unions, and social science in general. It is noted for its fine bibliographical work.

Crerar, Thomas Alexander, 1876-, Canadian political leader. Under his able direction the United Grain Growers, Ltd., of which he was president (1907-29), became one of the most successful farmers' cooperative movements in W. Canada. A Liberal, Crerar served (1917-19) as minister of agriculture in Sir Robert Borden's coalition cabinet, he resigned in protest against the government's high tariff policy. He was leader (1920-21) of the new National Progressive party and of the Progressives in the House of Commons, retiring in 1922 to private life. He reentered the political scene as minister of railways and canals (1929-30) in Mackenzie King's Liberal government and later served (1935-45) as minister of mines and resources in King's cabinet. In 1945, Crerar was appointed to the Canadian Senate, serving until 1966.

Cres (tsarēs'), Ital. *Cherso*, island (1961 pop. 4,113), 158 sq. mi. (409 sq. km), in the Adriatic Sea, off Croatia, NW Yugoslavia. Formerly in Austria-Hungary, it passed to Italy in 1918 and to Yugoslavia in 1947. Fruit growing, fishing, and sheep raising are the chief occupations.

Cresap, Michael (krēs'āp), 1742-75, American frontiersman and soldier, b. Allegany co., Md. An Indian fighter, he was accused by Thomas Jefferson and others of massacring the family of the friendly Indian chief Logan and thus starting (1774) Lord Dunmore's War. But this is denied by most modern historians who accept a letter from George Rogers Clark stating that Cresap was with him at the time of the massacre. Cresap fought in the war, and after the American Revolution began he became (1775) captain of a company of riflemen. Cresap drove his men at such a hard pace to support the patriots at Boston—traveling 550 mi. (885 km) in 22 days—that he died of exhaustion as a result. See biography by J. J. Jacob (1826, repr. 1971).

Crescents (krēs'anz), companion of Paul, a missionary in Galatia. 2 Tim. 4:10.

crescent, emblematic representation of the quarter moon. The crescent and star, ancient Byzantine symbols that became the emblems of Constantinople, were assumed as the standard of the Ottoman Turks after their capture of that city. The crescent surmounted by a cross indicates the origin of the Eastern Orthodox Church. The crescent appears on the flags of various present-day Muslim nations. The emblem is also used in blazonry.

Cresilas or Kresilas (both krēs'ilās), fl. c. 450 B.C., Greek sculptor, b. Crete. He worked at Athens. His statue of Pericles is the earliest Greek portrait statue that has been identified.

cresol (krēs'ōl), $\text{CH}_3\text{C}_6\text{H}_4\text{OH}$, any one of three aromatic alcohols present in coal tar. The three compounds are structural isomers, they may be thought of as hydroxy derivatives of TOLUENE or as methyl derivatives of PHENOL. The names of the three compounds indicate which of the hydrogens on the benzene ring portion of the molecule have been replaced. Two adjacent hydrogens are replaced, one with a methyl group and one with a hydroxyl group, to form *ortho*-cresol, also called 2-hydroxytoluene, or 2-methylphenol. When a single unreplaced hydrogen lies between the two that are replaced, the compound formed is *meta*-cresol, 3-hydroxytoluene, or 3-methylphenol. When the replaced hydrogens lie opposite one another on the ring, the compound formed is *para*-cresol, 4-hydroxytoluene, or 4-methylphenol. Because the boiling points of these three compounds are nearly the same, a separation of a mixture of the three into its pure components is impractical. The mixture of cresols obtained from coal tar is called cresylic acid. The cresols are used in the manufacture of disinfectants and synthetic resins.

Crespi, Giovanni Battista (jōvān'ē bat-tēs'ta krās-pē), c. 1575-1632, Italian painter, sculptor, and architect of the Milanese school. He was also called Il Cerano. His paintings are imbued with a highly dramatic religious fervor, described by broad areas of light and shadow and a warm palette. Much of his work is in the Cathedral of Milan, for which he executed paintings of the life of St. Charles Borromeo, and where he became head of the statuary works in 1629.

Crespi, Giuseppe Maria (jōzēp'pā mārē'a), 1665-1747, Italian painter of the Bolognese school, called Lo Spagnuolo. He is well represented in and around Bologna. His best-known works are the imposing paintings of the *Seven Sacraments* (1712, Dresden), but he is also noted for his spontaneous rendering of genre scenes. The National Gallery of Art, Washington, D.C., has his *Cupids with Sleeping Nymphs* and other paintings.

Crespi, Juan (hwan), 1721-82, Spanish explorer in the Southwest, a Franciscan. He came to America in 1749, and in 1767 he went to the peninsula of California in charge of Mission Purísima Concepción. In 1769 he joined the expedition of Gaspar de Portolá to occupy San Diego and Monterey and continued up the coast with Portolá. The following year he founded the Mission San Carlos Borromeo, in the present-day Carmel-by-the-Sea, which became his headquarters. He was chaplain of the expedition to the N. Pacific conducted by Juan Pérez in 1774. His diaries, published in H. E. Bolton's *Fray Juan Crespi* (1927, repr. 1971), provided valuable records of these expeditions.

Crespin, Régine (rāzhēn' krēs-pān'), 1927-, French soprano. She made her debut at the Paris Opera in 1951 as Elsa in Wagner's *Lohengrin*. The range, flexibility, and richness of her voice were critically acclaimed after her performance as Kundry in Wagner's *Parsifal* at Bayreuth in 1958. In 1962 she made her American debut at the Metropolitan Opera, singing the Marschallin in Richard Strauss's *Der Rosenkavalier*. She is also noted for her performances in such roles as Charlotte in Massenet's *Werther* and Dido in Berlioz's *The Trojans*.

Crespo, Joaquín (hwakēn' krās-pō), 1841?-1898, president of Venezuela (1884-86, 1894-98). He served his first term under the dominance of Antonio GUZMAN BLANCO. In 1892 he led a revolt and established a military dictatorship. His second term was noted for the bitter feelings between the United States and England brought about by the Venezuela Boundary Dispute. When he chose his successor, revolts occurred, and Crespo was killed in the fighting. The next year Cipriano Castro came into power.

Crespy: see CRÉPY, TREATY OF

cross, name for several plants often used for salads, e.g., the WATERCRESS, garden cress or PEPPERGRASS, and Indian cress or NASTURTIUM.

Cressent, Charles (sharl krēsān'), 1685-1768, French cabinetmaker, one of the chief creators of the RÉGENCE STYLE. Although at first a sculptor and bronze craftsman, he studied under the furniture designer Boulle and became official cabinetmaker to the regent Philippe II, duc d'Orléans. Examples of his furniture display a strong and majestic beauty, with subtly curving supports and swelling surfaces. Against their veneers of mahogany and ebony stand lavish relief adornments in superbly modeled gilt bronze—the scrolls, shells, female busts, and dragons typical of regence decoration. Pieces by Cressent are in the Louvre and in the Wallace Collection, London.

Cressida: see TROILUS and CRESSIDA

Cressy, Hugh Paulinus (krēs'sē), 1605-74, English Benedictine monk. He was educated at Oxford and converted to Roman Catholicism in Rome in 1646. His *Exomologesis* (1647) is an apologia for his conversion. His most ambitious work, however, is his *Church History of Brittany, or England* (1668), one of the first attempts at objective church history. He edited the work of several Catholic mystics—Walter Hilton's *Scale of Perfection*, Friar Augustin Baker's *Sancta Sophia*, and the *Revelations of Divine Love* by Juliana of Norwich. Cressy served as chaplain to Catherine of Braganza, wife of Charles II.

crest, in feudal livery, an ornament of the headpiece that afforded protection against a blow. The term is incorrectly used to mean family coat of arms. Crests were widely used in the 13th cent. by feudal chiefs, as they had been by ancient Greek warriors and the Roman centurions. The earlier forms were usually of stuffed leather, gilded, silvered, or painted, later they were of wood or metal. The crest came to be used in HERALDRY, first only by persons of high rank, then by all those entitled to a coat of arms. It surmounts the escutcheon, its colors are those of the coat of arms. The dragon, wyvern, and plume of feathers are common crests. The lion, used by Edward III of England, remains the crest of the English sovereigns. See also BLAZONRY.

crested swift: see SWIFT

Creston, Paul, 1906-, American composer, b. New York City as Joseph Guttoveggio. Creston was largely self-taught in composition. His music is generally tonal and conservative. Among Creston's many works are five symphonies (1941-56), *Two Choric Dances* (1938) for orchestra, two violin concertos (1956, 1970), a concerto for marimba (1940), and a concerto for alto saxophone (1944). Creston is the author of *Principles of Rhythm* (1964).

Crestwood, city (1970 pop. 15,398), St. Louis co., E. central Mo., a suburb of St. Louis, inc. as a city 1949. Located in a truck-farming area, it is mostly residential with some light industry. The Thomas Sapping-

ton House (1808, restored 1965) is a good example of Federal architecture

Creswell, John Angel James, 1828–91, US Postmaster General (1869–74), b Port Deposit, Md He was a lawyer, US Representative (1863–65), and US Senator (1865–67), but his important work was done later as Postmaster General He reorganized the Post Office Dept to meet the expanding needs of the United States One-cent post cards were introduced, postal treaties were revised, postal laws were recodified, money-order business was facilitated, free delivery was extended, methods of contracting with railways were improved, and the franking privilege was limited Some reforms that Creswell advocated, such as a postal savings bank and postal telegraph, were adopted later

Cretaceous period (krĭt'ā'shəs), third and last period of the MESOZOIC ERA of geologic time (see GEOLOGIC ERA, table) The Cretaceous was marked, both in North America and in Europe, by extensive submergences of the continents Changes both in the earth's surface and in its flora and fauna brought the Mesozoic to a close At the beginning of the Lower Cretaceous in North America, the Mexican sea of the late JURASSIC PERIOD spread over Texas, depositing the Trinity sandstone and limestone Retreating at the end of Trinity time, it returned in Fredericksburg time and inundated Texas, Oklahoma, New Mexico, and parts of Arizona, Kansas, and Colorado It reached its maximum late in Fredericksburg or early in Washita time, and was drained by a general emergence of land, which brought the Lower Cretaceous to a close Fredericksburg and Washita deposits were chiefly limestone, but some continental sediments (i.e., sandstone, shale, and conglomerate) mark the late Washita emergence The Comanchean series of rocks (Trinity, Fredericksburg, and Washita) reaches a thickness of some 1,500 ft (460 m) in central Texas, and is several times as thick in Mexico The Comanchean seas were probably separated by a land barrier from contemporaneous seas in the California area, where 26,000 ft (7,925 m) of Shastan shales, with sandstone and thin limestone, were laid down The sediments were by rapid erosion from the recently elevated Sierra Nevada and Klamath mts In Montana, Alberta, and British Columbia the Kootenai deposits of sandstone and sandy shale, which contain workable deposits of good coal, were formed, along the Atlantic coast the unconsolidated sandy clay, gravel, and sand of the Potomac series were deposited The Upper Cretaceous opened in W North America with the deposition of continental sands (now the Dakota sandstone) over the surface exposed by the Washita retreat Some of these sands were redistributed by the Colorado sea, which, advancing from Mexico, finally extended to the Arctic The eastern border of this, the greatest of North American Mesozoic seas, passed through Texas, Kansas, NW Missouri, Iowa, Minnesota, SW Ontario, Manitoba, Saskatchewan, and Mackenzie, while the western border crossed Arizona, Utah, E Idaho, W Montana, British Columbia, Yukon, and NE Alaska Branches extended eastward into the Gulf and Atlantic coast regions and southward over Mexico and Yucatan The Colorado deposits are composed chiefly of shales and limestone, but there is chalk in Kansas and South Dakota Slight shifting of the sea was followed by the deposition of the Montana shale and sandstone and then by withdrawal of the sea In Laramide time conditions in the West were similar to those of the CARBONIFEROUS PERIOD in other regions swamps and bogs were formed which later became valuable deposits of COAL In the Gulf region the Upper Cretaceous progression of rocks is from nonmarine sand and clay, with lignite, to marine sands, chalk or soft limestone, and continental sand, with clay On the Atlantic coast the late Upper Cretaceous is represented by continental sands, gravel, and clay, with lignite, followed by clays and sands with glauconitic greensands The Pacific Coast Upper Cretaceous is marine sandstone and shale, with local conglomerate and coal At the close of the Cretaceous occurred the Laramide revolution—at least two different epochs of mountain building and one of relative quiet In this disturbance the Rockies and the E Andes were first elevated, and there were extensive flows of lava The Appalachians, which had been reduced almost to base level by erosion, were rejuvenated, and the seas retreated from all parts of the continent The intermittent character of the Laramide disturbance makes difficult the demarcation of the Mesozoic and the succeeding CENOZOIC ERA The lower Cretaceous opened in NW Europe with the deposition of a continental and freshwater formation the Wealden sand and clay, best displayed in

England The sea, meanwhile, expanded from the Mediterranean, finally overlaying successive Wealden strata with limestone There was at the same time an extensive sea in N Europe At the close of the Lower Cretaceous, there was probably some recession of the seas In the Upper Cretaceous, a great transgression of seas submerged lands which had been emergent since the Paleozoic The striking feature of the European Upper Cretaceous is a great chalk deposit, now exposed in the cliffs of the English Channel In India, the late Upper Cretaceous was marked by an overflow of lava in the Deccan plateau The area covered by igneous rocks dating from this period now comprises over 200,000 sq mi (518,000 sq km) and was formerly much larger, having been reduced by erosion Near Bombay the formation is 10,000 ft (3,000 m) thick The Lower Cretaceous is characterized by a revolution in the plant life with the sudden appearance of flowering plants (angiosperms), such as the beech, fig, magnolia, and sassafras By the end of the Cretaceous such plants were dominant, the willow, elm, grape, laurel, birch, oak, and maple having made their appearance, besides grass and the sequoias of California This prepared the way for the dominance of mammals in Cenozoic animal life The marine invertebrates of the Cretaceous included nautilus, barnacles, lobsters, and crabs, sea urchins and foraminifers were common, ammonites, though plentiful, were increasingly degenerate Reptiles reached their climax New kinds of dinosaurs were Triceratops, Tyrannosaurus, Stegosaurus, Brontosaurus, and Iguanodon Flying reptiles were highly developed, while in the sea there were ichthyosaurs, plesiosaurs, and mosasaurs However, by the end of the Cretaceous the dinosaurs became extinct The rather abrupt disappearance of dinosaurs and other forms of Cretaceous life remains a mystery The decline in dinosaurs was accompanied by a rise in the mammals, but since the mammals were initially small, it does not appear likely that they were superior predators Changes in vegetation suggest that the ecological food chain for the large reptiles was disrupted, although this hypothesis is difficult to reconcile with the simultaneous disappearance of huge sea-dwelling reptiles A worldwide atmospheric change in the oxygen-carbon dioxide ratio may have occurred, caused by the rapid rise of modern plants and other life forms and resulting in climatic changes with which the large dinosaurs could not cope Of other reptiles there were crocodiles and turtles, while snakes and lizards made their first appearance The climate of the Cretaceous was apparently fairly mild and uniform, but it is possible that toward the end of the period some variant zones of climate had appeared By the end of the Cretaceous period, South America and Africa had separated, with the consequent widening of the S Atlantic The N Atlantic continued to widen, although it appears that Europe, Greenland, and North America were still connected Madagascar had separated from Africa, while India was still drifting northward toward Asia Antarctica and Australia had yet to separate

Cretan bull, in Greek mythology, giant bull that Hercules captured as his seventh labor Some versions of the legend state that this bull was the same one that carried Europa to Crete, others claim that it was the beautiful white bull loved by Pasiphaë

Crete (krĕt), Gr *Krīti*, island (1971 pop 456,642), c 3,235 sq mi (8,380 sq km), SE Greece, in the E Mediterranean Sea, c 60 mi (100 km) from the Greek mainland The largest of the Greek islands, it extends c 160 mi (260 km) from east to west and marks the southern limit of the Aegean Sea, the southern part of which is also called the Sea of Crete IRÁKLION is the capital of the Crete governorate and is the island's largest city, KHANIA is the only other large city The rocky northern coast of Crete is deeply indented, and the interior is largely mountainous, culminating in Mt Ida (8,058 ft/2,456 m) Crete has many small farms, whose chief crops are grains, olives, and oranges, and food processing is its main industry Sheep, goats, and dairy cattle are also raised The island has few mineral deposits Transportation facilities are very limited Crete had one of the world's earliest civilizations, the MINOAN CIVILIZATION, named after King Minos, the legendary author of Cretan institutions, in the ruined palace at CNOSSUS invaluable finds have been made The Cretan kingdom reached its greatest power, prosperity, and civilization c 1600 B C Later, for reasons still obscure, its power suddenly collapsed, but Crete flourished again after the Dorian Greeks settled on the island in large numbers and established city-states Among the most powerful of the cities (110 in num-

ber, according to Homer) were Cnossus and Cydonia (modern Khania) Although important as a trade center, Crete played no significant part in the political history of ancient Greece It became a pirate haven in the 3d cent B C but was conquered (68 B C–67 B C) by the Romans under Quintus Metellus It passed (A D 395) to the Byzantines, fell (824) to the Arabs, but was reconquered by Nicephorus Phocas (later Nicephorus II) in 961 As a result of the Fourth Crusade, the island passed to Venice in 1204, and in 1212, after expelling rival Genoese colonists, the Venetians set up a new administration, headed by a duke Under Venetian rule Crete was generally known as Candia (Iraklion) for the duke's residence Insurrections against the arbitrary Venetians were frequent, and the Cretans were not displeased at changing masters when the Ottoman Turks conquered (1669) virtually the whole island after a 24-year war Two offshore island fortresses remained in Venetian hands until 1715 A series of revolts against the Turks in the 19th cent reached a climax in the insurrection of 1896–97 that led to war (1897) between Greece and Turkey The European powers intervened in the war, forcing Turkey to evacuate (1898) Crete An autonomous Cretan state was formed under nominal Turkish rule, but it was governed by a high commission of the occupying powers (England, France, Russia, and Italy) The Cretan national assembly, led by Eleutherios VENIZÉLOS, declared in favor of union with Greece, but the powers rejected its demand The Young Turk revolution of 1908, however, enabled the Cretans to proclaim their union with Greece, and in 1909 foreign occupation troops were withdrawn Cretan representatives were admitted to the Greek parliament in 1912, and in 1913, as a result of the Balkan Wars, Crete was officially incorporated into Greece The followers of Venizelos controlled Crete during their uprising (1935) against the imminent restoration of the monarchy but were defeated by Gen George Kondylis A new revolt (1938) against the dictatorship of John Metaxas was also suppressed In World War II, Crete was used as a British military and naval base late in 1940 The British and Greek forces on the Greek mainland evacuated to Crete in 1941, but they were quickly overwhelmed by the Germans in a large-scale airborne invasion, the first of its kind Late in 1944, British ships isolated the German occupation troops, who eventually surrendered In the postwar period there was some Communist guerrilla activity on the island See R F Willetts, *Ancient Crete* (1965), J S Bowman, *Crete* (1969), K Bramgan, *The Foundations of Palatial Crete* (1970) See also bibliographies under AEGEAN CIVILIZATION and MINOAN CIVILIZATION

Créteil (krā'tē), city (1968 pop 49,233), capital of Val-de-Marne dept., N central France, on the Marne River Gold and silver items, pencils, and varnish are produced A church built in the 12th and 13th cent is in Créteil

cretinism, condition produced in infants and children due to lack of thyroid hormone It usually results from a congenital defect (e.g., absence of the thyroid, presence of only a rudimentary gland, inability of the gland to produce thyroxine) However, it can develop later if there is a lack of iodine in the diet, or if the thyroid is diseased or surgically removed Cretinism causes very serious retardation of physical and mental development, if the condition is left untreated, growth is stunted and the physical stature attained is that of a dwarf In addition, the skin is thick, flabby, and waxy in color, the nose is flattened, the abdomen protrudes, and there is a general slowness of movement and speech If discovered early enough and treated with thyroid extract and sufficient iodine intake throughout life, growth may become normal and mental facility greatly improved If the condition commences after adulthood is reached it is called MYXEDEMA

Creusa (krēō'sa), in Greek mythology 1 Daughter of Erechtheus and wife of Xuthus Her sons, Achilles by Xuthus, and Ion by Xuthus or Apollo, are the ancestors of the Achaeans and the Ionians 2 Princess of Corinth see JASON and MEDEA 3 Daughter of Priam and wife of Aeneas She died fleeing from Troy

Creuse (krōz), department (1968 pop 156,876), central France, in the MASSIF CENTRAL GUÉRET (the capital) and AUBUSSON are the chief towns

Creusot, Le (lə krōzō'), city (1968 pop 34,102), Saône-et-Loire dept., E central France, in Burgundy Situated in a coal-mining region, it is the site of the large Schneider iron and steel mills and munitions factories (founded 1837)

crevasse (kravās'), large crack in the upper surface of a GLACIER, formed by tension acting upon the brittle ice. Transverse crevasses occur where the grade of the glacier bed becomes suddenly steeper, longitudinal crevasses, where the glacier spreads over a wider valley or plain. Marginal crevasses are due to the strain built up when the central part moves faster than the sides.

Crevecoeur, J Hector St. John (krēv'kor'), 1735-1813, American author and agriculturist, b. France as Michel Guillaume Jean de Crèvecoeur. It is believed that he served under Montcalm in Canada. After traveling in the Great Lakes region and in the Ohio valley and working as a surveyor in Pennsylvania, he settled (c 1769) on a farm in Orange co., N.Y., where he wrote *Letters from an American Farmer* (1782). Other letters, found in 1922, were published as *Sketches of Eighteenth Century America* (1925). The two books give outstanding descriptions of American rural life of the period. He wrote, over the signature Agricola, agricultural articles for American newspapers. He introduced the culture of European crops, notably alfalfa, into America and of the American potato into Normandy. As French consul in New York City (from 1783) he sought to improve commercial relations between France and the United States. He lived in France from 1790. See biography by T. L. Philbrick (1970).

Crewe, Robert Offley Ashburton Crewe-Milnes, 1st marquess of (krōo'milz'), 1858-1945, British statesman. He succeeded (1885) his father as Baron Houghton and was created earl (1895) and later marquess (1911) of Crewe. A Liberal, he held a succession of high offices, including those of lord lieutenant of Ireland (1892-95), colonial secretary (1908-10), and secretary for India (1910-15). As Liberal leader in the House of Lords from 1908 he played an important role in securing passage of the Parliament Act of 1911, which deprived the Lords of its veto. He was later ambassador to France (1922-28). See biography by James Pope-Hennessy (1955).

Crewe (krōē), municipal borough (1971 pop 51,302), Cheshire, W central England. It is an important railroad junction with large locomotive and car works.

cribbage (krīb'ij), card game played by two persons with a deck of 52 cards and a scoring (pegging) device known as a cribbage board. The board contains four rows of 30 holes each (two rows for each player), plus additional holes, called game holes. Each player gets two pegs to keep the score. The English poet Sir John Suckling (1609-42) is credited with inventing and naming the game. Each king (high card), queen, jack, and ten represents a count of 10 points, each ace, a count of 1, each other card, its index value. Each player receives six cards and lays away two face down to form the crib. The stock is cut by the dealer to produce the starter. Cards are placed face up alternately, nondealer first, in front of the player, who announces the total count. The object of each series is to carry the total of the cards to 31 or as close as possible without exceeding it. A player pegs 1 for laying down the last card in a series before reaching 31, or he pegs 2 for adding a card that makes exactly 31. Points also are scored for making the count 15 and for playing cards in sequence or in pairs. When all the cards have been played, each player pegs additional points for the pairs, sequences, and counts of 15 that can be arranged from the cards in his hand and the starter, the dealer also pegs the score in the crib. Several hands are played until the game is reached when one player pegs 61 points (once around the board) or 121 points (twice around). See Douglas Anderson, *All about Cribbage* (1971).

Crichton, James (krī'ton), 1560?-1583?, Scottish adventurer and scholar, called the Admirable Crichton. A graduate of the Univ. of St. Andrews, he spent some time in France, possibly in military service. By 1579 he was in Italy, where he attracted attention by his scholarly accomplishments and personal charm. Reputedly he spoke 12 languages and displayed amazing erudition and powers of memory in public disputations. He entered the service of a Mantuan nobleman as tutor to his son and was slain by his charge in a street brawl. His fame is due to the extravagant praise given him by Aldus Manutius (grandson of the famous printer of the same name) and by his 17th-century biographer, Sir Thomas Urquhart.

Crick, Francis Harry Compton, 1916-, English scientist, grad. University College, London, and Caius College, Cambridge. From 1940 to 1947 he served as a scientist in the admiralty. He was a visiting lecturer at several institutions in the United States including

Brooklyn Polytechnic (1953-54), Harvard (1959), Univ. of Rochester (1959), and Johns Hopkins school of medicine (1960). He shared the 1962 Nobel Prize in Medicine and Physiology with Maurice Wilkins and James Watson for their work in establishing the structure and function of deoxyribonucleic acid (DNA), the key substance in the transmission of hereditary characteristics from generation to generation. See his *Of Molecules and Men* (1967) and J. D. Watson, *The Double Helix* (1968).

cricket, common name of the slender, chirping, hopping INSECTS forming the family Gryllidae in the order Orthoptera. Most crickets have long antennae, muscular hind legs for jumping, and two pairs of fully developed wings. In some subfamilies the wings are reduced or absent. In most subfamilies the males have song-producing, or stridulatory, organs on the front wings. Both sexes possess auditory organs on the forelegs. The stridulatory apparatus is most highly developed in the field crickets and the tree crickets. Members of these subfamilies have a ridged region, which acts as a file, and a hardened region, which acts as a scraper, on each front wing, sound is produced by rubbing the wings together. Crickets occur mostly in the temperate climates. The common field crickets of the United States are species of the genus *Gryllus*, all are brown to black, about 1 in. (2.5 cm) long, and are found in fields and meadows and often in houses. The tree crickets are slender, pale green or whitish insects of trees and shrubs, most U.S. species belong to the genus *Oecanthus*. The rate of chirping of tree crickets increases with increasing temperature. In the snowy tree cricket, *Oecanthus fultoni*, this variation is so regular that if the number 40 is added to the number of chirps per 15-sec interval, the sum is a fair approximation of the temperature in degrees Fahrenheit. Ant-loving crickets are tiny wingless forms $\frac{1}{8}$ in. to $\frac{1}{4}$ in. (3-5 mm) long that occur in ant nests, where they feed on an oily secretion produced by the ants. Unusual crickets are the mole crickets of the genus *Gryllotalpa*. These nocturnal insects have strong front legs adapted for digging and burrowing rather than strong hind legs for jumping. They live in moist soil. Crickets reproduce sexually, producing from one to three generations per year. The females usually lay eggs in the ground or in soft-stemmed plants during the late summer or fall. The eggs hatch in the spring and the emerging young are similar to the adults except for their smaller size and lack of wings. In addition to the true crickets of the family Gryllidae, some insects of the long-horned GRASS HOPPER family (Tettigoniidae) are also called crickets. These are the cave, or camel, crickets, found throughout the world in dark, moist places, and the stone, sand, or Jerusalem crickets of W North America, found under stones in sandy soil. True crickets belong to the phylum ARTHROPODA, class Insecta, order Orthoptera, suborder Ensifera, family Gryllidae.

cricket, summertime ball and bat game played chiefly in Great Britain and the Commonwealth countries. It is played by two opposing teams of 11 men each on a level, closely cut, green turf preferably measuring about 525 ft (160 m) by about 550 ft (170 m). Two wickets are placed 66 ft (20.12 m) apart near the middle of the field. A wicket consists of two small wooden crosspieces known as bails resting on three wooden stumps 28 in. (71.1 cm) high. At each wicket stands a batsman. If the bowler of the opposing team knocks down the bails of the wicket opposite him, the batsman defending that wicket is retired. In bowling the hard, leather-covered ball, the bowler may not bend his arm, and the ball usually approaches the batsman on one bounce. When the bowler has bowled the ball six times (eight in Australia and South Africa) to the batsman at one wicket, an umpire (there is one at each wicket) calls "over," and another bowler begins bowling to the batsman's partner at the other wicket. The players in the field shift their positions according to which batsman is batting. For his part, the batsman tries to hit the ball with his paddle-shaped bat far enough so that he and his partner may run to exchange places, thereby scoring a run. When the ball is hit for a long distance (in any direction, since there are no foul lines in cricket), several exchanges or runs may be made. (If the ball reaches the boundary of the field on the ground, four runs are scored without the batsmen having to run, similarly, if the ball clears the boundary in the air, six runs are added to the score.) However, if the opposing team recovers the ball in time to knock down the bails of a wicket before the batsman reaches it, he is out. A batsman is also retired if the ball he hits is caught on the fly (as in baseball), and

he may be retired for several other more technical reasons. An outstanding batsman may score more than 100 runs, a "century," before being retired, and totals in the 400s have been posted. A game consists of two innings, in one inning all the men of each team bat once in a fixed order (unless a team chooses to retire without completing its batting order), it may take several days to complete one game. The team scoring the most runs wins. Except in case of serious injury, no substitutions are allowed. The origin of cricket is obscure. Some contend that it was invented in France as a derivative of croquet. Most evidence, however, suggests that cricket was developed in medieval England (c 12th-13th cent.). In 1744 the London Cricket Club drew up the first authoritative set of rules. The Marylebone Cricket Club (founded 1787) is one of the world's oldest cricket organizations and is still the international governing body of the game. In Great Britain the principal cricket matches are those between the universities (especially Oxford and Cambridge) and between the largely professional teams representing the English counties. International, or test, matches are played annually, the most famous contest being that between Australia and Britain for the "Ashes." After Australia's surprising victory in the 1882 competition, London's *Sporting Times* displayed an obituary for British cricket whose final lines read "The body will be cremated, and the ashes taken to Australia." The following year the British vowed to retrieve "the ashes," thus was born the unusual name of this famous sporting event. In the United States the game was supplanted in popular favor by baseball, a sport derived in part from cricket. See *Wisden Cricketers' Almanack* (1864-), Rowland Bowen, *Cricket: A History* (1970), John Ford, *Cricket: A Social History, 1700-1835* (1972), Gordon Ross, *The History of Cricket* (1972), Peter Smith, *The Observer's Book of Cricket* (1973).

Crile, George Washington (krīl), 1864-1943, American surgeon, b. Coshocton co., Ohio, M.D. Univ. of Wooster medical school (later merged with Western Reserve Univ.), 1887. He taught at the Univ. of Wooster (1889-1900) and at Western Reserve Univ. (1900-1924) and was a founder and director (from 1921) of the Cleveland Clinic Foundation. He worked on hemorrhage and transfusion, surgery of the thyroid, and shock, developing the technique of anociassociation to prevent surgical shock. His works include *Diseases Peculiar to Civilized Man* (1934), *Phenomena of Life* (1936), and *Intelligence, Power, and Personality* (1941).

Crillon, Louis des Balbes de Berton de (lwē dā balb dā bērtōn' dā krēyōn'), c 1541-1615, French soldier. He fought under François de Guise in the retaking (1558) of Calais, served in the first wars against the Huguenots (1562-70), and fought under John of Austria in his Turkish campaign. Crillon distinguished himself at Lepanto (1571). He sided with King Henry III against the Catholic LEAGUE and was one of the best captains of King Henry IV, under whom he took part in the battle of Ivry and the siege of Paris.

Crime, see CRIMINAL LAW, CRIMINOLOGY, GANG JUVENILE DELINQUENCY, ORGANIZED CRIME.

Crimea (krīmē'ə), Rus and Ukr. *Krym*, peninsula (1970 pop 1,814,000), c 10,000 sq mi (25,900 sq km), extreme S European USSR, linked with the mainland by the Perekop Isthmus. The peninsula, administratively part of the Ukraine, is coterminous with the Crimea oblast, of which SIMFEROPOL is the capital. Other major cities include SEVASTOPOL, KERCH, FEO DOSIYA, YALTA, and YEVPAATORIYA. The peninsula is bounded on the S and W by the Black Sea. The eastern tip of the Crimea is the Kerch peninsula, separated from the Taman peninsula (a projection of the mainland) by the Kerch Strait, which connects the Black Sea with the Sea of Azov. Along the Crimea's northeast shore are a series of shallow, stagnant, but mineral-rich lagoons, known collectively as the Sivash or Putrid Sea, which are linked to the Sea of Azov by the Arabatskaya Strelka. The northern part of the Crimea is a semiarid steppe, drained by a few streams, this region supports fine wheat, corn, and cotton crops. In the south rises the Crimean or Yaila Range (Yailinskaya Yaila), with its extensive meadows and forests. The tallest peak rises to c 5,000 ft (1,520 m). Protected by steep mountain slopes, the Black Sea littoral, called the "Soviet Riviera," has a subtropical climate and numerous resorts, notably at Yalta and Sochi. In this region are vineyards and fruit orchards, fishing, mining, and the production of essential oils are also important. Heavy industry in the Crimea includes ironworks and plants producing machinery, chemicals, and building materials. In the Crimean Range is one of the USSR's chief

astronomical observatories. Known in ancient times as Tauris, the peninsula was the home of the Cimmerian people, called the Tauri. Expelled from the steppe by the Scythians in the 7th cent. B.C., they founded (5th cent. B.C.) the kingdom of Cimmerian Bosphorus, which later came under Greek influence. Ionian and Dorian Greeks began to colonize the coast in the 6th cent., and the peninsula became the major source of wheat for ancient Greece. In the 1st cent. B.C., the kingdom of Pontus began to rule the Greek part of the peninsula, which became a Roman protectorate in the 1st cent. A.D. Its Greek name was then Latinized into Chersonesus Taurica. During the next millennium the area was overrun by Ostrogoths, Huns, Khazars, Cumans, and in 1239, by the Mongols of the Golden Horde. Meanwhile, the southern shore was mostly under Byzantine control from the 6th to the 12th cent. Trade relations were established (11th-13th cent.) with Kievan Russia. In the 13th cent. Genoa founded prosperous coastal commercial settlements. After Tamerlane's destruction of the Golden Horde, the Tatars established (1475) an independent khanate in N and central Crimea. In the late 15th cent. both the khanate and the southern coastal towns were conquered by the Ottoman Empire, the Turks called the peninsula Crimea. Although they became Turkish vassals, the Crimean Tatars were powerful rulers who became the scourge of the Ukraine and Poland, exacted tribute from the Russian czars, and raided Moscow as late as 1572. Russian armies first invaded the Crimea in 1736. Empress Catherine II forced Turkey to recognize the khanate's independence in 1774, and in 1783 she annexed it outright, the annexation was confirmed by the Treaty of Jassy (1792). Many Tatars, with their Muslim religion and Turkish language, emigrated to Turkey, while Russians, Ukrainians, Bulgarians, Germans, Armenians, and Greeks settled in the Crimea. During the CRIMEAN WAR (1853-56), parts of the remaining Tatar population were resettled in the interior of Russia. After the Bolshevik Revolution (1917) an independent Crimean republic was proclaimed, but the region was soon occupied by German forces and then became a refuge for the White Army. In 1921 a Tatar Autonomous Soviet Socialist Republic was created (Tatars then constituted about 25% of the population). During World War II, German invaders took the Crimea after an eight-month siege. Accused by the Soviet government of collaborating with the Germans, the Crimean Tatars were forcibly removed from their homeland after the war and resettled in distant parts of the Asian USSR. The republic itself was dissolved (1945) and made into an oblast of the Russian Soviet Federated Socialist Republic, in 1954 it was transferred to the Ukraine. Russians and Ukrainians now constitute most of the Crimea's population.

Crimean War (krīmē'ən), 1853-56, war between Russia on the one hand and Turkey, England, France, and Sardinia on the other. The causes of the conflict were inherent in the unsolved EASTERN QUESTION. The more immediate occasion was a dispute between Russia and France over the Palestinian holy places. Challenging the claim of Russia to guardianship of the holy places, France in 1852 secured from Sultan ABD AL-MAJID certain privileges for the Latin churches. Russian counterdemands were turned down (1853) by the Turkish government. In July, 1853, Russia retorted by occupying the Turkish vassal states of Moldavia and Wallachia, and in October, after futile negotiations, Turkey declared war. In March, 1854, England and France, having already dispatched fleets to the Black Sea, declared war on Russia. Sardinia followed suit in Jan., 1855. Austria remained neutral, but by threatening to enter the war on the Turkish side forced Russia to evacuate Moldavia and Wallachia, which were occupied (Aug., 1854) by Austrian troops. In Sept., 1854, allied troops landed in the Crimea, with the object of capturing SEVASTOPOL. The Russian fortress, defended by TOTLEBEN, resisted heroically until Sept., 1855. Allied commanders were Lord RAGLAN for the British and Marshal Saint-Arnaud, succeeded later by Marshal Canrobert, for the French. Military operations, which were marked on both sides by great stubbornness, gallantry, and disregard for casualties, remained localized. Famous episodes were the battles of BALAKLAVA and INKERMAN (1854) and the allied capture (1855) of MALAKHOV and Redan, which preceded the fall of Sevastopol. On the Asiatic front the Russians gained advantages and occupied Kars. The accession (1855) of Czar Alexander II and the capture of Sevastopol led to peace negotiations that resulted (Feb., 1856) in the Treaty of Paris (see PARIS CONGRESS OF). The Crimean War ended the dominant role of Russia in SE Europe, the cooling of Aus-

tro-Russian relations was an important factor in subsequent European history. The scandalous treatment of the troops, particularly the wounded, depicted by war correspondents, prompted the work of Florence NIGHTINGALE, which was perhaps the most positive result of the war. See Peter Gibbs, *Crimean Blunder* (1960), W. B. Pemberton, *Battles of the Crimean War* (1962), J. Langdon-Davies, *Crimean War* (1964), A. J. Barker, *The War Against Russia 1854-6* (1970).

criminal law, the branch of law that defines crimes, treats of their nature, and provides for their punishment. A TORT is a wrong committed against an individual, a crime, on the other hand, is regarded as an offense committed against the public, even though only one individual may have been wronged. The real distinction lies in the way a remedy for the wrong is pursued. A tort is a wrong for which the remedy is pursued by, and at the discretion of, the injured individual or his representative, while a crime is a wrong for which the wrongdoer is prosecuted by the state for the purpose of punishment. However, the fact that a particular act has been or may be prosecuted as a crime does not necessarily preclude an injured party from seeking recovery from the offender in a civil action. Crimes are usually classified as TREASON, FELONY, and MISDEMEANOR. The fundamental distinction between felonies and misdemeanors rests with the penalty and the power of imprisonment. In general, a misdemeanor is an offense for which a punishment other than death or imprisonment in the state prison is prescribed by law. The term "degree of crime" refers to distinctions in the culpability of an offense because of the circumstances surrounding its commission. Crimes are sometimes divided according to their nature into crimes mala in se and crimes mala prohibita, the former class comprises those acts that are thought to be immoral or wrong in themselves, or naturally evil, such as murder, rape, arson, burglary, larceny, and the like, the latter class embraces those acts that are not naturally evil but are prohibited by statute because they infringe on the rights of others (e.g., acts in restraint of trade that have been made criminal under antitrust legislation). In the United States, the power to define crimes and set punishment for them rests with the legislatures of the United States, the several states, and the territories, the principal authority being that of the individual states. This power in the states is restricted by the Federal constitution, e.g., in the Fourteenth Amendment and in prohibitions against acts of attainder (an act of attainder is a legislative declaration that a particular individual is guilty of a crime) and against ex post facto laws (laws declaring certain actions to be criminal with retroactive effect). State constitutions may also limit state legislative action. The courts cannot look further into the propriety of a penal statute than to ascertain whether the legislature has the power to enact it. Administrative rules may have the force of law, and violations of such rules are punishable as public offenses, provided that the legislature has made such violations misdemeanors. A common law crime is one punishable under common law, as distinguished from crimes specified by statute. In many U.S. jurisdictions, including some in which comprehensive criminal statutes have been enacted, the common law in relation to crimes and criminal procedure has been recognized by the courts as in force, except insofar as it has been abrogated or repealed, expressly or impliedly, by statute. Thus the state may prosecute crimes that were indictable at common law even though they may not be denominated as such or be provided for by statute. In many other jurisdictions the courts have held the common law as to crimes as being abolished, and no act is punishable as a crime unless it is made so by statute, or unless the act is made punishable as a crime by the constitution, criminal procedure is entirely regulated by statute. There are no common law offenses against the United States, and one may be subject to punishment for crime in a Federal court only for the commission or omission of an act defined by statute or regulation having legislative authority, and then only if punishment is authorized by Congress. In general, crimes must be defined in a penal statute with appropriate certainty and definiteness, the constitutional requirement of due process of law is violated by a criminal statute that fails to give a person of ordinary intelligence fair notice that his contemplated conduct is forbidden by the statute. Except as otherwise provided by statute, to constitute a crime an overt act (actus reus) must be accompanied by a criminal intent (mens rea) or by such negligence as is regarded by law as equivalent to a criminal intent. Motive, or that which leads or

tempts the mind to indulge in a criminal act, as distinguished from intent, is neither a crime nor an essential element of a crime. The motive with which an offense was committed is immaterial. Proof of motive may be material in proving that the defendant committed a particular crime, but it is not essential to a conviction. Every accused has the right to avail himself of any and all defenses the law recognizes and permits—e.g., insanity, mistake of fact, or self-defense. An accused having the right to resort to several defenses may make an election as to the one on which he will rely. The fact that one undertakes a crime on the advice, or as the agent, of another is not a defense, on the other hand, except in the case of HOMICIDE, an act that would otherwise constitute a crime may be excused when committed under duress or compulsion that is present, imminent, and impending, and that produces a well-grounded apprehension of death or serious bodily harm if the act is not done (see COERCION). Religious belief is not ordinarily a justification or excuse for the commission of a crime (see BIGAMY). The procedure in criminal cases is substantially the same throughout the United States. The person suspected of crime is taken into custody by a police officer, usually by service of a WARRANT of arrest. The case is first presented to a grand jury, which draws up an INDICTMENT if there is sufficient evidence to justify trial, otherwise it discharges the accused. While action is pending, the party charged may be released on BAIL. Trial is by jury or before a judge alone. The government presents its case (i.e., attempts to prove the allegations of the indictment), through the public prosecutor, usually called the district attorney, while the accused is represented by counsel chosen by himself or appointed by the court. The legal presumption of innocence puts the burden of proving guilt beyond a reasonable doubt on the prosecution, unless, of course, the defendant pleads guilty to the charge. Special rules restricting the introduction of EVIDENCE in criminal trials further protect the defendant. If the accused is adjudged innocent, he is discharged, if he is found guilty, the judge pronounces sentence upon him. (For types of criminal penalties, see CAPITAL PUNISHMENT, CORPORAL PUNISHMENT, PRISON.) If the defendant is convicted, he may file for an APPEAL, if he is acquitted, however, the prosecution cannot appeal the verdict. Generally speaking, this procedure is confined to felonies, misdemeanors, being relatively less serious offenses, are handled in a more summary fashion. It is generally accepted that no court will enforce the criminal law of another jurisdiction, but by means of EXTRADITION a fugitive from justice may be delivered to the competent authorities. For an account of criminal law in ancient and medieval times, see COMPOSITION, VENDETTA. See also MILITARY LAW, MARTIAL LAW, INTERNATIONAL LAW, PIRACY, WAR CRIMES. See Glanville Williams, *Criminal Law* (2d ed., 1961), W. J. Chambliss, ed., *Crime and the Legal Process* (1969), S. H. Kadish, *Criminal Law and Its Processes* (1969).

criminology, the study of crime, its causes, its correction, and its prevention. Although it is generally considered a subdivision of SOCIOLOGY, it also draws on the findings of psychology, economics, and other disciplines that investigate humans and their environment. Most criminologists regard crime as a violation of social rules that have been codified into laws (see CRIMINAL LAW). Since cultures vary in organization and values, what is considered criminal may also vary, although most societies, preliterate or otherwise, have restrictive laws or customs. Crimes against property, long a major concern of Western criminology, acquired new definitions in Communist countries, where private property is limited to consumer goods. In examining the evolution and definition of crime, criminology aims to remove from this category acts that no longer conflict with society's norms and acts that violate the norms without imperiling society. Criminology as a study also embraces environmental, hereditary, or psychological causes, modes of investigation and conviction, and the efficacy of punishment (see PRISON). Determination of the prevalence of crime is difficult because of varying definitions and the fact that much crime is unreported. In the last few decades recorded crime in Western countries has risen. Offenses against property (burglary and theft) have risen in the United States and in other urbanized countries, as have crimes of violence (murder, rape, aggravated assault). Crime rates tend to fluctuate with social trends, rising in times of depression, after wars, and in other periods of disorganization. In the United States ORGANIZED CRIME first became significant during prohibition. Within cities, poverty areas have the highest rates of reported crime, espe-

cially among young people (see JUVENILE DELINQUENCY). The high incidence of recidivism (repeated criminality) has led criminologists to suggest the need for more effective penal systems and better analyses of causation. The causes of crime are complex. The idea that criminals can be detected by their physical structure (shape of head, ear lobes, and the like) has been largely discredited. Hereditary physical and psychological traits are generally ruled out as independent causes of crime, but psychological states are believed to determine an individual's reaction to potent environmental influences. Some criminologists assert that certain offenders are born into environments (such as extreme poverty or minority groups in areas where they are discriminated against) that tend to generate criminal behavior. Others argue that since only some persons succumb to these influences, there are additional stimuli. Perhaps the most widely accepted theory in criminology is Edwin Sutherland's theory of differential association, which argues that criminal behavior is learned in small groups. Psychiatry generally considers crime to result from emotional disorders, usually stemming from maladjustment in childhood. The criminal symbolically enacts a repressed wish, or desire, and such crimes as pyromania or kleptomania are specific expressions of personality disorders. Therefore, psychiatrists hold, crime prevention and the cure of offenders are matters of treatment rather than coercion. Criminologists are nearly unanimous in advocating that acts involving narcotics, alcohol, and sexual preferences (known among criminologists as crimes without victims) be removed from the category of crime. In dealing with crime in general the emphasis has gradually shifted from punishment to rehabilitation. Criminologists have worked to increase the use of probation and parole, psychiatric treatment, education in prison, and betterment of living conditions. One major area of crime that was relatively ignored until recent decades is that of white-collar crime, i.e., crimes committed by people of relatively high social status in the regular course of their professional or business careers. The President's Commission on Law Enforcement and Administration of Justice in 1967 concluded that about three times as much property is stolen by white-collar criminals as by other criminals outside of organized crime. See Sheldon Glueck and Eleanor Glueck, *Criminal Careers in Retrospect* (1943, repr. 1966), Hermann Mannheim, ed., *Pioneers in Criminology* (2d ed. 1960, repr. 1972) and *Comparative Criminology* (2 vol., 1965), Don Gibbons, *Society, Crime, and Criminal Careers* (1968), Jürgen Thorwald, *Crime and Science* (1968), Roger Hood, *Key Issues in Criminology* (1970), Edwin Sutherland and Donald Cressey, *Criminology* (8th ed. 1970), Richard Quinney, *The Social Reality of Crime* (1971), Stephen Schafer and William Knudten, *Reader in Criminology* (1973).

Crinoidea* see ECHINODERMATA, SEA LILY

Cripple Creek, city (1970 pop. 425), alt. 9,375 ft (2,858 m), seat of Teller co., central Colo., inc. 1892. Now a summer resort, it was once a great gold-mining town. The discovery of gold (1891) on a cattle ranch created one of the richest camps of a major gold-producing area, with a rough and exciting town life. In 1901 the district had an estimated population of 50,000. Although gold production declined after that year, the opening of a drainage tunnel in 1941 reactivated formerly flooded mines and led to the discovery of new veins. Violence marked miners' strikes there in 1893 and 1904. Today the old mines are tourist attractions.

Cripps, Sir Stafford, 1889–1952, British statesman. A brilliant and successful patent and corporation lawyer, he joined the Labour party in 1929 and became solicitor general in 1930, being knighted the same year. He resigned on the formation (1931) of the National government but won a seat in Parliament. He became a leading spokesman of the left wing of the Labour party and in 1939 was expelled from the party for urging a united front with the Communists. Sir Winston Churchill appointed (1940) him ambassador to the Soviet Union and on Cripps's return to England in 1942 made him lord privy seal and leader of the House of Commons. In the same year Cripps was sent to India with a self-government plan (which was rejected by India). Shortly thereafter he became minister of aircraft production. In 1945, Cripps was readmitted to the Labour party and appointed president of the Board of Trade in the new Labour government. He returned to India to negotiate independence in 1946, and the failure of his mission (because of the antagonism between Hindus and Muslims) is often seen as the point at

which the partition of India became inevitable. In 1947, Cripps was appointed to the newly created office of minister of economic affairs and within the same year became, in addition, chancellor of the exchequer. Great Britain was in the throes of a severe economic crisis, which Cripps sought to counter with his policy of austerity. By continuing rationing and imposing strict economic controls, he was able to slow inflation while maintaining full employment and without cutting back the government's welfare programs. Despite a vigorous export drive, however, Britain's balance of payments situation remained serious, and in 1949, Cripps most reluctantly devalued the pound by 30%. He retired in 1950. See biography by Colin Cooke (1957).

Cris: see KÖRÖS, river, Rumania

Crișana-Maramureș (krīshā'na-maramōō'rīsh), historic province, NW Rumania, between Transylvania and Hungary. It covers approximately the present-day regions of Crișana (4,725 sq mi/12,238 sq km) and of Maramureș (4,053 sq mi/10,497 sq km). ARAD, ORADEA, and SATU-MARE are the chief cities. The region occupies the easternmost part of the Hungarian plain and the western foothills of the Transylvanian Alps. It is largely agricultural. Crișana-Maramureș was part of Hungary until 1919 and retains a sizable Hungarian minority.

crisis, economic* see DEPRESSION

Crispi, Francesco (franchās'kō krēs'pē), 1819–1901, Italian premier (1887–91, 1893–96), b. Sicily. After participation in the Sicilian revolt of 1848 against the repressive rule of Ferdinand II of Sicily, he went into exile to Piedmont, then to Malta and England, where he met Mazzini, and to France. He returned to Italy and joined GARIBOLDI in his expedition to Sicily, which resulted in the proclamation of the kingdom of Italy (1861). A deputy to the Italian parliament from 1861, he was at first a republican, but later became an outspoken monarchist. He was minister of the interior (1877–78) and later premier. Through his personal relations with Bismarck, friendship with Germany was furthered, while Italian relations with France deteriorated. He was much interested in colonial policies, Eritrea in NE Africa was organized under him. Crispi was again premier, when the victory of the Ethiopians over the Italians at Adowa forced him from office.

Crispus, prominent Corinthian Jew converted by St. Paul. Acts 18, 1 Cor 1, 14.

Cristóbal (krēstō'bal), town (1970 pop. 388), Panama Canal Zone, near the Caribbean end of the canal. Cristóbal is the American residential suburb of Colón.

Cristus, Petrus* see CHRISTUS, PETRUS

Critias (krīsh'ēas, krītēās), c. 460–403 B.C., Athenian political leader and writer. A relative of Plato, he was an aristocrat and had early training in philosophy with Socrates and wrote poems and tragedies. He is best remembered, however, as one of the Thirty Tyrants imposed on Athens by the Spartans. He was soon at odds with Tharmenes, who was put to death. Critias earned a name for rapacity and bloodthirstiness, although Plato seems to have admired him, using him as a speaker in the dialogues *Protagoras*, *Timaeus*, and *Critias*. When THRASYBULUS led his forces against the Thirty, Critias was killed in battle.

critical angle. see REFRACTION

critical mass. see CHAIN REACTION

criticism, the interpretation and evaluation of literature and the arts. It exists in a variety of literary forms: dialogues (Plato, John Dryden), verse (Horace, Alexander Pope), letters (John Keats), essays (Matthew Arnold, W. H. Auden), and treatises (Philip Sydney, Percy Bysshe Shelley). There are several categories of criticism: theoretical, practical, textual, judicial, biographical, and impressionistic. One of the most laborious and exacting kinds is textual criticism, which is the comparison of different texts and versions of particular works with the aim of arriving at an incorrupt "master version." This has been perhaps most familiar over the centuries in biblical criticism. Textual critics of note include St. Augustine and St. Jerome (the Bible), Samuel Johnson and H. H. Furness (Shakespeare), and F. J. Furnival (early English texts). From its beginning criticism has concerned philosophers. Plato raised the question of the authenticity of poetic knowledge in the *Ion*, in which both poet and performer are forced to admit ignorance about the source of their inspiration or the function of their craft. In his *Poetics*, Aristotle focused on tragic drama to discover its effect—the purgation of the audience's emotions (see TRAGEDY). Roman civilization produced two critics

who were poets rather than philosophers. Horace declared in the *Ars Poetica* (c. 13 B.C.) that poetry must be "dulce et utile"—"sweet and useful." In his *On the Sublime* (1st cent. A.D.) the Greek Longinus presented the view that poetry must be the divinely inspired utterance of the poet's impassioned soul. Interestingly, each of these pronouncements was an accurate description of the author's own work rather than a set of rules for all poetry. Thus, the ancients can be credited with delineating the two major types of criticism: theoretical, which attempts to state general principles about the value of art (Plato, Aristotle), and practical, which examines the particular works, genres, or writers in light of theoretical criteria (Horace, Longinus). Renaissance critics ignored their recent heritage—the medieval attitude toward art as a form of prayer—and looked to the classics, Aristotle's works in particular, for usable models. Philip Sidney maintained in his *Defense of Poetry* (1595) that poetry must engage and uplift the emotions of its audience with "heart ravishing knowledge." In his *Poetics* (1561) the Italian critic Julius Caesar Scaliger transformed Aristotle's description of the dramatic unities of time, setting, and plot into exigencies, strictly adhered to by the neoclassical dramatists of 17th-century France and England. John Dryden, the master critic of Restoration England, upheld neoclassical standards, adding his own emphases. In his *Essay of Dramatic Poesy* (1668) he justified the use of rhyme in tragedy by arguing that drama was the work of a poet, not a transcription of random conversation. In his *Essay on Criticism* (1711) Alexander Pope added an important section on the criticism of critics: those who do their job best always "survey the Whole, not seek slight faults to find." Because the general tone of criticism of this period was prescriptive, it is called judicial criticism. Samuel Johnson's *Lives of the Poets* (1779–81) was the first thorough-going exercise in biographical criticism, the attempt to relate a writer's background and life to his works. The revolution from neoclassicism to romanticism was first outlined by William Wordsworth and Samuel Taylor Coleridge, who emphasized the importance of emotion and imagination in literature. In his Preface to the Second Edition of the *Lyrical Ballads* (1800), Wordsworth described the lyric as "emotion recollected in tranquility," whereas Coleridge, in his *Biographia Literaria* (1817) defined imagination as "the repetition in the finite mind of the eternal act of creation," rather than as a mere mechanical flight of fancy. The radical shift in emphasis was further delineated by John Keats in his letters and by Percy Bysshe Shelley in his *Defense of Poetry* (1821)—"poets are the unacknowledged legislators of the world." Diverse trends marked the criticism of the mid-19th century. The didacticism of Matthew Arnold, who held that the aims of literature should be "high seriousness" and a "criticism of life," was countered by Edgar Allan Poe in *The Poetic Principle* (1850), by Walter Pater in *Studies in the History of the Renaissance* (1873), and by Arthur Symonds in *The Symbolist Movement in Literature* (1899). These critics celebrated art for art's sake, with no moral strings attached. Henry James, an important novelist and critic of the novel, stressed the possibilities of point of view for further developing the narrative form in his essay "The Art of Fiction" (1893). The emphasis in criticism of this period on the reaction of the critic to the work under scrutiny led to the use of the term impressionistic criticism. However, as the American critic M. H. Abrams has pointed out in *The Mirror and the Lamp* (1953), all criticism, no matter what its form, type, or provenance, emphasizes one of four relationships: the mimetic, the work's connection to reality, the pragmatic, its effect on the audience, the expressive, its connection to the author, and the objective, the work as an independent, self-sufficient creation. The 20th cent. has been called the Age of Criticism. Such major disciplines as psychology and anthropology, and such ideologies as Christian theology and Marxist dialectic, were found to have valid application to works of literature. Freudian analysis became a tool for literary biographers. Carl Jung's theory of the collective unconscious also became a tool, along with anthropological methodology, for critics like T. S. Eliot (in *The Sacred Wood*, 1920) and Northrop Frye (in *Anatomy of Criticism*, 1957), who sought to trace similarities of pattern in literatures of disparate cultures and ages. I. A. Richards used techniques of psychological measurement to examine reader response with new precision, notably in *Practical Criticism* (1929). By means of the so-called New Criticism—the technique of close reading—such

critics as Cleanth Brooks, Allen Tate, Lionel Trilling, John Crowe Ransom, and Robert Penn Warren revived the notion of a poem as an autonomous art object. Notable among academic and journalistic critics who used a combination of critical approaches to enlighten their readers are Edmund Wilson (in such works as *The Triple Thinkers*, 1938), W. H. Auden (in *The Dyer's Hand*, 1962), and George Steiner (in *Language and Silence*, 1970). There have been a variety of critical trends in music and art criticism also. The approach has ranged from practical to theoretical, from G. B. Shaw's music reviews in the London press of the 1880s to treatises like Alfred Einstein's *Mozart* (1945) and Charles Rosen's *Classical Style* (1971). And the spectrum of art criticism includes such works as Robin George Collingwood's *Principles of Art* (1938), André Malraux's *Voices of Silence* (1952), and John Canaday's weekly reviews of museum and gallery exhibits. With the decline of representational art and the rise of cubism, abstract expressionism, and minimal art, art critics seem to have proliferated, with critics like Clement Greenberg, Barbara Rose, and Hilton Kramer among the most influential. Newer areas for critical scrutiny include film, architecture, and urban planning. Notable film critics include James Agee, André Bazin, and Pauline Kael. Ada Louise Huxtable's architecture criticism and Louis Mumford's studies of the city have broken new ground for critical scrutiny. See George Saintsbury, *A History of Criticism* (3 vol., 1961), F. C. Crews, *The Pooh Perplex* (1963), René Wellek, *A History of Modern Criticism* (4 vol., 1955-65), W. C. Greene, *The Choices of Criticism* (1965).

Critius (krīsh'ās), or **Kritios** (krīt'ēōs), and **Nesiotos** (nēshēō'tēz), fl. 5th cent. B.C., Greek sculptors, in the time of the Persian Wars. They made statues of the Tyrannicides, Harmodius and Aristogiton, who slew the tyrant Hipparchus. The works replaced a group by Antenor taken from Athens by Xerxes and later returned. The originals have disappeared, but a number of Roman reproductions survive. The most complete marble copies are those in the national museum at Naples. Critius, probably a pupil of Antenor, established a school of sculpture at Athens.

Crittenden, George Bibb, 1812-80, Confederate general, b. Russellville, Ky., son of John J. Crittenden and brother of Thomas L. Crittenden. Upon the outbreak of the Civil War, he left the U.S. army to become a Confederate brigadier general. At MILL SPRINGS (Jan., 1862) he was badly defeated and resigned, but he reenlisted and served without rank for the rest of the war.

Crittenden, John Jordan, 1787-1863, U.S. public official, b. Woodford co., Ky. A Kentucky legislator (1811-17), Crittenden entered the U.S. Senate (1817-19) but resigned to resume state offices. He served as Attorney General under Presidents William H. Harrison and John Tyler (March to Sept., 1841) and Millard Fillmore (1850-53). He replaced Henry Clay when Clay resigned from his Senate seat (1842) and was reelected the next year. During his last term in the Senate (1855-61), Crittenden was foremost in attempting to conciliate North and South (see CRITTENDEN COMPROMISE) and was chairman of the Border States Convention (May, 1863). See study by A. D. Kirwan (1962).

Crittenden, Thomas Leonidas, 1819-93, Union general in the Civil War, b. Russellville, Ky., son of John J. Crittenden and brother of George B. Crittenden. He served in the Mexican War and was (1849-53) U.S. consul at Liverpool. A major general in the Kentucky militia when the Civil War began, Crittenden became a Union brigadier general (Sept., 1861) and was promoted to major general (July, 1862) for his service at Shiloh. He commanded under Rosecrans at Murfreesboro and in the Chattanooga campaign. After being exonerated for the rout of his corps at Chickamauga, he served for a time in the Army of the Potomac. Crittenden resigned his commission in Dec., 1864, but reentered the army in 1867 and served until 1881.

Crittenden, Thomas Theodore, 1832-1909, governor of Missouri (1881-85), b. Shelby co., Ky., nephew of John J. Crittenden. In the Civil War he served (1862-65) as lieutenant colonel of a Missouri cavalry regiment in the fighting in Missouri and Arkansas. He was state attorney general in Missouri for a brief period after the war and served in the U.S. House of Representatives (1873-75, 1877-79). As governor, Crittenden brought an end to outlaw activity in the state, especially by breaking up the Jesse James gang. In President Cleveland's second term (1893-97) he was consul general in Mexico City. See

The Crittenden Memoirs (comp. by H. H. Crittenden, 1936).

Crittenden Compromise, in U.S. history, unsuccessful last-minute effort to avert the Civil War. It was proposed in Congress as a constitutional amendment in Dec., 1860, by Sen. John J. Crittenden of Kentucky with support from the National Union party. Basically, it accepted the boundary between free and slave states that had been set by the MISSOURI COMPROMISE (1820-21), extended the line to California, and assured the continuation of slavery where it already existed. In addition, it advocated slavery in the District of Columbia, upheld the FUGITIVE SLAVE LAW (1850) with minor modifications, and called for vigorous suppression of the African slave trade. At a peace conference called by the Virginia legislature in 1861, the compromise gained support from four border state delegations. Nevertheless, it failed in the House of Representatives in Jan., 1861, by a vote of 113 to 80 and in the Senate in March by a vote of 20 to 19. Its defeat made clear the inevitability of the Civil War. See A. D. Kirwan, *John J. Crittenden: The National Union Party Struggle for the Union* (1962).

Crivelli, Carlo (krēv'ēl'ā), b. c. 1430, d. after 1493, Venetian painter, who worked chiefly in the Marches. His paintings, notable for their rather harsh conception, include the *Virgin and Child* in the Ascoli Cathedral, a large altarpiece (National Gall., London), and *Coronation of the Virgin* (Brera, Milan). His work reveals a crystalline, linear technique and a fondness for elegant decorative motifs. Works in the United States include three entitled *Pieta* (Mus. of Fine Arts, Boston; Fogg Mus., Cambridge; Detroit Inst. of Arts), several of the *Madonna* (Walters Art Gall., Baltimore; National Gall. of Art, Washington, D.C.; Metropolitan Mus.), and *St. George on Horseback* (Gardner Mus., Boston).

Crna Gora: see MONTENEGRO, Yugoslavia.

Croaghpatrick (krō'āpāt'rīk, krō'āk'h-), mountain, 2,510 ft (765 m) high, Co. Mayo, W. Republic of Ireland, near Clew Bay. Legend connects it with St. Patrick, and its summit has long been a place of pilgrimage.

croaker, member of the abundant and varied family Sciaenidae, carnivorous, spiny-finned fishes including the weakfishes, the drums, and the whiting. The croaker has a compressed, elongated body similar to that of the bass. The name describes the croaking or grunting sounds produced by members of most species, chiefly during the breeding season. Croakers are found in sandy shallows of all temperate and warm seas. They range in weight from the 1-lb (0.5-kg) Atlantic croaker to the 150-lb (68-kg) common drum. The Atlantic croaker, common from Cape Cod to Texas, is an important food fish. The spot-fin croaker is found in the Pacific. The drums, the largest and noisiest croakers, include the red drum, or channel bass, of which over 2 million lb (900,000 kg) are taken per year off Florida, the common, or black, drum, found from New England to the Rio Grande, and the freshwater drum, found in central North America. The whittings, or kingfishes, include the Northern, or king, whiting, or sea mink, the Southern kingfish, or king whiting, and the surf whiting and its Pacific counterpart, the corbina. All average 3 lb (1.4 kg) in weight and 2 ft (60 cm) in length. Croakers are bottom feeders, those mentioned above have sensitive chin barbels to aid in locating their prey. The weakfishes, named for their easily torn flesh, lack barbels, they are also called sea trout. The common weakfish, or squeteague, abundant along the Atlantic coast, grows to 12 lb (5.5 kg) in weight and 3 ft (90 cm) in length. The more southerly spotted weakfish is similar. The white sea bass, weighing up to 60 lb (27 kg), is a Pacific croaker found as far north as Puget Sound. The spot, a small croaker, is commercially important in Virginia and the Carolinas, where the annual catch is estimated at 10 million lb (4.5 million kg) or more. Croakers are classified in the phylum CHORDATA, subphylum Vertebrata, class Osteichthyes, order Perciformes, family Sciaenidae.

Croatia (krōā'shā), Croatian *Hrvatska* (hārvāt'skā), constituent republic of Yugoslavia (1971 pop. 4,422,564; 21,824 sq mi [56,524 sq km]), NW Yugoslavia. ZAGREB is the capital. The second largest Yugoslav republic, it includes Croatia proper, SLAVONIA, DALMATIA, and most of ISTRIA. There are important seaports at RIJEKA (Fiume), OSIJEK, SPLIT, PULA, ZADAR, ŠIBENIK, and DUBROVNIK. Western Croatia lies in the Dinaric Alps, the eastern part, drained by the Sava and Drava rivers, is mostly low lying and agricultural. The Pannonian plain is the chief farming region. More than one third of Croatia is forested, and

lumber is a major export. The region is the leading coal producer of Yugoslavia, and also has deposits of bauxite, copper, petroleum, and iron ore. The republic is the most industrialized and prosperous area of Yugoslavia. Tourism, especially along the Adriatic coast, is important to the economy. The Croats are Roman Catholic and use the Latin alphabet, there are also Serbs, Slovenes, and other minorities in Croatia. A part of the Roman province of Pannonia, Croatia was settled in the 7th cent. by Croats, who accepted Christianity in the 9th cent. A kingdom from the 10th cent., Croatia conquered surrounding districts, including Dalmatia, which was chronically contested with Venice. Croatia's power reached its peak in the 11th cent., but internecine strife facilitated its conquest in 1091 by King LADISLAUS I of Hungary. In 1102 a pact between his successor and the Croatian tribal chiefs established a personal union of Croatia and Hungary under the Hungarian monarch. Although Croatia remained linked with Hungary for eight centuries, the Croats were sometimes able to choose their rulers independently of Budapest. In personal union with Hungary, Croatia retained its own diet and was governed by a ban, or viceroy. After the battle of MOHÁCS in 1526 most of Croatia came under Turkish rule. In 1527 the Croatian feudal lords agreed to accept the Hapsburgs as their kings in return for common defense and retention of their privileges. During the following century Croatia served as a Hapsburg outpost in the defense of central Europe from a Turkish onslaught. The centralizing and Germanizing tendencies of the Hapsburgs, however, severely weakened the power of the Croatian nobility and awakened a national consciousness. During the 19th cent. Hungary imposed Magyarization on Croatia and promulgated (1848) laws that seriously jeopardized Croatian autonomy within the Hapsburg empire. Joseph JELLACHICH, ban of Croatia, had the diet pass its own revolutionary laws, including the abolition of serfdom. Jellachich's forces also marched against the Hungarian revolutionaries in the 1848-49 uprisings in the Hapsburg empire. When the dual Austro-Hungarian monarchy was established in 1867, Croatia proper and Slavonia were included in the kingdom of Hungary, and Dalmatia and Istria in the Austrian empire. The following year Croatia, united with Slavonia, became an autonomous Hungarian crownland governed by a ban responsible to the Croatian diet. Despite the achievement of autonomy in local affairs, Croatia remained restless because of continuing Magyarization. Cultural and political Croat and South Slav organizations arose, notably the Croatian Peasant party, founded in the early 20th cent. With the collapse of Austria-Hungary (1918), the kingdom of Serbs, Croats, and Slovenes (see YUGOSLAVIA) was formed. Serbs dominated the new state, however, and promoted centralization, ignoring Croat desires for a federal structure. Agitation resulted in the assassination (1928) of Stefan RADICH, head of the Croatian Peasant party. After Radich's successor, Vladimir MAČEK, connived with fascist Italy to form a separate Croatian state, Yugoslavia allowed the formation (1939) of an autonomous *banovina* comprising Croatia, Dalmatia, and parts of Bosnia and Herzegovina. Nevertheless, many Croats, especially members of the Ustachi fascist terrorist organization, insisted on complete independence. When the Germans invaded Yugoslavia in 1941, the Ustachi seized power and declared Croatian independence under Ante Pavelić. Croatia was placed under Italian and later German military control, while the Ustachi dictatorship perpetuated brutal excesses, including the massacre of thousands of Serbs. A large part of the population joined the anti-fascist Yugoslav partisan forces under TITO, himself a native of Croatia. Pavelić fled in the wake of Germany's defeat in 1945, and Croatia became one of the six republics of reconstituted Yugoslavia. Croatian nationalism persisted in Communist Yugoslavia, however. The Ustachi and other émigré nationalist groups remained active abroad, in 1972 a small band of invaders waged a gun battle with Yugoslav border security forces. Meanwhile, the Yugoslav government hoped that a major decentralization reform that took effect in the early 1970s would satisfy Croat demands for increased republican autonomy and thus dampen secessionist sentiment. See Stephen Gazi, *A History of Croatia* (1973).

Croatoan, unexplained letters found (1590) carved on a tree on ROANOKE ISLAND off North Carolina by Governor John White when he returned to the colony from England and discovered the colonists gone. White took the letters to mean that the settlers had moved to Croatoan Island some 50 mi (80 km)

away, but no trace of them was ever found. The name, in the form Croatan, is popular in the region and is perhaps best known in the name of Croatan Sound, which connects Pamlico Sound with Albemarle Sound.

Croce, Benedetto (bānādēr'tō krō'chā), 1866–1952, Italian philosopher, historian, and critic. He lived mostly in Naples, devoting himself to studying and writing. He founded and edited (1903–44) *Critica*, a review of literature, history, and philosophy, which in 1944 became *Quaderni della critica*. Croce was made a senator in 1910 and was minister of education (1920–21). A staunch opposer of Fascism, he lived in retirement until 1943, when he became a leader of the Liberal party. Croce's system of philosophy is related to the idealistic school in that spirit, monistic in manifestation, constitutes the only reality. The general title of the work presenting his system is *Philosophy of the Spirit* (1902–17, tr. 1909–21), which is divided into four parts, *Aesthetic as Science of Expression and General Linguistic*, *Logic as the Science of Pure Concept*, *Philosophy of the Practical*, and *History: Its Theory and Practice*. Among his other works are *A History of Italy, 1871–1915* (1927, tr. 1929) and *History as the Story of Liberty* (1938, tr. 1941). See his essays, *My Philosophy* (tr. 1949), studies by A. A. De Gennaro (1961), G. N. G. Orsini (1961), and Bernard Bosanquet (1972).

crochet work (krōshā'), form of knitting done with a hook, by means of which loops of thread or yarn are drawn through other, preceding loops. Crochet stitches are all based on the chain or single crochet, i.e., a single loop. In double crochet the thread is thrown once about the hook before the loop is drawn. All other stitches and patterns are merely varying combinations of the single or double loop. The art finds its highest expression in Irish crochet, done with the finest thread and hooks in intricate patterns, usually displaying a motif of leaves or flowers set in an open weblike ground. Whole garments, as well as trimmings, hats, and bags are made by the skillful Irish needlewomen.

Crocker, Charles, 1822–88, American railroad builder, b. Troy, N.Y. In 1836 he moved with his family to Marshall co., Ind., where he later set up a small foundry. He joined a party to seek gold in California in 1849. He and a brother opened (1852) a store to sell supplies to miners, and as it prospered they started others, later consolidating them in Sacramento. There Crocker met Mark Hopkins, Hopkins's partner, Collis P. Huntington, and Leland Stanford, and with them he organized (1861) the Central Pacific Railroad Company of California. Crocker undertook responsibility for actual construction, completing it in 1869. His difficulty in maintaining an adequate labor force for the arduous work led to his employment of Chinese laborers, who were kept in a state of virtual slavery. In 1871, Crocker sold out his interest to his partners, but in the Panic of 1873 he returned as director and vice president. See Oscar Lewis, *The Big Four* (1938).

Crockett, Davy (David Crockett), 1786–1836, American frontiersman, b. Limestone, near Greeneville, Tenn. After serving (1813–14) under Andrew Jackson against the Creek Indians in the War of 1812, he settled in Giles co., Tenn., and in 1821 was elected to the state legislature. In 1823, Crockett, having moved to the extreme western part of the state, was reelected from his new constituency. When it was jokingly suggested that he should run for Congress, he took the proposal seriously and served three terms in the House (1827–31, 1833–35). His dress, language, racy backwoods humor, and naive yet shrewd comments on city life and national affairs made him a popular figure in Washington. Crockett became a political opponent of Jackson, and the Whigs took him up so assiduously that he became the showpiece of conservatism. Resenting his defeat for reelection in 1835, Crockett left Tennessee for Texas, where he heroically lost his life in the defense of the ALAMO. *A Narrative of the Life of David Crockett* (1834), *An Account of Col. Crockett's Tour to the North and down East* (1834), and *Col. Crockett's Exploits and Adventures in Texas* (posthumous, 1836) were supposedly written by Crockett himself in his own inimitable idiom, but they do not match, either in content or style, those letters which are definitely known to be his. See his *Narrative*, facsimile edition edited by J. A. Shackford and S. J. Folmsbee (1973), study by J. A. Shackford (1956).

crocodile, large, carnivorous REPTILE of the order Crocodylia, found in tropical and subtropical regions. Crocodiles live in swamps or on river banks and catch their prey in the water. They have flat-

tened bodies and tails, short legs, and powerful jaws. The eyes, ears, and nostrils are located near the top of the head and are exposed when the crocodile floats on the surface of the water. The ears and nostrils have valves that close when the animal is submerged. Most crocodiles are more aggressive than the related ALLIGATORS. The two forms are distinguished by the long lower fourth tooth in crocodiles, but not in alligators, this tooth protrudes on the side of the head when the mouth is closed. The snouts of most crocodiles are narrower than those of alligators. Small crocodiles feed on fish and small aquatic animals, larger ones also catch land mammals and birds that approach the water. Members of some large species sometimes attack and eat humans. The female crocodile deposits her eggs, usually about 20 in number, in a nest of rotting vegetation or in a shallow pit on the river bank, and digs them up when she hears them hatching. In most species the average adult length is between 6 and 10 ft (1.8–3 m). The largest crocodile (the saltwater crocodile) is often 14 ft (4.3 m) long and may exceed 20 ft (6 m) in length. The Nile, American, and Orinoco crocodiles are commonly 12 ft (3.7 m) long, and specimens up to 23 ft (7 m) long have been reported for the last two species. The smallest crocodile (the Congo dwarf crocodile) averages 3½ ft (1.05 m) long. With the exception of the two African dwarf crocodiles (*Osteolaemus*) and the so-called false gavia (*Tomistoma*) of Asia, crocodiles are classified in the genus *Crocodylus*, with about a dozen species. The Nile crocodile (*Crocodylus niloticus*) is found in fresh and salt water throughout S and central Africa. In early historic times it ranged N to the Nile delta and the Mediterranean coast. It sometimes attacks humans, as does the saltwater crocodile (*C. porosus*), found on islands and in straits from SE Asia to Australia and Melanesia. The marsh crocodile, or mugger (*C. palustris*), is a freshwater species of India and Ceylon, regarded as sacred in some regions. The American crocodile (*C. acutus*) is found in fresh and salt water in S Florida, the West Indies, Central America, and NW South America. It does not attack humans without provocation. The Orinoco crocodile (*C. intermedius*) is a freshwater species of the Orinoco basin of Colombia and Venezuela. Two smaller species are found in limited areas of Central America and Cuba. Crocodiles are classified in the phylum CHORDATA, subphylum Vertebrata, class Reptilia, order Crocodylia, family Crocodylidae. See also GAVIAL.

crocus see IRIS

Croesus (krē'sas), d. c. 547 B.C., king of Lydia (560–c. 546 B.C.), noted for his great wealth. He was the son of Alyattes. He continued his father's policy of conquering the Ionian cities of Asia Minor, but on the whole he was friendly to the Greeks, and he is supposed to have given refuge to the Athenian statesman Solon. Threatened by CYRUS the GREAT of Persia, Croesus allied himself with Amasis II of Egypt and Nabonidus of Babylonia against the Persian might, but the alliance was of no avail. Cyrus defeated and captured Croesus, and, according to Herodotus, Croesus cast himself upon a funeral pyre.

crofting see BLEACHING

Croghan, George (krō'gān), d. 1782, American Indian agent, b. Ireland. He migrated to North America in 1741 and became (1756) deputy superintendent of Indian affairs under Sir William Johnson. Croghan was to a large extent responsible for Johnson's success and reputation among the Indians. In the French and Indian War he caused many tribes to desert the French cause. See biographies by A. T. Volwiler (1926, repr. 1971) and N. B. Wainwright (1959).

Croghan, George, 1791–1849, American military officer, b. near Louisville, Ky., nephew of George Rogers Clark and William Clark. He won public acclaim and a congressional award for his defense of Fort Stephenson against almost overwhelming enemy forces in the War of 1812. Croghan later served under Zachary Taylor in the Mexican War. See *Army Life on the Western Frontier*, selections from Croghan's official reports ed. by F. P. Prucha (1958).

Croissy, Charles Colbert, marquis de (shārl kōlbēr mārķē dā krwāsē'), c. 1625–96, French diplomat, brother of Jean Baptiste Colbert. He entered the service of Cardinal Mazarin and filled many diplomatic posts in Europe in the 1650s and 60s. In 1668 he signed the peace treaty of Aix-la-Chapelle, which ended the War of Devolution. As ambassador to England (1668–74) he negotiated the first treaty of Dover with King Charles II (1670). In 1678 he became president for life of the Parlement of Paris. Becoming minister of state for foreign affairs in

1680, he worked to develop an alliance system for France and was probably instrumental in developing the "chambers of reunion" to aid Louis XIV's expansionist ambitions.

Croix, Carlos Francisco de Croix, marques de (kar'lōs franthēs'kō dā krawa' mārķās dā krawa'), 1699–1786, Spanish colonial administrator, b. Lille, France. As viceroy of New Spain (1766–71), he was a genial, honest, and industrious official, but the real ruler was Jose de GALVEZ, the Visitor-General. Many reforms were instituted, the Jesuits were expelled (1767), and the natives of NW Mexico were subdued in order to open the California frontier. His nephew, Teodoro de Croix, 1730–91, was military commander and provincial governor in Mexico before becoming viceroy of Peru (1784–90). He put into operation the reforms in Indian administration that resulted indirectly from the revolt of Tupac Amaru.

Croker, John Wilson (krō'kar), 1780–1857, British Tory politician and author, b. Ireland. He was a member of Parliament from 1807 to 1832 and secretary of the admiralty from 1810 to 1830. The most famous of his regular contributions as a critic to the *Quarterly Review* was his virulent attack (1818) on Keats's *Endymion*. Croker's best work was his careful edition (1831) of Boswell's *Life of Johnson*. See *Croker Papers* (ed. by L. J. Jennings, 3 vol., 1884, repr. 1972).

Croker, Richard, 1841–1922, American politician, head of TAMMANY HALL from 1886 to 1902, b. Co. Cork, Ireland. He became prominent as Democratic leader of New York City's East Side and as an aide of John KELLY. He was elected (1868) alderman and held minor appointive offices, which increased in importance after Kelly succeeded (1871) William M. Tweed as boss. Croker became Kelly's chief lieutenant, and after Kelly's death (1886) Croker was the acknowledged Tammany boss. Croker was (1889–90) city chamberlain and brought about the elections of Hugh Grant (1888), Thomas F. Gilroy (1892), and Robert Van Wyck (1897) as mayors. The election (1901) of Seth Low as mayor of New York caused Croker's abdication as Tammany leader, and he was succeeded by Charles F. MURPHY. Croker spent the remainder of his life in leisure in England and Ireland. See T. L. Stoddard, *Master of Manhattan* (1931).

Croker, Thomas Crofton, 1798–1854, Irish antiquary, b. Cork. One of the first to collect Irish folklore, he compiled *Fairy Legends and Traditions of the South of Ireland* (1825–28), *Legends of the Lakes* (1829), and *Popular Songs of Ireland* (1837).

Croly, Jane Cunningham, pseud. Jennie June, 1829–1901, American journalist and feminist, b. England. She came to the United States at the age of 12 and in 1857 married author and editor David Goodman Croly. She was one of the earliest American newspaperwomen, writing for various New York newspapers under the pseudonym Jennie June. From 1860 to 1887 she edited *Demorest's Quarterly Mirror of Fashion* (later *Demorest's Illustrated Monthly*) and later was part owner of *Godey's Lady's Book*. She specialized in women's features and was among the first journalists who syndicated their articles. In 1856 she called the first women's congress. Twelve years later, in 1868, she founded Sorosis, the only women's club of importance at that time, and in 1889, the New York Women's Press Club. She wrote *The History of the Woman's Club Movement in America* (1898).

Cro-Magnon man (krō'-māg'nōn), human being that lived about 35,000 years ago. Skeletal remains, associated with artifacts of the Aurignacian culture, were first found (1868) in the rock shelter of Cro-Magnon in Les Eyzies, Dordogne, France. Later finds, differing slightly from each other in skeletal characteristics, were made in a number of caverns in the Dordogne valley, Solutre, and in Spain, Germany, Czechoslovakia, and Poland. Cro-Magnon man is of the same species as modern man (*Homo sapiens*). Unlike NEANDERTHAL MAN, whom he superseded, Cro-Magnon stood straight and was 6 ft (180 cm) or more tall. The head was balanced as in modern man, the forehead was high, the brain large, and the chin well developed. Skillfully made flint and bone tools, shell and ivory jewelry, and polychrome paintings found on the walls of some caves in S. France and N. Spain indicate an advanced culture. See MAN, PREHISTORIC.

Cromarty, county, Scotland. See ROSS AND CROMARTY.

Cromarty Firth, deep narrow inlet of Moray Firth, c. 15 mi (25 km) long, in Ross and Cromarty co., N. Scotland. It provides excellent anchorage, its narrow

entrance being protected by the headlands of the Sutor rocks, more than 400 ft (122 m) high

Cromberger, Juan: see PABLOS, JUAN

Crome, John, 1768–1821, English landscape painter, b Norwich. Crome was the principal painter of the Norwich school. He is often called Old Crome to distinguish him from his son who painted in the same manner but with less mastery. He was born into poverty but rose to the position of a provincial landscape painter, earning his living by giving drawing lessons and selling an occasional picture. Crome's work was influenced by Gainsborough and by the Dutch masters. His landscapes are notable for simplicity and serenity. Beautiful examples are to be seen in many British galleries and private collections. *Mousehold Heath* and *Poringland Oak* are in the National Gallery, London. The Metropolitan Museum has *The Old Oak* and *Hautbois Common*. Crome's etchings were published after his death under the title *Norfolk Picturesque*. See studies by R. H. Motttram (1931) and D. and T. Clifford (1968).

Cromer, Evelyn Baring, 1st earl of (ēv'lin bār'ing krō'mar), 1841–1917, British administrator in Egypt. Appointed (1877) first British commissioner of the Egyptian public debt office, he directed investigations by France and England into the bankrupt administration of ISMAIL PASHA. After the deposition of Ismail and accession of TEWFIK PASHA, Baring became (1879) British controller general in Egypt. He was (1880–83) finance minister in India and returned to Egypt after Arabi Pasha's nationalist revolt to become British agent and consul general in 1883. Until his resignation in 1907, Baring (created Baron Cromer in 1892 and earl in 1901) was the virtual ruler of Egypt. Faced with the Mahdist rebellion in Sudan, he recommended Egyptian withdrawal and only reluctantly agreed to the appointment of Charles George GORDON to arrange the evacuation. He reformed Egyptian finances, administration, and education, improved the railroads, and developed methods of agriculture and irrigation. After the reconquest (1896–98) of the Sudan, he devised the Anglo-Egyptian system of government. Cromer was a Greek scholar and wrote books on imperial and Egyptian affairs. See biography by L. J. L. Zetland (1932), study by John Marlowe (1970).

cromlech (krōm'lēk) [Welsh or Breton, =crooked stone], term that has changed in meaning from its original equivalent to DOLMEN. It later came to be used for a single standing stone and now usually refers to a circle of such stones, as at STONEHENGE.

Crommelync, Fernand (fērnān' krōmalānk'), 1888?–, Belgian dramatist, b Brussels. Crommelync earned his living as an actor before the great success of his tragic farce about jealousy *Le Cocu magnifique* (1921, tr. 1966). Other plays that reveal his expert craftsmanship and strong lyric power include *Le Sculpteur de masques* (1908), *Le Marchand de regrets* (1913), and *Carne* (1930). See the translation of two plays by Marnit Gijzen (1966).

Crompton, Samuel, 1753–1827, English inventor of the mule spinner, or muslin wheel, an important step in the development of fine cotton spinning. Working as a young man in a spinning mill, he knew the defects of the Hargreaves jenny and determined to produce something better. After five years of secret work, he perfected (1779) a machine that combined the features of the jenny and Arkwright's frame and that, in one operation, by drawing, twisting, and winding the cotton, produced a very fine yarn. Crompton, however, was too poor to obtain a patent for his invention and sold his rights for £60. Later Parliament granted him £5,000.

Cromwell, Oliver, 1599–1658, lord protector of England. The son of a gentry family, he entered Cambridge in 1616 but probably left the next year. Cromwell entered Parliament in 1628, standing firmly with the opposition to CHARLES I, and was active in the Short and Long Parliaments (1640), although not a conspicuous leader. During the first civil war (see ENGLISH CIVIL WAR) he rose rapidly to leadership because of his military ability and his genius for organizing and inspiring the parliamentary armies. His own regiment, the Ironsides, distinguished itself at Marston Moor (1644) and in numerous minor engagements. In 1644 he pressed for a thorough reorganization of the parliamentary forces and was appointed (1645) second in command to Sir Thomas Fairfax (later Baron FAIRFAX OF CAMERON) in the resulting New Model Army, which defeated the king at Naseby in 1645. In the quarrel between the army and Parliament following the first civil war, Cromwell, himself an Independent, supported the sectarians in the army and approved the seizure (1647) of Charles from Parliament. However, he favored a

moderate settlement with the king (as opposed to the radical proposals of the LEVELERS) until Charles's flight to Carisbrooke (1647) and secret dealings with the Scots caused him to lose all hope of further negotiations with the king. In the second civil war he repelled the Scottish royalist invasion at Preston (1648). His political power was enhanced by the removal of Presbyterian leaders from Parliament in Pride's Purge (see under PRIDE, THOMAS), and at the king's trial (1649) his was the leading voice demanding execution. In 1649, after the proclamation of the republican Commonwealth, Cromwell led a punitive expedition into Ireland, remembered primarily for the massacre of the royalist garrison at Drogheda. He then initiated a policy of systematic dispossession of the Irish, transferring their lands to English landlords. In 1650 he invaded Scotland and routed the Scottish royalists at Dunbar; later he defeated the Scots and Charles II himself at Worcester (1651) and left the rest of the conquest of Scotland to Gen. George Monck. Cromwell, now virtual dictator of the Commonwealth, dissolved the Rump Parliament in 1653 after it had failed to effect reforms demanded by the army and had sought to perpetuate its power. His attempt to replace it by the Nominated (Barebone's) Parliament (see BAREBONE, PRAISE-GOD), appointed by himself from nominations of the Independent congregations, resulted in a reckless, hopelessly divided body that was finally forced to dissolve itself. A group of army officers then drew up the constitutional document known as the Instrument of Government (1653), by which Cromwell became lord protector (see PROTECTORATE). The Parliament of 1654, which was elected under the terms of the same document, wanted to prepare a new constitution and was soon dissolved. After that Cromwell resorted to open military government, dividing England into 11 districts, each administered by a major-general. Another, more amenable Parliament was summoned in 1656, and in 1657 it presented to Cromwell a new constitution known as the Humble Petition and Advice and offered him the crown. He declined the crown but accepted (with some modifications) the Humble Petition, which further increased his power and set up a second legislative chamber. The second session of this same Parliament, however, challenged the new constitution, and Cromwell dissolved it (1658) seven months before his death. Cromwell's foreign policy was governed by the need to expand English trade and prevent the restoration of the Stuarts, and by the desire to build up a Protestant league and enhance the prestige of the English republic. He approved the Navigation Act of 1651, which led to the first (1652–54) of the DUTCH WARS, and he pressed the war against Spain (1655–58) as a means of encroaching on Spanish rights of colonization in America. The Dutch war resulted in several important naval victories for the English under Admiral Robert BLAKE, but the Spanish war, apart from the sinking of a Spanish fleet (also by Blake), brought only Jamaica and imposed a great strain on English finances. Although Cromwell professed love for both toleration and constitutional government, only Jews and non-Anglican Protestants (excepting Quakers) were tolerated during his rule, and he found it impossible to cooperate with Parliament in governing. Opinions of Cromwell have always varied widely. His military skill and force of character are universally recognized. He met the task of holding together the gains of the civil wars and the disharmonious groups in the Puritan party in what seemed the only practical way. This involved cruelty, force, and intolerance, which were evidently alien to him personally. His government, dependent on his own strong character, costly in its foreign policy, and representing a break in English institutions and a minority religious viewpoint, could not survive him long. He was succeeded as protector by his son Richard. See the writings and speeches of Oliver Cromwell (ed. by W. C. Abbott and others, 4 vol., 1937–47), biographies by M. P. Ashley (1969), J. E. C. Hill (1970), C. V. Wedgwood (rev. ed. 1973), and Antonia Fraser (1973), M. P. Ashley, *The Greatness of Oliver Cromwell* (1957, repr. 1966), writings on the period by Samuel Rawson GARDINER and Sir Charles FIRTH.

Cromwell, Richard, 1626–1712, lord protector of England, third son of Oliver Cromwell. He was the eldest surviving son at the death of his father (Sept. 3, 1658), who had nominated him as his successor. Although he had served in Parliament and on the council of state, Richard lacked the energy and experience to manage complicated affairs of state. Army and Parliament struggled for power, and the army forced Richard to dismiss Parliament on April

22, 1659. His Protectorate had actually collapsed, but it continued in name until May 25, when the Rump Parliament, which had reassembled itself, reestablished the Commonwealth. He lived abroad (1660–80) and later in England under an assumed name. A man of integrity and dignity, he was unfortunate in being forced into a situation too difficult for his talents. See biography by R. W. Ramsay (1935), study by E. M. Hause (1972).

Cromwell, Thomas, earl of Essex, 1485?–1540, English statesman. While a young man he lived abroad as a soldier, accountant, and merchant, and on his return (c. 1512) to England he engaged in the wool trade and eventually became a lawyer. He entered Parliament in 1523 and soon became legal secretary to Cardinal WOLSEY, for whom he managed the suppression of minor monasteries. He avoided being disgraced with Wolsey in 1529, and by 1531 was serving HENRY VIII as a member of the privy council. By 1532 he had become the king's chief minister and was responsible for drafting most of the acts of Parliament by which the Reformation was effected. He probably originated the idea of making the king supreme head of the Church in England. As Henry's vicar-general after 1535, he supervised (1536–9) the visitation and suppression of monasteries and the confiscation of monastic lands and wealth. Much of Cromwell's unpopularity with the people, demonstrated by the PILGRIMAGE OF GRACE, derived from the ruthlessness of his agents in carrying out that project. He issued injunctions to the clergy, regulating their conduct and duties, assailed the worship of images and relics, and initiated a much-needed system of parish registers. He was made a baron and lord privy seal in 1536, lord great chamberlain in 1539, and earl of Essex in 1540. He negotiated the king's marriage to ANNE OF CLEVELAND as a means of securing the North German princes as allies against the Catholic Holy Roman emperor Charles V. When Anne proved unattractive and the alliance failed, Henry allowed charges of treason and heresy to be brought against Cromwell by his bitter enemy the duke of Norfolk. Cromwell was condemned by act of attainder and beheaded. See biographies by R. B. Merriman (1902), Theodore Maynard (1950), and A. G. Dickens (1959), G. R. Elton, *The Tudor Revolution in Government* (1953) and *Reform and Renewal* (1973).

Cronaca, Il' see POLLAIUOLO

Cronin, A. J. (Archibald Joseph Cronin), 1896–, Scottish novelist. He gave up his prosperous London medical practice to devote himself to writing after the success of his first novel, *Hatter's Castle* (1931). His novels, written in a direct simple style, reflect both his religious beliefs as a Roman Catholic and his medical training. He is best known for *The Citadel* (1937), *The Keys of the Kingdom* (1941), *The Green Years* (1944), *Shannon's Way* (1948), and *Pocketful of Rye* (1969).

Cronje, Piet Arnoldus (pēt arnōld'as krōn'yā), 1835?–1911, South African military commander. A Boer, he commanded the Transvaal forces that frustrated the raid against the Transvaal led by Sir Leander Starr Jameson. In the South African War (1899–1902), Cronje conducted the unsuccessful siege of Kimberley. Retreating west before the advance of Lord Roberts, he was surrounded (1900) at Paardeberg and forced to surrender.

Cronkite, Walter, 1916–, American radio and television newsman, b St. Joseph, Mo. He left the Univ. of Texas to write for the *Houston Press* and later for other Scripps-Howard newspapers. In 1939 he became a wire-service reporter with United Press, serving as a war correspondent (1942–45) and as a reporter at the Nuremberg trials. He joined the Columbia Broadcasting System in 1950 and in 1962 became managing editor and anchorman of "The CBS Evening News with Walter Cronkite." In 1973 a national poll indicated that he was the most trusted newsman in the United States. His books include *Challenges of Change* (1971).

Cronstadt: see KRONSTADT, USSR

Cronstedt, Axel Fredrik, Baron (āk'sal frā'drīk, krōn'stēt), 1722–65, Swedish mineralogist and chemist. In 1751 he discovered in niccolite an impure form of nickel, reported it as a newly discovered element, and proposed the name nickel for it. He was one of the first to recognize the importance of the chemical constituents of minerals and rocks and to use the blowpipe in the study of minerals. He wrote *An Essay towards a System of Mineralogy* (1758, tr. 2d ed., 1788).

Cronus (krō'nās), in Greek legend, the youngest Titan, son of Uranus and Gaea. With the help of his mother, he led the Titans in the revolt against Ura-

nus and ruled the world. He married his sister Rhea and fathered the great gods—Zeus, Poseidon, Demeter, Hera, Hades, and Hestia. Because he was fated to be overthrown by one of his children, he swallowed them all as infants until Rhea hid Zeus and presented Cronus with a stone wrapped in a blanket, which he ate. Later Zeus tricked him into disgorging his children. Zeus then led the Olympian gods in overthrowing Cronus in the battle called the Titanomachy, described by Hesiod. Cronus and all the defeated Titans, except Atlas, were exiled. Cronus is equated with the Roman Saturn and was probably a god of a pre-Hellenic people.

Crook, George, 1828–90, U.S. general, b. near Dayton, Ohio, grad. West Point, 1852. During the Civil War, Crook commanded a regiment of Ohio volunteers as colonel. After the war he operated so successfully against the Paiute and Snake Indians in Idaho and the Apache in Arizona that he was promoted (1873) to brigadier general in the regular army. Made commander of the Dept. of the Platte in 1875, he was engaged in the hard-fought Sioux War of 1876. In Arizona in 1883, Crook led an expedition into the mountains against a Chiricahua band of the Apache and finally succeeded in persuading GERONIMO to return to the reservation (1884). Later, Geronimo broke his pact and escaped, which led to censure of Crook's policies and his voluntary resignation. From 1888 until his death Crook was major general and commander of the Division of the Missouri. Although his fame rested upon his Indian campaigns, Crook also had a reputation for enlightened patience and integrity in dealing with Indian affairs, preferring negotiation to warfare. See his autobiography (ed. by M. F. Schmitt, 2d ed. 1960) and contemporary accounts by J. F. Finerty (1961) and Charles King (rev. ed. 1964).

Crooked Island: see BAHAMA ISLANDS

Crookes, Sir William, 1832–1919, English chemist and physicist. After serving at the Radcliffe Observatory, Oxford, and teaching chemistry at Chester Training College, he retired to work in his own laboratory in London. He discovered the element thallium and made special studies of radioactive substances in the course of which he invented the spintharoscope, used to make visible the flashes produced by bombarding a screen with the alpha rays of a particle of radium, and he devised the radiometer, which measures the intensity of radiant energy. He also intensively studied the rare earths and diamonds. Crookes devised spectacles to protect the eyes of glassworkers from damaging rays. One of his chief inventions is the Crookes tube, with which J. J. Thomson, W. C. Roentgen, R. A. Millikan, and others conducted important research. He founded the *Chemical News* in 1859 and was the author of numerous scientific papers and of *Select Methods in Chemical Analysis* (1871). Crookes was also interested in psychical research.

Crookes tube, device invented by Sir William Crookes (c.1875) consisting essentially of a sealed glass tube from which nearly all the air has been removed and through the walls of which are passed two electrodes. When a high voltage is applied between the two electrodes, electrons are emitted from the CATHODE and are accelerated toward the anode. Many of these electrons, or cathode rays (as they are usually called), miss the anode and strike instead the glass wall of the tube, causing it to exhibit fluorescence. The behavior of the rays indicates that they travel in straight lines and exert a pressure on any object placed in their path. The Crookes tube was used by Crookes in a number of experiments and was later used in experiments leading to the discovery of X rays by W. C. Roentgen (1895) and of the electron by J. J. Thomson (1897).

Cropsey, Jasper Francis, 1823–1900, American artist, b. Staten Island, N.Y. Trained as an architect, Cropsey designed two churches in Staten Island and several stations on the Sixth Ave. elevated railway in Manhattan. He was a founder of the American Water Color Society and is noted for his landscapes and Civil War scenes.

croquet (krōk'ā'), lawn game in which the players hit wooden balls with wooden mallets through a series of 9 or 10 wire arches, or wickets. The first player to hit the posts placed at each end of the field wins. The game developed in France in the 17th cent. and has been popular also, with varying rules, in Great Britain and the United States. *Rogue* (minus the first and last letters of *croquet*) is an American variant devised in 1899. See Paul Brown, *Croquet* (1957), A. G. F. Ross, *Croquet Handbook* (1959), J. W. Solomon, *Croquet* (1966).

Crosby, Bing, 1904–, American singer and film actor, b. Tacoma, Wash., as Harry Lillis Crosby. He sang with dance bands from 1925 to 1930, in 1931 he began work in radio and films and gained enormous popularity for his "crooning" style. In 1944 he won an Academy Award for his performance in *Going My Way*. Crosby's other notable films include *The Country Girl* (1955) and *Stagecoach* (1966). See his autobiography, *Call Me Lucky* (1953), Kathryn Crosby, Bing and Other Things (1967).

Crosby, municipal borough (1971 pop. 57,405), Lancashire, NW England, on Liverpool Bay. Formed in 1937 from the urban districts of Great Crosby and Waterloo-with-Seaforth, Crosby is primarily residential. The local history of Crosby dates back more than 1,000 years. The Merchant Taylor's School for boys was founded in 1620. In 1974, Crosby became part of the new metropolitan county of Merseyside.

Cross, Wilbur Lucius, 1862–1948, American educator and public official, b. Mansfield, Conn., grad. Yale (B.A., 1885, Ph.D., 1889). He was instructor (1894–97), assistant professor (1897–1902), and professor (1902–30) of English at Yale, where he also was dean (1916–30) of the graduate school. Cross became well known as a literary critic, edited the *Yale Review* for almost 30 years, and was the author of *The Life and Times of Laurence Sterne* (1909), *The History of Henry Fielding* (1918), and books on the English novel. After he retired (1930) from Yale he turned to politics. As Democratic governor of Connecticut (1931–39), he brought about much reform legislation—abolition of child labor, governmental reorganization, and improved factory laws. See his autobiography, *Connecticut Yankee* (1943).

cross, widely used symbol. In various forms, it can be found in such diverse cultures as those of ancient India, Egypt, and the American Indians. It is found in the megalithic monuments of Western Europe. The most important use is among Christians, to whom it recalls the crucifixion of Jesus and man's redemption thereby. The Christian form of blessing by tracing a cross over oneself or another person or thing originated before A.D. 200. The oldest Chris-

ture was painted or in bas-relief, a style surviving in the Christian East. Older Western crucifixes often presented the Savior reigning, in robe and crown, the realistic dying figure, dating from the Renaissance, is now universal in Roman Catholicism. Devotion to the cross as a symbol of the Passion is an outstanding development (from the 11th cent.) in the history of Christian thought; it has ever since been an essential part of the public and private religious life of Roman Catholics. Protestants have been generally sparing in using the cross, even in blessings, and have abandoned the crucifix, but the symbolism has been retained in their literature (e.g., in the hymn, *When I Survey the Wondrous Cross*). The cross was the badge of the Crusades and was adopted as the emblem of the Templars, of the Knights Hospitalers (Knights of Malta), and of the Teutonic Knights. It became important in HERALDRY, FLAG designs, and DECORATIONS. There are many shapes of crosses. The Latin cross, the commonest, has upright longer than transom. With two transoms it is called an archiepiscopal or patriarchal cross, with three it is a papal cross. A cross widely used by Slavs and by others of Eastern rites has two transoms and a slanting crosspiece below. The Greek cross has equal arms. St. Andrew's cross is like an X, and the tau cross is like a T. The Celtic, or Iona, cross bears a circle, the center of which is the crossing. The Maltese cross and the swastika (an ancient and widely diffused symbol) are still more elaborate. Examples of artistic effort spent on crosses are seen in the monumental crosses of market, town, and wayside in Europe (e.g., at Cheddar, Malmesbury, and Winchester, England) and in the wayside calvaries of Austria and Brittany. Some of the finest art products of the Celts were stone crosses. (For the later Eleanor Crosses, see ELEANOR OF CASTILE). Processional crosses (on poles) lend themselves to elaboration. Crosses are also worn for personal adornment. Pectoral crosses and necklace crosses have given scope for fine enameling.

crossbill, bird of the genus *Loxia*, in the FINCH family. Its bill, crossed at the tips, is specialized for pulling apart pine cones and picking out the seeds. Crossbills are found in the evergreen forests of the Northern Hemisphere, as far south as NW Africa and Guatemala. Two species occur in the United States. The red crossbill (*L. curvirostra*) is found in Europe and in N and central Asia as well as in North America. Males have orange to dull red plumage, with black wings. The white-winged crossbill (*L. leucoptera*) occurs in northern Russia and in North America; the male of this species is rosy red and both sexes are marked with white wing bars. Females of both species are olive-gray and yellow; they lay three to four pale green, brown-spotted eggs, in well-formed nests built in trees. Crossbills are not considered migratory, but they shift their breeding grounds erratically, probably in response to the availability of pine cones. Sometimes they suddenly appear in large numbers in areas where they are rarely seen. They are classified in the phylum CHORDATA, subphylum Vertebrata, class Aves, order Passeriformes, family Fringillidae.

crossbow: see BOW AND ARROW

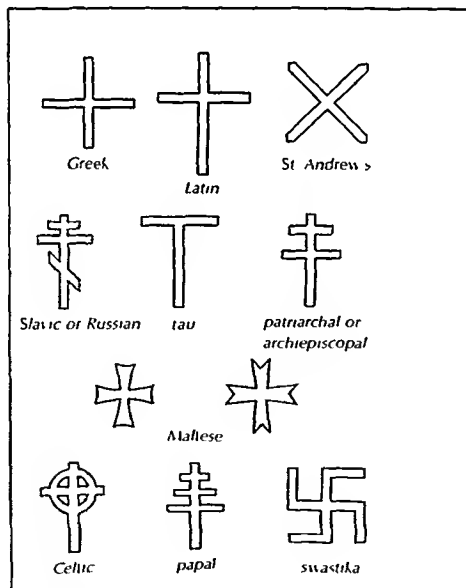
cross-examination: see EVIDENCE

cross-eye: see STRABISMUS

cross-fertilization: see FERTILIZATION

Cross-Florida Waterway: see OKEECHOBEE WATERWAY

crossing over, process in genetics by which the two CHROMOSOMES of a homologous pair exchange equal segments with each other. Crossing over occurs in the first division of MEIOSIS. At that stage each chromosome has replicated into two strands called sister chromatids. The two homologous chromosomes of a pair synapse, or come together. While the chromosomes are synapsed, breaks occur at corresponding points in two of the non-sister chromatids, i.e., in one chromatid of each chromosome. Since the chromosomes are homologous, breaks at corresponding points mean that the segments that are broken off contain corresponding GENES, i.e., alleles. The broken sections are then exchanged between the chromosomes to form complete new units, and each new recombined chromosome of the pair can go to a different daughter sex cell. Crossing over results in RECOMBINATION of genes found on the same chromosome, called linked genes, that would otherwise always be transmitted together. Because the frequency of crossing over between any two linked genes is proportional to the chromosomal distance between them, crossing over frequencies are used to construct genetic, or linkage, maps of genes on chromosomes. MUTATIONS,



Types of crosses

tian remains contain drawings of crosses and cruciform artifacts, and the fact that the cross was the Christian emblem before the toleration of Christianity is shown by the vision of CONSTANTINE I. His mother, St. HELENA, is supposed to have found the True Cross at Calvary in 327, and the event is commemorated on May 3 as the Finding of the Cross. Splinters of the relic are widely distributed and honored by Roman Catholics and Orthodox Eastern. In 614, to the scandal of Christendom, Khosru II of Persia took the largest piece of the relic from Jerusalem. It was restored by Heraclius I in 627, the anniversary of this event is Sept. 14, the Exaltation of the Cross. The relic was lost in the Muslim occupation of Jerusalem. Use of the cross was one of the popular practices attacked by Byzantine iconoclasm and vindicated (787) by the Second Council of Nicaea. The crucifix—the cross with the figure of Jesus upon it—had already been established in use, at first, the fig-

temperature changes, and radiation all affect crossing over frequency. Under the microscope, a crossover has the appearance of an X and is called a chiasma.

crossword puzzle, word game played on a rectangle marked with white and black squares that may or may not form a design, crossword puzzles typically appear in newspapers. Two lists of numbered definitions are given, one for horizontal words, the other for vertical words. The puzzle is solved when all the words are correctly supplied. In the diagramless puzzle, there is no key to the length of the words used. A crossword puzzle inscription has been found on an ancient tomb in Egypt; the puzzle first appeared in the modern world in Great Britain in the 19th cent. as a children's game, and after 1920 it became popular with adults there and in the United States. See ACROSTIC, ANAGRAM.

Croswell case, U.S. court case involving freedom of the press. In 1803, Harry Croswell, the editor of the *Wasp of Hudson, N.Y.*, was convicted of libeling President Thomas Jefferson in his newspaper. In his appeal of the conviction to the New York supreme court, Croswell was defended by Alexander Hamilton. In a famous brief, Hamilton argued that freedom of the press consisted in the right to print the truth, if with good motives and for justifiable ends, even if this truth reflected on "the government, magistracy or individuals." Although the court sustained the conviction, the legislature of New York incorporated Hamilton's position into law in 1805. It was the law of libel until 1964, when *New York Times Company vs. Sullivan* expanded the protection of the press.

Crothers, Rachel (krōth'arz), 1878-1958, American playwright and director, b. Bloomington, Ill., grad. Illinois State Normal Univ., 1892. Her plays, many of which were social comedies treating the ethical problems of women, were notable for their craftsmanship. Among her major successes were *The Three of Us* (1906), *A Man's World* (1909), *He and She* (1911), *Old Lady 31* (1916), *Let Us Be Gay* (1929), and *Susan and God* (1937).

Croton, Italy. See CROTONA.

Crotona (krōtō'na) or **Croton** (krō'tan), ancient city, S. Italy, on the east coast of Bruttium (now Calabria), a colony of MAGNA GRAECIA founded c. 708 B.C. There Pythagoras established his school, which exerted a notable political and moral influence. The nearby temple of Hera Lacinia was the religious shrine of Magna Graecia. Crotona's athletes won fame at the Olympic games. The height of the city's prosperity was reached after the army, led by the athlete Milo, destroyed the rival town of Sybaris (510 B.C.). Crotona then became involved in wars and soon declined. It was captured by the Romans in 277 B.C., until modern times it was never more than a provincial town. It was called Cotrone from the Middle Ages until 1928, when its name was changed to Crotona.

Croton Aqueduct (krō'tan), 38 mi (61 km) long, SE N.Y., carrying water from the Croton River basin to New York City, built 1837-42. It was one of the earliest modern aqueducts in the United States. Water impounded by New Croton Dam (completed 1905) is channeled S. to the Bronx, for most of its length in a covered trench along the surface. Water is carried over the Harlem River into Manhattan by Highbridge, a Roman-type aqueduct bridge. New Croton Aqueduct (built 1885-91), 30.5 mi (49 km) long, supplements the flow of Croton Aqueduct. Deep underground tunnels, including one under the Harlem River, channel water from this aqueduct to New York City.

Croton bug. See COCKROACH.

Crotone. See CROTONA.

croup (krōp), acute obstructive laryngitis in young children, usually between the ages of three and six. The manifestations are a high-pitched cough and difficulty in breathing, owing to a spasm or swelling of the larynx. The cause can be an acute infection (especially by the influenza virus or diphtheria bacterium), an allergy, a tumor of the larynx, or obstruction by a swallowed object. Treatment depends on the cause, e.g., antibiotics are used in the case of bacterial infections, epinephrine and similar drugs in the case of allergy. The inhalation of steam from a vaporizer or hot-water faucet relieves breathing difficulties in most cases. In severe cases oxygen may be administered, or it may be necessary to cut an opening in the trachea to prevent suffocation.

crow, partially migratory black bird of the same family as the raven, the magpie, the jay, and the rook and the jackdaw of Europe. The American, or com-

mon, crow, about 19 in (49 cm) long, has a wingspread of over 3 ft (92 cm). Crows eat some eggs and nestlings and grain, but destroy many harmful insects and rodents. In winter they gather at night by thousands in communal roosts. Crows, along with the other members of the family Corvidae, are considered to be the most intelligent of all birds. They are easily tamed and can learn to mimic some human sounds. Their throaty "caw" is familiar, although they can also produce a musical warble. The fish crow of the Atlantic and Gulf coasts is smaller than the common crow. The carrion crow of Great Britain is a flesh-eating bird 18 to 20 in (46-51 cm) long. Crows are classified in the phylum CHORDATA, subphylum Vertebrata, class Aves, order Passeriformes, family Corvidae.

crowberry, evergreen alpine and arctic shrub of the genus *Empetrum* (or, sometimes, other related species), bearing black, red, or purple berrylike fruits. Some are cultivated in rock gardens. Crowberry is classified in the division MAGNOLIOPHYTES, class Magnoliopsida, family Empetraceae.

crowfoot, name for plants with the leaf or some other part resembling the foot of a crow, particularly the BUTTERCUP.

Crow Indians, North American Indians whose language belongs to the Siouan branch of the Hokan-Siouan linguistic stock (see AMERICAN INDIAN LANGUAGES) and who call themselves the Absaroka, or bird people. They ranged chiefly in the area of the Yellowstone River and its tributaries and were a hunting tribe typical of the Plains cultural area. Their only crop was tobacco, which they used for pleasure and religious purposes. Until the 18th cent. the Crow lived with the HIDATSA INDIANS on the upper Missouri River, after a dispute they migrated westward until they reached the Rocky Mts. The Crow developed a highly complex social system that included, among other things, great care and attention for children. They were enemies of the Sioux and helped the white men in the Sioux wars. See R. H. Lowie, *The Crow Indians* (1935, repr. 1956), Peter Nabokov, *Two Leggings: The Making of a Crow Warrior* (1967).

Crowley, city (1970 pop. 16,104), seat of Acadia parish, SW La., inc. 1888. It is a shipping, milling, and storing center for one of the nation's largest rice-growing areas and has a rice experiment station. Oil and natural gas wells are located nearby.

crown, circular head ornament, symbolizing sovereign dignity (for crowns worn by nobles, see CORONET). The use of the crown as a symbol of royal rank is of ancient tradition in Egypt and the Orient. In ancient Greece and Rome, however, crowns—sometimes made of leaves—were merely wreaths, awarded to victors in athletic or poetic contests or bestowed on citizens in recognition of an act of public service. The crown as used in medieval and modern times is an elaboration of the DIADEM and is generally made of metal, often gold inlaid with precious gems. The crown became thoroughly identified with the functions of monarchy, and the term crown is often used in a purely institutional sense, as in crown lands, crown colonies, and crown debt. Among famous crowns of historic interest are the Lombard iron crown, kept at Monza, Italy, the crown of Charlemagne, at Vienna, Austria, and the sacred crown of St. Stephen of Hungary. These are exceptional in that they were used repeatedly over centuries for coronation ceremonies. Most crowns are of recent origin, although the jewels they contain are often taken from older crowns. The ancient crowns of England were destroyed under Oliver Cromwell. There are two crowns used by the British sovereigns: the crown of Edward the Confessor (a much-altered replica of the original crown) is used for the coronation ceremony in Westminster Abbey, and the imperial state crown is worn on state occasions. Crowns are also worn by the consorts and families of sovereigns. The triple crown of the popes, known as a tiara, dates from the 14th cent. Regardless of their actual shape, crowns are usually represented in heraldry as closed at the top by four arched bars called diadems and surmounted by a globe and a cross. In religion and art, a crown symbolizes sovereignty (Rev. 19:12) and also honor, especially the reward of martyrdom (Heb. 2:9).

Crowne, John, c. 1640-c. 1703, English playwright. The favorite playwright of Charles II, he is remembered for several rather mediocre comedies. Crowne was influenced by the French tradition, particularly by Molière, and the mental states of his characters are more important than plot. Among his plays are *Pandion and Amphigenia* (1665), *Sir Courtly Nice* (1685), and *The Married Beau* (1694).

crown gall: see GALL.

Crown Point. 1 City (1970 pop. 10,931), seat of Lake Co., NW Ind., inc. 1868. Film is processed, and truck conveyors, golf balls, feed grinders, and cabinets are made. 2 Town (1970 pop. 1,857), Essex Co., NE N.Y., on Lake Champlain. Crown Point is a summer resort on a historic site. The French realized the strategic importance of this point on the route from New York to Canada and in 1731 began building Fort St. Frederic. In the French and Indian Wars the fort successfully resisted (1755-56) early English attacks but was demolished (1759) before the advance of Jeffrey Amherst. The British began to build Fort Amherst (renamed Fort Crown Point) in 1759. Early in the American Revolution, Crown Point was captured (May 12, 1775) by Seth Warner and a detachment of Green Mountain Boys. After twice changing hands, it was finally abandoned (June 22, 1777) to Gen. John Burgoyne in the Saratoga campaign. Crown Point Reservation, with bathing and fishing facilities, a museum, and ruins of colonial forts, is nearby.

Croydon, borough (1971 pop. 331,851) of Greater London, SE England. The borough was created in 1965 by the merger of the county borough of Croydon with the urban district of Coulsdon and Purley. It has the largest population of the London boroughs. Scientific instruments, internal-combustion engines, and electronic equipment are manufactured, but Croydon is largely residential. Several office buildings have been constructed in the borough, which also has a technical college and a college of art.

crucible, vessel in which a substance is heated to a high temperature, as for fusing or calcining. The necessary properties of a crucible are that it maintain its mechanical strength and rigidity at high temperatures and that it not react in an undesirable way with its contents. PORCELAIN and GRAPHITE are two refractory materials widely used for crucibles, but FIREBRICK can be used as well, especially when vessels of large capacity are needed. The chamber at the bottom of a metal-refining furnace, in which the molten metal collects to be drawn off, is also known as a crucible.

crucifix: see CROSS.

crucifixion, hanging on a CROSS, in ancient times a method of CAPITAL PUNISHMENT. It was practiced widely in the Near East but not by the Greeks. The Romans, who may have borrowed it from Carthage, reserved it for slaves and despised malefactors. They used it frequently, as in the civil wars and in putting down the Jewish opposition. Crucifixion was probably at first a modification of hanging on a tree or impaling on a pole, and from such a connection come the synonyms tree and rood (i.e., rod or pole) for Jesus' cross. The Romans used mostly the T cross, the Latin cross, or St. Andrew's cross. Most ancient sources describe the cross Jesus died on as a Latin cross, the type most common in the liturgy of the West. It was common practice among the Romans to scourge the prisoner and to require him to carry his cross to the place of crucifixion. The prisoner was either nailed or tied to the cross, and, to induce more rapid death, his legs were often broken. See Mat. 27:24-61, Mark 15:15-47, Luke 23:13-56, John 19:13-42. Crucifixion was abolished when the empire became Christian. See also CALVARY and GOOD THIEF.

Cruden, Alexander, 1701-70, author of a famous biblical concordance, b. Aberdeen, Scotland. He spent most of his life near London. In 1737 he published his *Complete Concordance to the Holy Scriptures*, which went through several editions and is the basis of later biblical concordances.

crude oil: see PETROLEUM.

cruelty, prevention of. In the 19th cent. many laws were passed in Great Britain and the United States to protect the helpless, especially children, lunatics, and domestic animals, from willful and malicious acts of cruelty. At first, cruelty to animals was deemed criminal only when severe enough to constitute a public nuisance. But in 1822 the British Parliament passed the Martin Act for animal protection, and two years later Richard Martin formed the Society for the Prevention of Cruelty to Animals. The Cruelty to Animals Acts of 1849 and 1854 firmly established protection for animals. Not until 1884 was the first British law passed to protect children from cruelty. This movement to protect the helpless soon spread throughout Europe and to the United States, where the American Society for the Prevention of Cruelty to Animals was formed (1866) by Henry Bergh in New York City. The American Humane Association, for the protection of animals and chil-

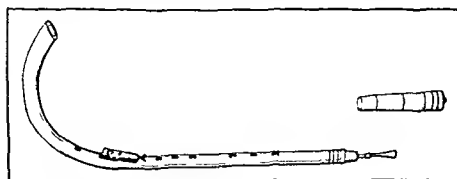
dren, was organized in 1877. In the United States, as in Great Britain, protection of children came after that of animals, the first Society for the Prevention of Cruelty to Children having been formed in New York City in 1875. In all states, parents guilty of bodily cruelty to, or moral corruption of, their children may now be lawfully punished, and the children may be taken from them to become wards of the state (see CHILD ABUSE). Societies of both types—for the protection of children and of animals—promote better legislation and enforcement, investigate and report alleged cruelties, establish shelters and sometimes (animal) hospitals, and carry on education against cruelty. While most of these societies are private, philanthropic organizations, some receive public funds. See R. C. McCrea, *The Humane Movement* (1910, repr. 1969), L. G. Housden, *The Prevention of Cruelty to Children* (1955), P. P. Hallie, *The Paradox of Cruelty* (1969), David Bakan, *Slaughter of the Innocents* (1971).

Cruikshank, George (krōōk'shāngk), 1792–1878, English caricaturist, illustrator, and etcher, younger son of Isaac Cruikshank (1756–1810), caricaturist. Self-taught, George early gained a reputation for his humorous drawings and political and social satires. He succeeded James Gillray as the most popular caricaturist of his day. Cruikshank illustrated more than 850 books and contributed to such publications as the *Meteor*, the *Scourge*, and the *Satirist*. Among the best of his many illustrations are the famous *Life in London* (in collaboration with his brother), his masterly etchings for Grimm's *German Popular Stories*, and the 12 etchings in Richard Bentley's miscellany, which include the notable illustrations of *Oliver Twist*. In his later years Cruikshank made many drawings depicting the evils of intemperance, such as *The Drunkard's Children*, *The Bottle*, and *The Gin Trap*. Collections of his works are in the British and the Victoria and Albert museums. See biographies by Blanchard Jerrold (1882) and William Bates (2d ed. 1972), catalogues by A. M. Cohn (1924) and M. D. George (1949), study, ed. by R. L. Patten (1973).

cruiser, large, fast, moderately armed warship, intermediate in type between the aircraft carrier and the destroyer. During World War II, battle cruisers operated as small battleships, combining in one vessel maximum qualities of gun caliber, armor protection, and speed. Upon the retirement of the BATTLESHIP from the major navies of the world, the cruiser became the largest of the conventionally armed warships in commission. The cruiser's primary mission in modern warfare is to provide antiaircraft defense and gunfire support for aircraft carriers. Light cruisers, lightly armed and very fast, are often employed in scouting, police duties, and other jobs where speed rather than defensive strength is important. The advent of guided missiles as the primary offensive weapon of modern warfare has led to the conversion of many cruisers into guided-missile cruisers. The guided-missile cruiser *Long Beach* (completed 1961) was the first ship since World War II to be constructed for the U.S. navy from keel up as a cruiser; it was also the first nuclear-powered surface fighting ship in the world. See *Jane's Fighting Ships* (pub. annually since 1897), study by S. L. Poole (1970).

cruisers: see DOUGHNUTS

crumhorn, J-shaped, double-reed musical instrument used throughout Europe from the 15th cent. through the 17th cent. It possesses a soft, reedy tone. The reed is enclosed by a wooden cap with a



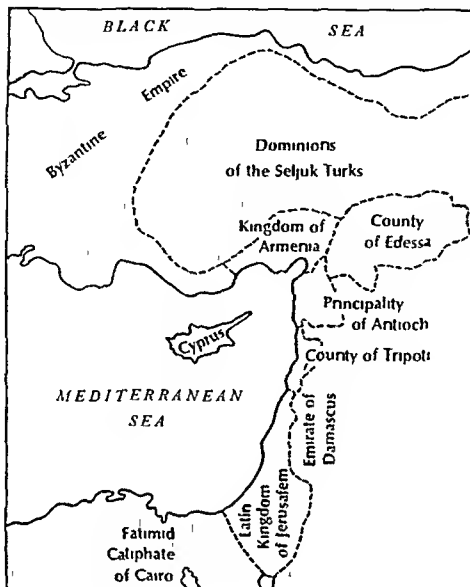
Tenor crumhorn

hole at the top through which the player blows. The cap serves as a wind chamber, which causes the reed to vibrate. The crumhorn is one of the ancestors of the OBOE.

Crump, Edward Hull, 1876–1954, American politician, Democratic boss of Tennessee, b. near Holly Springs, Miss. At first (1905–9) a municipal administrator in Memphis, Tenn., he was later mayor (1909–16, 1939–41) and Congressman (1931–35) from Tennessee. Meanwhile, he built an efficient political machine that dominated the state elections.

Crump's boss rule was upset in the 1948 Tennessee Democratic primaries, when his favored candidates for Senator and governor were beaten. See biography by W. D. Miller (1964).

Crusades, series of wars undertaken by European Christians between the 11th and 14th cent. to recover the Holy Land from the Muslims. In the 7th cent., Jerusalem was taken by the caliph UMAR. Pilgrimages (see PILGRIM) were not cut off at first, but early in the 11th cent. the FATIMID caliph Hakīm began to persecute the Christians and despoiled the Holy Sepulcher. Persecution abated after his death (1021), but relations remained strained and became more so when Jerusalem passed (1071) from the comparatively tolerant Egyptians to the Seljuk Turks, who in the same year defeated the Byzantine emperor Romanus IV at Manzikert. Late in the 11th cent., Byzantine Emperor ALEXIUS I, threatened by the Seljuk Turks, appealed to the West for aid. This was not the first appeal of the kind, while it may have helped to determine the time and the route of the First Crusade, 1095–99, its precise import is difficult to estimate. Direct impetus was given the crusade by the great speech of Pope URBAN II at the Council



Crusader States (c. 1140)

of Clermont (now Clermont-Ferrand), in 1095. Urban exhorted Christendom to go to war for the Sepulcher, promising that the journey would count as full penance and that the homes of the absent ones would be protected by a truce. The battle cry of the Christians, he urged, should be *Deus volt* [God wills it]. From the crosses that were distributed at this meeting the Crusaders took their name. Bishop ADEMAR was designated as papal legate for the crusade, and Count RAYMOND IV of Toulouse was the first of the leaders of the expedition to take the cross. Preached by many wandering preachers, notably PETER THE HERMIT, the movement spread through Europe and even reached Scandinavia. The chief factors that contributed to this enthusiastic response were the increase in the population and prosperity of Western Europe, the high point that religious devotion had reached, the prospect of territorial expansion and riches for the nobles, and of more freedom for the lower classes, the colonial projects of the Normans (directed against the Byzantine Empire as much as against the Muslim world), the desire, particularly of the Italian cities, to expand trade with the East, and a general awakening to the lure of travel and adventure. The conflict between spiritual and material aims, apparent from the first, became increasingly serious. The organized host of the crusade was preceded in the spring of 1096 by several undisciplined hordes of French and German peasants. WALTER THE PENNILESS led a French group, which passed peacefully through Germany and Hungary but sacked the district of Belgrade. The Bulgarians retaliated, but Walter reached Constantinople by midsummer. He was joined there by the followers of Peter the Hermit, whose progress had been similar. A German group started off by robbing and massacring the Jews in the Rhenish cities and later so provoked the king of Hungary that he attacked and dispersed them. The bands that had reached Constantinople were speedily transported by Alexius I to Asia Minor, where they were defeated by the Turks.

The survivors either joined later bands or returned to Europe. Alexius began to take fright at the proportions the movement was assuming. When, late in 1096, the first of the princes, Hugh of Vermandois, a brother of Philip I of France, reached Constantinople, the emperor persuaded him to take an oath of fealty. GODFREY OF BOUILLON and his brothers Eustace and Baldwin (later BALDWIN I of Jerusalem), Raymond IV of Toulouse, BOHEMOND I, TANCRED, Robert of Normandy, and Robert II of Flanders arrived early in 1097. At Antioch all except Tancred and Raymond (who promised only to refrain from hostilities against the Byzantines) took the oath to Alexius, which bound them to accept Alexius as overlord of their conquests. Bohemond's subsequent breach of the oath was to cause endless wrangling. The armies crossed to Asia Minor, took Nicaea (1097), defeated the Turks at Dorylaeum, and took Antioch (1098). Their campaign was completed in July, 1099, by the taking of Jerusalem, where they massacred the Muslims and Jews. The election of Godfrey of Bouillon as defender of the Holy Sepulcher marked the beginning of the Latin Kingdom of Jerusalem (see JERUSALEM, LATIN KINGDOM OF). A Latin patriarch was elected. Other fiefs, theoretically dependent on Jerusalem, were created as the crusade's leaders moved to expand their domains. These were the counties of Edessa (Baldwin) and Tripoli (Raymond) and the principality of Antioch (Bohemond). The First Crusade, which thus ended in victory, was the only crusade that achieved more than ephemeral results. Until the ultimate fall (1291) of the Latin Kingdom the brunt of the fighting in the Holy Land fell on the Latin princes and their followers and on the great military orders, the KNIGHTS HOSPITALERS and the KNIGHTS TEMPLARS, that arose out of the Crusades. The later Crusades were for the most part only expeditions to assist those who already were in the Holy Land, they are a single current, and dates are given them only for convenience. The Second Crusade, 1147–49, was preached by St. BERNARD OF CLAIRVAUX after the fall (1144) of Edessa to the Turks. It was led by Holy Roman Emperor CONRAD III, whose army set out first, and by King LOUIS VII of France. Both armies passed through the Balkans and pillaged the territory of the Byzantine emperor, MANUEL I, who provided them with transportation to Asia Minor in order to be rid of them. The German contingent, already decimated by the Turks, merged (1148) with the French, who had fared only slightly better, at Acre (Akko). A joint attack on Damascus failed because of jealousy and, possibly, treachery among the Latin princes of the Holy Land. Conrad returned home in 1148 and was followed (1149) by Louis. The Second Crusade thus ended in dismal failure. The Third Crusade, 1189–92, followed on the capture (1187) of Jerusalem by SALADIN and the defeat of GUY OF LUSIGNAN, REGINALD OF CHÂTILLON, and RAYMOND of Tripoli at Hattin. The crusade was preached by Pope Gregory VIII but was directed by its leaders—RICHARD I of England, PHILIP II of France, and Holy Roman Emperor FREDERICK I. Frederick set out first, but was hindered by the Byzantine emperor, ISAAC II, who had formed an alliance with Saladin. Frederick forced his way to the Bosphorus, sacked Adrianople (Edirne), and compelled the Greeks to furnish transportation to Asia Minor. However, he died (1190) in Cilicia, and only part of his forces went on to the Holy Land. Richard and Philip, uneasy allies, arrived at Acre in 1191. The city had been besieged since 1189, but the siege had been prolonged by dissensions between the two chief Christian leaders, Guy of Lusignan and CONRAD, marquis of Montferrat, both of whom claimed the kingship of Jerusalem. The city was nevertheless starved out by July, 1191, shortly afterward Philip went home. Richard removed his base to Jaffa, which he fortified, and rebuilt Ascalon (Ashqelon), which the Muslims had burned down. In 1192 he made a three-year truce with Saladin, the Christians retained Jaffa with a narrow strip of coast (all that remained of the Latin Kingdom of Jerusalem) and the right of free access to the Holy Sepulcher. Antioch and Tripoli were still in Christian hands, Cyprus, which Richard I had wrested (1191) from the Byzantines while on his way to the Holy Land, was given to Guy of Lusignan. In Oct., 1192, Richard left the Holy Land, thus ending the crusade. Pope INNOCENT III launched the Fourth Crusade, 1202–4, which was totally diverted from its original course. The Crusaders, led mostly by French and Flemish nobles and spurred on by FULK OF NEUILLY, assembled (1202) near Venice. To pay some of their passage to Palestine they aided Doge ENRICO DANDOLO (see under DANDOLO, family) and his Venetian forces in recovering Zara (Zadar).

on the Dalmatian coast from the Hungarians. The sack of Zara (1202), violently denounced by the pope, prefaced more serious political schemes. Alexius (later ALEXIUS IV), son of the deposed Byzantine emperor Isaac II and brother-in-law of PHILIP OF SWABIA, a sponsor of the crusade, joined the army at Zara and persuaded the leaders to help him depose his uncle, ALEXIUS III. In exchange, he promised large sums of money, aid to the Crusaders in conquering Egypt, and the union of the Roman and the Eastern churches. The actual decision to turn on Constantinople was largely brought about by Venetian pressure. The fleet arrived at the Bosphorus in 1203, Alexius III fled, and Isaac II and Alexius IV were installed as joint emperors while the fleet remained outside the harbor. In 1204, ALEXIUS V overthrew the emperors. As a result the Crusaders stormed the city, sacked it, divided the rich spoils with the Venetians according to a prearranged plan, and set up the Latin Empire of Constantinople (see CONSTANTINOPLE, LATIN EMPIRE OF). There followed the pathetic interlude of the *Children's Crusade*, 1212. Led by a visionary French peasant boy, Stephen of Cloyes, children embarked at Marseilles, hoping that they would succeed in the cause that their elders had betrayed. According to later sources, they were sold into slavery by unscrupulous skippers. Another group, made up of German children, went to Italy, most of them perished of hunger and disease. Soon afterward Innocent III and his successor, Honorius III, began to preach the *Fifth Crusade*, 1217–21. King Andrew II of Hungary, Duke Leopold VI of Austria, JOHN OF BRIENNE, and the papal legate Pelagius were among the leaders of the expedition, which was aimed at Egypt, the center of Muslim strength. Damietta (Dumyat) was taken in 1219 but had to be evacuated again after the defeat (1221) of an expedition against Cairo. The *Sixth Crusade*, 1228–29, undertaken by Holy Roman Emperor FREDERICK II, was simply a peaceful visit, in the course of which the emperor made a truce with the Muslims, securing the partial surrender of Jerusalem and other holy places. Frederick crowned himself king of Jerusalem, but, occupied with Western affairs, he did nothing when the Muslims later reoccupied the city. THIBAUT IV of Navarre and Champagne, however, reopened (1239) the wars, which were continued by Richard, earl of Cornwall. They were unable to compose the quarrels between the Knights Hospitallers and Knights Templars. In 1244 the Templars, who advocated an alliance with the sultan of Damascus rather than with Egypt, prevailed. A treaty (1244) with Damascus restored Palestine to the Christians, but in the same year the Egyptian Muslims and their Turkish allies took Jerusalem and utterly routed the Christians at Gaza. This event led to the *Seventh Crusade*, 1248–54, due solely to the idealistic enterprise of LOUIS IX of France. Egypt again was the object of attack. Damietta fell again (1249), and an expedition to Cairo miscarried (1250), Louis himself being captured. After his release from captivity, he spent four years improving the fortifications left to the Christians in the Holy Land. The fall (1268) of Jaffa and Antioch to the Muslims caused Louis IX to undertake the *Eighth Crusade*, 1270, which was cut short by his death in Tunisia. The *Ninth Crusade*, 1271–72, was led by Prince Edward (later EDWARD I of England). He landed at Acre but retired after concluding a truce. In 1289 Tripoli fell to the Muslims, and in 1291 Acre, the last Christian stronghold, followed.

Heritage of the Crusades. After the fall of Acre no further Crusades were undertaken in the Holy Land, although several were preached. Already, however, the term crusade was also being used for other expeditions, sanctioned by the pope, against heathens and heretics. ALBERT THE BEAR and HENRY THE LION led (1147) a crusade against the WENDS in NE Germany. Hermann von SALZA in 1226 received crusading privileges for the Teutonic Knights against the Prussians; the pope proclaimed (1228) a crusade against Emperor Frederick II, and several crusades were fought against the ALBIGENSES and the HUSSITES (see HUSSITE WARS). War against the Turks remained the chief problem of Eastern Europe for centuries after 1291. Campaigns akin to crusades were those of JOHN HUNYADI, JOHN OF AUSTRIA (d. 1578), and JOHN III of Poland. In their consequences, the crusades in Europe were as important as those in the Holy Land. However, although the Crusades in the Holy Land failed in their chief purpose, they exercised an incalculable influence on Western civilization by bringing the West into closer contact with new modes of living and thinking, by stimulating commerce, by giving fresh impetus to literature and invention, and by increasing geographical knowledge.

The crusading period advanced the development of national monarchies in Europe, because secular leaders deprived the pope of the power of decision in what was to have been the highest Christian enterprise. In the Levant the Crusades left a lasting imprint, not least on the Byzantine Empire, which was disastrously weakened. Physical reminders of the Crusades remain in the monumental castles built by the Crusaders, such as that of AL KARAK. The chief material beneficiaries of the Crusades were Venice and the other great Mediterranean ports. The ideal of chivalry was also developed by the Crusades. The chief collection of sources is *Recueil des historiens des croisades* (ed. by the Académie des Inscriptions et Belle-Lettres, 16 vol., 1841–1906), several chronicles are translated in the "Records of Civilization" series. Outstanding among eyewitness accounts are those of WILLIAM OF TYRE, RICHARD OF DEVIZES, Geoffroi de VILLEHARDOUIN, Jean de JOINVILLE, ANNA COMNENA, and Nicetas Acominatus. Treatments in English include Ernest Barker, *The Crusades* (1923, repr. 1971), A. S. Atiya, *The Crusade in the Later Middle Ages* (1938, repr. 1970), Steven Runciman, *A History of the Crusades* (3 vol., 1951–54, repr. 1962–66), K. M. Setton, ed., *A History of the Crusades* (2 vol., 1955–62, repr. 1969).

Crusca, Accademia della: see ACCADEMIA DELLA CRUSCA.

crusher, machine used to reduce materials such as ore, coal, stone, and slag to particle sizes that are convenient for their intended uses. Crushers operate by slowly applying a large force to the material to be reduced. Generally this is accomplished by catching it between jaws or rollers that move or turn together with great force. Reduction in size is generally accomplished in several stages, as there are practical limitations on the ratio of size reduction through a single stage.

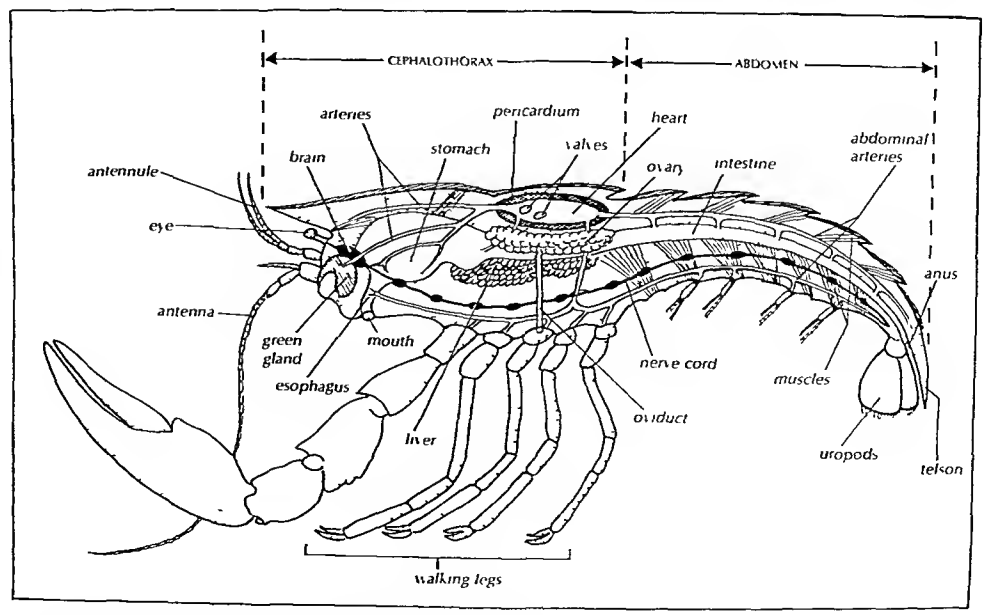
Crusius, Christian August (krī's'tēān ou'gōōst krōō'zēōōs), 1715–75, German philosopher and theologian. He was educated at the Univ. of Leipzig, where he became professor of philosophy (1744) and theology (1750). He opposed the philosophies of G. W. Leibniz and Christian Wolff and strongly influenced the early writings of Immanuel KANT. None of his many works has been translated into English.

crustacean (krūs'tā'shən), primarily aquatic arthropod of the class Crustacea. Most of the 26,000 crustacean species are marine, but there are many freshwater forms. The few groups that inhabit terrestrial areas have not been particularly successful in an evolutionary sense, most require very humid environments in order to survive. Crustaceans can be divided according to size into two main groups. The larger group includes the familiar SHRIMP, CRAYFISH, LOBSTERS, and CRABS, all belonging to the order Decapoda, as well as the BARNACLES that constitute the subclass Cirripedia. The smaller group includes species that are either microscopic or range up to a few inches (about 5 cm) in size. Most of the smaller marine forms can be found in plankton (see MARINE BIOLOGY) and thereby occupy an important position

in the marine food chain, for example, the very large crustacean order Copepoda supplies the food of a still larger crustacean order the Euphausiids, which in turn constitutes krill, the principal food of baleen whales. Other copepods supply food for small fish, and still others exist as parasites on the skin and gills of fish. Best known of the smaller freshwater crustaceans are members of the genus *Daphnia* (water fleas), the fairy shrimp (a phyllopod that swims inverted), and *Cyclops* (a copepod). The order Isopoda includes the only large group of truly terrestrial crustaceans. Known as wood lice, sow bugs, or pillbugs, these small animals can be found under the bark of trees, beneath stones and rocks, and in other damp places. When disturbed they curl up armadillo-like, withdrawing into the exoskeleton. All crustaceans have bilaterally symmetrical bodies covered with a chitinous exoskeleton, which may be thick and calcareous (as in the crayfish) or delicate and transparent (as in water fleas). Since it does not grow, the exoskeleton must be periodically molted when the animal undergoes metamorphosis (typically from free-swimming larva to adult) or simply outgrows its shell. The free-swimming larva characteristic of crustaceans, called a nauplius larva, has an unsegmented body, a median eye, and three pairs of appendages. Like other arthropods, adult crustaceans have segmented bodies and jointed legs, the segments are usually grouped into a recognizable head, thorax, and abdomen. In the majority of larger crustaceans the head and thorax are fused into a cephalothorax, which is protected by a large shield-like area of the exoskeleton called the carapace. The head bears two pairs of antennae, usually one median eye and two lateral eyes, and three pairs of biting mouthparts—the mandibles and the two pairs of maxillae. Crustacean appendages have undergone extensive adaptation for various tasks such as swimming, sensory reception, and walking. Many species have the first pair of thoracic appendages modified into claws and pincers. The gills are generally attached at the bases of the thoracic appendages, and the beating of the appendages creates a flow of water over the gills that facilitates respiration. Reproduction is sexual, and in most forms the sexes are separate. In many species the eggs are brooded beneath the abdominal segments of the female. Crustaceans constitute the class Crustacea of the phylum ARTHROPODA.

Cruveilhier, Jean (zhā'n kruv'ēyā'), 1791–1874, French physician. The first professor of pathology at the Univ. of Paris (from 1836), he introduced the descriptive method into the study of that field. He was the first to describe multiple sclerosis adequately. His works include *The Anatomy of the Human Body* (2 vol., 1829–42, tr. 1844).

Crux (krōōks) [Lat. = cross], small but brilliant southern CONSTELLATION whose four most prominent members form a Latin cross, the famous Southern Cross. The long arm of the cross, terminating in the brightest member, ACRUX (Alpha Crucis), points almost directly at the south celestial pole. Two other stars, MIMOSA (Beta Crucis) and Gacrux (Gamma Crucis) are also among the brightest in the sky. Also



Internal anatomy of a female crayfish, representative of the class Crustacea

in Crux is the Coalsack, a famous dark nebula. Crux reaches its highest point in the evening sky in May, its location in the far southern sky makes it visible most of the year to southern observers but not at all to observers north of about 25°N lat.

Cruz, Juana Inés de la: see JUANA INÉS DE LA CRUZ.

Cruz, Juan de la: see JOHN OF THE CROSS, SAINT.

Cruz, Ramón de la (ramón' dā la krōōth), 1731-94, Spanish dramatist. He wrote tragedies and adapted French and Italian plays, but he owes his fame to his *sainetes*, some 450 masterly one-act comedies that depict the life of the middle and lower classes. His work freed the awakening Spanish drama from foreign influence.

cryogenics: see LOW-TEMPERATURE PHYSICS.

cryolite or **kryolite** (both krī'ālīt) [Gr., = frost stone], mineral usually pure white or colorless but sometimes tinted in shades of pink, brown, or even black and having a luster like that of wax. Chemically, it is a double fluoride of sodium and aluminum, Na_3AlF_6 . Its principal use is as a flux in the smelting of aluminum. It is used also as a source of soda, aluminum salts, fluorides, and hydrofluoric acid (by the action of sulfuric acid). It was discovered in Greenland in 1794 and occurs almost nowhere else. Cryolite has been produced synthetically.

cryosurgery (krī'ōsūr'jārē), bloodless surgical technique using a supercooled probe to destroy diseased tissue. Liquid nitrogen circulating through the instrument cools it to temperatures as low as -196°C. Tissue destroyed on contact with the probe is removed by natural body processes. The method has proved successful in removal of tonsils, tumors, hemorrhoids, and cataracts, and in treating various brain disorders. Surgeons have been successful in treating PARKINSONISM with the cryogenic probe, the small areas of the brain that are believed responsible for the symptoms can be frozen temporarily at 0°C and thawed if the symptoms do not disappear. When the correct location is found, the tissue can be quickly supercooled and destroyed.

cryotron (krī'ōtrān'), magnetically controlled electronic switching device that operates at extremely low temperatures, it is designed to supplant, in part, the transistor in special electronic equipment (e.g., the computer). One type of cryotron consists of a straight wire (the gate) around which a wire coil (the control coil) is wound. Kept at temperatures near absolute zero, both wires become superconductors (see LOW-TEMPERATURE PHYSICS, SUPERCONDUCTIVITY), but when current is passed through the coil, a magnetic field is induced that causes the gate to lose its superconductivity, thus switching off the current through it. Another type of cryotron uses conducting films in place of the wires to increase the switching speed. The cryotron is so minute that many of these devices can be packed into a very small area, thereby greatly increasing the degree of control.

crypt (krīpt) [Gr., = hidden], vault or chamber beneath the main level of a church, used as a meeting place or burial place. It undoubtedly developed from the catacombs used by early Christians as places of worship. Early churches were commonly built over the tombs of martyrs. Such vaults, located beneath the main altar, developed into the extensive crypts of the Middle Ages that in many churches of the 11th and 12th cent. occupied the entire space beneath the sanctuary. At Canterbury the 12th-century crypt forms a large and complete lower church in itself. The crypt of the Rochester Cathedral is partly above ground. The cathedrals at Chartres and at Bourges have crypts typical of the Gothic development.

cryptococcosis: see FUNGUS INFECTION.

cryptogam, in botany, term used to denote a plant that produces spores, as in ALGAE, FUNGI, MOSSES, and FERNS, but not seeds. The term *cryptogam*, from the Greek *kryptos*, meaning "hidden," and *gamos*, meaning "marriage," was coined by 19th-century botanists because the means of sexual reproduction in these plants was not then apparent. In contrast, in the seed plants the reproductive organs are easily seen, the seed plants have accordingly been termed *phanerogams*, from the Greek *phaneros*, meaning "visible."

cryptography (krīptōg'rāfē) [Gr., = hidden writing], science of secret writing. There are many devices by which a message can be concealed from the casual reader, e.g., invisible writing, but the term *cryptography* strictly applies to translating messages into cipher or code. The science of breaking codes and ciphers without the key is called *cryptanalysis*. *Cryp-*

tology is the science that embraces both cryptography and cryptanalysis. In enciphering, each letter of the message is replaced by another letter or figure, in encoding, syllables, words, or whole sentences are treated. The code is the agreed upon set of rules whereby messages are converted from one form to another. The beginnings of cryptography can be traced to the hieroglyphs of early Egyptian civilization (c. 1900 B.C.). Ciphering has always been considered vital for diplomatic and military secrecy, the Bible is replete with examples of ciphering, and many figures throughout history have written in ciphers, including Julius Caesar, Charlemagne, Alfred the Great, Mary Queen of Scots, and Louis XIV. Francis Bacon's celebrated bilateral cipher (1605) was an arrangement of the letters *a* and *b* in five-letter combinations, each representing a letter of the alphabet. This code illustrates the important principle that a code employing only two different signs can be used to transmit information. In the 20th cent. mathematical theory and computer science have both been applied to cryptanalysis. As the science of cryptography becomes increasingly sophisticated, most nations have found it necessary to develop special governmental bureaus to handle diplomatic and military security, e.g., the National Security Agency in the United States. See Helen Gaines, *Cryptanalysis* (1956), David Kahn, *The Codebreakers* (1967), J. R. Wolfe, *Secret Writing: The Craft of the Cryptographer* (1970).

Cryptophyta, small division of the plant kingdom, consisting of only one class and one order of photosynthetic, unicellular, flagellate ALGAE of both fresh water and marine habitats. There are only a few genera and fewer than 90 species, most of them rare. The cells are somewhat flattened and often asymmetric in shape. The cell wall, when present, may be of cellulose, and is often in the form of a sheath called a lorica. The cell chloroplasts contain CAROTENES, the photosynthetic pigments chlorophyll *a* and chlorophyll *c*, and pigments unique to this division, the brown or yellow xanthophylls, which give the cells a brownish color.

crypts of Lieberkuhn: see DIGESTIVE SYSTEM.

Crystal, city (1970 pop. 30,925), Hennepin co., SE Minn., a suburb of Minneapolis.

crystal, a solid body bounded by natural plane faces that are the external expression of a regular internal arrangement of constituent atoms, molecules, or ions. The particles in a crystal occupy positions with definite geometrical relationships to each other. The positions form a kind of scaffolding, called a crystal lattice, the atomic occupancies of lattice positions are determined by the chemical composition of the substance. The formation of a crystal by a substance passing from a gas or liquid to a solid state, or by going out of solution (by precipitation

or evaporation), is called crystallization. A crystalline substance is uniquely defined by the combination of its chemistry and the structural arrangement of its atoms. In all crystals of any specific substance the angles between corresponding faces are constant (Steno's Law, or the First Law of Crystallography). Crystalline substances are grouped, according to the type of symmetry they display, into 32 classes. These in turn are grouped into seven systems on the basis of the relationships of their axes, i.e., imaginary straight lines passing through the ideal centers of the crystals. Crystals may be symmetrical with relation to planes, axes, and centers of symmetry. Planes of symmetry divide crystals into equal parts (mirror images) that correspond point for point, angle for angle, and face for face. Axes of symmetry are imaginary lines about which the crystal may be considered to rotate, assuming, after passing through a rotation of 60°, 90°, 120°, or 180°, the identical position in space that it originally had. Centers of symmetry are points from which imaginary straight lines may be drawn to intersect identical points equidistant from the center on opposite sides. The crystalline systems are cubic, or isometric (three equal axes, intersecting at right angles), hexagonal (three equal axes, intersecting at 60° angles in a horizontal plane, and a fourth, longer or shorter, axis, perpendicular to the plane of the other three), tetragonal (two equal, horizontal axes at right angles and one axis longer or shorter than the other two and perpendicular to their plane), orthorhombic (three unequal axes intersecting at right angles), monoclinic (three unequal axes, two intersecting at right angles and the third at an oblique angle to the plane of the other two), trigonal, or rhombohedral (three equal axes intersecting at oblique angles), and triclinic (three unequal axes intersecting at oblique angles). In all systems in which the axes are unequal there is a definite axial ratio for each crystal substance. Crystals differ in physical properties, i.e., in hardness, cleavage, optical properties, heat conductivity, and electrical conductivity. These properties are important since they sometimes determine the use to which the crystals are put in industry. For example, crystalline substances that have special electrical properties are much used in communications equipment. These include quartz and Rochelle salt, which supply voltage upon the application of mechanical force (see PIEZOELECTRIC EFFECT), and germanium, silicon, galena, and silicon carbide, which carry current unequally in different crystallographic directions (semiconductor rectifier). See SOLID, SOLID STATE PHYSICS. See F. C. Phillips, *An Introduction to Crystallography* (1970), J. D. Dana, *Manual of Mineralogy* (18th ed., rev. by C. S. Hurlbut, Jr., 1971).

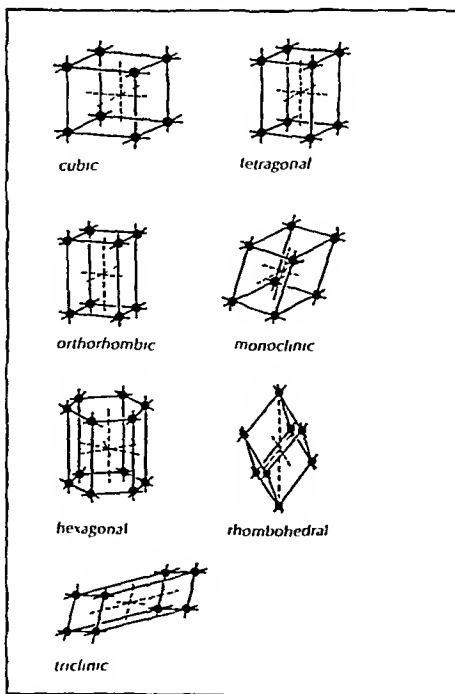
crystal gazing, form of DIVINATION in which a medium achieves CLAIRVOYANCE by staring steadily into a clear surface, such as a crystal ball, a pool, a mirror, or other bright object. It is in such a state that the crystal gazer is supposedly able to perceive persons or events that are distant in time or space. This ancient and widespread practice has its origin in the belief that certain objects have supernatural powers. In recent times the crystal ball has been used by some spiritualists as a vehicle through which contact is made with the dead. Colloquially, the term is often used to describe any irresponsible or unfounded prediction about the future. See SPIRITISM.

Crystal Lake, city (1970 pop. 14,541), McHenry co., NE Ill., in a dairy farm and lake resort area, inc. 1874. Electrical components, drills, and tools are manufactured. A junior college is there.

Crystal Palace, building designed by Sir Joseph PAXTON and erected in Hyde Park, London, for the Great Exhibition in 1851. In 1854 it was removed to Sydenham, where, until its damage by fire in 1936, it housed a museum of sculpture, pictures, and architecture and was used for concerts. In 1941 its demolition was completed because it served as a guide to enemy bombing planes. The building was constructed of iron, glass, and laminated wood. One of the most significant examples of 19th-century, proto-modern architecture, it was widely imitated in Europe and America.

CS, chemical symbol of the element CESIUM.

CS, chemical compound (orthochlorobenzalnitrite) used in riot control and, by the military, as a harassing agent. The compound is dispersed as an aerosol or as a finely divided powder. Exposure to CS causes intense pain in the eyes and upper respiratory tract, the pain spreads to the lungs and gives the sensation of suffocation. In humid weather CS may cause severe blistering of the skin. Heavy exposure to the compound may cause serious lung dam-

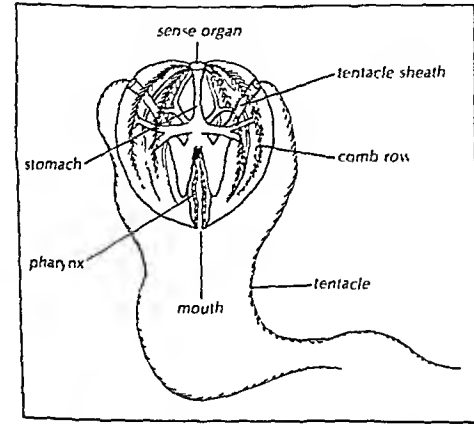


Types of crystal

age, resulting in death. Nonetheless, CS is less toxic than many other TEAR GASES. CS was first synthesized in the 1920s by Ben Carson and Roger Staughton; the compound's name is derived from their initials. **Csaba**: see **BÉKÉSCSABA**, Hungary.

Csepel (chě'pēl), island, c 100 sq mi (260 sq km), 30 mi (48 km) long, in the Danube, N central Hungary, just S of Budapest. In the northern section are the city and harbor of the same name, and there is an international free port. An industrial suburb of Budapest, the city of Csepel has ironworks and steelworks, an oil refinery, munitions factories, and motorcycle works. The rest of the island is agricultural.

Ctenophora (tīnōf'arə), a small phylum of exclusively marine, solitary invertebrate animals, commonly known as sea walnuts or comb jellies. Ctenophores are characterized by eight unique rows (combs) consisting of ciliated plates called ctenes, which are radially arranged on the spherical body surface. The animals swim weakly, powered by those structures. The two hemispheres of the ctenophore body are marked by a mouth, or oral pole, on the underside, and an opposite aboral pole, on which is located the statocyst, a unique sense organ controlling equilibrium. Most ctenophores resemble biradially symmetrical (see **SYMMETRY**, **BIOLOGICAL**) jellyfish (phylum **CNIDARIA**) but lack the cnidian whorl of tentacles around the mouth, and all but one species (*Euchlora rubra*) lack nematocysts, specialized stinging cells. Ctenophores, which are all carnivorous, have specialized adhesive cells called



Pleurobrachia, representative of the phylum Ctenophora

colloblasts, used to capture planktonic animals on which the ctenophores feed. Less than one hundred species are known, but many become locally abundant and are ecologically significant. They vary from less than 1/4 in (0.6 cm) to over 1 ft (30.5 cm) long. Most are transparent, but pale pinks, reds, violets, and oranges are also known in some species. All ctenophores are bioluminescent, the production of light originating in the walls of the eight canals. The phylum is also characterized by hermaphroditism. There are two classes, **Tentaculata** and **Nuda**.

Class Tentaculata Members of this class are characterized by having tentacles, typically two feathery ones that can be retracted into specialized sheaths. In some, there are smaller, secondary tentacles, and the primary tentacles are reduced. This class includes the small, oval sea gooseberries (genus *Pleurobrachia*), common on both Atlantic and Pacific coasts. The more flattened species of the genus *Mnemiopsis*, about 4 in long (10 cm), is common on the upper Atlantic coast; it has a large mouth and feeds mainly on larval mollusks and copepods. This species is especially brilliantly luminescent. The similar, but larger, genus *Leucothea* is abundant on the Pacific coast. Venus's girdle (genus *Cestum*) is a flattened, ribbonlike form reaching over 1 yd (91 cm) in length, and found in tropical waters.

Class Nuda This class includes species that have no tentacles. Typical is the large-mouthed genus *Beroë*, which feeds on jellyfish and other ctenophores. See P. A. Maglitsch, *Invertebrate Zoology* (1967), M. S. Gardiner, *The Biology of Invertebrates* (1972).

Ctesias (tēs'shēas, tēs'sēas), fl 400 B.C., Greek historian and physician of Cnidus. He lived many years in the Persian court. He tended Artaxerxes II when he was wounded in the battle of Cunaxa (401 B.C.). In 398 he was sent by the Persians as envoy to Evagoras and Conon. Of Ctesias' histories only Photius' abridgments of *Persica* and *Indica* remain, in them Ctesias hoped to show Herodotus' unreliability.

Ctesibius (tīsīb'ēas), fl 2d cent B.C., Alexandrian Greek inventor. He reputedly was the first to discover and apply the expansive power of air as a motive force. Among the inventions ascribed to him are a water clock (clepsydra), a hydraulic organ, and a force pump.

Ctesiphon, ruined ancient city, 20 mi (32 km) SE of Baghdad, Iraq, on the left bank of the Tigris opposite Seleucia and at the mouth of the Diyala River. After 129 B.C. it was the winter residence of the Parthian kings. Ctesiphon grew rapidly and was of renowned splendor. The Romans captured it in warring against Parthia. It became the capital of the Sassanids in c 224 and a center of Nestorian Christianity. In 637 it was taken and plundered by the Arabs who renamed it, along with Seleucia, Al Madain; it was abandoned by them when Baghdad became the capital of the Abbasids. Its site marks the farthest advance of Great Britain against the Ottoman Empire (Turkey) in World War I. It is now noted for its impressive ruins.

CTP (cytidine triphosphate) see **CYTOSINE**

Cu, chemical symbol of the element **COPPER**

Cuala Press (kōō'lā), private printing press founded in Dundrum, Ireland, in 1902 by Elizabeth and Lily Yeats, the sisters of William Butler Yeats. Called the Dun Emer Press until 1908, it began as part of a larger company whose purpose was to provide employment for Irish women. Until it ceased operation in the late 1940s, the press followed a program of publishing works by contemporary Irish writers and new editions and translations of Irish classics. Its publications emphasized literary merit rather than fine printing. Among the authors whose works were published by the Cuala Press are Yeats, Lionel Johnson, Lady Gregory, John Millington Synge, John Masefield, and Louis MacNeice.

Cuanza or Kwanza (both kwān'zā), river, 600 mi (966 km) long, rising in central Angola and flowing NW and W to the Atlantic. Its lower course, which is navigable for c 160 mi (260 km), was the original route of Portuguese penetration into N Angola. The large Cambambe project, on the lower Cuanza, produces hydroelectric power and supplies water for irrigation. Sugarcane is grown in the lower Cuanza valley.

Cuauhtémoc (kōō-outā'mōk), d 1525, Aztec emperor. Succeeding the brother of MONTÉZUMA II in 1520, Cuauhtémoc failed to unite the Indian city-states of the Valley of Mexico against the Spanish after the expulsion of Hernán CORTÉS from TENOCHTITLÁN. He courageously defended his capital, but was taken prisoner when it fell (1521) after a three-month siege. Tortured to reveal his treasure, Cuauhtémoc replied that it lay at the bottom of the lake—where the Spaniards had perished with it in their flight from Tenochtitlán on the *noche triste* [sad night]. Cortés took Cuauhtémoc with him on his march to Honduras and, accusing the Aztec of treason, had him hanged. The name occurs also as Cuauhtemotzín, Guatémoc, Guatemozín, and Quauhtemoc.

Cuautla (kwou'tlā), city (1970 pop 67,869), Morelos state, S Mexico, in the Cuautla River valley. It is a highway junction and the heart of a sugarcane and rice district. Cuautla's hot springs and lovely scenery make it a popular resort and tourist attraction. Historically, Cuautla is famous for the heroic defense made there in 1812 by patriot forces under José María Morelos y Pavón, who cut through Spanish besieging forces. The city is sometimes called Ciudad Morelos.

Cuba (kyōō'ba, Span kōō'bā), republic (1970 pop 8,553,395, including the Isle of Pines), 44,218 sq mi (114,524 sq km), consisting of the island of Cuba and numerous adjacent islands. HAVANA is the capital. Cuba is the largest and westernmost of the West Indies and lies strategically at the entrance of the Gulf of Mexico, with the western section only 90 mi (145 km) S of Key West, Fla. The south coast is washed by the Caribbean Sea, the north coast by the Atlantic Ocean, and in the east the Windward Channel separates Cuba from Haiti. The shores are often marshy and are fringed by coral reefs and cays. There are many fine seaports—Havana (the chief import point), MATANZAS, CARDENAS, NUEVITAS (the chief export point), SANTIAGO DE CUBA, CIENFUEGOS, and GUANTANAMO (a U.S. naval base since 1903). Of the many rivers, only the Cauto is important. Cuba has three mountain regions: the wild and rugged Sierra Maestra in the east, rising to 6,560 ft (2,000 m) in the Pico Turquino, a lower range, the scenic Sierra de los Órganos, in the west, and the Sierra de Trinidad, a picturesque mass of hills amid

the plains and rolling country of central Cuba, a region of vast sugar plantations. The rest of the island is level or rolling. The topography, the semitropical



and generally uniform climate, and the soil are suitable for various crops, but sugarcane has been dominant since the late 18th cent.; it is grown on about two thirds of all crop land. Attempts at diversification have been only partially successful; the program of agrarian reform established by the revolutionary government of Fidel Castro failed to solve the problems arising from a one-crop economy, and sugar and its derivatives still account for about 85% of the value of all exports. Cattle raising is second in production value. An excellent tobacco is grown, especially in the VUELTA ABAJO region of Pinar del Río, and coffee, rice, corn, citrus fruits, and sweet potatoes are important. However, the emphasis on export crops (sugar and to a lesser degree tobacco) necessitates the importation of much food. Large-scale fishing operations have been encouraged under the Castro regime, and that industry is now one of the largest in Latin America. Cuban fishing fleets operate from Greenland to Argentina. Manufacturing is centered chiefly in the processing of agricultural products; sugar-milling has long been the largest industry, and Cuba is also known for its tobacco products. Some consumer goods (textiles, fertilizer, cement, etc.) are also manufactured. Mining has never been of major importance, although Cuba's nickel deposits are among the largest in the world. Extraction is difficult because of the presence of other metals in the nickel ore, but production has nevertheless increased considerably and nickel is now the country's second most valuable export item (after sugar). Large amounts of copper, chromite, and manganese are also mined, as well as lesser quantities of salt, lead, zinc, gold, silver, and oil. Limestone, clay, gypsum, and sulfur production easily meet the country's needs. There are immense iron reserves, but problems of extraction and purification are even greater than with nickel, and iron production is still almost negligible. The island was discovered in 1492 by Christopher Columbus. The Spanish conquest began in 1511 under the leadership of Diego de VELÁZQUEZ, who founded BARACOA and other major settlements. Cuba served as the staging area for Spanish explorations of the Americas. As an assembly point for treasure fleets, it offered a target for French and British buccaneers, who attacked the island's cities incessantly. The native ARAWAK Indians soon died off and were replaced as laborers by Negro slaves, who contributed much to the cultural evolution of the island. The white element was continuously replenished by immigration, chiefly from Spain but also from other Latin American countries. Despite pirate attacks and the trade restrictions of Spanish mercantilist policies, Cuba, the Pearl of the Antilles, prospered. In the imperial wars of the 18th cent. other nations coveted the Spanish possession, and in 1762 a British force under George Pocock and the earl of Albemarle captured and briefly held Havana. Cuba was returned to Spain by the Treaty of Paris in 1763 and remained Spanish even as most of Spain's possessions became (early 19th cent.) independent republics. The slave trade expanded rapidly, reaching its peak in 1817. Sporadic slave revolts were brutally suppressed by the Spaniards. Desires for Cuban independence increased when representation at the Spanish Cortes, granted in 1810, was withdrawn, yet neither internal discontent nor filibustering expeditions (1848–51) led by Narciso LÓPEZ, achieved results. The desire of U.S. Southerners to acquire the island as a slave state also failed (see **OSTEND MANIFESTO**). Cuban discontent grew and finally erupted (1868) in the TEN YEARS WAR, a long revolt that ended

(1878) in a truce, with Spain promising reforms and greater autonomy. Spain failed to carry out most of the reforms, although slavery was abolished (1886) as promised. Revolutionary leaders, many in exile in the United States, planned another revolt, and in 1895 a second war of independence was launched with the brilliant writer José Martí as its leader. There was strong sentiment in the United States in favor of the rebels, which after the sinking of the *Maine* in Havana harbor led the United States to declare war on Spain (see SPANISH-AMERICAN WAR). The Spanish forces capitulated, and a treaty, signed in 1898, established Cuba as an independent republic, although U.S. military occupation of the island continued until 1902. The U.S. regime, notably under Leonard Wood, helped rebuild the war-torn country, and the conquest of yellow fever by Walter Reed, Carlos J. Finlay, and others was a heroic achievement. Cuba was launched as an independent republic in 1902 with Estrada Palma as first president, although the Platt Amendment (see PLATT, ORVILLE HITCHCOCK), reluctantly accepted by the Cubans, kept the island under U.S. protection and gave the United States the right to intervene in Cuban affairs. U.S. investment in Cuban enterprises increased, and plantations, refineries, railroads, and factories passed to American (and thus absentee) ownership. This economic dependence led to charges of "Yankee imperialism," strengthened when a revolt headed by José Miguel Gómez led to a new U.S. military occupation (1906-9). William Howard Taft and Charles MacGoon acted as provisional governors. After supervising the elections, the U.S. forces withdrew, only to return to guarantee order in the Negro insurrection of 1912. Sugar production increased, and in World War I the near-destruction of Europe's beet-sugar industry raised sugar prices to the point where Cuba enjoyed its "dance of the millions." The boom was followed by collapse, however, and wild fluctuations in prices brought repeated hardship. Politically, the country suffered fraudulent elections and increasingly corrupt administrations. Gerardo Machado as president (1925-33) instituted vigorous measures, forwarding mining, agriculture, and public works, then abandoned his great projects in favor of suppressing opponents. Machado was overthrown in 1933, and from then until 1959 Fulgencio Batista y Zaldívar, a former army sergeant, dominated the political scene, either directly as president or indirectly as army chief of staff. With Franklin Delano Roosevelt's administration a new era in U.S. relations with Cuba began. Sumner Welles was sent as ambassador, the Platt Amendment was abandoned in 1934, the sugar quota was revised, and tariff rulings were changed to favor Cuba. However, economic problems continued, complicated by the difficulties of U.S. ownership of many of the sugar mills and the continuing need for diversification. In March, 1952, shortly before scheduled presidential elections, Batista seized power through a military coup. Cuban liberals soon reacted, but a revolt in 1953 by Fidel Castro was abortive. In 1956, however, Castro landed in Oriente prov. and took to the Sierra Maestra, where, aided by Ernesto "Che" Guevara, he reformed his ranks and waged a much publicized guerrilla war. The United States withdrew military aid to Batista in 1958, with Cuba a tinder box and his army demoralized. Batista finally fled on Jan. 1, 1959. Castro, supported by young professionals, students, urban workers, and some farmers, was soon in control of the nation. Castro's social revolution began in a burst of popular enthusiasm, but many groups were soon disillusioned. Massive executions, often summary, of so-called war criminals were followed by dismissal, resignation, and frequent incarceration of prominent revolutionists such as Hubert Matos, who disagreed with Communist tendencies in the regime. Private press, radio, and television were first muzzled and then completely suppressed. Land reform was pushed energetically, but little land was apportioned to individual farmers, by 1970 the state owned almost 70% of the farmland. Industrial reform meant essentially confiscation. The expropriation of U.S. landholdings, banks, and industrial concerns, and an intensive program of vilification against the United States, led to the breaking (Jan., 1961) of diplomatic relations by the U.S. government. That same year Castro openly proclaimed his allegiance with the Communist camp. The Soviet Union replaced the United States as major trading partner, and since 1961 massive Soviet aid has maintained Cuba's economic and military security. Meanwhile Cuban exiles were pouring into the United States by the thousands, one result of their activities was the preparation of an invasion force

(trained mostly in Florida and Guatemala under the supervision of the U.S. Central Intelligence Agency) which landed on Giron Beach in the Bay of Pigs, Cuba, in April, 1961. It was quickly crushed—a debacle especially humiliating to the United States because of its involvement. Cuba's significance as a pawn in the COLD WAR was further dramatized the following year when the USSR began to buttress Cuba's military power and to build missile bases on the islands. In a dramatic confrontation President John F. Kennedy demanded (Oct., 1962) the dismantling of the missiles and ordered naval vessels to blockade the island, preventing further importation of offensive weapons. After a period of great world tension, during which several Soviet vessels turned away from Cuba, Soviet Premier Khrushchev (despite fiery denunciations by Castro and by Chinese Communists) agreed to withdraw the missiles. Shortly before Christmas, 1962, Castro released over 1,000 prisoners captured during the Bay of Pigs invasion in exchange for considerable quantities of food and medicine. His relations with other Latin American countries were harmed by his openly announced intention of spreading his revolution to those countries by guerrilla warfare. In Feb., 1962, the ORGANIZATION OF AMERICAN STATES (see also PAN-AMERICANISM and PUNTA DEL ESTE) formally excluded Cuba from its council, and by Sept., 1964, all Latin American nations except Mexico had broken diplomatic and economic ties with Cuba. After the death (1967) of Guevara while engaged in guerrilla activity in Bolivia, Cuban attempts to encourage revolution in other countries abated, and by the early 1970s the Castro government exhibited an interest in regaining the friendship of the Latin American nations and resumed diplomatic relations with several of them. In Cuba, Castro has remained in firm control, most of the thousands who had opposed him have fled the island (between Dec., 1965, and April, 1973, a Cuban government-controlled airlift carried more than 250,000 people between Havana and Miami, Fla.), and, despite economic disappointments, he is tremendously popular with the poorer people, who make up the bulk of the population. Perhaps his greatest success has been in increasing educational opportunities and dramatically reducing illiteracy. The principal institutions of higher learning are the Univ. of Havana (founded 1728, reorganized 1943 and 1960), in Havana, Universidad de Oriente, in Santiago de Cuba, and Central Universidad de las Villas, in Santa Clara. See W. F. Johnson, *The History of Cuba* (4 vol., 1920), Elie Abel, *The Missile Crisis* (1966), C. A. Chapman, *A History of the Cuban Republic* (1927, repr. 1969), R. R. Fagen, *The Transformation of Political Culture in Cuba* (1969), R. E. Ruiz, *Cuba, the Making of a Revolution* (1970), H. I. Blustein et al., *Area Handbook for Cuba* (1971), K. S. Karol, *Guerrillas in Power* (tr. 1971), Carmelo Mesa-Lago, ed., *Revolutionary Change in Cuba* (1971), Andrew Salkey, *Havana Journal* (1971), Bertram Silverman, comp., *Man and Socialism in Cuba* (1971), Hugh Thomas, *Cuba, the Pursuit of Freedom* (1971), L. E. Aguilar, *Cuba 1933* (1972), R. E. Bonachea and N. P. Valdes, ed., *Cuba in Revolution* (1972), P. S. Foner, *The Spanish-Cuban American War and the Birth of American Imperialism, 1895-1902* (2 vol., 1972), Lowry Nelson, *Cuba* (1972).

Cubango, river, Angola. See OKAVANGO, river.

Cuban missile crisis, 1962, major cold war confrontation between the United States and the Soviet Union. After the BAY OF PIGS INVASION, the USSR increased its support of Fidel Castro's Cuban regime, and in the summer of 1962, Nikita Khrushchev secretly decided to install ballistic missiles in Cuba. When U.S. reconnaissance flights revealed the clandestine construction of missile launching sites, President Kennedy publicly denounced (Oct. 22, 1962) the Soviet actions. He imposed a naval blockade on Cuba and declared that any missile launched from Cuba would warrant a full-scale retaliatory attack by the United States against the Soviet Union. On Oct. 24, Russian ships carrying missiles to Cuba turned back, and when Khrushchev agreed (Oct. 28) to withdraw the missiles and dismantle the missile sites, the crisis ended as suddenly as it had begun. The United States ended its blockade on Nov. 20, and by the end of the year the missiles and bombers were removed from Cuba. See D. L. Larson, ed., *The Cuban Crisis of 1962* (1963), Elie Abel, *The Missile Crisis* (1966, repr. 1968), Robert F. Kennedy, *Thirteen Days* (1969, repr. 1971), G. T. Allison, *Essence of Decision* (1971), Abram Chayes, *The Cuban Missile Crisis* (1974).

Cubberley, Ellwood Patterson, 1868-1941, American educator, b. Andrews, Ind., grad. Univ. of Indiana, 1891, Ph.D. Columbia, 1905. He was a pioneer

writer in the history of American education and served as president (1891-96) of Vincennes Univ. and as superintendent of schools (1896-98) in San Diego, Calif. In 1898 he joined the faculty of Stanford, becoming professor of education in 1906 and in 1917 dean of the school of education, which he administered until his retirement in 1933. His works include *Changing Conceptions in Education* (1909), *The History of Education* (1920), *Public School Administration* (1929), and *Public Education in the United States* (rev. and enl. ed. 1947). See J. B. Sears and A. D. Henderson, *Cubberley of Stanford* (1957), study by L. A. Cremin (1965).

cube, in geometry, regular solid bounded by six equal squares. All adjacent faces of a cube are perpendicular to each other, any one face of a cube may be its base. The dimensions of a cube are the lengths of the three edges which meet at any vertex. The volume of a cube is equal to the product of its dimensions, and since its dimensions are equal, the volume is equal to the third power, or cube, of any one of its dimensions. Hence, in arithmetic and algebra, the cube of a number or letter is that number or letter raised to the third power. For example, the cube of 4 is $4^3 = 4 \times 4 \times 4 = 64$. The problem to construct a cube with a volume equal to twice that of a given cube using only a compass and a straightedge is known as the problem of the duplication of the cube and is one of the famous GEOMETRIC PROBLEMS OF ANTIQUITY. The cube, or hexahedron, is one of only five regular polyhedra (see POLYHEDRON).

cubeb: see PEPPER.

cubism, art movement, primarily in painting, originating in Paris c. 1907. It began as an intellectual revolt against the artistic expression of previous eras. Among the specific elements the cubists abandoned were the sensual appeal of paint texture and color, subject matter with emotional charge or mood, the play of light on form, movement, atmosphere, and the illusionism that proceeded from scientifically based perspective. To replace these they employed an analytic system in which the three-dimensional subject (usually still life) was fragmented and redefined from several points of view described simultaneously within a shallow plane or within several interlocking and often transparent planes. In this analytic phase (1907-12) the cubist palette was severely limited, forms rigidly geometric, compositions subtle and intricate. Cubist abstraction as represented by the analytic works of Picasso and Braque intended an appeal to the intellect. This approach has been termed conceptual realism because the cubists sought to show everyday objects as the mind, not the eye, perceives them—from all sides at once. During the later, synthetic phase of cubism (1913 through the 1920s), paintings were composed of fewer and simpler forms based to a lesser extent on natural objects. Brighter colors were employed, and many artists introduced the *trompe l'oeil* element of COLLAGE. The works of Juan Gris are most representative of this phase. The major exponents of cubism included Picasso, Braque, Jean Metzinger, Gris, Duchamp, and Leger. Although few painters remained faithful to its tenets, many profited from its discipline. The several sources of cubist inspiration included the later work of Cézanne, the geometric forms and compressed picture space in his paintings appealed especially to Braque, who developed them in his own works. African sculpture, particularly mask carvings, had enormous influence in the early years of the movement. Picasso's *Les Femmes d'Alger* (1907, Mus. of Modern Art, New York City) is one of the most significant examples of this influence. Within this revolutionary composition lay much of the basic material of cubism. The cubist break with the tradition of imitation of nature was completed in the works of Picasso, Braque, and their many groups of followers. The major segments of the cubist movement included the Montmartre-based Bateau-Lavoir group of artists and poets (Max Jacob, Guillaume Apollinaire, Gertrude and Leo Stein, Modigliani, Picabia, Delaunay, Archipenko, and others), the Puteaux group of the Section d'Or salon (J. Villon, Leger, Picabia, Kupka, Marcoussis, Gleizes, Apollinaire, and others), the Orphists (Delaunay, Duchamp, Picabia, and Villon), and the experimenters in collage who influenced cubist sculpture (Laurens and Lipchitz). Although the cubist groups were largely dispersed after World War I, their collective break from visual realism had an enriching and decisive influence on the development of 20th-century art. It provided a new stylistic vocabulary and a technical idiom that remain forceful today. See also ORPHISM and articles on individual artists, e.g., GRIS. See Guillaume Apollinaire, *The Cubist Painters* (1913, tr. 1949), D. H. Kahnweiler,

The Rise of Cubism (1915, tr 1949), A H Barr, Jr, *Cubism and Abstract Art* (1936, repr 1966), Robert Rosenblum, *Cubism and Twentieth-Century Art* (rev ed 1967), Douglas Cooper, *The Cubist Epoch* (1971)

Cuchulain (kōō'hōōlīn), Irish legendary hero of Ulster, of prodigious strength and remarkable beauty. He is the central figure of the Ulster legends, the greatest work of which is the *Táin Bo Cualnge* [the cattle raid of Cooley]. The great feature of this is Cuchulain's stand at a ford on the boundary of Ulster, where he defended single-handedly his province against the armies of the rest of Ireland.

cuckoo, common name for members of the extensive avian family Cuculidae, including the ani and the roadrunner (*Geococcyx californianus*), widely distributed in temperate and tropical regions. Cuckoos are slender-bodied, long-tailed birds with medium to stout down-curved bills, pointed wings, short legs (except in the terrestrial species), and dull (usually grayish brown or rufous) plumage. They are generally insectivorous and arboreal. Of the parasitic Old World cuckoos, the common European cuckoo, *Cuculus canorus*, is typical. The female visits the nests of smaller birds, selecting those whose eggs match hers in color, and replaces an egg of the host with one of her own, she usually lays four or five eggs, each at 48-hr intervals and each in a different nest. The young cuckoo, being larger than its nest mates, displaces them from the nest and becomes the sole recipient of its foster parents' care. Each species of Old World cuckoo has its own unique pattern of parasitism, and different species choose different host species for their eggs. The cuckoo is referred to in the Bible, by Aristotle and Pliny, in mythology, and in English poetry. Its nesting habits have given us the word *cuckold*, and its simple but musical song, which gives it its name, was used by Beethoven in his Pastoral Symphony and is also imitated in the cuckoo clock. The American cuckoos look like attenuated pigeons; they are not parasitic and build flimsy nests of twigs. Typical are the black-billed and yellow-billed (*Coccyzus americanus*) cuckoos, known for their low, chuckling call notes. They frequent and breed at the edges of deciduous woodlands, either species tending the young of the other. These birds are valued as destroyers of harmful insects—particularly the tent caterpillar, which few other birds will eat. There are also western and southern species. Most gregarious of the cuckoos are the anis of the American tropics. The groove-billed ani, from 12 to 14 in (30–35 cm) long, has black plumage with a faint purple gloss. Anis nest colonially, several females together laying as many as 25 eggs in the same nest, and they may breed at any time of the year. Of the ground cuckoos, the roadrunner, or chaparral cock, of the southwest deserts is best known. It feeds mostly on small snakes and lizards, which it pounds to death with its heavy bill and swallows headfirst. The roadrunner speeds over the ground at up to 15 mi (40.3 km) per hr with its long tail extended horizontally, its head down, and its ragged crest erect. Roadrunners are weak fliers and nonmigratory. They build coarse nests in thorny bushes, because they lay at intervals, both eggs and young may appear together in the nest. Also included in the cuckoo family are the coucals, medium to large in size, slow-flying, mostly terrestrial birds of the tropics from Africa to Australia, e.g., the black coucal, *Centropus griffi*. Cuckoos are classified in the phylum CHORDATA, subphylum Vertebrata, class Aves, order Cuculiformes, family Cuculidae.

cucumber, fruit of *Cucumis sativus*, a species of Gourd whose many varieties are descended from a plant native to Asia and Africa. Cucumber is classified in the division MAGNOLIOPHYTA, class Magnoliopsida, order Violales, family Cucurbitaceae.

cucumber tree: see MAGNOLIA

Cucupa Indians: see COCOPA INDIANS

Cúcuta (kōō'kōōtā), city (1968 est pop 167,400), capital of Norte de Santander dept., NE Colombia, near the Venezuelan border, on the eastern cordillera of the Colombian Andes. An industrial city, Cúcuta is the center of a rich coffee, oil, and mineral region. The city was founded in 1733. Simon BOLÍVAR captured Cúcuta in 1813 and set out from there on his march to CARACAS. At Cúcuta the constituent congress of 1821 met to draft the constitution of Greater Colombia (present-day Venezuela, Ecuador, and Colombia). The city was rebuilt after an earthquake in 1875.

Cudahy, Michael (kūd'ahē), 1841–1910, American meat packer, b Co Kilkenny, Ireland. He went (1849) to Milwaukee and after 1856 worked for

meat-packing firms. In the 1870s he introduced refrigeration into the meat-packing industry. He became a partner of Philip D. Armour and later, with his brother John, established a packing company in Omaha, Nebr.

Cudahy, city (1970 pop 22,078), Milwaukee co., SE Wis., an industrial suburb of Milwaukee, on Lake Michigan, inc 1906. It was founded in 1892 by John and Patrick Cudahy as a site for their meat-packing enterprise, which remains a major industry. The city also produces pipe fittings, valves, drop forgings, packaging and bottling machinery, cranes, and truck seats.

Cuddalore or Kudalur (both kūdalōr'), town (1971 pop 101,345), Tamil Nadu state, SE India. It is a port on the Bay of Bengal and a district administrative center. Peanut products, cashew nuts, and sugar are the chief exports. Fort St. David, a stronghold of Tipu Sahib, is a notable architectural monument in Cuddalore.

Cuddapah (kūd'apā), city (1971 pop 66,238), Andhra Pradesh state, S central India. It is a district administrative center and a market for peanuts, cotton, tumeric, and onions. Paint and varnish are manufactured, and asbestos and barite are processed. Melons from the district are famous. The city was part of the Chola empire (11th–15th cent.). Muslims conquered it in 1565, and the British took control in 1800.

Cudworth, Ralph, 1617–88, English theologian and philosopher. He was a noted representative of the CAMBRIDGE PLATONISTS. Cudworth's most ambitious work, *The True Intellectual System of the Universe*, was never completed. The first part, a critique of atheistic materialism, appeared in 1678, and two parts were published posthumously as *A Treatise concerning Eternal and Immutable Morality* (1731) and *A Treatise on Freewill* (1838). In his works Cudworth attacked the materialistic philosophy of Hobbes and maintained the belief that moral ideas are innate in man. See study by J. A. Passmore (1951).

Cuenca (kwēng'ka), city (1970 est pop 77,300), alt c 8,000 ft (2,440 m), S central Ecuador. Founded in 1557, Cuenca is in one of the richest agricultural basins of the Ecuadorian Andes and is the commercial center of S Ecuador. The chief industry is weaving of Panama hats. Cuenca is known as the "marble city" because of its many fine buildings, including the cathedral, government palace, and university.

Cuenca, city (1970 pop 34,485), capital of Cuenca prov., E central Spain, in New Castile, at the confluence of the Huecar and Jucar rivers, c 3,000 ft (910 m) above sea level. This historic town retains its medieval character in the narrow streets, clustered houses, and bridges, the modern, industrial section (timber trade, furniture, pottery, paper, leather) called Curretaria, extends onto the Huecar plain. The city was taken (1177) from the Moors by Alfonso VIII of Castile. Cuenca was badly damaged in the Peninsular War and the Second Carlist War. It has a notable Gothic cathedral (begun 13th cent.). Nearby is the Ciudad Encantada [enchanted city], a fantastic labyrinth of eroded rocks.

Cuenod, Hugues (üg kwānō'), 1902–, Swiss tenor. Cuenod was educated in Lausanne, Basel, and Vienna. Noted for his interpretation of works ranging from Monteverdi to Stravinsky, he was still performing in his 70s.

Cuernavaca (kwārnāvā'ka), city (1970 pop 159,909), capital of Morelos state, S Mexico, in the Cuernavaca Valley. The city has flour mills and beverage, textile, and cement industries. Cuernavaca is also a popular tourist and health resort. In the city are beautiful churches, monasteries, a 16th-century Franciscan convent, a palace built by Hernán Cortés and now decorated with murals by Diego Rivera, and a formal garden that was frequented by Emperor Maximilian and Empress Carlotta. Nearby is the Toltec ruin, Xochicalco, built over limestone caves.

cuesta (kwēs'tā), asymmetric ridge characterized by a short, steep escarpment on one side, and a long, gentle slope on the other. The steep side exposes the edge of erosion-resistant rock layers that form the cuestas. They are usually formed by erosion in plains areas underlain by gently dipping sedimentary rock layers. Cuestas have a more gentle dip than similar structures called HOGBACKS. Along the U.S. Atlantic and Gulf coastal plains are found a series of low subdued cuestas composed of seaward-dipping and poorly cemented Cretaceous and Tertiary sandstones, while the intervening lowlands are underlain by impermeable clays. These conditions produce ideal structures for artesian water supply systems,

which have been extensively tapped by coastal cities. A well-known example of a cuesta is the Niagara cuesta that runs westward across W. New York State and Ontario, then swings northward, forming the peninsula between Lake Huron and Georgian Bay, and finally curves southward, forming the Door Peninsula between Green Bay and Lake Michigan. Following withdrawal of the last Pleistocene ice sheet about 10,000 years ago, Niagara Falls first formed where the Niagara River crosses the Niagara cuesta at Lewiston, N.Y., and Queenston, Ont. Since then, the falls have migrated nearly 7 mi (11 km) southward as a result of undercutting and rockfall, leaving the steep-walled Niagara Gorge to mark its path.

Cueva, Beatriz de la (bāātrēs' dā la kwā'va), d 1541, governor of Guatemala. After the death of her husband, Pedro de ALVARADO, she maneuvered her own election and became the only woman to govern a major American political division in Spanish times. A young, beautiful, and ambitious woman who styled herself the Hapless One (*La Sin Ventura*), she was drowned a few weeks after assuming office in the destruction of Ciudad Vieja by a mysterious flood from the volcano AGUA.

Cueva, Juan de la (hwān), 1550?–1610?, Spanish dramatist, one of the precursors of Lope de Vega. He spent the years from 1574 to 1577 in Mexico. Of his 14 plays, the most famous is the comedy *El infamador* [the scoundrel] (1581). Cueva rejected traditional dramatic unities and introduced national themes to the stage, laying the foundation for the national drama of Spain's Golden Age. His innovations included employing a variety of meters and reducing the comedy to four acts. See study by R. F. Glenn (1973).

Cui, César Antonovich (tsāzar' antō'nōvich kuē'), 1835–1918, Russian composer and critic, a military engineer by profession. As a music critic in St. Petersburg and Paris, he championed the group of nationalist Russian composers known as The Five, consisting of Rimsky-Korsakov, Balakirev, Mussorgsky, Borodin, and himself. Of these, he was the least distinctive composer. He was largely self-taught, and his best works are songs and short salon pieces, which avoid the technical deficiencies of his operas and orchestral music. See V. I. Seroff, *The Mighty Five* (1948), M. O. Zetlin, *The Five* (tr 1959).

Cuiabá (kōōyabā'), city (1970 pop 100,865), capital of Mato Grosso state, W Brazil, at the head of navigation on the Cuiaba River. Founded in the gold rush of the early 18th cent., it has been the state capital since 1818. The city is a trading center for an extensive cattle-raising and agricultural area. Economic development has been hampered by Cuiabá's isolation and by the shortage of labor. The chief means of communication is still the riverboat.

Cuismancu: see CHANCAY

Cujas or Cujacius, Jacques (zhāk kūzhās', kyōōjā'shās), 1522–90, French jurist and scholar of Roman law. He taught at Toulouse, Bourges, and elsewhere. Unlike previous scholars, he was relatively unconcerned with the practical applications of Roman law and wished primarily to study the ancient texts in their relation to history and literature. He is often considered the founder of the historical school of jurisprudence. Much of his critical effort was directed toward reconstructing in the original form the excerpts from eminent Roman jurists quoted in the Corpus Juris Civilis. Cujas prepared critical editions of works of Ulpian and Paulus.

Culbertson, Ely (ē'lē kŭl'bārtson), 1893–1955, American authority on contract bridge, b Rumania. His father was an American engineer then living in Rumania, and his mother was of Russian parentage. Culbertson introduced the first successful system of bidding in contract bridge, wrote numerous books on the game, edited *Bridge World* magazine, wrote a widely read newspaper column on bridge, and won many bridge tournaments. After World War II he wrote and lectured on world peace, setting forth his plans in the book *Must We Fight Russia?* (1946). See his autobiography, *The Strange Lives of One Man* (1940), and his *Contract Bridge for Everyone*, ed by Victor Mollo (rev ed 1969).

Culdees (kaldēz') [Irish, = servants of God], ancient monks of Ireland and Scotland, appearing after the 8th cent. Little is known of their origin, and their relationship to the monks of the Celtic Church, e.g., at Iona, is unclear. They were originally anchorites, but by the time of the reforms of St. Malachy (12th cent.) they had become secular canons living in community. They gained a reputation for extreme laxness. The last Culdee community, at Armagh, was disbanded in 1541.

Culebra Cut: see PANAMA CANAL

Culiacán (kōōlēakan'), city (1970 pop 358,812), capital of Sinaloa state, W Mexico, on the Culiacan River. It is situated on a hot coastal plain that produces tropical fruits, sugarcane, cotton, beans, and maize, cattle-raising is also important. Fine oysters come from the city's Pacific port. Altata Culiacan, founded in 1531, figured prominently in the early Spanish colonial period as a point of departure for northern expeditions, notably that of Francisco Coronado in 1540. Within the city are numerous plazas, an impressive cathedral, and luxuriant tropical gardens.

Cullen, Countee (koun'tē'), 1903-46, American poet, b. New York City, grad. New York Univ. 1925, M.A. Harvard, 1926. A major writer of the Harlem Renaissance—a flowering of Negro artistic and literary talent in the 1920s—Cullen wrote poetry inspired by American Negro life. His technique was conventional, modeled on that of John Keats, and his mood passed from racial pride and optimism in the 1920s to sadness and disappointment in the 1930s. Among his volumes of verse are *Color* (1925), *Copper Sun* (1927), *The Ballad of the Brown Girl* (1927), and *On These I Stand* (1947). See bibliography by Margaret Penny (1971).

Cullman, city (1970 pop 12,601), seat of Cullman co., N Ala., inc. 1875. It is a shipping and trade center for a cotton, timber, and dairy region. Cullman College is there, and St. Bernard College is nearby. Cullman was settled in 1873 by immigrants from Germany.

Culloden Moor (kālōd'an, -lō'dan), moorland in Inverness-shire, NE Scotland, in the Highland region. There, on April 16, 1746, English forces under the duke of Cumberland defeated the Highlanders under Prince Charles Edward Stuart, thus ending the Jacobite uprising of 1745.

Cullum, George Washington (kūl'am), 1809-92, American army officer, b. New York City, grad. West Point, 1833. In the Civil War, Cullum was made a brigadier general of volunteers (Nov. 1861) and served as chief of staff to General Halleck (1861-64) and as superintendent of West Point (1864-66). He is chiefly known for his excellent *Biographical Register of the Officers and Graduates of the U.S. Military Academy* (1850, 3d ed., 3 vol., 1891), which furnishes sketches of the graduates of West Point.

culminate, in astronomy, the maximum height in the sky reached by a celestial body on a given day. At the culminate the body is crossing the observer's CELESTIAL MERIDIAN and is said to be in upper TRANSIT.

Culpeper, Thomas Culpeper, 2d Baron, 1635-89, English colonial governor of Virginia. In 1673, with the earl of Arlington, he was granted all lands in Virginia not previously patented. In addition, Culpeper was granted (1675) the right of succession to the governorship of Virginia and soon replaced Sir William Berkeley. He remained in England and ruled through deputies until 1680, when Charles II required him to go in person to Virginia. His general pardon of all those who had participated in Bacon's Rebellion made him popular for a brief time, but after about four months he returned to England. When disturbances arising out of the low price of tobacco broke out in the colony, he was threatened with removal unless he remained in Virginia. During his second stay (1682-83) Culpeper hanged some of the planters who had destroyed tobacco plants and quarreled violently with the burgesses. Upon leaving the colony again in 1683 he was deprived of the governorship. However, in 1688 he procured from James II a renewal in perpetuity of his vast Northern Neck proprietary (see FAIRFAX OF CAMERON, THOMAS FAIRFAX, 6TH BARON).

cult, ritual observances involved in worship of, or communication with, the supernatural or its symbolic representations. A cult includes the totality of ideas, activities, and practices associated with a given divinity or social group. It includes not only ritual activities but also the beliefs and myths centering on the rites. The objects of the cult are often things associated with the daily life of the celebrants. The English scholar Jane Harrison pointed out the importance of the cult in the development of religion. Sacred persons may have their own cults. The cult may be associated with a single person, place, or object or may have much broader associations. There may be officials entrusted with the rites, or anyone who belongs may be allowed to take part in them.

cultivation, tilling or manipulation of the soil, done primarily to eliminate weeds that compete with crops for water and nutrients. Cultivation may be used in crusted soils to increase soil aeration and

infiltration of water, it may also be used to move soil to or away from plants as desired. Cultivation among crop plants is best kept at a minimum, excessive cultivation can be harmful as it may cause root pruning and loss of soil water due to increased evaporation.

cultivator, agricultural implement for stirring and pulverizing the soil, either before planting or to remove weeds and to aerate and loosen the soil after the crop has begun to grow. The cultivator usually stirs the soil to a greater depth than does the HARROW. See CULTIVATION.

culture, in anthropology, the way of life of a society. The scientific use of the term was established by Sir Edward Burnett Tylor in the late 19th cent. The concept of culture has proved so useful that it has spread to the other social sciences, to the humanities, and to the biological sciences. The concept of culture is used to distinguish human societies from animal groups. The customs, ideas, and attitudes shared by a group, which make up its culture, are transmitted from generation to generation by learning processes rather than biological inheritance. Adherence to these customs and attitudes is regulated by systems of rewards and punishments peculiar to each culture. Language and other symbolic media are the chief agents of culture transmission, but many behavior patterns are acquired through experience alone. A pattern of cultural universals is found in all societies. It includes such human institutions as social organization, religion, structure, economic organization, and material culture (tools, weapons, clothing). Societies are differentiated according to the degree of complexity of cultural organization. Basically, each human group has its own distinctive culture, but a complex society may contain subcultures determined by national origin, religion, or social status. Conversely, a common culture may be adopted by several different societies through peaceful or enforced culture contact. This involves acculturation, the process whereby the members of one group adopt the customs of another. The spread of culture traits through direct or indirect contact among groups is called diffusion. A culture area is the territory within which a certain configuration of culture traits is to be found. The two theories of culture that have dominated anthropological thought in the 20th cent are the structural-functional theory derived from Bronislaw Malinowski and the pattern-process theory derived from Franz Boas. Structural-functional theory focuses on social structure, while pattern-process theory emphasizes cultural patterns. Each theory attempts to explain all aspects of culture, and each is applied to all cultures. All anthropologists, however, recognize certain broad evolutionary sequences in the cultural history of mankind, particularly in the technological and economic spheres. These stages of development have not occurred everywhere at the same time, nor have all cultures passed through all of them. One or more stages may be skipped through culture contact or acculturation. The first stage is that of the food collectors—fishers, hunters, and vegetation gatherers who live in small migratory groups, following the food supply and camping in caves or temporary shelters, as in the Paleolithic and Mesolithic periods. The next stage is that of the food producers, who have learned to domesticate plants and animals and who live in settled villages, an example is the culture of the Neolithic period. This stage leads to the rise of urban centers, as in the great historic civilizations of the world. In classifying a contemporary culture according to its stage of development, its technological level should not be considered alone. The food collectors of the 20th cent., such as the Australian aborigines, cannot be equated with the Paleolithic hunters of 25,000 years ago, for the Paleolithic systems of kinship and religion, for example, were quite different. See Ruth Benedict, *Patterns of Culture* (1934), A. L. Kroeber and Clyde Kluckhohn, *Culture: A Critical Review of Concepts and Definitions* (1952), Margaret Mead, ed., *Cultural Patterns and Technical Change* (1953), Ralph Linton, *The Tree of Culture* (1955), Jack Lindsay, *A Short History of Culture* (1962), Ashley Montagu, ed., *Culture* (1968), P. L. Wagner, *Environments and Peoples* (1972).

Culver City, city (1970 pop 31,035), Los Angeles co., S Calif., a residential suburb of Los Angeles, inc. 1917. It is a center of the U.S. motion-picture industry, which began in the city c. 1915. The city's chief industrial products are electronic and aerospace equipment. West Los Angeles Univ. College of Law, a private law school, and a junior college are in Culver City. Directly south of the city is Los Angeles International Airport.

Culver's root: see FIGWORT

Cumae (kyōō'mē), ancient city of Campania, Italy, near Naples. According to Strabo, it was the earliest Greek colony in Italy or Sicily, and it seems to have been founded c. 750 B.C. by Chalcids. The area has yielded earlier non-Greek archaeological finds. Cumae founded a number of colonies and grew to be a great power. It repulsed Etruscan and Umbrian attacks, but fell in the late 5th cent. B.C. to the Samnites. Cumae supported Rome in the 2d cent. B.C. and adopted Roman culture, ultimately its inhabitants became Roman citizens. As neighboring cities rose to power, Cumae declined, although it did not disappear until the 13th cent. A.D. There are extensive Greek and Roman ruins, and the cavern where the famed Cumaean Sibyl (the priestess of Apollo mentioned by Vergil) uttered her prophecies may still be seen.

Cumaná (kōōmana'), city (1970 est. pop. 100,000), capital of Sucre state, NE Venezuela, on the Manzanares River near its mouth on the Gulf of Cariaco, an inlet on the Caribbean Sea. Coffee, tobacco, cacao, and sugar are exported. Founded in 1521 to exploit the pearl fisheries near Margarita island, Cumaná was often raided by the Dutch and British in the 16th and 17th cent. Frequently a victim of earthquakes, the city was severely damaged in 1929.

Cumans or Kumans (both kōō'manz), nomadic East Turkic people, identified with the Kipchaks (or the western branch of the Kipchaks) and known in Russian as Polovtsi. Coming from NW Asiatic Russia, they conquered S. Russia and Walachia in the 11th cent., and for almost two centuries warred intermittently with the Byzantine Empire, Hungary, and Kiev. They founded a nomadic state in the steppes along the Black Sea, and were active in commerce with the Orient and Venice. In the early 12th cent. the main Cuman forces were defeated by the Eastern Slavs. The Mongols decisively defeated the Cumans c. 1245. Some were sold as slaves, and many took refuge in Bulgaria and also in Hungary, where they were gradually assimilated into the Hungarian culture. Others joined the khanate of the Golden Horde (also called the Western Kipchaks), which was organized on the former Cuman territory in Russia.

Cumberland, Richard, 1631-1718, English philosopher. He was bishop of Peterborough from 1691. In his *De legibus naturae* [on natural laws] (1672) he first propounded the doctrine of utilitarianism and opposed the egoistic ethics of Thomas Hobbes.

Cumberland, Richard, 1732-1811, English dramatist, great-grandson of the 17th-century philosopher Richard Cumberland. His family connections earned him a clerical position with the British board of trade. The author of over 40 plays, he was most successful with his sentimental comedies, the best of which are *The Brothers* (1769) and *The West Indian* (1771). He also wrote two seldom read novels, *Arundel* (1789) and *Henry* (1795), and an autobiography (1806-7).

Cumberland, William Augustus, duke of, 1721-65, British general, third son of George II. Entering the army shortly before the outbreak (1740) of the War of the Austrian Succession, he was defeated by the French at Fontenoy (1745). Returning to England to put down the 1745 rising of the JACOBITES, he defeated Prince Charles Edward Stuart at Culloden Moor (1746) and earned the nickname "the Butcher" by his ruthless punishment of the rebels. Once more on the Continent, he averted the fall of Maastricht but was again defeated by the French in 1747. In the Seven Years War he signed (1757) a capitulation to the French (the Convention of KLOSTER ZEVEN) for which he was dismissed. See two biographical studies by Evan Charteris (1913, 1925).

Cumberland, county (1971 pop 71,497), 1,520 sq mi (3,937 sq km), N England, bordering on the Irish Sea to the west, Solway Firth to the north and west, and Scotland to the north. The county town is CARLISLE. The region, with adjacent Westmorland and N Lancashire, includes the area known as the LAKE DISTRICT. Cumberland is largely mountainous in the south and central area and low in the west, east, and north. Scafell Pike (3,210 ft/978 m) is the highest point in England. The chief streams are the Derwent, the Eden, and the Esk. Cumberland is a pastoral region (sheep and cattle grazing) with some crop farming. Coal and iron mining are important along the west coast. Other industries are quarrying (granite, limestone, and slate), chemical and textile manufacturing, and smelting. Tourism is important in the Lake District. There are nuclear-power plants at Windscale and Calder Hall. In 1974, Cumberland

became part of the new nonmetropolitan county of Cumbria. The district has remains of the great walls built during the Roman occupation. Cumberland was the scene of many centuries of border strife between England and Scotland.

Cumberland. 1 City (1970 pop 29,724), seat of Allegany co., NW Md., on the North Branch of the Potomac, settled 1750, inc 1815. It is an important railroad and shipping center for a coal-mining area. Its manufactures include textiles, synthetic fibers, tires, glass, metal products, petrochemicals, propellants, and plastics. Cumberland grew around the site of a trading post established (1750) by the Ohio Company at a natural gateway through the Appalachians to the Ohio valley. Fort Cumberland (built 1754) was the base of operations for the ill-fated Braddock expedition (1755) against the French and Indians and the site of Washington's first military headquarters (1757). The city became the eastern terminus of the Cumberland Road, or NATIONAL ROAD, a division point for the Baltimore & Ohio RR, and the western terminus of the Chesapeake and Ohio Canal (completed 1850), which now runs through Green Ridge State Forest. Other local attractions include the old toll gate house (1833) and the Narrows, a magnificent gorge through the Appalachians to the Ohio valley. A junior college is in the city and Frostburg State College is to the west. 2 Town (1970 pop 26,605), Providence co., NE R.I., on the Blackstone River and the Mass. line, included in Massachusetts until 1746, inc as a R.I. town 1747. Its manufactures include textiles and metal and fiber-glass products. The Ballou Meetinghouse dates from c 1740.

Cumberland, river, 687 mi (1,106 km) long, rising in E Ky. and winding generally SW through Ky and Tenn., then NW to the Ohio River near Paducah, Ky., drains c 18,500 sq mi (47,910 sq km). Locks and canals make the river navigable for small craft for much of its length. The river's upper course flows through the rugged, forested coal-mining region of SE Kentucky, where its valley is a main transportation route. The central section of the river passes through the Nashville Basin, an agricultural region and the site of Nashville, Tenn. The Tennessee Valley Authority markets hydroelectric power produced by dams on the Cumberland and its tributaries, including Wolf Creek Dam, Ky. (270,000-kw capacity), which impounds Lake Cumberland, Dale Hollow Dam (\$4,000 kw), Center Hill Dam (135,000 kw), and Barkley Dam (130,000 kw). The Cumberland valley was the scene of several important Civil War battles (see FORT DONELSON).

Cumberland Gap, natural passage through Cumberland Mt., near the point where Virginia, Kentucky, and Tennessee meet. The gap was formed by the erosive action of a stream that once flowed there. It was discovered and named in 1750 by Dr. Thomas Walker, leader of a land company exploration party. Daniel Boone's WILDERNESS ROAD ran through the gap. A strategic point in the Civil War, the gap was held alternately by Confederate and Union forces. Cumberland Gap National Historic Park was established there in 1955 (see NATIONAL PARKS AND MONUMENTS, table).

Cumberland Island National Seashore, Ga. see NATIONAL PARKS AND MONUMENTS, table.

Cumberland Plateau or **Cumberland Mountains**, southwestern division of the Appalachian Mt. system, extending northeast to southwest through parts of West Virginia, Virginia, Kentucky, and Tennessee into N Alabama, Black Mt., Ky., is the highest point (4,145 ft/1,263 m). On the east the plateau rises sharply from the Great Valley of E Tennessee, on the west the slope is rough and broken. The plateau is the source of the Cumberland River and several tributaries of the Tennessee. The surrounding region, which is sparsely populated, yields various minerals, especially coal. The coal is strip-mined, the removal of surface material and the building of unsightly spoil dumps have killed vegetation and interfered with stream flow by causing accelerated erosion and flooding. Cumberland Gap provides a natural passage through Cumberland Mt., a ridge of the plateau.

Cumberland Presbyterian Church, branch of the Presbyterian Church in the United States founded in 1810. In 1906 many of its congregations were united with the main body of the church. It began as a revival movement in the "Cumberland country," a newly settled region of Kentucky and Tennessee. The Negro members organized separate churches, and in 1869 they were legally set apart as the Colored Cumberland Presbyterian Church. The church has a combined membership of c 90,000.

Cumberland Road. see NATIONAL ROAD.

Cumberland Valley, 75 mi (121 km) long and from 15 to 20 mi (24-32 km) wide, part of the great Appalachian valley, between the Potomac and Susquehanna rivers, W Md. and S Pa. It is a fertile farming area that is now becoming urbanized, Chambersburg and Carlisle, Pa., and Hagerstown, Md., are in the valley.

Cumbernauld, new town and burgh (1971 pop 31,784), in the detached, eastern portion of Dunbartonshire, Glasgow. Cumbernauld, the 15th of Britain's NEW TOWNS, was designated in 1955 to alleviate Glasgow's growth problems. Its population target was set at 70,000, anticipating that 80% of the immigrants would come from Glasgow. Cumbernauld's industries include food processing and the manufacture of adding machines and adhesive products. It was the first new town in which automobile traffic was adequately anticipated and provided for. Wherever possible, vehicular roads were completely separated from pedestrian ways. Under the local government act of 1973, Cumbernauld was included in the new region of Strathclyde.

Cumbria, nonmetropolitan county (1972 est pop 476,000), extreme NW England, created under the Local Government Act of 1972 (effective 1974). It is composed of the county boroughs of Barrow-in-Furness and Carlisle, the former counties of Cumberland and Westmorland, and parts of the former counties of Lancaster and Yorkshire (West Riding).

Cumbrian Mountains, mountains of the Lake District, NW England, Scafell Pike (3,210 ft/978 m) is the highest point. Studded with lakes and narrow valleys, the range extends through Cumberland, Westmorland, and N Lancashire.

cumin or **cummin** (both kŭm'ĭn), low annual herb (*Cuminum cyminum*) of the family Umbelliferae (CARROT family), long cultivated in the Old World for the aromatic seedlike fruits. The fruits resemble the related caraway and are similarly used in cooking. Cumin is an ingredient of curry powder, the oil is used for liqueurs and in veterinary practice and was formerly used in medicine. Cumin is mentioned in the Bible. For black cumin, see LOVE-IN-A-MIST. Cumin is classified in the division MAGNOLIOPHYTES, class Magnoliopsida, order Umbellales, family Umbelliferae.

Cumming, John: see COMYN, JOHN.

cummings, e e (Edward Estlin Cummings), 1894-1962, American poet, b. Cambridge, Mass., grad Harvard, 1915. His poetry, noted for its eccentricities of typography, language, and punctuation, usually seeks to convey a joyful, living awareness of sex and love. Among his 15 volumes of poetry are *Tulips and Chimneys* (1923), *Is 5* (1926), and *95 Poems* (1958). A prose account of his war internment in France, *The Enormous Room* (1922), is considered one of the finest books ever written about World War I. Cummings was also an accomplished artist whose paintings and drawings were exhibited in several one-man shows. See his *Complete Poems, 1913-1962* (2 vol., 1972), studies by B. A. Marks (1964) and Norman Friedman, comp. (1972).

Cummings, Homer Stille, 1870-1956, American lawyer, U.S. Attorney General, b. Chicago. He practiced law in Stamford, Conn., where he was mayor three times. He rose to prominence in the state Democratic organization, served as a state representative on the Democratic National Committee, (1900-1925), and was chairman of the National Committee (1919-20). When Thomas J. Walsh, whom President Franklin Delano Roosevelt had named Attorney General, died just before the inauguration in 1933, Cummings was given a temporary appointment to fill the position. The appointment was made permanent in April, 1933, and he served until 1939.

cumingtonite (kŭm'ĭngtənīt) see AMPHIBOLE.

Cummins, Albert Baird, 1850-1926, U.S. Senator from Iowa (1909-26), b. Green co., Pa. He studied law in Chicago and in 1878 joined his brother in practice in Des Moines. As governor of Iowa (1901-8), Cummins worked to break up railroad domination in politics and to inaugurate progressive policies in the state. He was elected (1908) to the U.S. Senate and was co-author there of the Esch-Cummins Transportation Act of 1920.

cumulonimbus, see CLOUD.

cumulus: see CLOUD.

Cunard, Sir Samuel (kyōōnārd'), 1787-1865, Canadian pioneer of regular transatlantic steam navigation, b. Halifax, N.S. The son of a United Empire Loyalist, he became a leading businessman of Nova Scotia and engaged in banking, lumbering, shipping and shipbuilding enterprises. His fleet at one

time numbered some 40 vessels. He was interested in the development of steam navigation and owned shares in the *Royal William*, the first Canadian steamer to cross the Atlantic (1833) from Canada to England. When the British government invited bids (1838) for carrying mail to and from Liverpool, Halifax, and Boston, Cunard went (1839) to England and presented to the admiralty such carefully considered plans for a line of steamships that he received the contract. In association with others, he formed the British and North American Royal Mail Steam Packet Company, which in 1840 placed four ships in operation, establishing the first regular steamship service between the continents. This was the beginning of the noted Cunard Line. See F. E. Dodman, *Ships of the Cunard Line* (1955).

Cunaxa (kyōōnāk'sā), ancient town of Babylonia, near the Euphrates River, NE of Ctesiphon. It was the scene of a battle (401 B.C.) between CYRUS THE YOUNGER and ARTAXERXES II, described by XENOPHON in the *Anabasis*. CLEARCHUS, Spartan mercenary leader under Cyrus, chose to attack the Persian left wing (under Tissaphernes), which he completely routed and pursued. When he and his Ten Thousand returned, they found that Cyrus had fought hard in the center, had broken Artaxerxes' bodyguard, but in the moment of victory had been killed. Cyrus' army, demoralized, had broken up, and the Persians had taken the field. The retreat of the Ten Thousand northward is the most famous feature of the campaign.

cuneiform (kyōōnē'fōrm) [Lat. = wedge-shaped], system of WRITING developed before the last centuries of the 4th millennium B.C. in the lower Tigris and Euphrates valley, probably by the Sumerians. The characters consist of arrangements of wedge-like strokes generally impressed with a stylus on wet clay tablets, which were then dried or baked. The history of the script is strikingly parallel to that of the Egyptian HIEROGLYPHIC (see also ALPHABET and INSCRIPTION). The normal Babylonian and Assyrian writing used a large number (300-600) of arbitrary cuneiform symbols for words and syllables, some

pictograph original	pictograph as positioned in later cuneiform	early Babylonian cuneiform	Assyrian	meaning
				heaven god
				earth
				woman
				to drink
				fish
				sun day
				donkey
				orchard
				to plow to till

Examples of the development of cuneiform

had been originally pictographic. There was an alphabetic system, too, making it possible to spell a word out, but because of the adaptation from Sumerian, a different language, there were many ambiguities. A single symbol could be used to represent a concept, an object, a simple sound or syllable, or to indicate the category of words requiring additional definition. Cuneiform writing was used outside Mesopotamia also, notably in ELAM and by the Hittites (see ANATOLIAN LANGUAGES). There are many undeciphered cuneiform inscriptions, apparently representing several different languages. Cuneiform writing declined in use after the Persian conquest of Babylonia (539 B.C.), and after a brief renaissance (3d-1st cent. B.C.) ceased to be used in Mesopotamia. A very late use of cuneiform writing was that of the Persians, who established a syllabary for Old Persian. This is the writing of the Achaemenids (mid-6th cent. B.C.-4th cent. B.C.), whose greatest monument is that of Darius I at Behistun. Key discoveries of cuneiform inscriptions have been made at Nineveh, Lagash, Erech, Tel el Amarna, Susa, and Bogazköy. Two great names in the interpretation of cuneiforms are those of Sir Henry C. RAWLINSON and G. F. GROTEFEND. See Edward Chiera, *They Wrote on*